MASTER OF SCIENCE IN
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PROJECT

INVESTMENT POLICY STATEMENT FOR INDIVIDUAL INVESTORS:
MR. & MRS. GREY

KIRTAN SHRESTHA

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SUPERVISOR'S NAME

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Acknowledgements

Abstract

This Investment Policy Statement (IPS) is a formal document that establishes a structured investment framework and serves as a communication mechanism between the client and advisor, ensuring clarity, alignment, and accountability in all investment decisions.

It is developed for a Swiss couple, Mr. and Mrs. Grey, with a moderately conservative risk profile, who seek to invest a CHF 500,000 inheritance over a 15-year horizon, targeting a real annual return of 5.17%. The investment objective is to grow the portfolio to CHF 1,064,331 in order to fully repay their mortgage and accumulate capital for their child's education and discretionary early retirement.

The investment philosophy follows a passive, factor-aware, and behaviourally aligned approach, emphasizing long-term discipline, global diversification, and implementation simplicity through a carefully screened universe of low-cost, physically replicated ETFs. The portfolio reflects structural and factor-based tilts emerging from ETF screening and constraint-driven optimization. The final portfolio is constructed using Mean-Variance Optimization and corresponds to the Tangency Portfolio, offering the highest Sharpe ratio on the efficient frontier, with a projected real annual return of 5.94% and annualized volatility of 7.8%.

Risk is assessed using Value at Risk (VaR), Monte Carlo simulation, and a structured risk assessment matrix to evaluate downside exposure and ensure alignment with the client's risk profile.

JEL classification: C6; G11

Keywords: IPS; Individual Investor; Multi-Asset Portfolio; Asset Management; Portfolio Optimization; Factor Tilts; ETF Strategy; Behavioural Finance; Mean Variance Theory; Risk Analysis

Resumo

Esta Declaração de Política de Investimento (DPI) é um documento formal que estabelece uma estrutura de investimento e serve como mecanismo de comunicação entre o cliente e o consultor, garantindo a clareza, o alinhamento e a responsabilidade em todas as decisões de investimento.

Foi desenvolvido para um casal suíço, o Sr. e a Sra. Grey, com um perfil de risco moderadamente conservador, que procuram investir uma herança de 500.000 francos suíços num horizonte de 15 anos, visando um retorno anual real de 5,17%. O objetivo do investimento é aumentar o portefólio para 1.064.331 francos suíços para pagar integralmente a hipoteca e acumular capital para a educação dos filhos e para a reforma antecipada discricionária.

A filosofia de investimento segue uma abordagem passiva, consciente dos fatores e alinhada com o comportamento, enfatizando a disciplina a longo prazo, a diversificação global e a simplicidade de implementação através de um universo cuidadosamente selecionado de ETFs de baixo custo e fisicamente replicados. O portefólio reflete inclinações estruturais e baseadas em fatores decorrentes da triagem de ETFs e da otimização orientada por restrições. O portfólio final é construído utilizando a Otimização de Média-Variância e corresponde ao Portfólio de Tangência, oferecendo o maior rácio de Sharpe na fronteira eficiente, com um retorno real anual projetado de 5,94% e uma volatilidade anualizada de 7,8%.

O risco é avaliado através do Valor em Risco (VaR), simulação de Monte Carlo e uma matriz de avaliação de risco estruturada para avaliar a exposição negativa e garantir o alinhamento com o perfil de risco do cliente.

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Abbreviations

AI	Artificial Intelligence
AUM	Asset Under Management
AWCI	All Country World Index
BNP	Banque Nationale de Paris
CHF	Swiss Francs
CMA	Capital Market Assumption
CML	Capital Market Line
CVaR	Conditional Value at Risk
ECB	European Central Bank
ES	Expected Shortfall
ESG	Environmental, Social and Governance
ETF	Exchange Traded Fund
EU	European Union
EUR	Euro
FED	Federal Reserve System
FX	Foreign Exchange
GBP	Great British Pound
GDP	Gross Domestic Product
GICS	Global Industry Classification Standard
IMF	International Monetary Fund
IPS	Investment Policy Statement
ISIN	International Securities Identification Number
KYC	Know Your Client
MSCI	Morgan Stanley Capital International
MV	Minimum Variance
MVO	Mean Variance Optimization
REIT	Real Estate Investment Trust
RL	Return Level
SAA	Strategic Asset Allocation
TIPS	Treasury Inflation Protected Securities
UCITS	Undertakings for Collective Investment in Transferable Securities
US	United States
USA	United States of America
USD	United Staes Dollar
VaR	Value at Risk

1. Scope & Purpose

This Investment Policy Statement (IPS) provides a structured, client-centric framework for managing the investment portfolio of Mr. and Mrs. Grey, a married couple residing in Switzerland. In 2025, the couple received an inheritance of CHF 500,000, which serves as an initial capital governed by this policy to achieve a set of clearly defined financial goals.

The IPS guides all investment decisions in alignment with the clients' long-term objectives, moderately conservative risk tolerance, and any specific constraints or preferences they have communicated. It establishes a disciplined foundation for constructing and managing an investment strategy that reflects their financial circumstances, investment horizon, and behavioural profile. The document ensures that all decisions are consistent, transparent, and goal-driven, outlining the investment approach, asset allocation framework, and security selection in accordance with the clients' profile and objectives.

It follows best practices in discretionary investment management, including adherence to suitability and know-your-client (KYC) standards (CFA Institute, 2024). The strategy is grounded in the principles of Modern Portfolio Theory (Markowitz, 1952), which emphasizes diversification, long-term risk management, and alignment with client-specific return requirements. These principles advocate for portfolio design based on investor characteristics rather than market speculation. Behavioural finance insights are also incorporated to ensure the approach is both analytically robust and behaviourally sustainable.

The strategy aims to build a globally diversified, multi-asset portfolio capable of delivering competitive performance while remaining aligned with the clients' goals and constraints.

In managing the portfolio, the advisor will act in a fiduciary capacity, always prioritizing the clients' best interests in accordance with prudent investor standards. Serving as a long-term strategic roadmap for the next 15 years, the IPS promotes consistent and accountable decision-making, with periodic reviews to ensure continued alignment with the clients' evolving financial needs and objectives. To support this, the IPS follows a structured progression, beginning with risk profiling, advancing through investment design and portfolio construction, and concluding with governance and a final summary.

2. Risk Profiling

2.1. Context

The investment environment in which this strategy is developed is characterized by persistently low interest rates, a long-duration mortgage liability, and a stable dual-income household. These macroeconomic and household-level conditions materially influence the rationale and timing of capital deployment decisions.

In 2023, Mr. and Mrs. Grey purchased a second residential property in Switzerland valued at CHF 2 million. The acquisition was financed through a CHF 1.6 million fixed-rate mortgage with a 30-year term at an annual interest rate of 1.5%. As of 2025, the couple has successfully completed two years of scheduled repayments. The mortgage is comfortably serviced through a combination of salaried employment and recurring rental income, reflecting the household's strong cash flow position and prudent financial management.

In early 2025, the clients received an inheritance of CHF 500,000. After careful financial consideration, they chose not to apply the funds toward early mortgage repayment. With a fixed interest rate of just 1.5% on their long-term mortgage, the cost of borrowing remains low and predictable. In contrast, capital markets offer the potential for significantly higher long-term returns. By investing the inheritance over a 15-year horizon, the clients aim to outperform the savings they would achieve by reducing debt early. This decision reflects a disciplined, goal-based strategy, redirecting capital from a low-yield liability into a diversified investment portfolio designed to accumulate sufficient funds and repay the full mortgage balance by 2039. While also, contributing toward other long-term goals such as education funding and early retirement, and preserving financial flexibility along the way.

This intertemporal capital allocation represents a deliberate shift from passive debt reduction to proactive wealth generation. Rather than minimizing liabilities with limited financial benefit, the clients have chosen to pursue capital growth through disciplined market participation. This decision reflects a rational response to current financial conditions, specifically the availability of low-cost, long-term debt and the higher expected returns offered by diversified investment portfolios. In this context, the clients' financial position and investment horizon support a structured, goal-oriented strategy focused on compounding returns, capital sufficiency, and behavioural alignment over time.

2.2. The Investor

Mr. and Mrs. Grey, both aged 35 are working professionals with reliable earnings and supplementary income from rental properties. Mr. Grey is a practicing physician, while Mrs. Grey works as a secondary school teacher. The couple has one dependent child and in addition to the mortgage obligation, anticipates future expenses related to education and lifestyle enhancement. Both individuals demonstrate a moderate level of financial literacy, having previously engaged in direct equity investments. Although they currently hold no market-based financial assets, their experience has informed a clear set of investment preferences. Specifically, they favour transparent, low-cost vehicles with a strong emphasis on diversification and simplicity. They have expressed a consistent behavioural orientation toward clarity and stability, displaying limited appetite for tactical shifts, leverage, or high-complexity products.

Their profile suggests a preference for long-term investment strategies that minimize behavioural friction and support disciplined adherence through economic and market cycles. As such, they are well-suited to a passive, globally diversified portfolio that offers exposure to compensated risk factors without relying on frequent intervention or speculative decision-making.

2.3. Investment Objective

The clients' primary investment objective is to accumulate sufficient capital to fully repay and extinguish the remaining balance of their mortgage estimated at CHF 795,158 by the end of a 15-year investment horizon. Achieving this target represents a major milestone in their long-term financial independence. In addition to this goal, the clients have articulated two secondary objectives: (i) saving CHF 100,000 to support their child's future education, and (ii) allocating CHF 100,000 for discretionary travel in early retirement. The aggregate real capital requirement to meet all objectives is CHF 1,064,331 by 2039.

2.4. Return, Distribution and Risk Requirements

To determine the required return, a compound growth analysis is conducted. The goal is to grow CHF 500,000 into CHF 1,064,331 over 15 years. This is calculated using a standard future value formula, where the implied real rate of return is approximately 5.17% per annum. This

reflects the annualised rate of growth needed to meet both fixed and inflation-sensitive targets in real terms.

Of the total capital objective, CHF 795,158 is allocated to repaying a fixed-rate mortgage, which is a nominal liability. However, the two secondary goals, CHF 100,000 for future education costs and CHF 100,000 for retirement travel, represent future expenditures that are expected to be affected by inflation. As a result, while the mortgage target remains fixed, the overall portfolio must be designed to preserve purchasing power. Consequently, the total investment requirement is treated as a real capital goal, and the associated return objective is expressed on a real (inflation-adjusted) basis.

Considering Switzerland's historically low inflation environment, the return assumption is anchored on real performance, meaning after inflation. According to data from the International Monetary Fund (2025), Switzerland's projected inflation rate for 2030 is 0.7%. Additionally, data compiled by The Global Economy (2025) indicates that the long-term average inflation rate from 1980 to 2030 stands at 1.44%. Consequently, the assumption of a 2.0% inflation rate in this analysis represents a deliberately conservative estimate, designed to ensure robustness against moderate inflation volatility while remaining aligned with historical trends.

Given the clients' stable employment income and recurring rental cash flows, there are no anticipated liquidity needs during the investment period. This enables a fully invested portfolio strategy, maximizing the benefits of long-term compounding without the need to hold idle cash or generate distributions.

To guide portfolio construction and ongoing evaluation, the investment strategy incorporates quantitative risk management tools, including Value at Risk (VaR), Monte Carlo simulation, and scenario stress-testing. These methods are used not only to assess expected volatility but also to estimate shortfall probabilities against a conservative reference point aligned with the clients' perceived downside sensitivity.

The portfolio's design is directly informed by these return and risk parameters, ensuring alignment with the clients' long-term objectives while maintaining overall risk efficiency.

2.5. Investors Risk Tolerance

Understanding both risk tolerance (the willingness to accept risk) and risk capacity (the financial ability to bear it) is essential in designing an investment strategy that is both technically sound and behaviourally sustainable. For Mr. and Mrs. Grey, these dimensions are

not fully symmetrical, which carries direct implications for portfolio construction and expected responses under market stress.

A formal risk profiling assessment was conducted using the Risk Assessment Questionnaire (Table A2 in the Appendix), structured in accordance with the principles outlined in the CFA Institute's Investment Risk Profiling framework (CFA Institute, 2020). The results place the clients in the moderately conservative risk quadrant, suggesting a willingness to accept some market volatility in pursuit of long-term financial goals, but with a strong preference for capital stability and behavioural simplicity. These findings indicate openness to capital market exposure, but with clear limits on volatility tolerance and downside risk. Qualitative responses further support this profile: while the clients recognise the long-term benefits of investing, they maintain a strong preference for capital preservation, low portfolio complexity, and a predictable investment journey.

From a financial capacity perspective, the clients are well-positioned to assume investment risk. They maintain stable, high-income employment, have no short- or medium-term liquidity needs, and benefit from positive household cash flow. Furthermore, their long investment horizon of 15 years increases their capacity to absorb temporary market downturns without compromising financial objectives.

However, their psychological tolerance remains more conservative. The clients expressed discomfort with sharp drawdowns and are particularly sensitive to pronounced underperformance. Their mortgage interest rate of 1.5% was informally referenced as a useful comparison point, reflecting a behavioural comfort zone rather than a formal performance benchmark. In this context, it is employed in Roy's Safety-First Criterion as a conservative diagnostic tool within the stress-testing framework, providing supplementary insight into the portfolio's downside risk profile under adverse conditions. This behavioural anchor reinforces the need for a strategy that prioritizes downside protection and avoids significant fluctuations, even if such moves are temporary and statistically normal.

The asymmetry between risk capacity and tolerance calls for a balanced investment approach, one that avoids excessive equity exposure or speculative positioning, while still maintaining sufficient growth orientation to meet long-term goals. The portfolio must be resilient enough to navigate adverse market conditions without provoking emotional responses that could lead to premature changes in strategy.

As such, the risk framework will focus not only on traditional volatility metrics, but also on behavioural consistency, capital sufficiency, and exposure management. This ensures that the investment plan remains sustainable both financially and emotionally across the full investment horizon.

2.6. Constraints

Several structural and behavioural constraints shape the design and implementation of the investment strategy, ensuring that it remains both suitable and sustainable over the full investment horizon.

The first and most fundamental constraint is the 15-year investment horizon, extending from 2025 to 2039. This long-term framework supports the inclusion of growth-oriented assets and justifies exposure to moderate market volatility, provided that the portfolio remains within the bounds of the clients' risk tolerance.

Liquidity constraints are minimal. The clients do not anticipate needing to draw from the portfolio during the investment period, as their ongoing income is sufficient to cover all expected expenditures. This enables a fully invested strategy, maximizing the compounding potential of long-term capital markets without the drag of liquidity buffers.

From a legal and tax perspective, the clients are subject to the standard framework of Swiss jurisdiction. There are no reported complexities that would influence asset selection or reporting.

The clients have not expressed any ethical or ESG-specific preferences. As such, the portfolio does not apply exclusion screens or thematic filters based on environmental, social, or governance criteria.

A key implementation constraint is the clients' strong preference for instrument simplicity and transparency. Investment vehicles are limited to physically replicated exchange-traded funds (ETFs), with UCITS-compliant structures prioritized.[1] Synthetic instruments, leveraged products, and structured notes are excluded due to their opacity and behavioural incompatibility. All instruments must demonstrate sufficient liquidity, institutional-scale assets under management (AUM), and low tracking error relative to their respective benchmarks.

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[1] UCITS (Undertakings for Collective Investment in Transferable Securities) is a European regulatory framework designed to protect investors through standardised rules on liquidity, transparency, and risk management.

Additionally, the clients have expressed a clear preference for gaining investment exposure beyond Switzerland and Europe, seeking to benefit from the risk-adjusted return potential of global capital markets. As a result, a constraint is imposed to prevent over-concentration in any single geography, sector, or asset class. Portfolio exposures are diversified across developed and emerging markets, with regional and currency risks actively monitored to maintain alignment with the clients' Swiss Franc-denominated liabilities and moderate-conservative risk profile.

Collectively, these constraints provide a disciplined framework that governs investment decisions and ensures alignment with the clients' financial position, behavioural profile, and strategic objectives. A detailed breakdown of implementation constraints is provided in Table A3 in the Appendix.

2.7. Other Considerations

Beyond quantifiable financial objectives and constraints, the clients' behavioural tendencies and psychological preferences play a critical role in portfolio sustainability.

Mr. and Mrs. Grey exhibit a clear aversion to tactical trading, speculative strategies, and complex instruments, favouring intuitive, straightforward structures. This behavioural disposition heightens their sensitivity to excessive short-term volatility, portfolio drawdowns, and strategies that deviate from intuitive logic or clear structure.

To promote long-term adherence and mitigate the risk of emotionally driven decision-making, the investment strategy is implemented using a passive, rules-based approach. Asset allocation emphasizes diversified exposure to rewarded risk factors and excludes strategies that rely on market timing or discretionary security selection. Instruments are selected not only for return potential but also for their ability to deliver consistency, transparency, and low behavioural friction.

These considerations underscore that the success of the investment plan depends as much on behavioural alignment as on quantitative optimisation. By integrating psychological and emotional realities into portfolio design, the IPS aims to foster trust, reduce reactivity, and increase the likelihood of long-term goal achievement.

3. Investment Design

3.1. Investment Philosophy

The investment philosophy guiding this portfolio is rooted in the combined disciplines of financial theory, empirical research, and behavioural economics. It reflects the belief that a successful investment strategy must not only be efficient in capturing market returns but also sustainable from a behavioural perspective. For Mr. and Mrs. Grey, this philosophy ensures that all investment decisions across allocation, implementation, and risk management are grounded in evidence and tailored to their financial objectives and psychological preferences.

At its foundation, this approach accepts that capital markets are broadly efficient over the long term. While short-term pricing anomalies may arise from behavioural biases or macroeconomic shocks, these deviations are typically unpredictable and mean-reverting. Empirical literature (Fama, 1970; Malkiel, 2003) suggests that attempts to time the market or actively select securities rarely yield consistent outperformance once costs are accounted for. As such, this strategy avoids tactical interventions or discretionary management, instead relying on a long-term, fully invested structure designed to harness global capital market returns.

This philosophy is implemented through a top-down asset allocation process, beginning with strategic decisions across asset classes, geographies, and risk exposures. Rather than building from the bottom up through individual stock selection, the approach focuses on aligning broad portfolio structure with the clients' return requirements, risk tolerance, and investment horizon. This method provides a stable framework that accommodates diversification while ensuring the strategy remains coherent with both macroeconomic dynamics and client-specific constraints.

The strategy adheres to a passive investment approach, implemented through physically replicated ETFs, prioritizing UCITS-compliant. These vehicles are preferred for their transparency, low cost, liquidity, and index fidelity. The portfolio is globally diversified across equities, fixed income, and real assets via a broad range of ETFs, in line with Modern Portfolio Theory (Markowitz, 1952), which emphasizes diversification as the most effective tool to reduce uncompensated risk.

In alignment with this framework, the portfolio incorporates modest factor tilts toward persistent sources of risk and return such as value, quality, size, and low volatility, supported

by empirical research (Fama & French, 1993; Asness et al., 2017). These exposures are implemented through disciplined rules-based ETF selection (see Section 3.3), without relying on discretionary stock picking or proprietary smart beta products. The strategy avoids instruments involving leverage, opacity, or thematic speculation favouring simplicity, structural clarity, and low turnover to support investor resilience and disciplined long-term implementation.

This philosophy is not merely an intellectual position; it is a practical and measurable framework. It governs strategic asset allocation, ETF selection, portfolio optimization, and risk control. Most importantly, it embodies the principle that effective investing is not solely about return maximization but about crafting a strategy that the clients can understand, trust, and sustain over time.

The portfolio structure also reflects key macroeconomic themes likely to shape asset class behaviour over the strategic horizon. Persistent inflation volatility, shifting interest rate regimes, ageing demographics in developed markets, and geopolitical fragmentation continue to weigh on global growth and asset valuations.

As shown in Figure 1, IMF (International Monetary Fund, 2025) projected global GDP growth to slow to 2.8% in 2025 and 3.0% in 2026, significantly below the 2000-2019 average of 3.7%. Advanced economies are expected to decelerate to 1.4%, with the United States revised down to 1.8% and the euro area to 0.8%, reflecting ongoing trade disruptions and policy uncertainty. While emerging markets are forecasted to grow at 3.7%-3.9%, with China particularly impacted by trade measures.

Figure 1: Real GDP growth (Annual % Change)
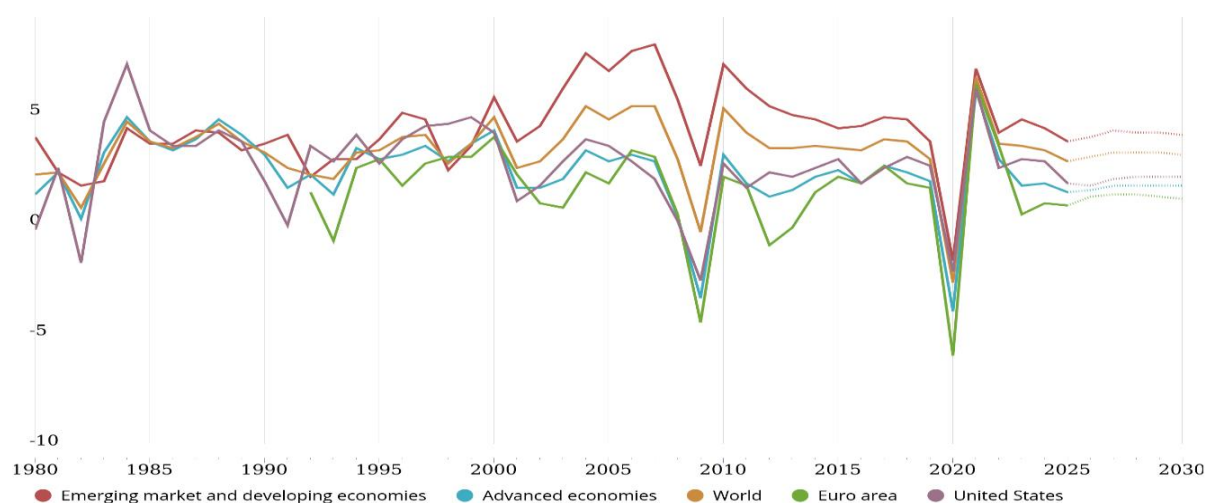
Source: IMF, World Economic Outlook

Inflation is projected to moderate globally, but regional disparities persist. Headline inflation is forecasted to decline to 4.3% in 20 25 and 3.6% in 2026. However, core inflation in advanced economies is expected to remain above central bank targets, driven by persistent wage and services price pressures. Figure 2 shows the historical and projected inflation rate changes for different economies. Central bank policy has responded accordingly: while the Federal Reserve System (FED) maintains a cautious "wait-and-see" stance amid elevated uncertainty (Powell, 2025), the European Central Bank (ECB) has recently begun rate cuts in light of moderating inflation dynamics (European Central Bank, 2025).

Figure 2: Inflation rate (Annual % Change)
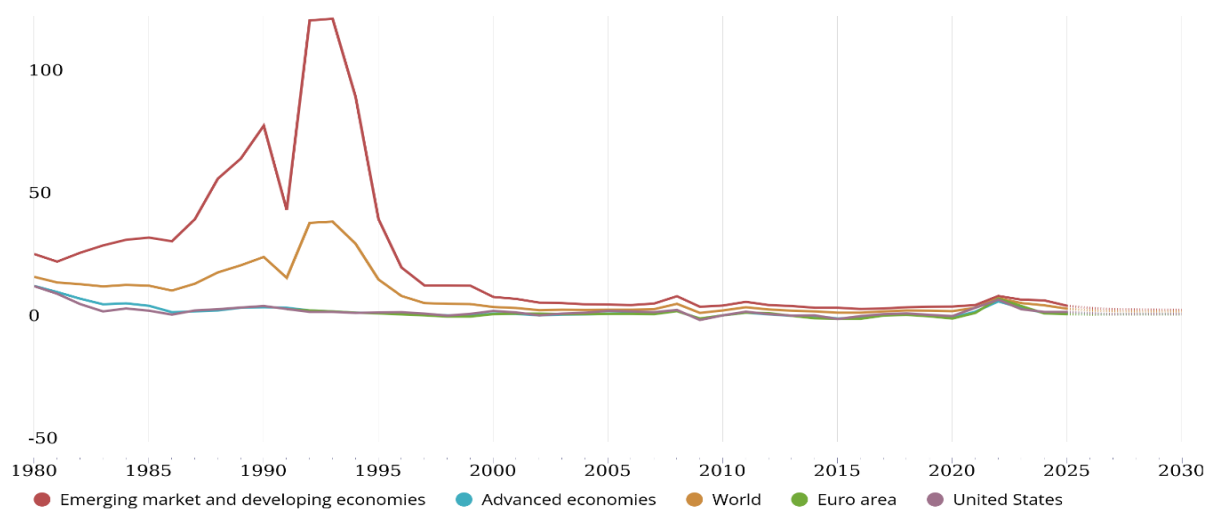
Source: IMF, World Economic Outlook

3.2. Strategic Asset Allocation

Strategic Asset Allocation (SAA) serves as the long-term policy blueprint for the portfolio, determining how capital is distributed across asset classes in accordance with the clients' return objectives, risk tolerance, constraints, and behavioural preferences. It represents the structural expression of the investment philosophy, translating high-level principles into a coherent, durable asset mix capable of withstanding varying market conditions.

3.2.1. Asset Allocation Structure

The portfolio adopts a 40/60 defensive framework, inverting the traditional growth-oriented 60/40 model. Here, 40% is allocated to global equities for long-term growth, while 60% is dedicated to capital-preservation assets, comprising 50% fixed income and 10% real assets (gold and listed real estate). This structure prioritizes capital stability without compromising long-term return potential. The allocation strikes a balance between growth and resilience,

aligning with clients' moderate-conservative risk profile. J.P. Morgan's balanced portfolio model, which recommends a 40/50/10 split across equities, fixed income and alternatives for cautious investors further validates this design (J.P. Morgan Asset Management, 2025).

The strategic policy allocation is structured as follows:

1. Equities (40%): Equities serve as the primary source of long-term capital appreciation. The allocation is globally diversified across developed and emerging markets and incorporates systematic risk premia such as value, quality, low volatility, and size through ETF selection. These factor tilts aim to enhance risk-adjusted returns while supporting behavioural stability.

2.a. Fixed-Income (50%): Fixed income constitutes the portfolio's core defensive layer. It spans sovereign and investment-grade corporate bonds across geographies and maturities, alongside inflation-linked bonds for real return preservation. This segment provides income, principal stability, and protection against equity market volatility. Given the absence of liquidity needs, all fixed income cashflows are assumed to be reinvested.

2.b. Alternatives (10%): This sleeve includes gold and listed real estate investment trusts (REITs), selected for their inflation-hedging properties and low correlation to traditional asset classes. Though classified as alternatives, these instruments operate as part of the defensive allocation, enhancing portfolio resilience without introducing excessive complexity or volatility.

Together, these allocations form a modernised defensive interpretation of the 40/60 model, in which the traditional equity-heavy structure is rebalanced in favour of capital-preserving exposures. This adaptation is not simply a risk-reduction mechanism, but a more refined approach to balancing long-term return objectives and behavioural sustainability.

To support disciplined implementation and risk control, each asset class is assigned a strategic policy weight and bounded by minimum and maximum limits. These corridors, as presented below in Table 1 facilitate effective rebalancing, minimize concentration risk, and help maintain client discipline during periods of market stress. The Corridor ranges are calibrated to allow optimization flexibility while preserving the intended 40/60 defensive structure. Sub-asset class bounds are chosen to enforce diversification across geography, maturities and risk exposures. These parameters are informed by both analytical considerations and the clients' behavioural risk tolerance. The corresponding strategic weights and allocation bands are outlined below:

Table 1: Asset Allocation Policy Weights and Corridors

Asset Class	Policy weight	Min	Max	Rationale
Equity	40%	20%	45%	Long term capital appreciation
U.S.	17.5%	15%	30%	Core growth driver
Europe	12.5%	10%	25%	Sectoral / currency diversification
Developed World	7.5%	5%	15%	Exposure to developed economies
Emerging Market	2.5%	2%	5%	Higher growth potential
Fixed Income	50%	50%	60%	Income & capital preservation
US Government	15%	10%	25%	Safe haven asset
US Corporate	12.5%	9%	20%	High yield, balance safety with income
Euro Government	10%	5%	20%	Diversify interest rate & geopolitical risk
Inflation linked	5%	3%	10%	Protection against inflation
Aggregate	7.5%	5%	10%	Broad exposure
Alternatives	10%	0%	10%	Stabilizing diversifier
REITS	5%	2%	5%	Income potential, inflation hedge
Gold	5%	2%	5%	Low corelation with equities & bonds
Total	100%			

In addition to the strategic allocation corridors, portfolio-level restrictions detailed below are incorporated into the optimization process to derive the final allocation weights.

- Factor Exposure Limits: To control concentration in equity risk premia, Low Volatility exposure is constrained to 0–20%, and multi factor exposures (value, quality, and size) are bounded between 12–28%, based on ETF strategy descriptions, and Bloomberg Allocation Style Exposure, in line with MSCI Factor Investing methodology (Bonne et al., 2018).

- Sector Allocation Controls: Sector exposures are managed using the Morningstar sector classification framework (Morningstar, n.d.). Sensitive and defensive sectors are capped at 40%, while cyclical sectors are constrained to 15–25% to prevent unintended tilts.

- Mid-Cap Equity Exposure: Exposure to mid-cap equities is constrained to 2–5%, aiming to capture mid-cap return potential while avoiding excessive volatility or concentration.

- Inflation-Sensitive Asset Bounds: Allocation to inflation-sensitive assets is restricted to 8–12% range, providing inflation protection without overexposure to any single asset class.

- Duration Controls: To diversify interest rate risk, bands are applied to fixed income allocations segmented by maturity into short-term bonds (3%–11%), intermediate-term (6%–19%), long-term (3%–8%), and mixed-duration holdings (6%–28%). This approach reflects maturity as a key determinant of volatility, return, and interest rate sensitivity (Cacace, K., 2023).

These strategic allocation corridors and portfolio-level restrictions jointly form the foundation of the constrained mean-variance optimization framework. While the final optimized portfolio weights are presented in Section 3.4, the structure outlined here is designed to maintain portfolio balance, reduce unintended exposures, and ensure long-term investment discipline. A full break down of the implementation constraints is provided in Table A3 (Appendix).

3.3. Security Selection

Security selection is the implementation layer of strategic asset allocation. It translates long-term policy weights into specific, investable instruments while ensuring alignment with the portfolio's return objectives, behavioural preferences, and defined risk parameters. For Mr. and Mrs. Grey, the security selection must balance analytical rigor with simplicity, delivering a structure that is low-cost, transparent, diversified, and behaviourally sustainable.

Consistent with the investment philosophy outlined in Section 3.1, implementation relies on physically replicated ETFs, with a strong preference for UCITS-compliant structures. These instruments offer global diversification, institutional liquidity, and low structural costs, while avoiding leverage, active mandates, or unnecessary complexity. This transparent approach supports long-term behavioural discipline and reduces portfolio complexity across market cycles.

The security selection framework follows a structured two-layer process. First, qualitative filters assess legal, structural, and operational suitability across the ETF universe. This is followed by a multi-factor quantitative scoring model, that ranks eligible instruments within each asset class. Together, these layers ensure that each selected ETF contributes to the portfolio's strategic role, reflects exposures to validated risk premia and aligns with client-specific implementation constraints.

3.3.1. Initial Screening and Qualitative Filters

The first stage of the selection process involved preliminary screening, conducted via Bloomberg Terminal (March 2025), applying strict eligibility criteria to construct a viable ETF universe across all asset classes.

Structural filters included a minimum AUM of $100 million; the use of full or optimised physical replication (excluding swap-based/synthetic ETFs); a passive investment style; and primary denomination in USD or EUR, with a flexibility for other major currencies. Preference was given to currency-hedged share classes.

Asset-specific filters were applied to further refine the universe. Equity ETFs were limited to large and mid-cap universes following either blend or value strategies. Fixed income ETFs were required to hold investment-grade ratings (minimum A/BBB), exhibit an average aggregated trading volume of at least $10 million, and exceed a total value traded threshold of $20 million. A diversified maturity profile spanning short, medium, long, and mixed durations was maintained to manage interest rate exposure. Alternatives were limited to broad, non-thematic real asset exposures such as REITs and gold.

Legal and operational constraints were also applied to ensure regulatory robustness and transparency. ETFs were generally required to be domiciled in jurisdictions offering strong investor protection, such as Ireland and Luxembourg, with a strong preference for UCITS-compliant funds. Cross-listed or secondary share classes were excluded, and ETFs engaged in securities lending or synthetic replication were filtered out due to opacity and counterparty risk.

Regarding payment structure, accumulating share classes were prioritised to support long-term compounding. However, distributing share classes were also considered, with proceeds systematically reinvested given the client's lack of immediate liquidity needs. As the clients expressed no ethical or ESG-specific preferences, no ESG-related exclusions were applied.

The initial filtering process qualified 277 ETFs across all asset classes. To support robust historical analysis and align with the clients' 15-year investment horizon, only ETFs with at least 12 years of performance data were retained, substantially narrowing the eligible universe for subsequent quantitative scoring and final selection.

3.3.2. Quantitative Screening and Multi-Factor Scoring

Following the qualitative screening, a structured quantitative evaluation was applied to refine the ETF universe. This phase aimed to identify ETFs that provide efficient exposure to target asset classes, offer indirect exposure to recognised investment factors, maintain high liquidity, minimise costs, and exhibit stable long-term performance.

The process draws on insights from multi-factor investing literature, including the Fama-French (1993) three-factor model, and incorporates methodologies such as FTSE Russell's tilt-tilt framework, which supports the integration of multiple factors (e.g. value, quality, low volatility) without diluting the strength of individual factor tilts (FTSE Russell, 2017). To translate these multi-factor principles into ETF selection criteria, specific quantitative indicators were identified.

Table 2 summarises how these metrics serve as proxies for recognised investment factors.

Table 2: Mapping of Investment Factors to Applied Screening Indicators

Investment Factor	Associated Indicators /Criteria
Value	Strategy classification (Value/Blend) as per Bloomberg ETF meta data
Quality	Sharpe ratio, Information ratio, Investment-grade credit rating
Low Volatility	Beta ≤ 1, Tracking error
Size (Negative Tilt)	Market capitalisation screen: large and mid-cap equity ETFs only
Liquidity	AUM > $100 million, 100- day average trading volume threshold
Cost Efficiency	Expense ratio ≤ 0.40

These factors have been empirically associated with persistent risk premia across economic cycles. In this context, exposure is not achieved through direct smart beta mandates, but rather through the deliberate selection of ETFs whose characteristics such as low tracking error, below-market beta, and elevated Sharpe ratios indirectly reflect these factor exposures.

The selected indicators summarised in Table 3 below, reflect distinct factor exposures and are weighted according to their specific evaluative roles. These metrics are implemented within a composite scoring model, based on Bloomberg Terminal data (March 2025).

Table 3: Multi-Factor Scoring Framework for Security Selection

Indicator	Weight	Purpose
AUM	5%	Ensures scalability and operational viability
100-day avg. volume	10%	Enhances tradability, and minimizes bid-ask spreads
Expense ratio	25%	Reduces structural cost at the fund level
Beta	5%	Controls market sensitivity and volatility
Tracking error	30%	Minimises benchmark deviation, passive strategy integrity
Sharpe ratio	10%	Measures stability of risk-adjusted returns
Information ratio	15%	Evaluates performance consistency over the benchmark

Using percentile rankings, each ETF was scored across these indicators and subsequently converted to a standardised 0–1 scale. Each score was then multiplied by its corresponding weight, and the weighted values were aggregated to generate a composite score. ETFs were then ranked within each sub-asset class, with the top-performing ETFs shortlisted for inclusion. In cases where complementary exposures improved diversification or liquidity, multiple ETFs were retained.

This multi-criteria decision-making approach, grounded in multi-attribute utility theory (Keeney & Raiffa, 1993), reflects institutional best practices. Frameworks such as FTSE Russell's multi-factor methodology (FTSE Russell, 2017) and BNP Paribas Asset Management's systematic scoring model (BNP Paribas AM, 2019) demonstrate the practical integration of factor-based evaluation and long-term risk premia exposure in ETF selection.

Although the scoring framework provided a quantitative foundation, qualitative judgment remained essential. ETFs with persistently negative long-term return profiles were excluded, even if they ranked favourably on certain metrics. Similarly, instruments with incomplete or unreliable data (such as missing Sharpe or information ratios) were filtered out to maintain analytical rigour. Only ETFs with a minimum 12-year track record, institutional-scale AUM, and consistent adherence to passive replication strategies were retained for final consideration.

The final eligible investment universe consists of a carefully curated set of 18 ETFs (Table A4, Appendix), spanning three strategic allocations: equities, fixed income, and alternatives. Table 4 presents the average characteristics of the final ETF universe, segmented by asset class.

Table 4: Aggregate Characteristics of the Final Selected ETF Universe

Metric	Equities	Fixed Income	Alternatives	Total
Expense Ratio	0.22%	0.12%	0.26%	0.18%
Tracking Error	0.21	0.08	0.11	0.14
AUM ($ million)	26,215	2,783	792	12,976
Volume (100-day avg.)	36,698	292,721	3,307	146,776
Beta (vs broad market)	0.92	0.96	1	0.95
Sharpe Ratio 5Y	0.69	-0.31	0.32	0.20
Information Ratio 5Y	0.08	-0.13	0.10	-0.01

Despite some negative Sharpe and information ratios in the fixed income segment, these reflect recent market dislocations, such as interest rate volatility and yield curve inversion, rather than structural flaws in the ETFs. These instruments remain essential for diversification, capital preservation, and reducing portfolio volatility, in line with the clients' conservative risk profile.

These aggregate metrics reflect high institutional quality and compatibility with a passive, low-turnover, multi-asset framework. This rules-based ETF selection process ensures that every asset chosen for the final portfolio falls within the strategic allocation bounds, aligns with the clients' behavioural and financial preferences, contributes meaningfully to diversification, factor exposure, and risk-adjusted return potential.

3.4. Portfolio composition

Portfolio composition represents the culmination of the investment strategy design process., translating theoretical asset allocation models and security-level analysis into a practical, implementable structure. Grounded in the principles of Modern Portfolio Theory (Markowitz, 1952), this section employs Mean-Variance Optimization (MVO) to identify the optimal mix of assets that maximizes expected return for a given level of risk, subject to investors specific objectives and constraints.

The composition operationalises the strategic 40/60 allocation framework, allocating 40% equities for long-term growth and 60% to capital-preserving assets, including fixed income and real assets. The optimization process integrates historical analysis with forward-looking modelling to build a portfolio that is not only statistically efficient but also behaviourally sustainable.

3.4.1. Optimization Framework and Efficient Frontier

Mean-Variance Optimization defines a continuum of optimal portfolios along the Efficient Frontier, each offering the highest expected return for a given level of risk. MVO relies on three core statistical inputs: expected returns, variance and correlations. These inputs are generated using 12 years of historical data (2013–2025), with monthly adjusted closing prices for each ETF retrieved from Bloomberg. Monthly returns are calculated as the percentage change in adjusted closing prices and annualised to derive expected returns. Variance is calculated from these returns, with annualised standard deviation obtained as its square root. These are then used to construct the variance–covariance and correlation matrices, which serves as the basis for the optimization process. The complete set of inputs is provided in Table A5 (Appendix).

All data are denominated in Swiss Francs (CHF) to neutralise currency risk. The Swiss 15-Year Government Bond Yield (0.549% as of April 2025) is used as the risk-free rate in accordance with long-term planning standards (World Government Bonds, 2025).

The optimization is conducted using the Excel Solver tool, under the restrictions previously outlined in Section 3.2.3. Additionally, no short selling ($w_i \geq 0$), no leverage ($\sum w_i = 100\%$), and a 10% maximum allocation per ETF ($w_i \leq 10\%$) were imposed to mitigate concentration risk. Table A3 (Appendix) provides the full set of portfolio constraints.

The Efficient Frontier represents the set of optimal portfolios that deliver the highest expected return for a given level of risk. It is constructed by solving a series of Mean-Variance

Optimization problems across a range of target return levels, generating the corresponding minimum variance portfolios for each return level. From this frontier, three candidate portfolios were derived through numerical optimization.

The Minimum Variance Portfolio (MV) lies at the lowest volatility point on the frontier, but compromises on return efficiency. It is constructed by minimizing total portfolio variance.

Roy's Safety-First Portfolio (Roy) is constructed to minimise the probability of the portfolio return falling below a defined return threshold (RL)=1.5%, which reflects the clients psychological risk anchor, not a strict threshold but used for comparison. The portfolio is derived by minimizing shortfall risk (SR_{Roy}), using the Roy safety-first criterion:

$$\bar{R}_{Roy} = RL + SR_{Roy} \cdot \sigma \qquad (1)$$

The Tangency portfolio (T) lies at the tangency point between the Efficient Frontier and the capital market line from the risk-free rate (R_f). It maximizes the Sharpe ratio (SR_T), delivering the most efficient risk return trade-off under standard assumption.

$$\bar{R}_T = R_f + SR_T \cdot \sigma \qquad (2)$$

Among the three portfolios, the Tangency portfolio was selected as an optimal final portfolio due to its superior risk-adjusted return and its ability to meet and exceed the client's capital goals within acceptable volatility levels. Figure 3 illustrates the Efficient Frontier with the three candidate portfolios, highlighting the Tangency Portfolio's optimal position along the Capital Market Line (CML).

Figure 3: Efficient Frontier and Portfolio Optimization
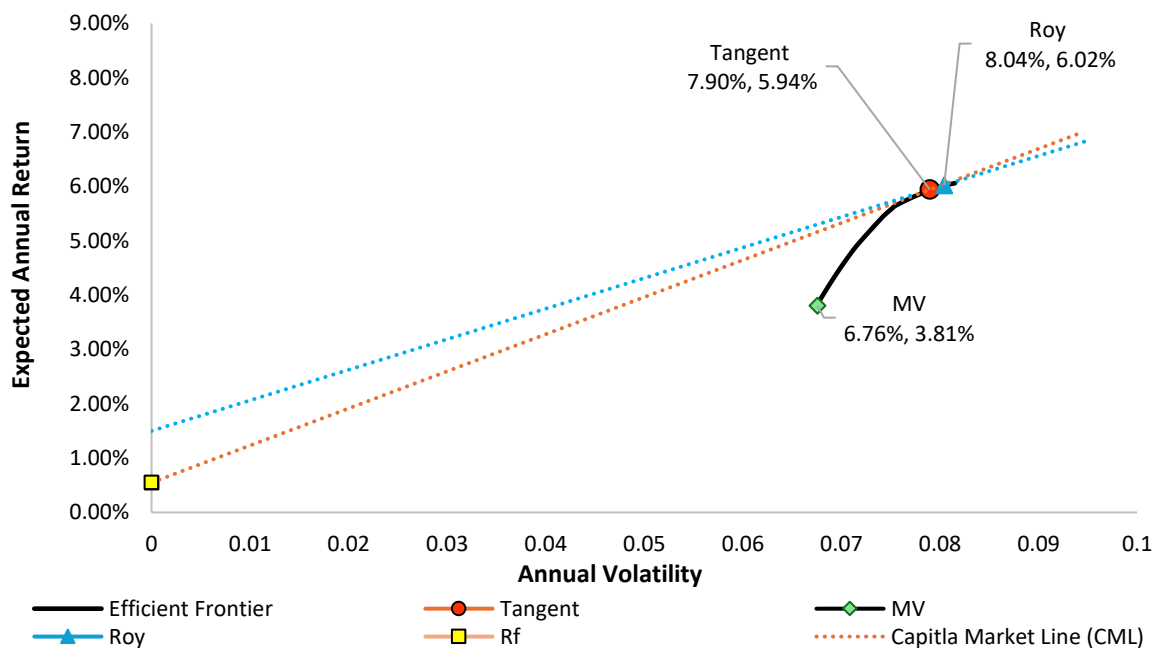
3.4.2. Portfolio Selection and Performance Comparison

The final portfolio selection was informed by a comparative evaluation of three candidate portfolios, assessed across key performance metrics. The objective is to identify the structure best aligned with the clients' capital objectives and behavioural preferences by analysing expected return, volatility, Sharpe ratio, and shortfall risk. The composition and performance characteristics of these candidate portfolios are presented in Table 5.

Table 5: Portfolio Composition & Performance Metrics of Optimized Portfolios

Securities	MV	Roy	Tangent
CSPX LN Equity	0%	10%	10%
SPMV LN Equity	5%	10%	10%
SPY4 LN Equity	2%	2%	2%
C50 FP Equity	0%	10%	10%
ERO FP Equity	10%	0%	0%
SWDA LN Equity	1%	6%	6%
MVOL LN Equity	10%	4%	3%
EMMV LN Equity	5%	2%	2%
SCHR US Equity	10%	10%	10%
UEFF GR Equity	10%	3%	6%
UEFI GR Equity	5%	9%	9%
LQDE LN Equity	5%	10%	10%
X1G FP Equity	8%	2%	2%
MTE FP Equity	7%	3%	3%
SPIP US Equity	5%	6%	3%
USAG LN Equity	10%	7%	7%
D5BK GR Equity	2%	2%	2%
CSGOLD SW Equity	5%	4%	5%
Expected Return	3.81%	6.02%	5.94%
Volatility	0.067	0.080	0.078
Sharpe Ratio	0.482	0.680	0.683
Shortfall Risk (<1.5%)		0.286	0.287

Although the Roy's Safety-First Portfolio exhibits marginally lower downside risk, the Tangency Portfolio achieves the highest Sharpe ratio (0.683), offering superior risk-adjusted return. The difference in shortfall probability between Roy and Tangent portfolio is statistically negligible (28.69% vs. 28.70%), yet the Tangent Portfolio delivers lower volatility (0.078 vs 0.080) and an expected return that comfortably exceeds the client's real return target of 5.17%.

Importantly, the Safety-First Framework does not reflect the client's minimum acceptable return nor imply that outcomes below 1.5% would trigger action. Rather, the 1.5% threshold, introduced as a behavioural anchor during risk tolerance assessment and rooted in the long-term mortgage rate, serves as a conservative benchmark. Though the client remains open to variability and even temporary losses, this stringent threshold enables a disciplined evaluation of downside risk resilience under adverse market conditions without overstating the client's sensitivity to shortfall.

Therefore, the Tangency Portfolio offers the most appropriate balance of return ambition and behavioural suitability and is selected as the final optimal portfolio. Figure 4 illustrates the final optimized allocation across both asset classes and sub-asset classes, reflecting the portfolio's strategic positioning.

Figure 4: Optimized Allocation by Asset Class & Sub-Asset Class
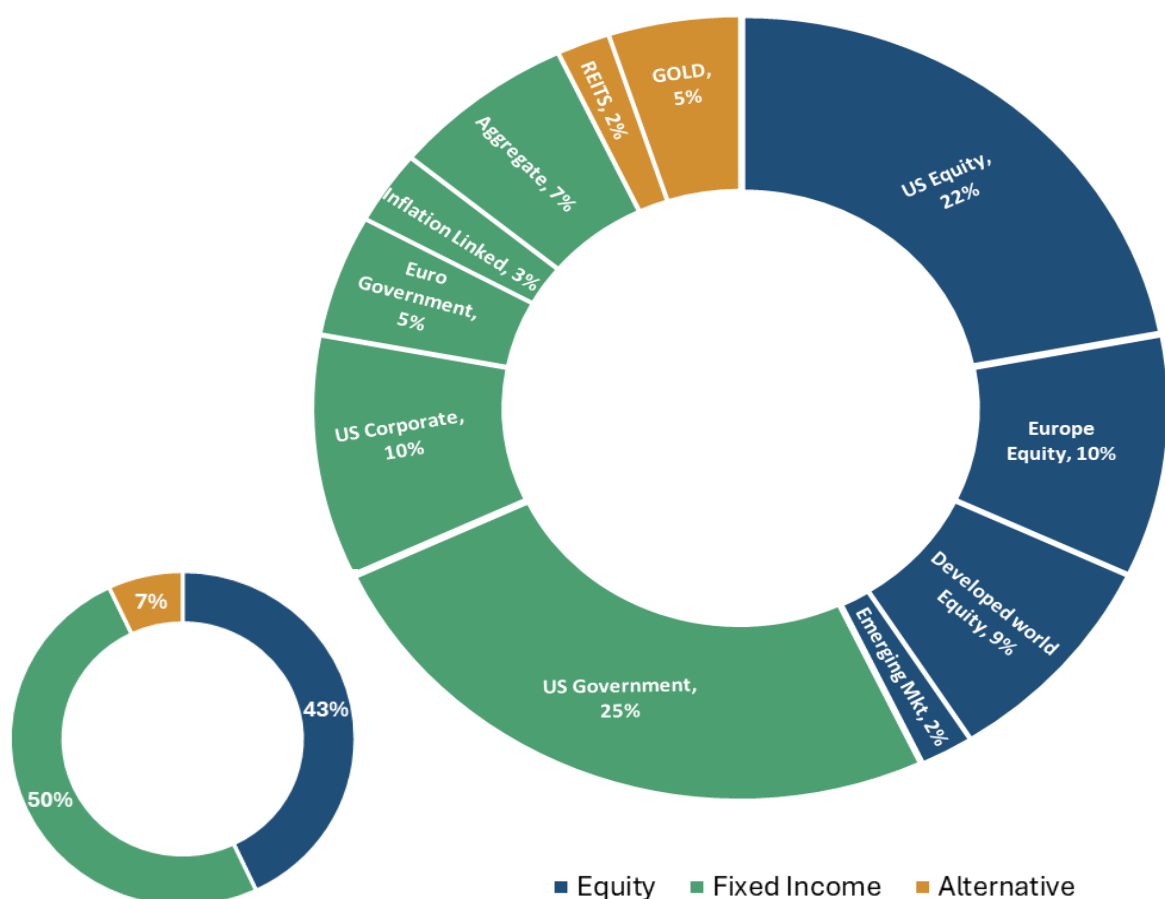
This allocation reflects global diversification, interest rate exposure across durations, and indirect factor tilts, consistent with a top-down, passive, and evidence-based philosophy. Aligned with the clients' Swiss Franc-denominated liabilities and psychological risk anchors, the strategy supports a high likelihood of meeting long-term financial goals.

Figure 5 presents the final composition of the selected Tangency Portfolio, comprising a total of 17 ETFs with their respective weights and asset class classification. This allocation reflects a disciplined balance across equities, fixed income, and alternatives, consistent with the portfolio's strategic 40/60 framework and implementation constraints.

Figure 5: Final Portfolio Composition by ETF (% of Total Portfolio)
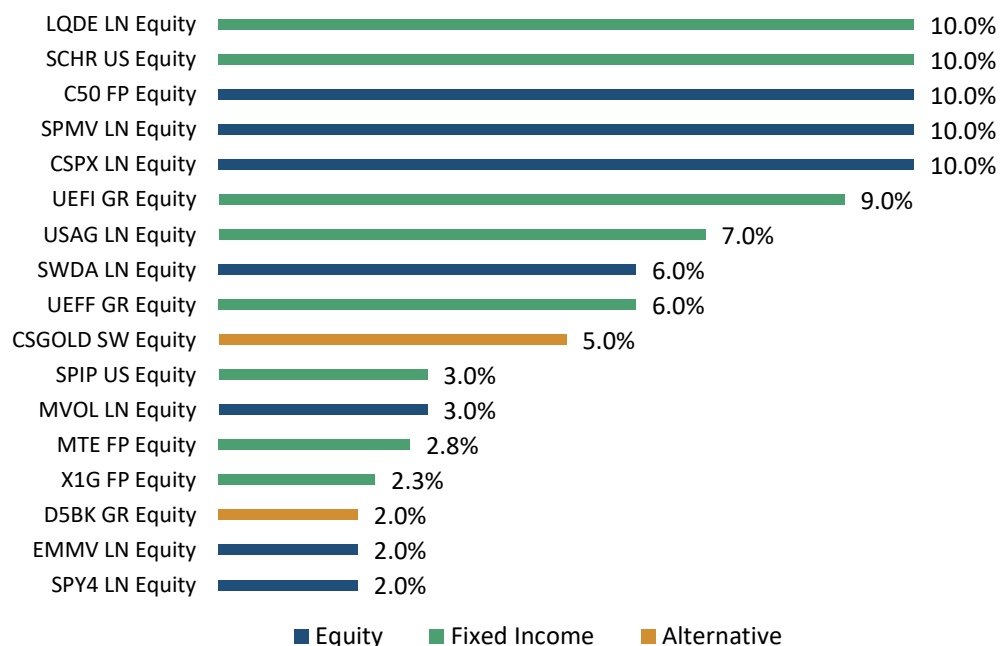
3.5. Expected Performance

As established in section 3.4, the Tangency portfolio is an optimal final portfolio and is expected to deliver the following:

Table 6: Final Optimal Portfolio expected performance

Expected Annual Return	Annual Volatility	Sharpe Ratio
5.94%	0.078	0.683

A robust investment strategy must be not only theoretically coherent and historically grounded, but also resilient under future uncertainty. To assess this, the portfolio is further evaluated using two complementary techniques: (1) empirical historical back testing and (2) forward-looking Monte Carlo simulation. Together, these methods provide a multidimensional perspective on portfolio behaviour over the 15-year investment horizon, assessing the likelihood of achieving the clients' goals while preserving long-term capital stability.

3.5.1. Historical Back testing

A historical back test is conducted using CHF-denominated monthly total return data from 2013 to 2025. The back test replicates the performance of the selected Tangency Portfolio by applying the optimized allocation weights to each selected ETF's historical price series, thereby assessing how the portfolio would have performed under actual market conditions.

For benchmarking purposes, a custom composite benchmark is constructed. Rather than relying on a generic index, this benchmark is developed by aggregating the distinct reference indices associated with each of the 17 selected securities, each weighted in proportion to its corresponding portfolio allocation. This bottom-up construction approach ensures that the benchmark closely mirrors the portfolio's specific asset class, regional, and sector exposures, providing a more relevant and representative basis for performance comparison (CFA Institute, 2023).

The objective of the back test is to evaluate the portfolio's ability to deliver risk-adjusted returns, assess its historical drawdown resilience, and validate the consistency of its performance relative to its strategic allocation. Table 7 compares the Tangency Portfolio's performance to the custom benchmark previously defined.

Table 7: Performance Comparison (Portfolio vs Benchmark)

Metric	Tangency Portfolio	Custom Benchmark
Cumulative Return (%)	5.57%	5.64%
Annualized Return (%)	5.94%	5.86%
Annualized Volatility (%)	7.90%	7.09%
Sharpe Ratio	0.683	0.749
Sortino Ratio	0.973	1.049
Max Drawdown (%)	-13%	-16%
Tracking Error (%)	3.04%	–
Information Ratio	0.025	–

The final optimal portfolio (i.e. the Tangency Portfolio) outperformed its benchmark in terms of absolute return and drawdown protection, though slightly underperformed on volatility-adjusted metrics. This trade-off is attributable to its growth tilt and modestly higher factor exposure. Importantly, the portfolio maintained a positive information ratio, validating that the optimization decisions, such as factor tilts and ETF exclusions added value over a purely passive index replication.

Figure 6 further illustrates the comparative historical performance of the final optimal portfolio versus its benchmark over the 2013–2025 period, highlighting consistency, return behaviour, and drawdown dynamics across varying market conditions.

Figure 6: Historical Performance of the Portfolio vs Benchmark (2013–2025)

3.5.2. Monte Carlo Simulation: Scenario Analysis

While historical back testing provides insight into past performance, forward-looking analysis is essential to assess future uncertainty. To model the uncertainty of future outcomes, a Monte Carlo simulation is conducted over a 15-year period (180 months) using 10,000 randomized return paths. Inputs are based on the selected Tangency Portfolio's expected annual return of 5.94%, and annualized volatility of 7.90%, with monthly equivalents of 0.48% return and 0.028 standard deviation. The simulation assumes a fully invested, passively managed portfolio with reinvestment and compounding throughout.

The resulting distribution of terminal values is summarized in Table 8.

Table 8: Monte Carlo Simulation of Portfolio Performance

Metrics	Value (CHF)
Mean Terminal Value	1,216,677
Median Terminal Value	1,162,908
Standard Deviation	381,237
5th Percentile (P5)	703,524
25th Percentile (P25)	938,698
75th Percentile (P75)	1,428,713
95th Percentile (P95)	1,919,405

Both the mean and median terminal portfolio values exceed the clients' capital target of CHF 1,064,331, indicating a strong probability of goal attainment. Even in 5th percentile outcome, the portfolio is projected to grow to approximately CHF 703,524. While this is below the full target, it still covers a substantial portion of the outstanding mortgage and supports essential financial resilience. This is further illustrated in Figure 7, which presents the distribution of Monte Carlo-simulated portfolio paths and key percentile outcomes over the 15-year horizon.

Figure 7: Forward-looking Simulated Portfolio Paths (10,000 Iterations)
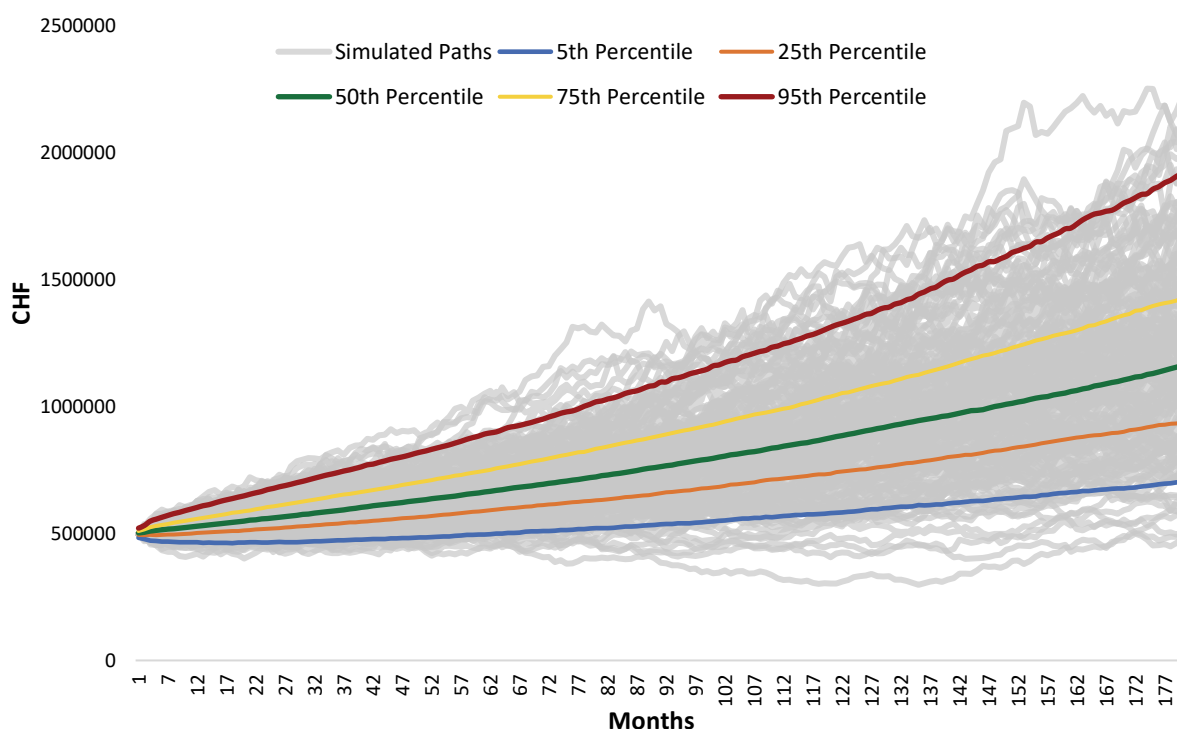
The forward-looking simulation underscores the portfolio's capacity to meet long-term capital goals under a wide range of market conditions, without introducing excessive downside risk. It also affirms alignment with the clients' financial objectives and behavioural tolerance. A broader analysis of adverse scenarios is discussed in Section 3.6: Risk Analysis.

3.6. Risk Analysis

A risk analysis supplements the optimization framework with a multi-layered assessment of downside risk, ensuring the selected portfolio is not only return-efficient but also resilient under adverse market conditions and aligned with the clients' long-term financial objectives.

Value at Risk (VaR) serves as the core diagnostic tool, estimating potential losses across varying confidence levels and assumptions. In parallel, Conditional Value at Risk (CVaR) also known as Expected Shortfall, is used to estimate the average loss in the worst-case scenarios beyond the VaR threshold. To provide a comprehensive view of risk exposure, three VaR methodologies are employed: Historical, Parametric (variance-covariance), and Monte Carlo VaR.

3.6.1. Historical VaR

The Historical VaR method offers a non-parametric (distribution-free) estimate of downside risk, calculated from monthly portfolio returns between January 2013 and January 2025. These returns are derived by applying the optimized portfolio weights to the historical monthly returns of the selected ETFs. By ranking actual outcomes without assuming normality, the method captures market realities such as fat tails and regime shifts. A 1-month horizon is applied to ensure sufficient data points for statistically meaningful tail risk estimation. The resulting empirical distribution of monthly returns is used to calculate Var and Cvar at 90%, 95%, and 99% confidence levels, providing a tiered view of potential short-term drawdowns. The results are presented in Table 9.

Table 9: Historical 1-Month VaR and Conditional VaR

Confidence Level	VaR (CHF)	Loss (%)	Conditional VaR (CHF)	Expected Shortfall (ES %)
90%	11,952	2.39%	19,211	3.84%
95%	16,439	3.29%	23,937	4.79%
99%	28,167	5.63%	31,337	6.27%

These results indicate that, even in a severe 99% confidence scenario, the portfolio is unlikely to lose more than CHF 28,167 in a single month, corresponding to a 5.63% drawdown. The Conditional VaR (Expected Shortfall) suggests that, in the event losses exceed this threshold, the average loss could reach 6.27%, or CHF 31,337. While such tail events are infrequent, acknowledging their potential impact is essential for informed long-term planning and disciplined risk governance.

3.6.2. Parametric VaR (Variance-Covariance Method)

The Parametric VaR, also known as the Variance-Covariance method, estimates downside risk under the assumption that returns are normally distributed and independently and identically distributed (i.i.d). Unlike the historical approach, this method estimates potential losses based on statistical parameters, specifically the portfolio's expected return and standard deviation. The model applies the following formula:

$$VaR = V \cdot (\mu - z_\alpha \cdot \sigma) \tag{3}$$

where, V is the portfolio value, μ is the expected return, σ is the standard deviation, and z_α is the positive z-score at the chosen confidence level. The analysis is anchored on the final portfolio's expected annual return of 5.94% and annualized volatility of 7.90%. To maintain consistency with the short-term horizon applied in the Historical VaR, a 1-month Parametric VaR is first calculated by converting the annual inputs to monthly equivalents (0.48% return and 2.28% volatility). Additionally, a 1-year VaR is computed to capture potential losses over a longer investment horizon. Both VaR and CVaR are derived at the 90%, 95%, and 99% confidence levels using standard normal distribution (z-scores), as shown in the tables below:

Table 10: Parametric 1-Month VaR and CVaR

Confidence Level	Z score	VaR (CHF)	Loss (%)	CVaR (CHF)	ES (%)
90%	-1.28	12,199	2.44%	17,596	3.52%
95%	-1.65	16,340	3.27%	21,104	4.22%
99%	-2.33	24,109	4.82%	27,972	5.59%

Table 11: Parametric 1-Year VaR and CVaR

Confidence Level	Z score	VaR (CHF)	Loss (%)	CVaR (CHF)	ES (%)
90%	-1.28	20,907	4.18%	39,602	7.92%
95%	-1.65	35,253	7.05%	51,754	10.35%
99%	-2.33	62,165	12.43%	75,546	15.11%

These results provide two distinct yet complementary views of portfolio risk. At the 99% confidence level, the portfolio is unlikely to lose more than CHF 24,109 in absolute terms in a single month or CHF 62,165 over a year. The Conditional VaR offers a more conservative estimate, representing the average loss beyond the VaR threshold in extreme market conditions. Presenting both short- and long-term measures ensures alignment with the clients' capital obligations and long-term financial plan, while addressing the potential for acute drawdowns.

3.6.3. Monte Carlo VaR

To complement the Historical and Parametric approaches, a Monte Carlo-based VaR analysis is conducted using the 10,000 simulated return paths introduced in Section 3.5.2, repurposed to estimate 1-year downside risk. Unlike return-based simulations, this analysis frames outcomes as losses from the initial investment, capturing the full distribution of results without relying on historical repetition or normality assumptions. Table 12 presents the 1-year VaR and CVaR across different confidence levels.

Table 12: Monte Carlo 1-Year VaR and CVaR

Confidence Level	VaR (CHF)	Loss (%)	CVaR (CHF)	ES (%)
90%	21,802	4.36	39,171	7.83
95%	34,556	6.91	50,572	10.11
99%	58,218	11.64	72,606	14.52

These results suggest that, with 99% confidence level, losses are unlikely to exceed CHF 58,218 in a single year, while extreme outcomes may average up to CHF 72,606 or 14.52%. These result underscores the portfolio's resilience under rare stress scenarios, supporting prudent long-term planning. Figure 8 presents a histogram of simulated 1-year return outcomes, illustrating the distribution of potential drawdowns and highlighting clustering around key percentiles. The distribution exhibits slight positive skewness of 0.23, suggesting a longer right tail. The low kurtosis of 0.12, indicate a relatively flat distribution with thinner tails than the normal distribution. These features suggest moderate asymmetry and limited tail risk, reinforcing the value of stress testing and behavioural framing in long-term planning.

Figure 8: Histogram of 1-Year Simulated Return Outcomes
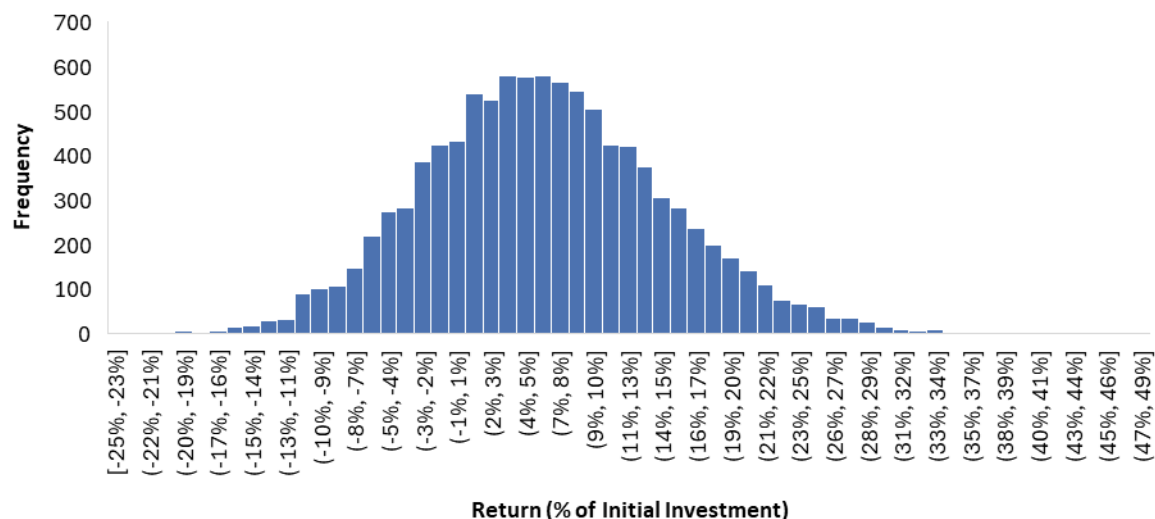
3.6.4. Risk Matrix Assessment

A qualitative risk matrix is employed to identify structural, macroeconomic, and thematic vulnerabilities that may emerge over the 15-year investment horizon. This assessment addresses non-statistical risks that could impact the portfolio's ability to achieve its real-return objective. Each risk is evaluated on a five-point scale for both likelihood and potential impact, with scores based on portfolio's exposures, market sensitivities, and client-specific objectives. The key risks, their scores, and potential implications are presented in Table 13.

Table 13: Long-Term Risk Assessment (15-Year Horizon)

Risk	Probability	Impact	Description/ Implication
Interest rate hikes (A)	3 (medium)	4 (high)	Rising interest rates may reduce the value of fixed income securities, leading to moderate capital losses and short-term volatility. However, duration controls and diversified maturities help limit the overall impact.
Inflation risk (B)	3 (medium)	4 (high)	Sustained inflation, particularly in the U.S. or Eurozone, could erode real returns and challenge the CHF-based target. Inflation-linked bonds, gold, and REITs provide partial but not comprehensive protection.
Currency risk (C)	2 (low)	3 (medium)	Holdings in USD, EUR, and GBP may be affected while targeting returns in CHF. These are relatively stable currencies, but long-term FX movements, especially CHF appreciation, may reduce CHF-converted returns. Currency-hedged ETFs mitigate, but do not eliminate this risk.
Geo-Political risk (D)	4 (high)	4 (high)	Conflicts such as the Russia-Ukraine war, Middle east tensions, global trade disputes, or Political instability can disrupt market and supply chains, widen bond spreads, and trigger equity volatility. The portfolio's US and EU bias increases exposure to such shocks, despite diversification and partial real asset buffers. These risks may persist for extended periods with unpredictable resolution timelines.
Climate Change (E)	3 (medium)	3 (medium)	Long term environmental risks, such as regulatory changes, extreme weather, or resource scarcity, may impact sectors like energy, utilities, and real estate. While the portfolio is diversified and not thematically tilted, it may still be affected by climate-related disruptions.
AI/Tech Disruption (F)	4 (high)	3 (medium)	Accelerated AI and automation could transform industries, benefiting some sectors while disrupting others. The portfolio's broad equity exposure offers upside potential but also brings some sectoral disruption risks.

Figure 9 illustrates the position of each identified risk within the risk matrix, providing a visual summary of their relative severity over the 15-year horizon. Risks are categorized from very low to very high, offering a clear overview of where risk concentrations may lie within the portfolio.

Figure 9: Risk Matrix
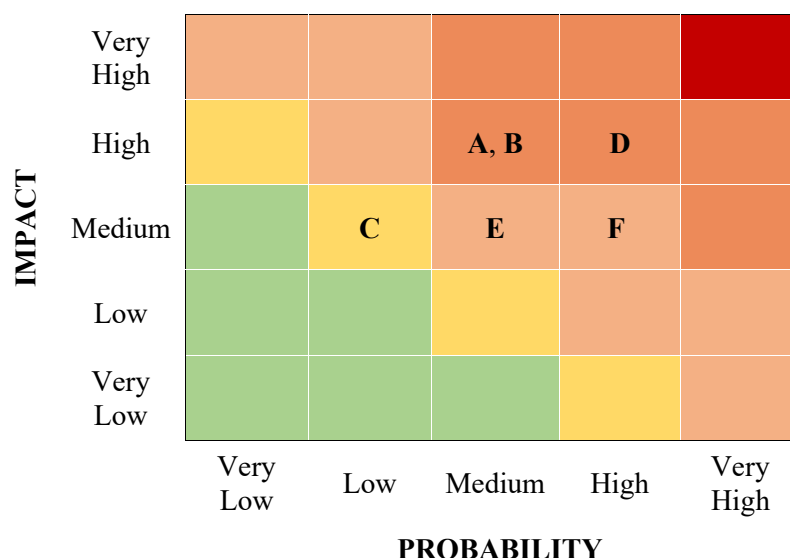
The risks positioned in the higher-impact and higher probability zones are subject to closer oversight, scenario review and where appropriate, mitigation. This integrated approach strengthens the portfolio's resilience and supports its alignment with the clients' long-term real return objectives.

4. Governance

The governance framework ensures disciplined implementation, regular oversight, and continued alignment with the clients' financial objectives and risk profile.

Mr. and Mrs. Grey retain final authority over all investment policy decisions. Their financial advisor, Kirtan Shrestha serves in a fiduciary capacity, providing strategic counsel on policy development, including guidance on asset allocation, investment vehicle selection, and implementation strategy. While all investment decisions are made in consultation with Mr. Shrestha, they remain subject to the final approval of Mr. and Mrs. Grey.

Execution of the investment policy is delegated to Mr. Shrestha, who is responsible for implementing the approved strategy in full alignment with this IPS. This includes selecting

appropriate investment instruments, rebalancing the portfolio as needed, and ensuring adherence to the policy's stated objectives, risk parameters, and asset allocation targets.

Mr. Shrestha also oversees ongoing portfolio performance through continuous monitoring and formal reviews conducted at least quarterly. These reviews assess alignment with strategic goals, benchmark performance, and compliance with investment guidelines. Any material deviations or concerns will be promptly communicated to Mr. and Mrs. Grey, along with recommendations for corrective actions.

The IPS will be reviewed annually, or more frequently if triggered by material changes in the clients' financial situation, goals, or market conditions. The advisor is responsible for initiating and facilitating the review process, which includes evaluating portfolio performance and risk, assessing changes in asset allocation or investment goals, and discussing potential revisions with the clients. Any updates to the IPS require formal approval by Mr. and Mrs. Grey prior to implementation. All revisions will be documented and retained as part of the official investment record.

The engagement or dismissal of external advisors' remains solely at the discretion of the clients. The advisor may recommend or coordinate with third-party professionals when needed but must disclose any affiliations, compensation arrangements, or potential conflicts of interest in advance. All external relationships must align with the clients' investment objectives and will be reviewed periodically to ensure ongoing suitability, performance, and value.

The financial advisor will review the asset allocation at least annually and propose adjustments as needed, subject to final approval by the clients. The allocation policy outlines target weights and permissible ranges across asset classes, ensuring continued alignment to the clients' return objectives and risk tolerance.

Mr. Shrestha is responsible for managing and monitoring portfolio risk to ensure alignment with the client's risk parameters as outlined in Table A2 (Appendix). This includes identifying key risks and proactively managing the portfolio exposures. The advisor will provide regular reporting, including quarterly and annual reviews, covering both performance and risk metrics to support informed decision-making.

5. Executive Summary

This Investment Policy Statement (IPS) serves as a strategic guide and communication tool for managing Mr. and Mrs. Grey's investment portfolio. It defines long-term objectives, return expectations, risk tolerance, and key constraints, while outlining the responsibilities of both the clients and their financial advisor. The IPS provides a disciplined framework for investment decisions, asset allocation, and performance monitoring, ensuring alignment with the clients' evolving financial goals and promoting transparency, consistency, and accountability.

Mr. and Mrs. Grey aim to achieve a real annual return of approximately 5.17% over a 15-year horizon to meet defined goals. The portfolio is structured to balance long-term growth with capital preservation through a moderately conservative strategy. While their financial capacity permits risk-taking, their lower behavioural tolerance for volatility calls for a more cautious approach. Accordingly, the investment strategy emphasizes diversification, simplicity, and the avoidance of leverage, tactical timing, or complex instruments.

The recommended portfolio adopts a globally diversified 40/60 defensive allocation, implemented via low-cost, UCITS-compliant ETFs. Security selection is guided by a disciplined, factor-based framework. The final Tangency Portfolio, derived through mean-variance optimization, targets a real annual return of 5.94% and a moderate volatility of 7.89%. It offers the highest risk-adjusted return among the candidate portfolios. This structure supports the clients' long-term objectives while maintaining strong alignment with their behavioural preferences and downside risk tolerance.

The portfolio is continuously monitored to ensure alignment with the clients' evolving objectives and risk profile. Performance is reviewed quarterly, with rebalancing conducted as needed to maintain strategic targets. Risk is assessed through back testing, Monte Carlo simulation, Value-at-Risk analysis, and qualitative risk reviews. Adjustments are made in response to market changes or shifts in client circumstances.

Investment governance is structured to ensure clarity, accountability and effective oversight. The clients retain final authority over all investment decisions and policy approvals, while the financial advisor, acting in a fiduciary capacity, provides strategic oversight, manages risks, and conducts performance reviews, including regular IPS reviews and updates in response to changes in financial circumstances, objectives, or market conditions.

References

Asness, C. F. (2017). Quality Minus Junk. Retrieved from https://dx.doi.org/10.2139/ssrn.2312432

BNP Paribas AM. (2019, September). *A Practical Guide To Multi-Factor Investing.* Retrieved from BNP Paribas AM: https://docfinder.bnpparibas-am.com/api/files/350BC4A6-621B-49A0-A8C4-E818FF727859

Bonne.G, Roisenberg.L, Subramanian.R.A, Melas.D. (2018). *MSCI FaCS Methodology.* Retrieved from https://www.msci.com/documents/10199/275765e9-d631-4222-b4aa-520f7fa7d830

Cacace, K. (2023, November 29). *How to choose a bond ETF*. Retrieved from justETF: https://www.justetf.com/en/academy/how-to-choose-a-bond-etf.html

CFA Institute. (2020). *Investment Risk Profiling : A guide for financial advisors.* Retrieved from https://rpc.cfainstitute.org/sites/default/files/-/media/documents/survey/investment-risk-profiling.pdf

CFA Institute. (2023). *Guidance Statement on Benchmarks for Asset Owners.* CFA Institute. Retrieved from https://www.gipsstandards.org/wp-content/uploads/2023/04/guidance-statement-benchmarks-asset-owners.pdf

CFA Institute. (2024). *Code of Ethicss and Standard - Standard III(C) Suitability*. Retrieved from https://www.cfainstitute.org/standards/professionals/code-ethics-standards/standards-of-practice-iii-c

European Central Bank. (2025, March). *European Central Bank - Economic Bulletin Issue 2, 2025.* Retrieved from ECB: https://www.ecb.europa.eu/press/economic-bulletin/html/eb202502.en.html#:~:text=The%20economy%20faces%20continued%20challenges,to%20a%20particular%20rate%20path.

Fama, E. (1970). Efficient Capital Markets: A review of theory and empirical work. . *The Journal of Finance*.

Fama, E. F. (1993). Common risk factors in the returns on stocks and bonds. *Journal of financial economics*. Retrieved from https://doi.org/10.1016/0304-405X(93)90023-5

Federal Reserve. (2025, May 7). *FOMC Statement - Press Release.* Retrieved from Federal Reserve.gov: https://www.federalreserve.gov/monetarypolicy/files/monetary20250507a1.pdf

FTSE Russell. (2017, August). *Multi-factor indexes: The power of tilting.* Retrieved from ftserussell: https://www.lseg.com/content/dam/ftse-russell/en_us/documents/research/multi-factor-indexes-power-of-tilting.pdf

International Monetary Fund. (2025, April). *Inflation Rate, Annual consumer prices*. Retrieved from https://www.imf.org/en/Countries/CHE#countrydata

International Monetary Fund, W. E. (2025). *World Economic Outlook: A Critical Juncture amid Policy Shifts.*

J.P. Morgan Asset Management. (2025, February). *Portfolio Insights - Building Stronger Portfolios*. Retrieved from JP Morgan: https://am.jpmorgan.com/content/dam/jpm-am-aem/americas/mx/en/insights/portfolio-insights/pi-model-portfolios-latam.pdf

Keeney, R. &. (1993). Decisions with Multiple Objectives. *Preferences and Value Tradeoffs*.

Malkeil, B. (2003). *A random walk down wall street.*

Markowitz, H. (1952). *Portfolio selection. The Journal of Finance. .*

Morningstar. (n.d.). *Morningstar*. Retrieved from Morningstar Stock Sector Structure: https://www.morningstar.com/content/dam/marketing/apac/au/pdfs/Legal/StockSectorStructure_Factsheet.pdf

Powell. (2025, May 7). Federal Reserve Chair Jerome Powell speaks as Fed holds interest rates steady — 5/7/2025. CNBC. Retrieved from https://www.youtube.com/watch?v=7tOf-eYotvw

The Global Economy. (2025). *Switzerland: Inflation Forecast*. Retrieved from https://www.theglobaleconomy.com/Switzerland/inflation_outlook_imf/

World Government Bonds. (2025, April 14). *Switzerland 15 Years Bond - Historical Data*. Retrieved from World Government Bonds: https://www.worldgovernmentbonds.com/bond-historical-data/switzerland/15-years/

Appendix

Table A1: Clients Profile (Detailed)

Personal Details	Name & Age	Mr. & Mrs. Grey, both aged 35
	Status	Married, 1 Child (3 years old)
	Occupation	Doctor & Teacher
	Residency	Swiss citizens, tax residents
	Housing	Primary residence in Winterthur, Switzerland
	Other Properties	Multiple rental properties
Income & Assets	Annual Income	CHF 200,000 + CHF 60,000 (Rental Income)
	Savings	Not specified
	Inheritance (2025)	CHF 500,000
Investment Profile	Investment Capital	CHF 500,000 from Inheritance
	Investment Horizon	15 years (2025-2039)
	Financial Knowledge	Moderate, prior equity investing
	Risk Profile	Moderately conservative (Table A2, Appendix)
	Ability/ Willingness	High/Low
	Liquidity needs	None
	Retirement Plan	Targeted for 2040
Investment Goals	Primary Goal	Repay mortgage balance – CHF 795,158
	Secondary Goals	Child's Education + retirement travel CHF 100,000 each
	Total Target	CHF 1,064,331
Liabilities	Debt	CHF 1.6M mortgage (30 years, 1.5% fixed, since 2023
Investment Constraints	Minimum Return	5.17%
	Portfolio style	Globally diversified ETF investing
	Restrictions	No Leverage or Short selling
	Preference	Regulated ETFs
		Quality, value and low volatility preferences
		Long-term growth & capital preservation
Proposed Portfolio	Expected Return	5.94%
	Volatility	0.078 (annualized)

Table A2: Clients Risk Profile Questionnaire and Responses

	Clients Risk Profiling Questionnaire
Advisor:	What are your key financial goals, how much do you plan to invest, and over what time frame?
Client:	We aim to repay our mortgage by 2039, support our child's education, and retire early with travel flexibility. We'll invest the CHF 500,000 inheritance and stay invested until then.
Advisor:	What influenced your decision to invest instead of using it to pay down your mortgage?
Client:	With a low fixed mortgage rate of 1.5%, we believe investing offers better long-term result than early repayment would save.
Advisor:	Will you need to withdraw funds before then, for living cost, mortgage payments, emergencies?
Client:	No, our income covers all expenses, and we have separate reserves for emergencies.
Advisor:	Do you have any preferences about which currencies your investments are held in?
Client:	We're fine with foreign currencies if returns are strong, though we prefer stable ones.

	Knowledge & Experience
Advisor:	How do you describe your knowledge of investment and financial market? 1. None 2. Minimal 3. Moderate 4. Competent 5. Very knowledgeable
Client:	Moderate (2)
Advisor:	Do you have any experience with investment products? How would you describe it? 1. None 2. Very little 3. Some 4. Modest 5. Extensive
Client:	Some (3) - In equities, but not actively. We have some basic understanding of how markets work.

	Risk Preferences & Attitudes
Advisor:	What amount of financial risk are you willing to take when you invest?
Client:	Take average risks expecting to earn average return.
Advisor:	While holding investment that involve risky assets, what is your preference? 1. Maximize safety 2. Mostly safety 3. Mix - safety & return 4. Mostly return 5. Maximize return
Client:	Mix of safety & return (3) - We prefer transparent, low-cost and well-regulated investment. Ideally in global ETFs without complexity or high-risk products by keeping things simple.
Advisor:	When you think about the stock market, which of these best reflects how you feel? 1. Very Risky 2. Somewhat Risky 3. Neutral 4. Somewhat safe 5. Very safe
Client:	Somewhat risky (2) - We know the market involves risk, but also some level of risk is necessary for return. We prefer something stable with lower ups and downs, growing our money overtime.
Advisor:	Assume a global event causes your portfolio to decline by 20% over the past 3 months. What most likely would you do? 1. Sell all 2. Sell part 3. Wait & monitor 4. Stay invested 5. Buymore
Client:	Sell part of it (2)

	Behavioural Assessment
Advisor:	Imagine you have 2 options: A. Receive a guaranteed amount of money right now B. Flip a coin - if its heads, you win CHF 100,000, if its tail you get nothing. At what amount you will choose option A. instead of taking the coin toss?
Client:	Around CHF 45,000
Advisor:	Is there a certain level of loss that would make you uncomfortable with your investment?
Client:	We'd like to avoid a high chance of losing money, though it's hard to define a precise discomfort threshold. The 1.5% mortgage rate serves as a helpful reference point, but not a strict benchmark. We understand market fluctuate; we just want to avoid unnecessary risks, or large losses.

Table A3: Portfolio Constraints and Exposures (Detailed)

Strategic Design Constraints

Constraint Category	Description	Constraint Range
Factor Exposure	**Low Volatility ETFs**	**0% – 20%**
	SPMV LN Equity	
	MVOL LN Equity	
	EMMV LN Equity	
	Mixed factor ETFs	**12% – 28%**
	CSPX LN Equity	
	SPY4 LN Equity	
	C50 FP Equity	
	ERO FP Equity	
	SWDA LN Equity	
Sector Allocation	**Sensitive Sectors Tilts**	**≤ 40%**
	CSPX LN Equity	
	SWDA LN Equity	
	SPY4 LN Equity	
	C50 FP Equity	
	MVOL LN Equity	
	EMMV LN Equity	
	Defensive Sectors Tilts	**≤ 40%**
	SPMV LN Equity	
	MVOL LN Equity	
	Cyclical Sectors Tilts	**15% – 25%**
	SPY4 LN Equity	
	C50 FP Equity	
	ERO FP Equity	
	EMMV LN Equity	
	D5BK GR Equity	
Mid-Cap Exposure	**US Mid-Cap Equity**	**2% – 5%**
	SPY4 LN Equity	
Inflation Sensitivity	**Inflation Protection**	**8% – 12%**
	SPIP US Equity	
	CSGOLD SW Equity	
	D5BK GR Equity	
Duration Structure	**Short-Term Bonds**	**2.75% – 11.0%**
	UEFF GR Equity	
	Intermediate-Term Bonds	**5.5% – 19.0%**
	UEFI GR Equity	
	SCHR GR Equity	
	Long-Term Bonds	**2.75% – 8.25%**
	MTE FP Equity	
	Mixed-Duration Bonds	**5.5% – 27.5%**
	USAG LN Equity	
	LQDE LN Equity	
	X1G FP Equity	
	SPIP US Equity	

Allocation & Structural Constraints

Constraint Category	Description	Constraint Range
Asset Allocation Bounds	**Equity**	**20% – 45%**
	U.S.	15% – 30%
	Europe	10% – 25%
	Developed World	5% – 15%
	Emerging Market	2% – 15%
	Fixed Income	**50% – 60%**
	US Government	10% – 25%
	US Corporate	9% – 20%
	Euro Government	5% – 20%
	Inflation linked	3% – 10%
	Aggregate	5% – 10%
	Alternatives	**0% – 10%**
	REITS	2% – 5%
	Gold	2% – 5%
Structural Constraints	Total Portfolio Weight	$\sum w_i = 100\%$
	No Short Positions	$w_i \geq 0$
	Individual ETF Cap	$\leq 10\%$

Figure A1: Final Portfolio Tilts by Thematic Exposure (%)
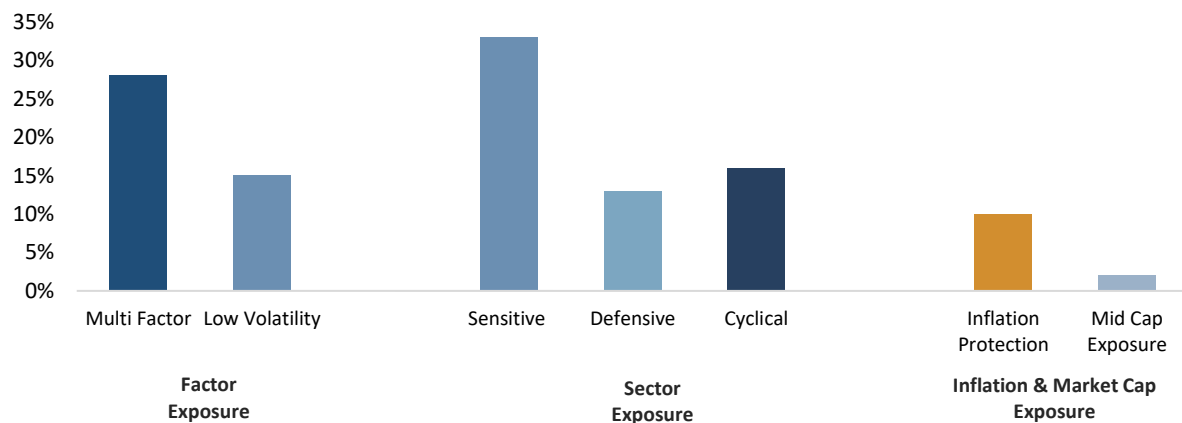

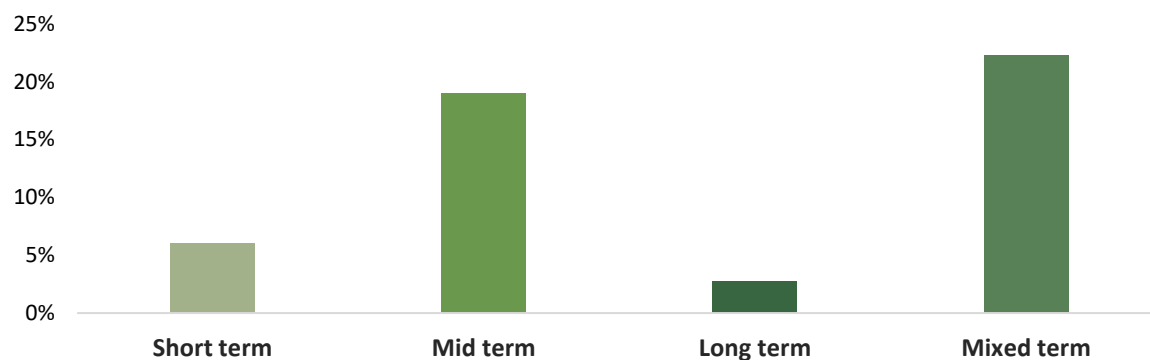## Figure A2: Final Portfolio Allocation by Bond Maturity Structure (%)

Table A4: Final Eligible Investment Universe (Detailed)

Eligible Securities Characteristics *Source- Bloomberg*

Ticker	ISIN	Replication	UC ITS	Cur.	Pay ment	Tot. Asset (M)	Avg. Vol 100day	Exp. Rat	Track Error	Beta 5Y	Sharp e 5Y	Inf Rat 5Y
CSPX LN Equity	IE00B5BMR087	Full	Y	USD	Acc.	97345	67909	0.07	0.02	0.88	0.962	-0.025
SPMV LN Equity	IE00B6SPMN59	Optimized	Y	USD	Acc.	1255	14869	0.2	0.031	0.866	0.762	-0.044
SPY4 LN Equity	IE00B4YBJ215	Full	Y	USD	Acc.	4678	67778	0.3	0.053	0.935	0.583	-0.083
C50 FP Equity	LU1681047236	Full	Y	EUR	Acc.	3298	16577	0.09	0.213	0.993	0.761	0.863
ERO FP Equity	IE00BKWQ0Q14	Full	Y	EUR	Acc.	302	346	0.25	0.119	0.978	0.737	0.106
SWDA LN Equity	IE00B4L5Y983	Optimized	Y	GBP	Acc.	98382	103933	0.2	0.841	0.902	1.027	-0.005
MVOL LN Equity	IE00B8FHGS14	Optimized	Y	USD	Acc.	4180	20345	0.3	0.147	0.894	0.488	-0.034
EMMV LN Equity	IE00B8KGV557	Optimized	Y	USD	Acc.	276	1834	0.4	0.334	0.96	0.219	-0.074
SCHR US Equity	US8085248545	Full	N	USD	Inc.	10375	2093542	0.03	0.14	0.998	-0.557	-0.075
UEFF GR Equity	LU0721552544	Full	Y	EUR	Inc.	135	52	0.07	0.029	0.938	0.194	-0.026
UEFI GR Equity	LU0721552973	Full	Y	EUR	Inc.	154	24	0.07	0.03	0.933	-0.284	-0.054
LQDE LN Equity	IE0032895942	Optimized	Y	USD	Inc.	8401	31854	0.2	0.12	0.933	-0.248	-0.072
X1G FP Equity	LU1681046774	Optimized	Y	EUR	Acc.	984	562	0.14	0.019	0.985	-0.476	-0.282
MTE FP Equity	LU1650489385	Full	Y	EUR	Acc.	1136	5353	0.15	0.046	1	-0.493	-0.376
SPIP US Equity	US78464A6560	Optimized	N	USD	Inc.	927	209240	0.12	0.197	0.975	-0.105	-0.048
USAG LN Equity	IE00B459R192	Optimized	Y	USD	Inc.	150	1147	0.17	0.072	0.944	-0.509	-0.181
D5BK GR Equity	LU0489337690	Full	Y	EUR	Acc.	769	979	0.33	0.226	1.031	-0.094	0.128
CSGOLD SW Equity	CH0104136236	Full	N	USD	Acc.	814	5635	0.19	0.005	0.975	0.751	0.075

GICS Sector Classification of Eligible Securities *Source- Bloomberg*

Ticker	Cons. Disc	Cons. Staples	Energy	Fin	Health Care	Ind	Tech	Materi	Comm	Utils	Real Estate	Sensi tive	Defe nsive	Cycli cal
EMMV LN	8.15%	10.00%	4.60%	22.81%	8.86%	4.90%	16.40%	4.87%	13.88%	4.09%	.73%	40%	23%	37%
C50 FP	18.83%	6.89%	5.36%	20.46%	5.47%	17.04%	16.42%	4.19%	2.17%	3.18%	-	41%	16%	43%
MVOL LN	6.15%	12.06%	1.99%	13.79%	16.69%	9.99%	18.10%	2.00%	12.06%	6.55%	.29%	42%	35%	22%
SPMV LN	5.66%	13.62%	.35%	20.65%	19.38%	1.27%	22.36%	-	5.95%	9.04%	1.38%	30%	42%	28%
SWDA LN	10.57%	6.42%	4.66%	15.35%	11.77%	11.24%	23.42%	3.96%	7.56%	2.43%	2.19%	47%	21%	32%
CSPX LN	10.24%	5.90%	4.14%	13.09%	12.16%	8.80%	29.41%	2.39%	9.20%	2.22%	2.23%	52%	20%	28%
ERO FP	11.06%	10.46%	5.66%	18.59%	15.15%	16.33%	8.08%	7.02%	2.96%	3.79%	.81%	33%	29%	37%
SPY4 LN	14.97%	4.57%	5.65%	16.08%	8.12%	22.10%	9.33%	7.16%	1.43%	3.43%	7.10%	39%	16%	45%
D5BK GR	-	-	-	-	-	-	-	-	-	-	99.3%	-	-	99%

Ratings & Maturity Classification (BBG Composite) *Source- Bloomberg*

Ticker	AAA	AA	A	BBB	BB	NR	1-3 Yrs	3-5 Yrs	5-7 Yrs	7-10 Yrs	+10 Yrs	Not Classified
UEFI GR	-	100%	-	-	-	-	-	-	-	100.60%	-	-
SPIP US	-	-	-	-	-	99.80%	24.83%	27.68%	11.85%	17.06%	18.38%	.20%
X1G FP	-	11.43%	-	8.35%	-	80.22%	19.74%	19.15%	14.36%	17.30%	29.46%	-
LQDE LN	1.12%	6.55%	45.98%	40.96%	2.92%	0.04%	0.0003275	17.37%	17.92%	19.76%	42.52%	2.43%
SCHR US	-	99.98%	-	-	-	-	-	50.30%	29.01%	20.68%	-	0.02%
USAG LN	3.13%	47.06%	11.19%	11.42%	0.67%	1.20%	21.66%	18.62%	13.40%	24.20%	19.93%	-
MTE FP	-	5.10%	-	3.38%	-	91.52%	-	-	-	6.10%	93.90%	-
UEFF GR	-	100%	-	-	-	-	99.12%	-	-	-	-	-

Table A5: MVO Inputs

Expected Return & Volatility

Ticker	Name	Monthly Return	Monthly Volatility	Annualized Return	Annualized Volatility
CSPX LN Equity	ISHARES CORE S&P 500	1.15%	0.041	14.76%	0.143
SPMV LN Equity	ISHARES EDGE S&P500 MIN VOL	0.99%	0.036	12.53%	0.125
SPY4 LN Equity	SPDR S&P 400 US MID CAP	0.92%	0.051	11.67%	0.175
C50 FP Equity	AMUNDI EURO STOXX 50 ETF DR	0.67%	0.051	8.37%	0.176
ERO FP Equity	SPDR MSCI EUROPE	0.57%	0.042	7.04%	0.144
SWDA LN Equity	ISHARES CORE MSCI WORLD	0.91%	0.039	11.46%	0.135
MVOL LN Equity	ISH EDG MSCI WLD MNVL USD A	0.73%	0.030	9.15%	0.104
EMMV LN Equity	ISHARES EDGE MSCI EM MIN VOL	0.22%	0.032	2.62%	0.111
SCHR US Equity	SCHWAB INTERMEDIATE-TERM US	0.11%	0.020	1.35%	0.069
UEFF GR Equity	UBS ETF BBG. CAP. US TR. 1-3	0.09%	0.021	1.11%	0.074
UEFI GR Equity	UBS ETF BBG. CA. US TR. 7-10	0.11%	0.023	1.36%	0.078
LQDE LN Equity	ISHARES USD CORP BOND USD D	0.24%	0.022	2.95%	0.078
X1G FP Equity	AM GOVT BD LO RA EU INVGR-C	0.01%	0.022	0.18%	0.076
MTE FP Equity	AM EURO GOV BD 10-15Y-ETF A	0.04%	0.026	0.46%	0.091
SPIP US Equity	SPDR PORTFOLIO TIPS ETF	0.16%	0.021	1.91%	0.073
USAG LN Equity	SPDR BBG US AGGREGATE	0.12%	0.020	1.50%	0.068
D5BK GR Equity	X FTSE EUROPE REAL ESTATE 1C	0.30%	0.056	3.60%	0.193
CSGOLD SW Equity	ISHARES GOLD ETF CH	0.42%	0.037	5.11%	0.130

Variance- Covariance Matrix

	CSPX	SPMV	SPY4	C50	ERO	SWDA	MVOL	EMMV	SCHR	UEFF	UEFI	LQDE	X1G	MTE	SPIP	USAG	D5BK	CSGOLD
CSPX	0.020	0.017	0.023	0.018	0.016	0.019	0.012	0.011	0.003	0.004	0.002	0.006	0.005	0.005	0.005	0.004	0.016	0.000
SPMV	0.017	0.016	0.018	0.014	0.013	0.015	0.012	0.009	0.003	0.004	0.003	0.006	0.004	0.005	0.005	0.004	0.014	0.001
SPY4	0.023	0.018	0.031	0.021	0.019	0.022	0.014	0.012	0.002	0.003	0.002	0.007	0.005	0.006	0.005	0.004	0.021	-0.001
C50	0.018	0.014	0.021	0.031	0.025	0.019	0.011	0.013	0.001	0.001	0.001	0.006	0.007	0.008	0.003	0.002	0.024	-0.001
ERO	0.016	0.013	0.019	0.025	0.021	0.017	0.011	0.011	0.001	0.001	0.001	0.005	0.006	0.006	0.003	0.002	0.022	-0.001
SWDA	0.019	0.015	0.022	0.019	0.017	0.018	0.012	0.011	0.002	0.003	0.002	0.006	0.005	0.006	0.004	0.003	0.018	0.000
MVOL	0.012	0.012	0.014	0.011	0.011	0.012	0.011	0.007	0.003	0.003	0.003	0.005	0.004	0.004	0.004	0.003	0.011	0.001
EMMV	0.011	0.009	0.012	0.013	0.011	0.011	0.007	0.012	0.001	0.002	0.001	0.004	0.004	0.004	0.003	0.002	0.011	0.001
SCHR	0.003	0.003	0.002	0.001	0.001	0.002	0.003	0.001	0.005	0.004	0.005	0.004	0.002	0.003	0.004	0.004	0.000	0.002
UEFF	0.004	0.004	0.003	0.001	0.001	0.003	0.003	0.002	0.004	0.006	0.004	0.003	0.002	0.001	0.004	0.004	-0.001	0.001
UEFI	0.002	0.003	0.002	0.001	0.001	0.002	0.003	0.001	0.005	0.004	0.006	0.005	0.003	0.003	0.005	0.005	0.002	0.002
LQDE	0.006	0.006	0.007	0.006	0.005	0.006	0.005	0.004	0.004	0.003	0.005	0.006	0.004	0.005	0.005	0.004	0.007	0.002
X1G	0.005	0.004	0.005	0.007	0.006	0.005	0.004	0.004	0.002	0.002	0.003	0.004	0.006	0.007	0.003	0.003	0.008	0.002
MTE	0.005	0.005	0.006	0.008	0.006	0.006	0.004	0.004	0.003	0.001	0.003	0.005	0.007	0.008	0.003	0.003	0.010	0.002
SPIP	0.005	0.005	0.005	0.003	0.003	0.004	0.004	0.003	0.004	0.004	0.005	0.005	0.003	0.003	0.005	0.004	0.004	0.003
USAG	0.004	0.004	0.004	0.002	0.002	0.003	0.003	0.002	0.004	0.004	0.005	0.004	0.003	0.003	0.004	0.005	0.002	0.001
D5BK	0.016	0.014	0.021	0.024	0.022	0.018	0.011	0.011	0.000	-0.001	0.002	0.007	0.008	0.010	0.004	0.002	0.037	0.000
CSGOLD	0.000	0.001	-0.001	-0.001	-0.001	0.000	0.001	0.001	0.002	0.001	0.002	0.002	0.002	0.002	0.003	0.001	0.000	0.017

Correlation Matrix

	CSPX	SPMV	SPY4	C50	ERO	SWDA	MVOL	EMMV	SCHR	UEFF	UEFI	LQDE	X1G	MTE	SPIP	USAG	D5BK	CSGOLD
CSPX	1	0.936	0.902	0.715	0.767	0.977	0.838	0.675	0.264	0.335	0.207	0.540	0.428	0.406	0.469	0.417	0.588	-0.024
SPMV	0.936	1	0.843	0.646	0.711	0.907	0.936	0.634	0.354	0.412	0.326	0.601	0.451	0.436	0.547	0.485	0.565	0.062
SPY4	0.902	0.843	1	0.674	0.739	0.907	0.755	0.633	0.175	0.266	0.135	0.496	0.362	0.349	0.397	0.332	0.618	-0.047
C50	0.715	0.646	0.674	1	0.971	0.822	0.630	0.652	0.055	0.093	0.038	0.406	0.524	0.480	0.267	0.190	0.710	-0.041
ERO	0.767	0.711	0.739	0.971	1	0.869	0.706	0.684	0.065	0.110	0.054	0.431	0.510	0.465	0.303	0.211	0.778	-0.027
SWDA	0.977	0.907	0.907	0.822	0.869	1	0.837	0.736	0.212	0.283	0.173	0.541	0.480	0.450	0.446	0.378	0.671	-0.026
MVOL	0.838	0.936	0.755	0.630	0.706	0.837	1	0.634	0.383	0.387	0.378	0.617	0.477	0.474	0.577	0.487	0.565	0.104
EMMV	0.675	0.634	0.633	0.652	0.684	0.736	0.634	1	0.139	0.183	0.115	0.415	0.460	0.421	0.337	0.288	0.510	0.043
SCHR	0.264	0.354	0.175	0.055	0.065	0.212	0.383	0.139	1	0.852	0.922	0.744	0.414	0.426	0.876	0.933	0.031	0.191
UEFF	0.335	0.412	0.266	0.093	0.110	0.283	0.387	0.183	0.852	1	0.738	0.563	0.277	0.210	0.749	0.830	-0.048	0.118
UEFI	0.207	0.326	0.135	0.038	0.054	0.173	0.378	0.115	0.922	0.738	1	0.784	0.427	0.483	0.835	0.887	0.110	0.222
LQDE	0.540	0.601	0.496	0.406	0.431	0.541	0.617	0.415	0.744	0.563	0.784	1	0.599	0.649	0.816	0.835	0.474	0.198
X1G	0.428	0.451	0.362	0.524	0.510	0.480	0.477	0.460	0.414	0.277	0.427	0.599	1	0.971	0.492	0.501	0.538	0.178
MTE	0.406	0.436	0.349	0.480	0.465	0.450	0.474	0.421	0.426	0.210	0.483	0.649	0.971	1	0.515	0.507	0.554	0.188
SPIP	0.469	0.547	0.397	0.267	0.303	0.446	0.577	0.337	0.876	0.749	0.835	0.816	0.492	0.515	1	0.854	0.269	0.277
USAG	0.417	0.485	0.332	0.190	0.211	0.378	0.487	0.288	0.933	0.830	0.887	0.835	0.501	0.507	0.854	1	0.187	0.162
D5BK	0.588	0.565	0.618	0.710	0.778	0.671	0.565	0.510	0.031	-0.048	0.110	0.474	0.538	0.554	0.269	0.187	1	-0.014
CSGOLD	-0.024	0.062	-0.047	-0.041	-0.027	-0.026	0.104	0.043	0.191	0.118	0.222	0.198	0.178	0.188	0.277	0.162	-0.014	1

Table A6: Final Portfolio ETF and Benchmark (Detailed)

ETF	Fund Description	Index
ISHARES CORE S&P 500	Incorporated in Ireland. The fund seeks to track the performance of 500 large cap US companies.	S&P 500 Index
ISHARES EDGE S&P500 MIN VOL	Incorporated in Ireland. The fund aims to track the performance of the index composed of selected large cap US companies that, in the aggregate, have lower volatility characteristics relative to the broader US equity market.	S&P 500 Minimum Volatility Index
SPDR S&P 400 US MID CAP	Incorporated in Ireland. This open-ended fund's objective is to track the performance of the US mid cap equities.	S&P Midcap 400 Index
AMUNDI EURO STOXX 50 ETF DR	Incorporated in Luxemburg. This ETF enables the investors to benefit from an exposure of the 50 leading stocks covering countries in the Eurozone.	Dow Jones EUROSTOXX 50 index TRN
ISHARES CORE MSCI WORLD	Incorporated in Ireland. The fund aims to track an index composed of companies from developed countries.	MSCI World Index.
ISH EDG MSCI WLD MNVL USD A	Incorporated in Ireland. The fund seeks to track the performance of an index composed of selected companies from developed countries that, in the aggregate, have lower volatility characteristics relative to broader developed equity markets.	MSCI World Minimum Volatility Index
ISHARES EDGE MSCI EM MIN VOL	Incorporated in Ireland. The fund seeks to track the performance of an index composed of selected companies from emerging market countries that, in the aggregate, have lower volatility characteristics relative to broader emerging equity markets.	MSCI Emerging Markets Minimum Volatility Index
SCHWAB INTERMEDIATE-TERM US	Incorporated in USA. The fund's goal is to track as closely as possible, before fees and expenses, the total return of an index, that measures the performance of the intermediate-term US Treasury bond market.	Bloomberg US 3–10-yr Treasury Bond Index
UBS ETF BBG. CAP. US TR. 1-3	Incorporated in Luxembourg. The objective of the share class is to deliver the performance of the index that includes treasury bonds issued by the USA with maturity of at least 1 year but no more than 3 years and allowing intraday trading.	Bloomberg US 1-3yr Treasury Bond Tot. Return
UBS ETF BBG. CA. US TR. 7-10	Incorporated in Luxembourg. The objective of the share class is to deliver the performance of the index that includes treasury bonds issued by USA with maturity of at least 7 years but no more than 10 years and allowing intraday trading.	Bloomberg US 7-10yr Treasury Bond Tot. Return
ISHARES USD CORP BOND USD D	Incorporated in Ireland. The fund aims to track the performance of an index composed of an exposure to the most liquid, US dollar denominated, investment grade corporate bonds.	Markit Iboxx USD liquid investment Grade Index
AM GOVT BD LO RA EU INVGR-C	Incorporated in Luxembourg. The fund's objective is to replicate the performance of the index composed of debt securities issued by the Eurozone member states and having at least two ratings lower than 'AAA' (or a lower equivalent from S&P, Moody's and Fitch).	FTSE Eurozone Lowest-Rated Government Bond IG Index
AM EURO GOV BD 10-15Y-ETF A	Incorporated in Luxembourg. The fund seeks to track the performance of the index that represents the performance of EUR denominated government bonds issued by countries of the European Monetary Union with at least €50bn of government bonds in issuance and maturities of at least 10 to 15 years, with a minimum outstanding amount of €300m.	Bloomberg Barclays Euro Treasury 50bn 10-15 Year Bond Index
SPDR PORTFOLIO TIPS ETF	Incorporated in USA. The fund aims to provide investment results corresponding to the price and the yield of its benchmark index including publicly issued, U.S. Treasury inflation protected securities, having least 1 year remaining to maturity on index rebalancing date, with an issue size equal to or more than $500 million.	Bloomberg US Government Inflation Linked Bond Index
SPDR BBG US AGGREGATE	Domiciled in Ireland. The fund's objective is to track the performance of the index that measures investment grade, US dollar denominated, fixed rate taxable bond market. This includes Treasuries, government-related and corporate securities, asset-backed securities, and collateralised mortgage-backed securities.	Bloomberg US Aggregate Bond Index
X FTSE EUROPE REAL ESTATE 1C	Domiciled in Ireland. This UCITS ETF physically replicates the performance of its benchmark index and offers direct investment in Europe Real Estate, provides Exposure to Real Estate holding and development companies, as well as REITS.	FTSE EPRA/NAREIT Dev Europe Real Estate NR Index
ISHARES GOLD ETF CH	Domiciled in Switzerland. The fund seeks to track the return of the gold return price.	LBMA Gold Price

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AI Disclosure

I disclose that AI tools were employed during the development of this thesis as follows:

1. AI-based research tools were used to assist in literature review and data collection.
2. AI-powered software was utilized for data analysis and visualization.
3. Generative AI tools were consulted for brainstorming and outlining purposes.
4. AI tools were also used to assist with English language revision, including grammar, clarity and style.

However, all final writing, synthesis, and critical analysis are my own work. Instances where AI contributions were significant are clearly cited and acknowledged. Nonetheless, I have ensured that the use of AI tools did not compromise the originality and integrity of my work. All sources of information, whether traditional or AI-assisted, have been appropriately cited in accordance with academic standards. The ethical use of AI in research and writing has been a guiding principle throughout the preparation of this thesis. I understand the importance of maintaining academic integrity and take full responsibility for the content and originality of this work.

Kirtan Shrestha, Lisbon, 28 June 2025.