Lisbon School of Economics & Management
Universidade de Lisboa

MASTER OF SCIENCE IN

FINANCE

MASTERS FINAL WORK

PROJECT

INVESTMENT POLICY STATEMENT:

MIGUEL SANTOS

JOÃO LOPES

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Abstract

This Investment Policy Statement (IPS) outlines the investment plan for Miguel Santos, a 35-year-old mechanical engineer, who intends to invest €300,000 over a 15-year horizon with the goal of growing his capital through a disciplined value investing approach. The investment objective is to reach a future portfolio value that preserves and grows purchasing power, targeting an annual nominal return of 7.25%**,** which translates to a projected future value of approximately €851,874, in today's money, by the end of the investment period. ETFs will serve as the primary investment vehicles due to their cost-efficiency, liquidity, transparency, and ease of diversification.

The investment philosophy emphasizes value investing and risk-adjusted returns, leveraging Markowitz's Modern Portfolio Theory to construct a portfolio along the Efficient Frontier. Strategic asset allocation includes 75,34% of a Risky Portfolio (52,5% equities, 25% bonds, and 22,5% alternatives, selected based on geographic and sectoral diversification. The portfolio includes ETFs such as VTV, XDWS, and IUVL for value equity exposure, VAGU and TIP5 for fixed income, and GLD for inflation protection—each selected for their diversification, cost efficiency, and alignment with the IPS.

This IPS presents a comprehensive framework for aligning investment strategy with individual financial goals, while accounting for the structural influence of market limitations.

Keywords: Investment Policy Statement, Value Investing, ETFs, Modern Portfolio Theory.

Resumo

Este Investment Policy Statement (IPS) descreve o plano de investimento de Miguel Santos, um engenheiro mecânico de 35 anos, que pretende investir €300.000 ao longo de um horizonte de 15 anos, com o objetivo de fazer crescer o seu capital através de uma abordagem disciplinada de investimento em valor. O objetivo do investimento é alcançar um valor futuro da carteira que preserve e aumente o poder de compra, visando uma rentabilidade nominal anual de 7,25%, o que corresponde a um valor futuro projetado de aproximadamente €851.874, em valores atuais, no final do período de investimento. Os ETFs serão os principais veículos de investimento, devido à sua eficiência de custos, liquidez, transparência e facilidade de diversificação.

A filosofia de investimento enfatiza o investimento em valor e os retornos ajustados ao risco, recorrendo à Teoria Moderna do Portfólio de Markowitz para construir uma carteira ao longo da Fronteira Eficiente. A alocação estratégica de ativos inclui 75,34% numa carteira arriscada (52,5% em ações, 25% em obrigações e 22,5% em ativos alternativos), selecionados com base na diversificação geográfica e sectorial. A carteira inclui ETFs como VTV, XDWS e IUVL para exposição a ações de valor, VAGU e TIP5 para rendimento fixo, e GLD para proteção contra a inflação — todos selecionados pela sua diversificação, eficiência de custos e alinhamento com o IPS.

Este IPS apresenta uma estrutura abrangente para alinhar a estratégia de investimento com os objetivos financeiros individuais, tendo em conta a influência estrutural das limitações do mercado

Classificação JEL: C6; G11 .
Palavras-Chave: Investment Policy Statement; Investimento em Valor, ETFs, Teoria Moderna do Portefólio.

Acknowledgements

I would like to take this opportunity to express my deepest gratitude to the many people who have supported and guided me throughout this journey. Without their help and encouragement, this accomplishment would not have been possible.

First and foremost, I want to thank my parents. Their unwavering belief in me has been a constant source of motivation. They have always been by my side, supporting me through every challenge, and instilling in me the confidence to pursue my dreams. Their trust in my abilities has allowed me to believe that anything is possible, and for that, I am forever grateful.

To my brother, thank you for being not only a sibling but also a true companion throughout this journey. Your presence has provided me with strength and reassurance, and I could not have asked for a better person to share this path with. Your support and understanding have meant the world to me.

I must also thank my friends, who have been with me through thick and thin. You have been my source of joy, laughter, and comfort during difficult times, and I am truly fortunate to have such an amazing group of people by my side. Together, we have faced challenges, celebrated successes, and supported each other in countless ways. I will always cherish our friendship.

I would also like to extend my heartfelt thanks to my grandparents. Many times, they have stepped in to guide and care for me, taking on the role of second parents. Their wisdom, kindness, and love have been invaluable in shaping who I am today. I am eternally grateful for their constant presence and support in my life.

Finally, I want to express my sincere appreciation to Professor Pedro Rino Vieira. His advice and guidance throughout this academic year have been crucial to my growth. I am truly thankful for the time and effort he dedicated to helping me, and for always providing thoughtful feedback that allowed me to improve and develop both personally and professionally.

Abbreviations

IPS	Investment Policy Statement
ETF	Exchange-Traded Fund
TER	Total Expense Ratio
AUM	Assets Under Management
MPT	Modern Portfolio Theory
CAPM	Capital Asset Pricing Model
EF	Efficient Frontier
MV	Minimum Variance (Portfolio)
SR	Sharpe Ratio
CAL	Capital Allocation Line
VaR	Value at Risk
CAPE	Cyclically Adjusted Price-to-Earnings Ratio
ERP	Equity Risk Premium
CPI	Consumer Price Index
HICP	Harmonized Index of Consumer Prices
ECB	European Central Bank
IMF	International Monetary Fund
OECD	Organization for Economic Co-operation and Development
FRED	Federal Reserve Economic Data
USD	United States Dollar
EUR	Euro
REIT	Real Estate Investment Trust

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1 Introduction

An Investment Policy Statement (IPS) is a crucial document that outlines the investment objectives, strategies, and guidelines for managing an investment portfolio. Its primary purpose is to ensure that the investment decisions are made in alignment with the client's financial goals, risk tolerance, and time horizon. The IPS acts as a roadmap for both the investor and the portfolio manager, providing clear directions for decision-making and helping to maintain consistency throughout the investment process.

The importance of an IPS lies in its ability to establish a framework for disciplined, objective, and strategic investment management. For the client, it offers a sense of security by ensuring that their portfolio is managed according to a well-defined plan that reflects their personal financial situation. It also helps to mitigate emotional decision-making and ensures that the portfolio remains aligned with long-term goals, regardless of market fluctuations.

The objective of this report is to apply the principles of Applied Portfolio Management in a practical way, showcasing how theoretical concepts can be used to build and manage an investment portfolio effectively. The data used in this analysis spans up to April 2025, ensuring that the findings are based on current and relevant information.

2 Executive Summary

2.1 Scope and Purpose

This Investment Policy Statement (IPS) establishes the investment plan for Miguel Santos, in collaboration with his advisor, Paulo Ferreira, Funded by Miguel's savings, the IPS serves as a communication framework to align on goals and ensure adherence to fiduciary standards and legal requirements, with regular monitoring and updates to support Miguel's financial objectives.

2.2 Governance

The governance framework of this IPS establishes clear roles and responsibilities to ensure alignment and effective implementation. The advisor is responsible for reviewing, implementing, and maintaining the IPS. The advisor will continuously assess and manage risks, ensuring the IPS remains aligned with the client's goals and risk profile.

2.3 Investment Return and Risk

Considering an average inflation rate of 2.5%, the inflation-adjusted target rises to approximately €825,360 in future nominal terms. With a target annual return of 7.25%, this corresponds to a real return of approximately 4.36%. The proposed Portfolio has 7,25% Return and 0,86 Sharpe Ratio.

2.4 Risk Management

The advisor will ensure performance monitoring and reporting in accordance with the CFA Institute's GIPS standards. Clients will receive regular updates that include risk assessments, Key risk metrics will be reviewed and communicated on a quarterly basis.

3 Investment Policy Statement

3.1 Scope and Purpose

3.1.1 Context and investor

This agreement, known as an IPS, serves as a clear communication tool between Miguel Santos and Mr. Paulo Ferreira, regarding Miguel's investment plan. The client participating in this agreement and receiving financial advice is Miguel Santos, a Mechanical Engineer, with a stable job. The advisor is Mr. Paulo Ferreira, a 45-year-old financial consultant with a master's degree in Finance. Paulo is married and has a wealth of experience in helping professionals navigate their financial journeys. He is committed to providing Miguel with the guidance needed to achieve his investment goals. The funds to be invested will primarily come from Miguel's personal savings. Additionally, Miguel anticipates a portion of his future salary, once employed, to be allocated towards his investment fund. He also plans to seek potential financial support from his family to enhance his investment capacity.

3.1.2 Structure

As previously mentioned, Mr. Paulo Ferreira, in addition to fulfilling the objectives agreed upon with Miguel, must also adhere to applicable tax and legal requirements. Consequently, he will be responsible for regularly monitoring and updating his client. Miguel, on his part, will be responsible for approving the final IPS as well as any future amendments to it. As an advisor, Mr. Paulo Ferreira must uphold fiduciary duty as one of the core principles of his work, consistently prioritizing the interests of his client, Miguel. The firm adheres to the CFA Institute's Asset Manager Code of Professional Conduct. The client has entrusted full responsibility to Paulo Ferreira, delegating all investment decisions to him. As a result, he holds sole authority to manage investments on Miguel's behalf.

3.2 Governance

For the best results with this IPS, the advisor should clearly communicate their responsibilities as a financial advisor and clarify the client's obligations, ensuring maximum efficiency. The financial advisor is responsible for reviewing, implementing and maintaining the IPS. He must regularly update the client on investment progress and present options to address any deviations for consideration. The IPS will undergo quarterly performance evaluations, with adjustments recommended as necessary. Client will also periodically review the IPS to ensure it remains consistent with their objectives and preferences. The client authorizes the advisor to appoint and remove individuals or entities managing their investment assets. For asset allocation, the advisor suggests the most appropriate financial assets and their distribution to align with the clients' goals. An annual review and rebalancing of the portfolio will be conducted, with any proposed adjustments requiring client approval. The advisor will provide full disclosure, including the proportions allocated to each asset class, expected returns, return correlations, anticipated changes in inflation, marginal tax rates, and benchmarks for comparing return and risk. ETFs will serve as the primary investment vehicle, with the distribution of sub-classes such as equities, fixed income, commodities, and alternative investments clearly specified. The advisor is responsible for continuously assessing and managing investment related risks. Annual financial reports will be issued as the official record of the investment policy and a foundation for risk evaluation. Any deviations in risk exposure will be identified, and the clients' risk profile will be reviewed to address any breaches of acceptable limits.

3.3 Investment, Return and Risk Objectives

3.3.1 Investment Objective

The objective of this IPS is to generate sufficient income over a 15-year period to achieve the client’s financial goals and ensure long-term stability. The total target is €570,000, with €450,000 allocated for purchasing a house, €80,000 designated for covering university-related educational expenses for two children, and €50,000 set aside as a reserve for unforeseen circumstances or leisure. This investment plan is structured to reflect the client’s financial priorities while balancing growth and risk throughout the investment horizon.

3.3.2 Return, Distribution and Risk Requirements

To meet the investment goal by 2040, an annual nominal rate of return of 7.25% is targeted. As reported by Banco de Portugal, the Harmonised Index of Consumer Prices in Portugal is projected to decline to 2.10% by 2025. Consequently, the advisor will adopt an average inflation estimate of 2.50% for the period.

Considering this inflation rate over the next 15 years, the inflation-adjusted value of the €570,000 goal rises to approximately €825,360 in nominal terms. With the return being capitalized over time, the portfolio is expected to reach its target. The investment strategy will aim to maximize the Sharpe Ratio to ensure an efficient balance between return and risk.

It is also important to consider the potential impact of taxation on capital gains, which may reduce the effective return of the portfolio. Given the client's intention to invest with minimal trading and a long-term horizon, the preference for accumulating ETFs is advantageous not only for compounding but also for deferring taxable events. While transaction and custody costs are expected to be low due to the ETF structure and passive strategy, the advisor will monitor any fiscal developments that could materially affect the portfolio's performance over time.

3.3.3 Portfolio Policy

An optimized allocation for each asset class will be determined using the advisor's model (MVT). Furthermore, upper and lower limits will be defined to permit variations within the allocation of each asset class. The advisor must comply with the asset allocation plan, ensuring that the actual allocations remain within the established limits. At the conclusion of each quarter, the investment manager is responsible for delivering a report to the client, outlining the current asset allocations and verifying that all the allocations made during the period stayed within the approved parameters.

3.3.4 Investor´s Risk Tolerance

The IPS captures the investor's attitude toward risk, recognizing that the portfolio may be exposed to various risks such as liquidity, legal, political, regulatory, longevity, mortality, business, and health risks, which can cause returns to fluctuate over time. It should also specify acceptable risk thresholds and consider any existing liabilities.
Regarding the capacity to handle risks, the client's long investment horizon allows for greater flexibility to recover from potential losses. Additionally, the client has no immediate liquidity requirements and does not rely on the invested capital during the investment period.

However, in terms of willingness to take on risk, since the money came from the sale of a property, they aim to invest in a way that minimizes exposure to capital gains tax. Separately, their investment preference also reflects a moderate level of capital preservation over taking on high risk. Although the client does not have a background in finance, he has always kept informed about financial markets and their volatility. Therefore, it can be said that he has a moderate risk aversion.

3.3.5 Relative Constraints

Due to the clients' financial stability from his career and untouched savings, there are few limitations on the liquidity of the investment assets, as long as they can be converted into cash within the investment period. In certain market scenarios, assets might need to be temporarily liquidated for rebalancing.
The portfolio will be structured through investments in ETFs. When utilizing this type of financial instrument, the investor should be aware that a range of costs may apply, including management fees, trading commissions, and potential bid-ask spreads, all of which can impact overall returns.

No investments outlined in this IPS should involve leverage strategies. There are no specific limits on the percentage of investments denominated in foreign currencies. If any funds are received in a currency other than Euros, the advisor will convert them at the prevailing exchange rate.

The benchmark was constructed using the reference indices of the ETFs included in the portfolio, applying the same allocation weights used in the portfolio itself. This method ensures that the benchmark accurately reflects the portfolio's asset class distribution and investment strategy. Instead of relying on a single broad market index, this composite benchmark allows for a more relevant and tailored performance comparison. The portfolio's returns were compared with those of the benchmark over the past five years to assess consistency and effectiveness.

The client has not expressed specific ESG (Environmental, Social, and Governance) preferences. As such, the portfolio does not exclude or require exposure to any particular sectors based on sustainability criteria. Given that the primary objective is long-term capital growth through cost-efficient and diversified ETF exposure, ESG screening was not prioritized in the selection process. However, the advisor remains open to integrating ESG considerations in the future should the client's values or regulatory context evolve.

3.3.6 Specific Portfolio

A strategy primarily based on ETFs focuses on using these funds to achieve broad exposure to various asset classes in a cost-efficient and diversified manner. The process begins with a comprehensive assessment of the investor's financial objectives, risk tolerance, and time horizon. This analysis is fundamental in determining the most appropriate asset allocation tailored to the investor's needs and long-term goals. With the asset allocation plan in place, the advisor undertakes detailed research to identify ETFs that align with the desired asset class exposures. The selection process prioritizes ETFs known for their cost efficiency, performance reliability, and ability to mirror specific segments of the market, such as equities, fixed income, or alternative assets.

Once the ETFs have been carefully selected, they are integrated into the portfolio by allocating a proportionate share of the assets to each ETF in accordance with the established asset allocation. This approach ensures the portfolio is well-diversified and

positioned to meet the investor's goals while managing risk. Leveraging ETFs within the strategy also provides advantages such as liquidity, transparency, and reduced investment costs, making it an effective choice for achieving long-term financial objectives.

3.4 Risk Management

The advisor will assess any deviations in risk positions and re-examine the risk classification or profile to identify potential breaches of acceptable limits, taking necessary measures to address and rectify them.

Alongside performance reporting, the advisor will deliver quarterly updates to clients, focusing on key risk metrics. These updates will include risk assessments such as the annualized standard deviation of portfolio returns compared to the benchmarks set for each portfolio, the Sharpe Ratio for evaluating risk-adjusted returns, and the Value at Risk (VaR) analysis

In terms of risk management actions, the advisor will recommend rebalancing whenever asset class allocations deviate from defined thresholds, to maintain the desired risk profile. Diversification across asset classes, regions, and sectors also contributes to mitigating concentration risk. Regarding currency risk, the portfolio does not implement systematic hedging, as the client’s long-term investment horizon allows short-term exchange rate fluctuations to average out over time. Foreign currency exposure is accepted as part of the portfolio's diversification strategy, with monitoring in place to assess material deviations.

4 Investment Design

4.1 Investment Philosophy

An investment philosophy represents the structured foundation through which investors interpret financial markets, manage uncertainty, and make consistent, evidence-based decisions. As noted by Damodaran (2012), it is not merely a set of rigid rules or models, but a conceptual framework grounded in experience and supported by empirical research. It incorporates beliefs about how markets function, where inefficiencies may arise, and how recurring patterns in investor behavior—such as overreaction, loss aversion, or herd mentality—can create exploitable mispricings. Importantly, any sound investment philosophy must be aligned with the investor's objectives, risk tolerance, and individual financial circumstances.

This IPS is tailored for a 35-year-old investor with a 15-year investment horizon and an initial capital of €300,000. The primary objective is to preserve and grow purchasing power while avoiding excessive risk. Therefore, the investment philosophy must integrate both theoretical rigor and practical applicability. The foundation of the approach lies in Markowitz's Modern Portfolio Theory (1952), which assumes risk-averse investors seek to maximize returns for a given level of volatility. This theory was implemented in the Excel model using mean-variance optimization and the efficient frontier to determine optimal portfolio weights. Strategies involving leverage or short selling were excluded to reflect the investor's moderate risk profile and regulatory constraints.

To complement the strategic allocation framework, quantitative tools such as Monte Carlo simulations and Value at Risk (VaR) analysis were also employed. These tools provide probabilistic insight into potential outcomes under various economic scenarios, enhancing the robustness of the IPS and reinforcing the investor's ability to adhere to the strategy during uncertain periods.

Central to this philosophy is a clear preference for value investing. This approach emphasizes the selection of companies that trade at relatively low valuation multiples—such as low price-to-earnings (P/E) or price-to-book (P/B) ratios in

companies with high current and expected performance—and that often operate in mature, stable industries. These companies are generally less sensitive to market sentiment and more resilient during economic downturns. Value stocks tend to exhibit consistent dividend payments and demonstrate stronger fundamentals, aligning with extensive empirical literature (Fama & French, 1992) that supports their long-term outperformance relative to growth stocks, particularly when adjusted for risk.

The philosophy also integrates market valuation tools to enhance decision-making without relying on market timing. Metrics such as Shiller's CAPE ratio (2000) and the earnings yield (the inverse of the P/E ratio) are employed to assess relative market attractiveness. These tools help identify periods of potential overvaluation or undervaluation, providing additional context for rebalancing decisions. For instance, when earnings yield on equity ETFs exceed bond yields, this may signal an attractive equity risk premium, consistent with the insights of the FED Model (Yardeni, 1997).

While the core of this IPS is grounded in a long-term, value-oriented investment strategy, it is enhanced by the integration of market valuation tools that serve to guide strategic decisions in asset allocation. These tools are not intended for short-term speculation but for contextualizing market conditions and informing marginal portfolio adjustments. By leveraging valuation indicators, the IPS balances discipline with adaptability—ensuring that shifts in market sentiment or macroeconomic conditions are considered without compromising the strategy's integrity.

Among the key instruments used are the cyclically adjusted price-to-earnings ratio (CAPE) and the earnings yield. The CAPE ratio, introduced by Shiller (2000), smooths earnings across a ten-year period to filter out cyclical distortions and identify long-term valuation trends. High CAPE levels typically reflect overvaluation and lower future returns, while lower levels suggest potential opportunities. Complementarily, the earnings yield offers a comparison between the income potential of equities and that of risk-free bonds. When the earnings yield of equity ETFs (such as VTV or IUVL) significantly exceeds prevailing bond yields, the equity risk premium becomes compelling—supporting increased exposure within the defined risk constraints. This concept, highlighted in the FED Model (Yardeni, 1997), adds a quantitative anchor to asset allocation decisions. The integration of these tools into the Excel-based asset allocation model enabled a data-driven assessment of timing and risk.

The implementation of the IPS is achieved through a portfolio constructed exclusively with Exchange-Traded Funds (ETFs). ETFs provide cost-efficient, transparent, and liquid access to a diversified set of asset classes, allowing for consistent exposure without the complexity or behavioral risk associated with individual security selection. Their passive structure reduces the likelihood of emotional, reactionary decisions and aligns well with the IPS's rules-based approach.

ETFs are selected according to strict criteria: low total expense ratios, physical replication methods, high liquidity, and substantial assets under management. The equity component includes value-focused ETFs such as VTV, XDWS, and IUVL, chosen for their fidelity to the value investing approach. Fixed income is represented by ETFs such VAGU and TIP5, offering both nominal and inflation-linked sovereign debt. To diversify further and protect against inflation or market stress, GLD provides exposure to gold—a historically low-correlation asset.

By combining valuation-informed strategic tilts with systematic ETF implementation, the IPS offers a coherent and disciplined path to long-term capital growth. The approach benefits from theoretical soundness, empirical validation, and operational simplicity—all while embedding behavioral safeguards that enhance investor resilience in the face of market volatility.

Effective risk management is central to the integrity and sustainability of this Investment Policy Statement. In line with the investor's long-term objectives and moderate risk tolerance, this IPS adopts a multifaceted approach to risk that includes both quantitative techniques and behavioral safeguards.

However, managing risk extends beyond numbers. Behavioral factors—such as emotional reactions to market downturns, fear of missing out, or recency bias—often cause investors to deviate from rational strategies. As documented by Kahneman and Tversky (1979), investors frequently exhibit loss aversion and tend to overreact to short-term fluctuations, jeopardizing long-term outcomes. This IPS addresses those tendencies by embedding structural discipline into its design.

The use of passive ETFs, adherence to predefined asset allocation bands, and reliance on historical valuation indicators all contribute to reducing behavioral errors.

By anchoring decisions to evidence rather than sentiment, the strategy fosters consistency and reduces the likelihood of panic-driven actions during periods of volatility. Additionally, periodic portfolio reviews—conducted quarterly—serve not only to rebalance the portfolio mechanically but also to reinforce investor commitment to the long-term plan, even in the face of short-term underperformance.

Furthermore, the preference for accumulation share classes within ETFs supports compounding through automatic reinvestment, minimizing decision fatigue and tax friction. This design choice enhances long-term efficiency and further reduces the temptation for market timing or reactive trades.

As Meir Statman (2011) argues, successful investing is not solely about maximizing return—it also involves managing behavior. By integrating both technical and psychological dimensions of risk, this IPS provides a comprehensive framework that supports resilience, promotes rational decision-making, and ultimately enhances the likelihood of achieving long-term financial goals.

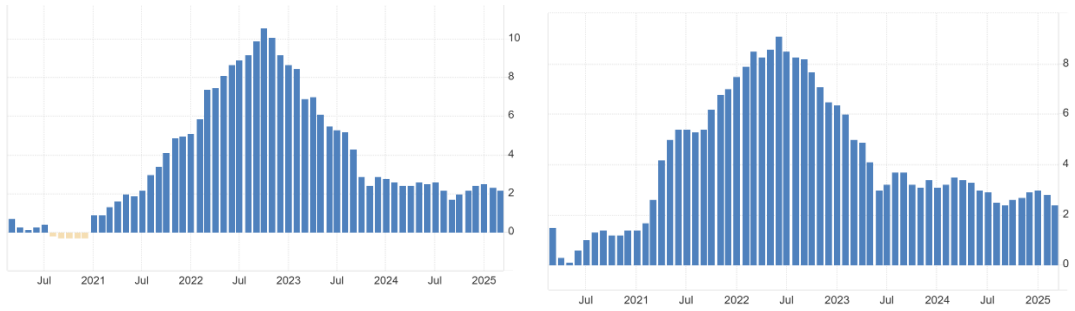
4.2 Strategic Asset Allocation

4.2.1 Macroeconomic Briefing

The global economic landscape in 2025 remains heavily influenced by the evolution of inflation and the response of major central banks, particularly the Federal Reserve and the European Central Bank (ECB).

After historic peaks in 2022 and 2023, inflation has been gradually easing. In the United States, the year-over-year CPI has declined to 2.3%, while core inflation remains more persistent. In the Euro Area, the harmonized CPI (HICP) currently stands at 2.2%, approaching the ECB’s 2% target. In Portugal, the most recent data shows a year-on-year inflation rate of 2.4%, in line with the broader European trend, as shown in Figure 1.

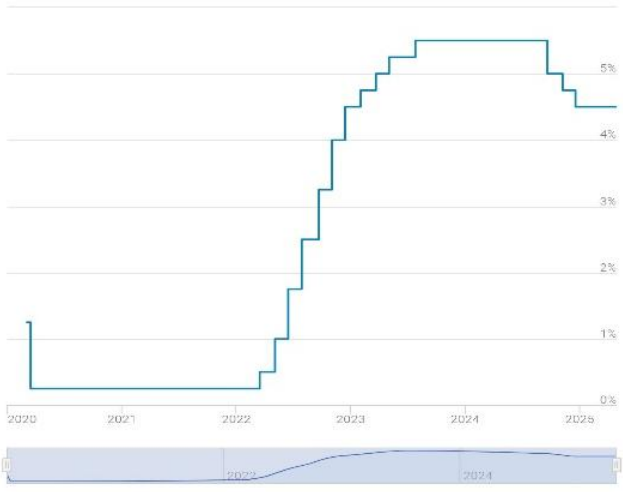
Figure 1- EA and US Inflation Rate(2021-2025)(Respectively)



Source: Trading Economics

In this context, the Federal Reserve has begun gradually reducing its benchmark interest rate, which now stands between 4.50% and 4.75%, down from its 2023 peak of 5.50%, This movement is depicted in Figure 2 – Federal Funds Rate (2020–2025). However, recent remarks by Chair Jerome Powell suggest that additional inflationary shocks, particularly those driven by newly introduced trade tariffs by the Trump administration, may lead the Fed to adopt a more cautious approach. Powell stated that "our obligation is to keep longer-term inflation expectations well anchored," and warned that a persistent rise in prices could delay or reduce the scope of future rate cuts.

Figure 2- Federal Funds Rate(2020-2025)



Source:Investing.com

The newly imposed tariffs are broad and significant in scale, and according to Powell, the economic impact is likely to be greater than initially expected. These measures have raised concerns about a potential second-round effect, where temporary price shocks translate into a sustained increase in inflation expectations. Powell's speech reflects the Fed's delicate balancing act—managing inflation risks without prematurely tightening or easing policy.

Meanwhile, the ECB has also started cutting rates, with the deposit facility rate now at 3.50%, following five consecutive reductions since 2024. Although inflation appears to be coming under control, ECB Vice-President Luis de Guindos has emphasized that the recent U.S. tariffs on European imports, coupled with persistent geopolitical tensions, are adding a high degree of uncertainty to the inflation outlook. He also cautioned that weakening demand for Euro Area exports, combined with the depreciation of the euro, could create conflicting pressures on inflation and growth.

According to the International Monetary Fund (IMF), global GDP growth is projected to reach 3.3% in 2025, below the historical average of 3.7% observed between 2000 and 2019 (IMF, 2025). While inflation is gradually receding from the multi-decade highs observed in 2022–23, its persistence in certain sectors, alongside recent trade measures, has created new headwinds for global demand.

The Portuguese economy is projected to outperform the euro area average. According to the Banco de Portugal's Economic Bulletin (March 2025), Portugal's GDP is expected to grow by 2.3%, reflecting stronger external demand, an improved investment environment, and the accelerated implementation of European Union structural funds (Banco de Portugal, 2025). The report emphasizes a shift towards more balanced growth, with investment and exports gaining weight relative to private consumption. Despite the economic resilience, the central bank warns that downside risks persist, particularly if geopolitical tensions escalate or if the inflationary impact of global trade frictions proves more persistent than expected.

Given the portfolio's composition, which includes significant exposure to assets denominated in U.S. dollars, the decision was made to assume currency risk rather than implement systematic hedging. This choice is supported by research from several institutions, which consider the long-term outlook for the EUR/USD exchange rate.

According to BBVA Research (2025), the U.S. dollar is currently overvalued relative to the euro, based on structural equilibrium exchange rate models. The institution estimates that, over the coming years, the exchange rate should gradually converge toward levels close to 1.20 EUR/USD as global financial conditions normalize. This projection suggests that, although short-term currency fluctuations may occur, their net impact is likely to be diluted over a 15-year horizon.

Furthermore, J.P. Morgan (2025) acknowledges that the dollar may remain relatively strong in the short to medium term, supported by high interest rates in the U.S., stronger economic growth, and the dollar's ongoing role as a global reserve currency. In this context, the initial foreign exchange exposure may act as a risk buffer during periods of market stress or heightened risk aversion—particularly relevant in an environment of geopolitical uncertainty. This short-term resilience may benefit the portfolio, especially when accompanied by timely rebalancing.

4.2.2 CAPE Ratio

The Cyclically Adjusted Price-to-Earnings Ratio (CAPE), developed by Robert Shiller, is a valuation metric designed to assess equity markets by adjusting corporate earnings for both inflation and the business cycle. Rather than relying solely on the most recent year's earnings, the CAPE uses the average of real earnings over the past ten years to smooth out the volatility caused by economic expansions and recessions (Shiller, 2000). By doing so, it aims to provide a more stable and meaningful representation of market valuation than traditional trailing price-to-earnings ratios.

Empirical studies, such as Campbell and Thompson (2008), have demonstrated that elevated CAPE ratios have historically been associated with lower average returns over subsequent decades, whereas lower CAPE values tend to precede higher returns. This inverse relationship between CAPE levels and future market performance makes it a valuable tool for strategic asset allocation decisions, particularly for long-term investors seeking to optimize risk-adjusted returns.

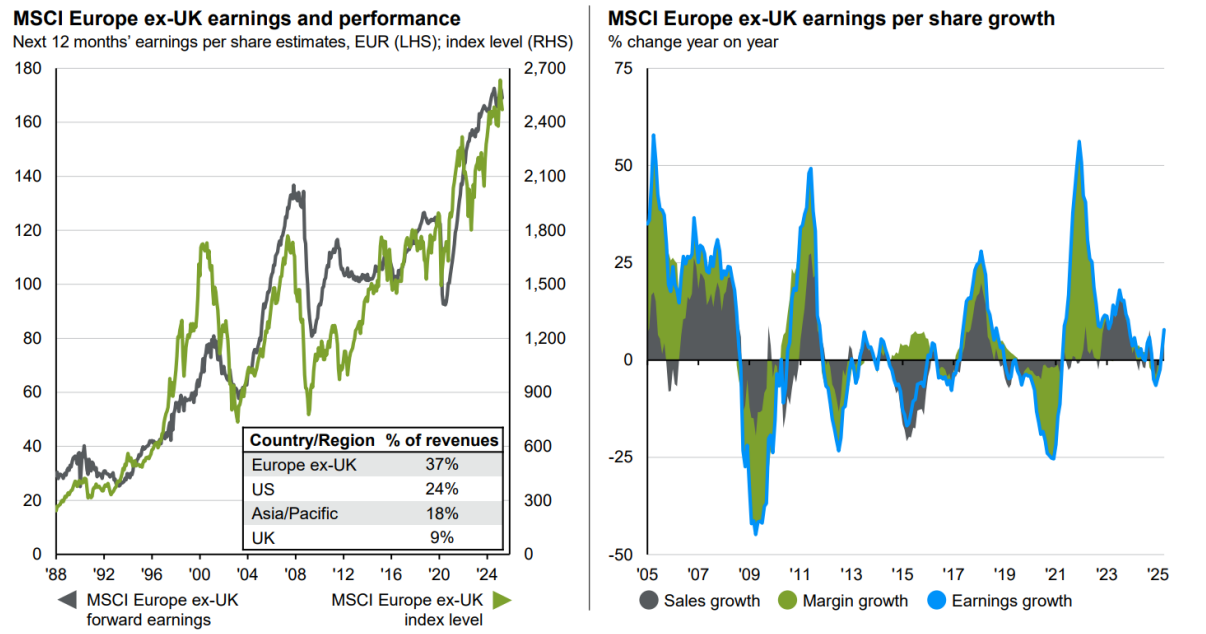
Figura 3- Shiller CAPE Ratio 10-Year Cyclically Adjusted P/E (2016-2025)

Source: Multipl.com

Strategic equity allocation decisions should be informed by both macroeconomic context and relative valuation metrics across regions. As of April 2025, a key rationale supporting the current 52.5% allocation to equities, with an emphasis on Europe, is derived from the stark disparity in valuation levels between major developed markets. According to J.P. Morgan Asset Management (2025), the Shiller CAPE ratio for the S&P 500 stands at 33.1x, compared to just 20.3x for the MSCI Europe ex-UK. This valuation gap is not only historically significant but also implies asymmetric return expectations over the medium to long term (Figure 3). Empirical studies by Campbell and Thompson (2008) and Estrada (2015) confirm the inverse relationship between CAPE levels and subsequent 10-year equity returns. In this context, the U.S. market appears vulnerable to multiple compression or low forward returns, while European equities present a more attractive risk-adjusted entry point, justifying a relative overweight in the region.

Additionally, corporate fundamentals in Europe reinforce this valuation-based thesis. As shown in Figure 4, earnings per share (EPS) for the MSCI Europe ex-UK index have followed a consistent upward trajectory since the pandemic-induced downturn, with healthy contributions from both sales' growth and margin expansion. The forward earnings estimates, aligned with index performance, suggest fundamental support for current price levels. These dynamics indicate that European companies are regaining profitability momentum, reducing valuation risk.

Figure 4- MSCI Europe earnings and performance



Source: JP Morgan

Strategic equity allocation decisions should be informed by both macroeconomic context and relative valuation metrics across regions. As of April 2025, the Shiller CAPE ratio for the S&P 500 stands at 33.1x, compared to just 20.3x for the MSCI Europe ex-UK. This valuation gap is historically significant and implies asymmetric return expectations over the medium to long term. Given this valuation disparity, we have allocated 52.5% of our equity exposure, with a greater emphasis on Europe. The lower CAPE for Europe suggests higher future returns, while the elevated CAPE of the U.S. market signals the potential for lower returns or multiple compression. This strategic overweight in Europe aligns with the long-term view that European equities offer a more attractive risk-return profile.

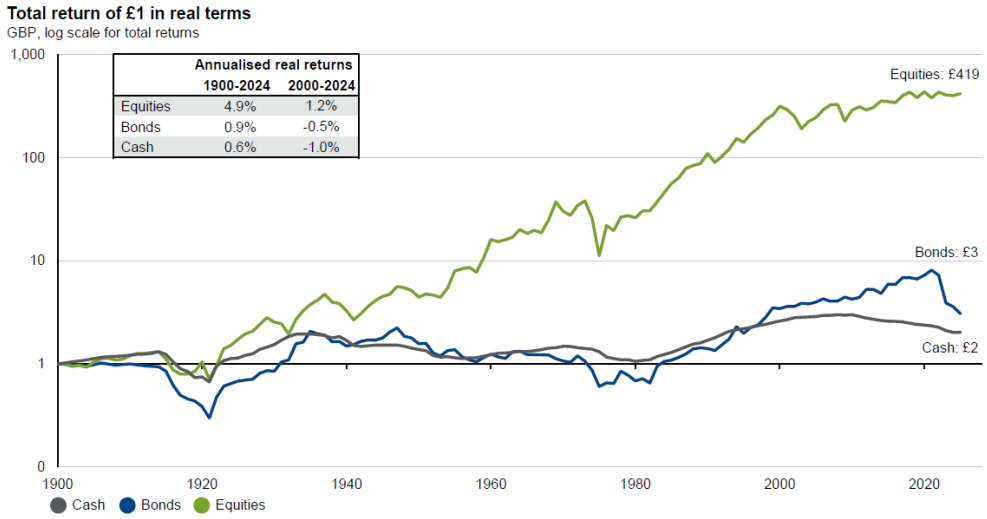
4.2.3 Equity Risk Premium

The equity risk premium (ERP) remains a cornerstone of long-term asset allocation, serving as a measure of the excess return that equities are expected to deliver over risk-free or fixed income investments. This premium represents not just a reward for taking on additional risk, but a rational basis for preferring equities in portfolio

construction—particularly when that premium remains positive in relative and absolute terms.

Historical evidence overwhelmingly supports the long-term advantage of equities. As illustrated in Figure 5, equities have delivered a real annualized return of 4.9% from 1900 to 2024, compared to just 0.9% for bonds and 0.6% for cash equivalents. Even in the more recent 2000–2024 period, which included two major financial crises and a global pandemic, equities still outperformed, albeit at a more modest 1.2% real annualized return. This enduring outperformance reinforces the structural case for maintaining equity exposure as a key component of diversified portfolios.

Figure 5- Long-term asset Returns



Source: JP Morgan 2025

The shape of the yield curve, especially the spread between 10-year and 2-year sovereign bond yields, is widely recognised as one of the most reliable forward-looking indicators of macroeconomic sentiment. When this spread turns negative—i.e., when short-term yields exceed long-term ones—the curve is said to be "inverted", typically signalling that markets expect a future slowdown in growth or even a recession.

As of April 2025, the U.S. Treasury yield curve remains inverted, with a 10Y–2Y spread of approximately –34 basis points. This inversion has persisted for over a year, echoing similar patterns seen before major economic contractions such as the early 2000s recession and the global financial crisis of 2008. According to Goldman Sachs (2024), “Yield curve inversions remain one of the most robust predictors of economic

recessions over a 12–24-month horizon, particularly when supported by broader credit market tightening."

More recently, during the 2024–2025 period, the yield curve has begun to normalize, with the spread between 10-year and 2-year Treasuries gradually steepening. This trend reflects a shift in market sentiment, with expectations of future interest rate cuts and a declining probability of recession. In this context, intermediate-term bonds (with maturities between 2 and 5 years) become increasingly attractive. They offer a more balanced risk-return profile by capturing higher yields than cash or very short-term bonds, while remaining less sensitive to interest rate risk than long-duration exposures. Historically, this segment of the fixed income market has performed well in the early stages of monetary easing cycles.

Against this backdrop, a balanced fixed income allocation might combine core exposure to U.S. Treasuries across the curve, selective positioning in investment-grade corporates to enhance yield, and a consideration of inflation-linked securities to hedge against persistent price pressures. Such a structure seeks to capture potential capital gains from declining interest rates, while generating a steady income stream and maintaining high levels of liquidity and credit quality—key objectives for long-term investors navigating a complex and evolving macroeconomic landscape.

Figure 6- 1- 10-Year Treasury Constant Maturity Minus 2-Year Treasury Constant Maturity

Source: Federal Reserve Bank

In summary, while the Equity Risk Premium (ERP) underscores the long-term case for equities as a driver of returns, bonds remain a critical pillar of portfolio construction—

offering unique benefits that equities cannot replicate. Their role extends beyond cyclical hedging (e.g., during yield curve inversions) to structural diversification: bonds provide capital preservation in downturns, reduce overall portfolio volatility, and deliver predictable income. Thus, a strategic allocation to bonds—spanning Treasuries for defense, corporates for yield, and TIPS for inflation resilience—is not merely a tactical response to near-term risks but a foundational element of robust, long-term asset allocation.

4.2.4 Asset Allocation

The final asset class weights were determined using Excel's Solver add-in, aiming to maximize the Sharpe Ratio while respecting the client's moderate risk tolerance and constraints (e.g., no short selling). The portfolio weights were determined using the standard expected-return formula:

$$Rp = \Sigma(Wi \times Ri) = W\_risky \times R\_risky + W\_risk-free \times R\_risk-free \quad (1)$$

where Wi are the asset-class weights and Ri their respective expected returns. In this case, a return slightly above the client's requirement was targeted—so the expected returns assigned to both the risky and risk-free components were set marginally higher than the minimum acceptable. This method led to a final allocation of 75.35% in risky assets and 24.65% in so-called "risk-free" assets. Since the client does not have immediate liquidity needs, no allocation will be assigned to cash or equivalents. However, in certain market scenarios, temporary reallocation to liquidity may be necessary to manage short-term adjustments until rebalancing occurs.

Table 1 defines the minimum, central, and maximum allocation limits for each asset class within the portfolio. The central weights for each asset class were calculated by applying their respective proportions within the risky portfolio to the overall 75.35% allocation. For example, the central weight for Equity results from multiplying 75.35% by 52.5%, giving 39.52%. To establish allocation bands, a 10% reduction and a 50% increase were applied to the central value to determine the minimum and maximum limits, respectively resulting in a minimum of 35.57% and a maximum of 59.28% for

Equity. This same methodology was consistently applied across all asset classes, ensuring a disciplined and proportionate allocation framework.

Table 1- Final Asset Allocation

Asset Classes	Final Allocation	Minimum Allocation	Central Allocation	Maximum Allocation
Equity	39.52%	35.57%	39.52%	59.28%
Bonds	18.84%	16.96%	18.84%	28.26%
Alternatives	16.95%	15.26%	16.95%	25.43%
Sovereign Bond	24.65%	22.19%	24.65%	36.98%

Source: The Author

4.3 Security Selection

The selection of ETFs for this IPS adheres to a set of well-defined criteria to ensure efficient, cost-effective, and diversified portfolio management:

- **Dividend Policy**: Only accumulating ETFs are considered, as the client does not require periodic income. This approach promotes compounding by automatically reinvesting dividends, enhancing long-term portfolio growth.
- **Expense Ratios**: Preference is given to ETFs with low total expense ratios. Broad market ETFs must have a TER below 0.50%, while those targeting specific sectors, strategies, or asset classes may have higher costs, up to a maximum of 0.80%, provided they offer clear diversification or strategic value.
- **Replication Method**: The portfolio prioritizes physically replicating ETFs to ensure transparency and tracking accuracy. In specific cases—such as commodities or private equity exposure—synthetic replication may be accepted when physical replication is impractical or cost-inefficient.
- **Currency and Trading Location**: Most ETFs are EUR-denominated or traded on European exchanges, minimizing currency conversion costs. In cases where ETFs are denominated in other currencies, the decision to accept currency exposure reflects the portfolio's long-term horizon and diversification

benefits. Currency hedging is generally avoided due to associated costs and limited long-term benefit.

- **Provider Diversification**: To reduce counterparty and operational risk, no more than 50% of total assets are allocated to ETFs from a single provider. The portfolio includes funds from multiple reputable issuers, supporting resilience and independence from any single asset manager.

When considering the currency of ETFs, the associated risks go beyond the currencies of the stocks held within the ETF. While equities are affected by their denomination in a particular currency, the performance of the underlying businesses may also rely heavily on international sales and revenue streams. For long-term investments, currency risk is generally less significant to overall returns, as fully hedging all underlying currencies in an equity ETF is both challenging and costly. Additionally, the fund currency—used for reporting and distributing dividends— is less impactful when investing in accumulating ETFs, where dividends are automatically reinvested rather than distributed.

Furthermore, it is essential to note that currency fluctuations tend to even out over the long term. When selecting ETFs, investors should balance the benefits of potential currency risk mitigation against the higher costs and reduced flexibility that often accompany hedged options. For this strategy, non-hedged, accumulating ETFs align best with the portfolio's long-term growth objectives. In the equity class, a geographic diversification strategy was used: ETFs from European, American and emerging markets.

The selection of bond ETFs was guided by the objective of achieving broad diversification across geographies, sectors, maturities, and credit qualities. The allocation to alternative ETFs was designed to complement traditional assets and enhance overall diversification.

The screens can be found in Table C of the Appendix 3, where a table is provided to show how these screens are used to obtain the ETFs being utilized.

4.4 Portfolio Composition

The portfolio weights are determined using Markowitz's (1952) optimization strategy, which emphasizes maximizing returns while minimizing risk, as measured by variance. According to Beyhaghi et al. (2013), Modern Portfolio Theory (MPT) offers a framework for identifying the optimal combination of assets that either maximizes expected returns for a given level of risk or minimizes portfolio variance. This principle forms the foundation of the efficient frontier concept, guiding investors toward the most efficient allocation of resources.

MPT operates under several assumptions, but the key assumption relevant to this IPS is that the investor is moderately risk averse. As such, given two portfolios with identical expected returns, a risk-averse investor will always prefer the portfolio with the lower risk. This risk-return trade-off is central to portfolio construction under MPT principles.

The Efficient Frontier (EF), represented by a hyperbolic function, is derived using the following equations:

$$A = 1' \cdot V^{-1} \cdot 1 \quad (2)$$

$$B = 1' \cdot V^{-1} \cdot R \quad (3)$$

$$C = R' \cdot V^{-1} \cdot R \quad (4)$$

The EF defines the set of optimal portfolios that provide the maximum expected return for a given level of risk or the minimum risk for a specified expected return. Portfolios below the EF are considered sub-optimal, as there exists another portfolio with the same level of risk but offering a higher return. Similarly, portfolios positioned to the right of the EF are also sub-optimal, as another portfolio with the same return but lower risk is available.

To compute the Minimum Variance (MV) Portfolio, the Excel Add-in Solver was employed to minimize portfolio variance. This portfolio represents the point on the EF with the least risk. Additionally, to identify the portfolio of risky assets that maximizes the Sharpe Ratio (SR) and lies tangent to the EF on the Capital Allocation Line (CAL),

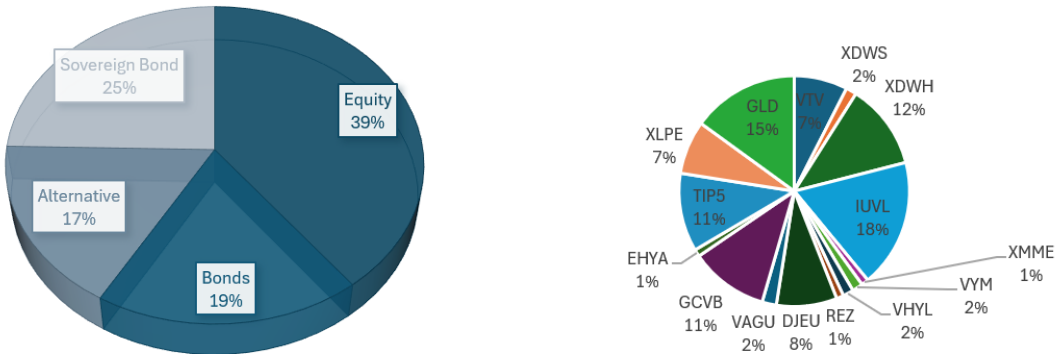
the Solver was used to optimize the SR. The Sharpe Ratio, defined as the excess return per unit of risk, identifies the most efficient portfolio in terms of risk adjusted returns.

In cases where the solution produces negative weights for securities, it indicates the potential for short selling, which is not permitted under this IPS. Consequently, the Solver was constrained to avoid negative weights while maximizing the SR. This ensures compliance with the IPS's guidelines and reflects a practical approach to portfolio optimization. EF's significance lies in its ability to guide investment decisions by identifying portfolios that achieve the best trade-off between risk and return.

4.4.1 Portfolio Composition

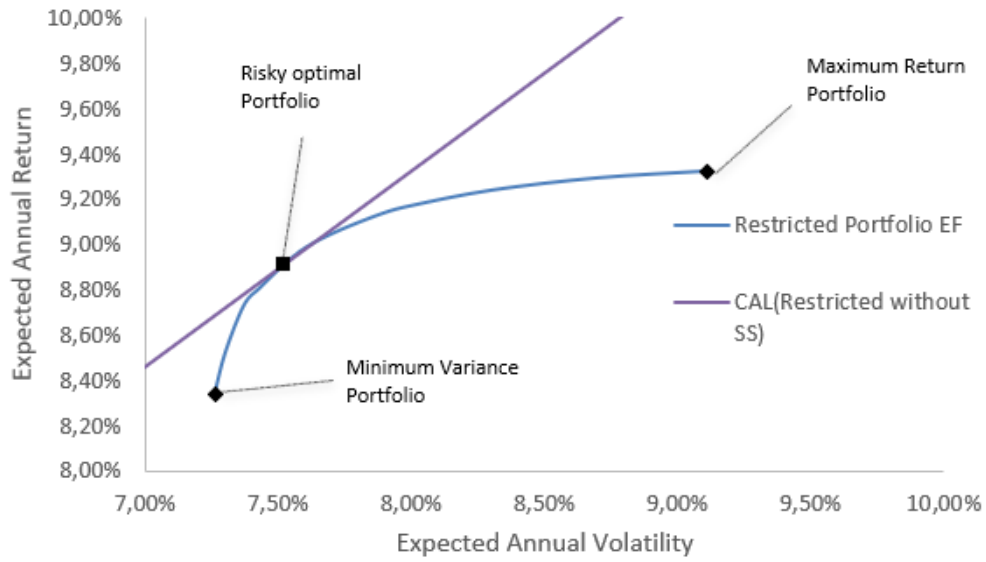
The portfolio composition is disclosed below.

Figure 7- Portfolio Composition



The graph below represents the efficient frontier and Capital Allocation Line (CAL) for the restricted portfolio scenario, where short selling is not allowed and portfolio weights are constrained. The dark blue curve illustrates the efficient frontier constructed using Solver in Excel. From this frontier, three key points are highlighted: the Minimum Variance Portfolio (the point with the lowest volatility), the Maximum Return Portfolio, and the Risky Optimal Portfolio—the tangency point between the frontier and the CAL, representing the highest Sharpe ratio. The CAL, plotted in light blue, starts from the risk-free rate and is tangent to the efficient frontier, indicating the most efficient combination of risky and risk-free assets under the given constraints. This setup enables a clear visualization of how an investor can allocate capital to achieve an optimal balance between risk and return within a constrained environment.

Figure 8- Restricted Portfolio Efficient Frontier

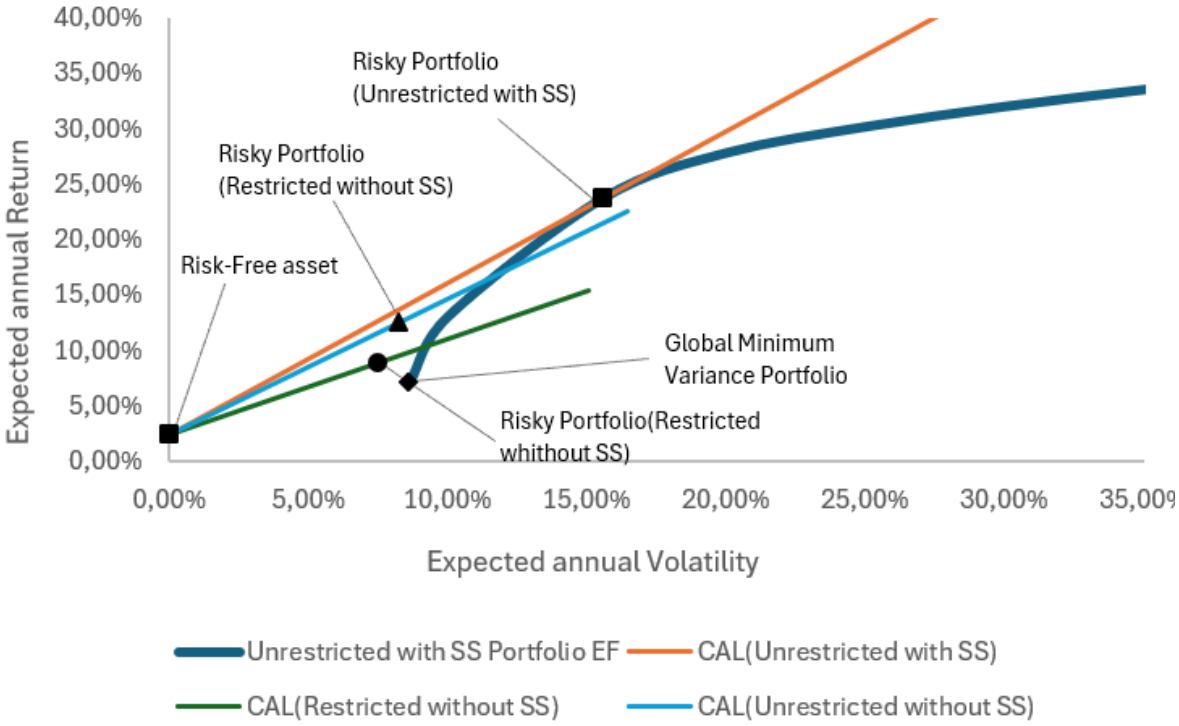


Source: The Author

Then, the efficient frontier and the Capital Allocation Line (CAL) were recalculated under two alternative portfolio construction scenarios, both optimized using Excel's Solver. In the first scenario, no constraints were imposed on individual asset weights apart from the prohibition of short selling, meaning all weights were restricted to non-negative values. This resulted in a restricted efficient frontier, reflecting realistic investment constraints. In the second scenario, the optimization allowed for unrestricted asset allocations, including the possibility of short selling. Negative weights were therefore permitted, enabling the construction of portfolios that theoretically enhance diversification and potential returns, albeit with higher leverage and risk exposure.

The outcomes from both approaches were used to derive their respective efficient frontiers and Capital Allocation Lines by incorporating the risk-free asset. These CALs represent the optimal combinations of risk and return achievable under each scenario. Finally, all results were consolidated in a single graph to enable a clear comparison between constrained and unconstrained strategies, as shown in Figure 10.

Figure 9- Unrestricted with SS allowed Portfolio Efficient Frontier



Source: The Author

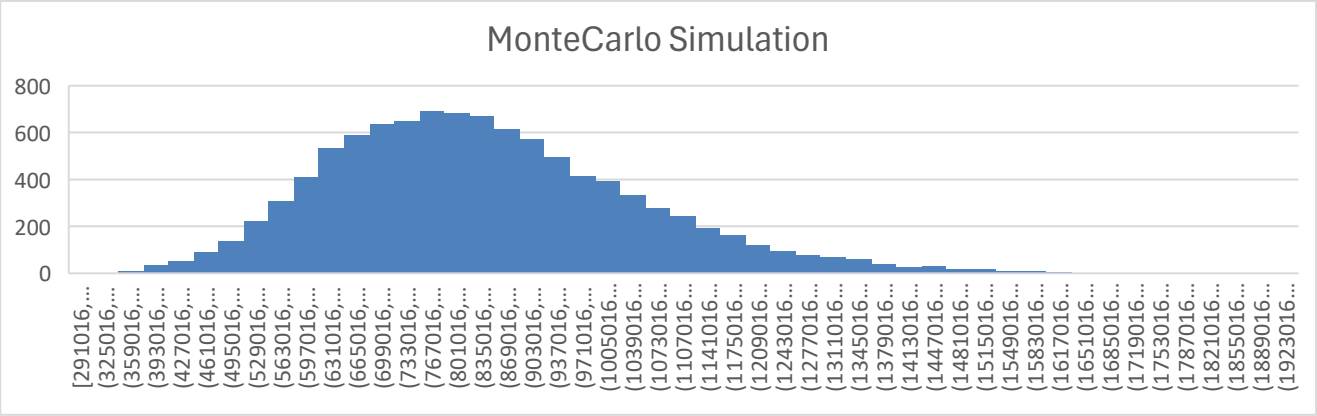
4.5 Expected Performance

To estimate the expected performance of the investment strategy over a 15-year horizon, a Monte Carlo simulation was conducted using the annual contribution of €300,000, a mean return of 7.25%, and an annual standard deviation of 6.71%.

The simulation generated a distribution of possible outcomes by incorporating randomness in the annual returns, assuming they follow a normal distribution. After running 10,000 iterations, the median portfolio value at the end of the investment horizon was approximately €832,894, while the mean value was slightly higher, at €857,184, reflecting a slight positive skew in the distribution.

The simulation also provided useful probabilistic insights: there is a 25% chance of ending below €704,611 and a 75% probability of surpassing that value. This approach allowed for a more comprehensive understanding of the uncertainty associated with long-term investing, beyond relying solely on deterministic projections.

Figure 10- Monte Carlo Simulation Histogram



Source: The Author

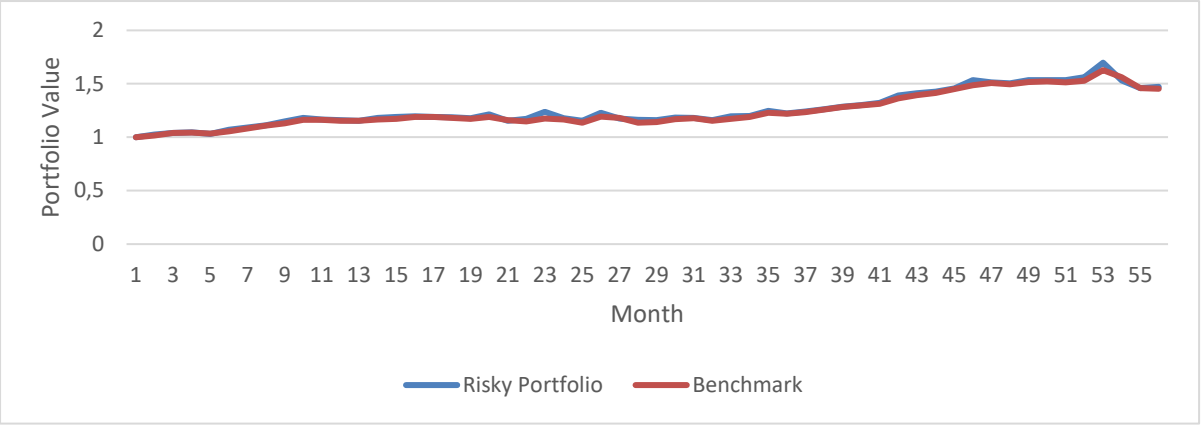
Table 2- Percentiles Montecarlo Values

Percentiles	Portfolio Value(€)
5%	557228,4456
25%	706051,0825
50%	832474,5756
75%	980604,1774
95%	1236254,214

Source: The Author

The graph below displays the performance of the risky portfolio versus its benchmark over a 55-month period, from January 2020 to July 2024. To construct this chart, the reference indices for each ETF in the portfolio were collected, and the corresponding weights were applied to reflect the composition of both the portfolio and the benchmark. Both series were normalized to start at the same value in January 2020, enabling a direct performance comparison. The horizontal axis represents the 55 consecutive months, capturing the full investment horizon.

Figure 11- Performance Against Benchmark



Source: The Author

4.5.1 Performance Attribution via Factor Models

The Fama-French multifactor models represent one of the most influential advancements in asset pricing theory. Initially introduced by Fama and French (1993), the three-factor model extended the traditional Capital Asset Pricing Model (CAPM) by incorporating two additional factors: size (SMB, small minus big) and value (HML, high minus low). These factors aim to capture the empirical observation that small-cap stocks and high book-to-market stocks tend to outperform the market over time.

Building upon this foundation, Fama and French (2015) later proposed a five-factor model, integrating profitability (RMW, robust minus weak) and investment (CMA, conservative minus aggressive) to better explain asset returns. These extensions have proven particularly useful in portfolio evaluation, performance attribution, and understanding the cross-section of expected returns.

In this analysis, the multifactor models—ranging from the original three-factor specification to extended versions including momentum (Carhart, 1997) and other custom factors—were used to evaluate the portfolio's exposure to systematic risks. The objective was to determine which factors best explain the returns of the

constructed portfolio, and how these exposures align with the investment strategy outlined in the IPS.

The factor model analysis was conducted using monthly excess returns from January 2020 to July 2024 (55 observations). Factor data for the U.S. and Euro Area (e.g., MKT-RF, SMB, HML, RMW, CMA) were sourced from the Kenneth R. French Data Library. Macro-financial variables (VIX, 10Y Treasury yield, and breakeven inflation) were obtained from Bloomberg and FRED. Regressions were implemented in Microsoft Excel using the Data Analysis Toolpak. Each model was tested separately (FF3, FF5, and extended with macro factors), with explanatory power assessed via R^2 and statistical significance via p-values. This methodology ensures transparency and replicability of the results.

4.5.2 Fama French 3 Factor Model

The Fama-French Three-Factor model was applied to the portfolio using monthly returns over a 55-month period. A linear regression was conducted in Excel, with excess portfolio returns as the dependent variable and the market (MKT-RF), size (SMB), and value (HML) factors as independent variables. The model yielded an R^2 of 7.04%, indicating limited explanatory power. None of the factor loadings were statistically significant at the 5% level, with p-values of 0.10 (MKT-RF), 0.85 (SMB), and 0.30 (HML). The intercept (alpha) was also not significant, suggesting no abnormal return unexplained by the factors.

Table 3- Fama-French 3 Factor Model Values

Coefficient	Value	P-value	Statistically Significant?
Intercept (α)	-0.00465	0.172	No
MKT-RF	-0.00102	0.104	No
SMB	0.00027	0.851	No
HML	0.00072	0.295	No
R^2	0.0704	—	—

Source: The Author

4.5.3 Fama French 5 Factor Model

Subsequently, to obtain a more robust explanation of portfolio returns, the Fama and French five-factor model was applied. This model incorporates the market factor (MKT-RF), size (SMB), value (HML), profitability (RMW), and investment (CMA) factors. However, the results did not show statistically significant explanatory power, as evidenced in the table below.

Table 4 -Fama-French 5 Factor Model Values

Coefficient	Value	P-value	Statistically Significant?
Intercept (α)	-0.00465	0.165	No
MKT-RF	-0.00102	0.134	No
SMB	0.00048	0.727	No
HML	0.00033	0.767	No
RMW	0.00045	0.764	No
CMA	0.00056	0.726	No
R^2	0.0740	—	—

Source: The author

4.5.4 Fama French New Factors Model

In order to improve the explanatory power of the Fama-French five-factor model and capture additional sources of systematic risk, three further variables were included in the analysis: the VIX (Volatility Index), the USG (US Government Bond Yield), and the USGBE (US Breakeven Inflation Rate). These factors were selected based on economic theory and recent empirical literature suggesting their influence on asset pricing.

The VIX captures short-term market volatility and investor risk aversion, with studies such as Ang et al. (2006) and Whaley (2000) highlighting its relevance in explaining cross-sectional asset returns. Long-term interest rates (USG) affect the discounting of

future cash flows and investment decisions, as shown in works by Chen, Roll, and Ross (1986) and Fama & Schwert (1977). Meanwhile, USGBE reflects inflation expectations, which directly impact real returns and sector-specific performance, as discussed in Boudoukh et al. (1994) and Campbell & Vuolteenaho (2004). Therefore, these factors were introduced to account for systematic risks not captured by traditional asset pricing models.

Table 5- Fama-French 5+3 Factor Model Values

Coefficient	Value	P-value	Statistically Significant?
Intercept (α)	-0.05383	0.00035	Yes
MKT-RF	-0.00091	0.06806	No
SMB	3.5e-06	0.9973	No
HML	0.0012	0.17624	No
RMW	0.0010	0.23336	No
CMA	-0.0015	0.7263	No
Treasury	0.0052	0.76414	No
Inflation	0.0016	0.0205	Yes
VIX	-0.0003	5.8e-05	Yes
R^2	0.5492	—	—

Source: The Author

The results of the expanded regression model reveal a notable improvement in explanatory power compared to previous specifications, as evidenced by the significantly higher R^2 of 0.5492. This suggests that approximately 55% of the variation in excess portfolio returns is explained by the combination of the Fama-French five factors and the additional macro-financial variables (Treasury, Inflation, and VIX).

Despite this improvement in model fit, only three coefficients are statistically significant at conventional levels: the intercept (α), Inflation, and the VIX index. The intercept is significantly negative (–0.05383, p = 0.00035), which may imply underperformance relative to the risk factors included. Inflation has a positive and significant coefficient

(0.0016, p = 0.0205), suggesting that higher inflation is associated with higher portfolio excess returns. This aligns with literature showing that inflation expectations can influence equity risk premiums. The VIX index, which proxies market volatility, has a significantly negative impact (–0.0003, $p < 0.0001$), consistent with the intuition that heightened uncertainty tends to depress returns.

Interestingly, none of the traditional Fama-French factors—including MKT-RF, SMB, HML, RMW, and CMA—are statistically significant, indicating that in this sample and time period, their explanatory power is limited once broader macroeconomic risks are accounted for. This suggests that while factor models are foundational, incorporating relevant macro variables can substantially enhance the model's explanatory capacity.

4.6 Risk Analysis

The risk assessment included the application of different Value-at-Risk (VaR) methodologies, namely the Parametric (Variance-Covariance) VaR and the Monte Carlo simulation approach.

4.6.1 Parametric VaR

The Parametric Value at Risk (VaR) is a statistical method used to estimate the maximum potential loss of an investment portfolio over a specified time horizon, assuming normally distributed returns. This technique is based on the variance-covariance approach and requires only the portfolio's expected return, standard deviation, and a selected confidence level.

The Parametric VaR is calculated using the formula:

$$VaR\% = z \times \sigma \times \sqrt{T} - \mu \times T \qquad (5)$$

where:

z = 1.645 (for 95% confidence)

σ = 6.71%

μ = 7.25%

T = 15 years

The result is a positive VaR value, which implies that the portfolio is expected to grow beyond its initial capital over the investment horizon. As a result, the actual risk of loss is negligible and the VaR converges to 0.

This measure provides a clear quantitative benchmark for assessing downside risk and aligns with the long-term orientation of the portfolio, as defined in the Investment Policy Statement (IPS).

Table 6- Parametric VaR

Percentiles	Z-Stat	1-year Period	1-Year period %	15 years period	15 years period %
0,99	2,326347874	25081,61747	8,36%	0,00000	0,00%
0,98	2,053748911	19593,93847	6,53%	0,00000	0,00%
0,97	1,880793608	16112,18208	5,37%	0,00000	0,00%
0,96	1,750686071	13492,99238	4,50%	0,00000	0,00%
0,95	1,644853627	11362,48361	3,79%	0,00000	0,00%

Source: The Author.

For example, at a 95% confidence level, the portfolio is expected to gain approximately 66% over 15 years — even in one of the worst-case outcomes — further validating the resilience of the investment strategy. Nonetheless, following conventional risk management definitions, the VaR in these cases is formally considered to be zero, as no loss is anticipated.

4.6.2 MonteCarlo VaR

The Monte Carlo Value at Risk (VaR) is a simulation-based method used to estimate the potential downside of the portfolio under normally distributed returns. Unlike closed-form methods such as Parametric VaR, the Monte Carlo approach generates

a distribution of possible outcomes by simulating thousands of random return paths. In this case, the model uses 10,000 simulations, assuming a mean annual return of 7.25% and a standard deviation of 6.71%**,** over a 15-year horizon (180 months)**.**

The expected return over the investment horizon was computed as:

$$Expected\ Return\ =\ Capital\ Invested\ \times\ \mu\ \times\ (180\ \div\ 12) \qquad (6)$$

To model return variability, normally distributed shocks were introduced using standard Z-scores generated through the Excel formula =NORM.S.INV(RAND()). These random draws are used to generate a broad range of market scenarios, incorporating both average behavior and tail events.

For each simulation, the following Scenario VaR equation was applied:

$$Scenario\ VaR\ =\ Expected\ Return\ -\ (Capital\ Invested\ \times\ \sigma\ \times\ Z\ \times\ \sqrt{(180\ \div\ 12)}) \qquad (7)$$

After running the simulations, the Monte Carlo VaR at the 5th percentile (i.e., the 95% confidence level) was determined using the Excel formula:

$$Monte\ Carlo\ VaR\ (95\%)\ =\ PERCENTILE.INC(simulated\ values, 0.05) \qquad (8)$$

The results from the Monte Carlo Value at Risk (VaR) analysis across different time horizons illustrate how the investment risk profile evolves over time. For the 1-year period, the Monte Carlo VaR values are negative across all confidence levels, ranging from −7.91% at the 95th percentile to −14.96% at the 99th percentile. These figures reflect the potential short-term losses in adverse market scenarios and are consistent with the nature of short-horizon risk, where volatility has a more immediate impact and downside movements are more pronounced.

Conversely, the 15-year Monte Carlo VaR values are positive, increasing from 49.22% at the 99th percentile to 66.00% at the 95th percentile. Although this may seem counterintuitive—since VaR typically expresses potential losses—the interpretation here is relative to the long-term expected return. These positive values indicate that,

even under stress scenarios, the portfolio is expected to grow over a 15-year horizon, albeit with lower-than-expected gains. The apparent “gain” reflects a shortfall from the projected long-term growth path rather than an absolute loss in capital. This outcome highlights the power of long-term compounding and the effect of mean reversion, which can offset short-term volatility in well-diversified portfolios.

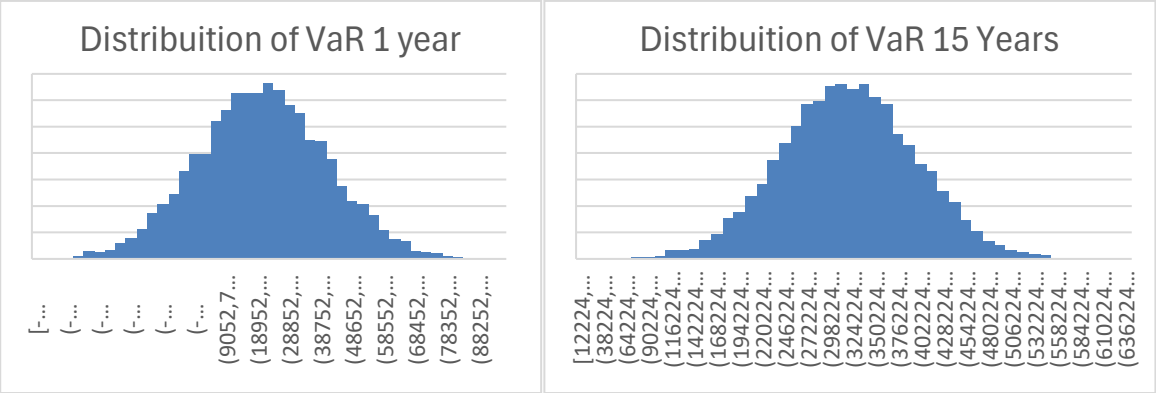
Tabela 7- Montecarlo VaR Table

15-years Period		1-year Period	
Percentile	MonteCarlo VaR	Percentile	MonteCarlo VaR
99%	0.00%	99%	14.96%
98%	0.00%	98%	11.94%
97%	0.00%	97%	10.96%
96%	0.00%	96%	9.02%
95%	0.00%	95%	7.91%

Source: The Author

The histograms for the Monte Carlo VaR simulations over 1 year and 15 years provide a visual representation of potential portfolio outcomes under stochastic modeling. The 1-year distribution is slightly skewed to the left, indicating a higher concentration of adverse outcomes and aligning with the higher downside risk in short horizons. In contrast, the 15-year distribution appears more symmetrical and centered at higher values, reflecting the compounding effect of returns over time and the reduced relative impact of volatility. This reinforces the notion that long-term investment horizons tend to mitigate the effects of short-term fluctuations, resulting in a more favorable distribution of outcomes.

Figure 12- Distribution of VaR(End of 1st Year and End of 15th Year)



Source: The author

4.6.3 15 years horizon risks

It is essential to remain vigilant about the macroeconomic and financial risks that could influence portfolio performance over the 15-year horizon defined in this IPS. Table 7 outlines a selection of key risk factors, alongside their potential implications and investment opportunities.

According to JP Morgan (2025), several cyclical and structural risks are likely to shape global economic and market dynamics in the coming years. These include persistent inflation pressures, tighter monetary policy, geopolitical tensions, and shifts in global energy markets. The adviser's role is to monitor these developments and consider how they may impact the strategic asset allocation. Where possible, the portfolio should integrate asset classes—such as inflation-protected bonds, commodities, or alternative investments—that are well-positioned to benefit from or hedge against these scenarios. This proactive risk-aware approach supports the IPS's objective of delivering consistent, risk-adjusted returns across varying macroeconomic conditions.

Table 8- 15 Years Horizon Risks

Code	Risk	Implications (15 years)	Investment Opportunities	Probability (15 years)	Impact if Occurs
A	Climate Change	Structural increase in extreme events, impact on insurance, infrastructure	Clean energy, water, sustainable agribusiness, resilient infrastructure.	High	High

		and agriculture.			
B	Side effects of the Russia/Ukraine war	Extension of the multipolar order, increasing economic fragmentation and cyber instability.	Defense, cybersecurity, diversified energy, gold.	Medium	High
C	Accelerated adoption of technology and AI	Complete transformation of the labor market, new industries, impact on inequality.	Tech, AI, online education, industrial automation, digital health.	High	Medium
D	Abandonment of USD as reserve currency	Monetary multipolarity, increasing role of the yuan or cryptoassets, reduction of US financial hegemony.	Currency diversification, real assets, gold, emerging markets with reserves in other currencies.	Low	High
E	Structural/persistent inflation	Prolonged supply-demand imbalance, wage pressures and intermittent energy shocks.	Infrastructure, commodity-linked stocks, inflation-linked REITs.	Medium	Medium
F	Global economic recession (or stagnation)	Possible prolonged stagnation in developed economies, population aging, lower productivity.	Quality fixed income, healthcare, productivity innovation (AI, robotics).	Medium	High
G	Pandemics / Health Crises	Recurrent biological risks, increasing	Biotech, healthcare,	Medium	Medium

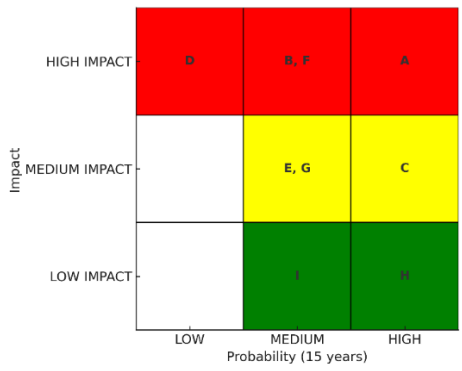
		focus on preventive health and biotechnology.	medtech, ESG in healthcare.		
H	Digital Misinformation & Algorithmic Bias	Spread of misinformation and AI bias affecting trust and markets.	Verification platforms, digital education, transparency tools.	High	Low
I	ESG Regulatory Divergence	Diverging ESG standards between regions, raising compliance costs and complexity.	ESG consulting, reporting and compliance tech.	Medium	Low

Source: The Author

To ensure that the strategic asset allocation remains robust over the long term, it is essential to anticipate macro-level risks that could materially affect global markets. The following matrix presents a selection of systemic risks with a 15-year horizon, assessing their probability and impact.

These risks were identified based on internal analysis and external sources such as JPMorgan's Guide to the Markets. Each risk is mapped according to its potential severity (impact if it materializes) and the estimated likelihood of occurrence, allowing for a clear visual prioritization.

Figura 13- Risk Matrix



Source: The Author

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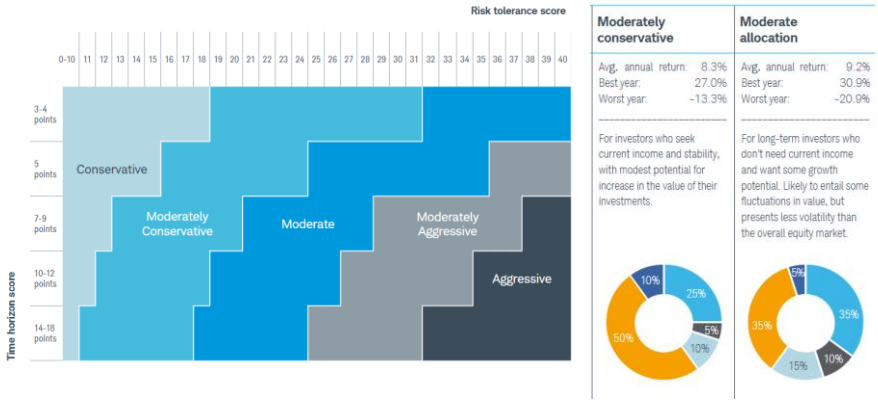
Appendix

Table A1- Client's Profile

Name	Miguel Santos
Age	35 years old
Children	2 (ages 5 and 3)
Work (Net Annual Wage)	Mechanical Engineer – €52,000 (net)
Academic Background	Bachelor's Degree in Mechanical Engineering
Additional Information	- Aims to buy a home, fund children's education, and build a financial cushion - Follows financial news, but has no formal background - Investment managed by advisor Paulo Ferreira
Investment Constraints	- Only ETFs (accumulating, low-cost) - No leverage or short selling - No liquidity needs during the investment horizon - Exposure to foreign currencies permitted - Max 50% exposure per ETF provider
Ability to Bear Risks / Willingness to Take on Risk	High ability / Moderate willingness
Risk Profile	Moderate
Amount to Invest	€300,000 (initial capital)
Investment Objective	€520,000(€825,360 in 15 years, assuming an average annual inflation rate of 2.5%).
Time Horizon	15 years (180 months)
Minimum Rate of Return	6.90%
Exp. Average Annual Return / Volatility of Proposed Portfolio	7.25% / 6.71%

Table A2- Profilling Questionaire

Time Horizon (14 Points)	I plan to begin withdrawing money from my investments in: 11 years or more (10)	Once I begin withdrawing funds from my investments, I plan to spend all of the funds in: 6-10 years (4)			
Risk Tolerance (25 Points)	I would describe my knowledge of investments as: Good (4)	What amount of financial risk are you willing to take when you invest? Take above average risks expecting above average returns (4)	Select the investments you currently own or have owned: Stocks and/or stock funds (6)	Consider this scenario: Imagine that in the past three months, the overall stock market lost 25% of its value. An individual stock investment you own also lost 25% of its value. What would you do? Do nothing(5)	Review the chart below. We've outlined the most likely best-case and worst-case annual returns of five hypothetical investment plans. Which range of possible outcomes is most acceptable to you? 9.2% 30.9%/ -20.9%(6)



Source: Charles Schwab (https://www.schwab.com/resource/investment-questionnaire)

Table A3- ETF Screener

ETF	Fund Size (EUR)	Index	Distribution Policy	Investment Focus	Replication Method
VTV	€125.57 B	CRSP US Large Cap Value	Accumulating	Equity, US, Value	Physical (Full)
XDWS	€918M	MSCI World Enhanced Value	Accumulating	Equity, Global, Value	Physical (Optimized)
XDWH	€2,5 B	MSCI World High Dividend Yield	Accumulating	Equity, Global, High Dividend	Physical (Optimized)
IUVL	€2.01B	MSCI USA Enhanced Value Index	Accumulating	Equity, US, Value	Physical (Replicated)
XMME	€6.08B	MSCI Emerging Markets	Accumulating	Equity, Emerging Markets	Physical (Full)
VHYL	€5.39B	FTSE All-World High Dividend Yield	Accumulating	Equity, Global, High Dividend	Physical (Full)
REZ	€730.57M	FTSE Nareit All Residential Capped Index	Distributing (Quarterly)	Equity, US, Real Estate	Physical (Full)
VYM	€56.9B	FTSE High Dividend Yield	Distributing (Quarterly)	Equity, US, High Dividend	Physical (Full)
DJEU	€375.98M	DJ Industrial Average Net TR	Accumulating	Equity, US, Blue Chips	Physical (Full)
VAGU	€4.14B	Bloomberg Global Aggregate Float-Adjusted	Accumulating	Bonds, Global, Aggregate	Physical (Full)
GCVB	€1.39B	Refinitiv Qualified Global Convertible Index	Distributing	Bonds, Global, Convertible	Physical (Backed)
EHYA	€3.34B	Bloomberg MSCI Euro Corp HY Sustainable BB+ SRI	Accumulating	Bonds, EUR, High Yield, ESG	Physical (Sampled)
TIP5	€1.86B	Eurozone Inflation-Linked 5Y	Accumulating	Bonds, EUR, Inflation Linked	Physical (Full)
XLPE	€454M	LPX MM Listed Private Equity TR	Accumulating	Private Equity, Global	Synthetic (Swap-based)
GLD	€74.5B	LBMA Gold Price PM USD	Distributing	Precious Metals, Gold	Physical (Backed)

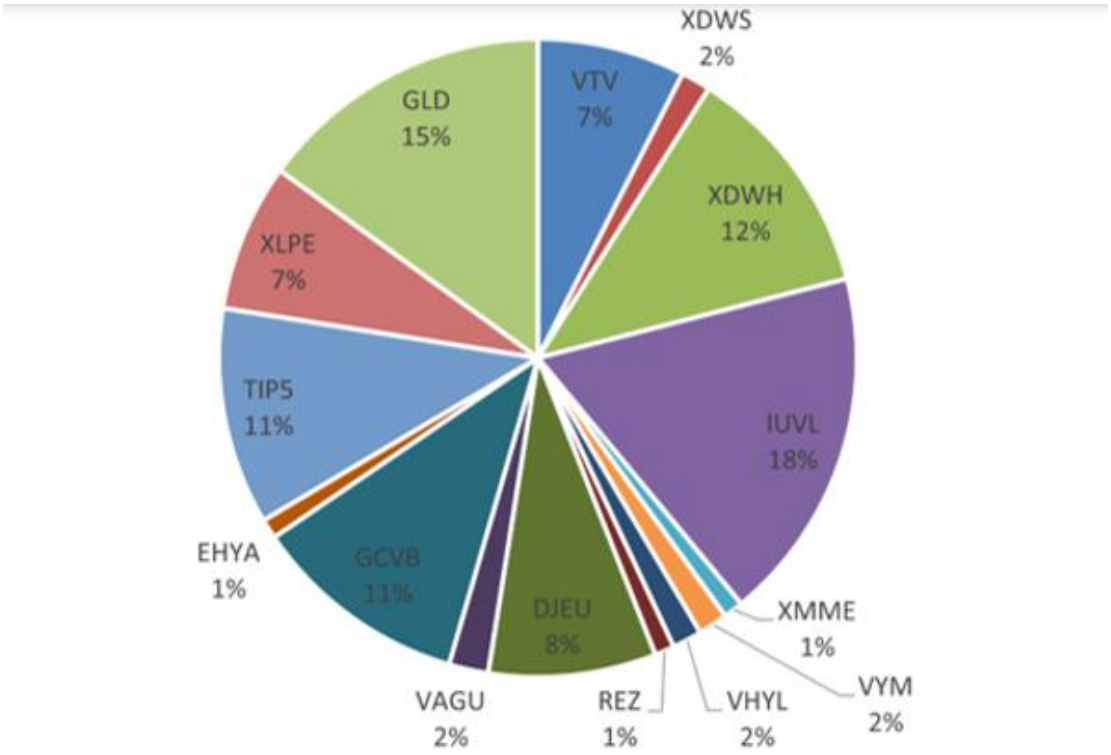
Table A4-ETF Detailed Information

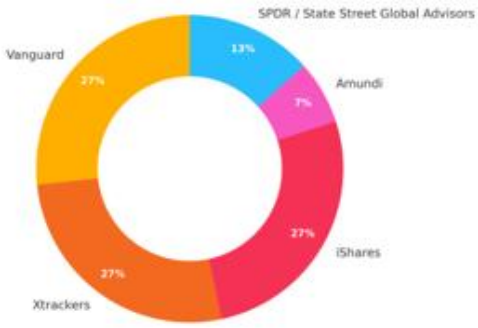
ETFs	ISIN	Holdings / Sector Info	TER	Provider
Vanguard Value ETF (VTV)	US9229087443	US large-cap value stocks. Top sectors: Financials (22.9%), Health Care (15.5%), Industrials (14.4%).	0.04%	Vanguard
Xtrackers MSCI World Consumer Staples UCITS ETF (XDWS)	IE00BM67HN09	Global consumer staples exposure. Top holdings: Nestlé, Procter & Gamble, Coca-Cola.	0.25%	Xtrackers
Xtrackers MSCI World Health Care UCITS ETF (XDWH)	IE00BM67HK77	Global healthcare sector. Top weights: Pharma (49.7%), Equipment (25.3%), Services (13%).	0.25%	Xtrackers
iShares MSCI USA Enhanced Value UCITS ETF (IUVL)	IE00BD1F4M44	Top holdings: AT&T, Cisco, Intel. Value-weighted US equity exposure. 203M shares outstanding.	0.20%	iShares
Xtrackers MSCI Emerging Markets UCITS ETF (XMME)	IE00BTJRMP35	Exposure to 1,224 emerging market companies. Benchmark: MSCI EM. Launched 2017.	0.18%	Xtrackers
Vanguard High Dividend Yield ETF (VYM)	US9219464065	US dividend-paying stocks. Top sectors: Financials (22.9%), Consumer (22.1%), Technology (11.3%).	0.06%	Vanguard
Vanguard FTSE All-World High Dividend Yield UCITS ETF (VHYL)	IE00B8GKDB10	Global high dividend yield stocks. Broad diversification across developed and EM.	0.29%	Vanguard
iShares Residential and Multisector Real Estate ETF (REZ)	US9229087443	US real estate exposure focused on residential REITs. Top sectors: Real Estate, Financials.	0.48%	iShares
Amundi Dow Jones Industrial Average UCITS ETF (DJEU)	LU0389811372	Tracks 30 large-cap US blue-chip companies. Examples: Apple, Microsoft, Johnson & Johnson.	0.30%	Amundi

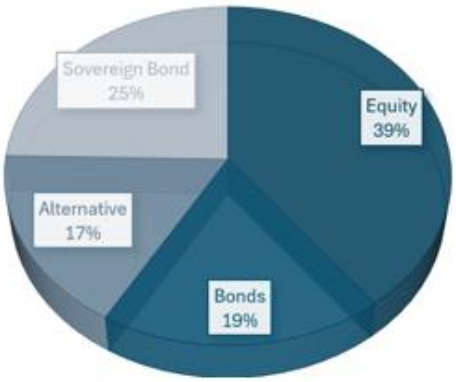
ETFs	ISIN	Holdings / Sector Info	TER	Provider
SPDR Global Convertible Bond UCITS ETF (GCVB)	IE00BNH72088	Global convertible bonds. Sector exposure: Tech (20.6%), Comms (18.6%), Consumer (15.4%). 66% North America.	0.50%	SPDR / State Street Global Advisors
Vanguard Global Aggregate Bond UCITS ETF (VAGU)	IE00BG47KJ78	Diversified bond exposure: 59.5% Government, 30.2% Corporate. Global allocation. Bloomberg Global Agg Index.	0.10%	Vanguard
iShares USD TIPS 0–5 UCITS ETF (TIP5)	IE00BDQYWQ65	99.95% in US inflation-linked bonds. Duration: 0–5 years. Benchmark: ICE U.S. TIPS 0–5 Index.	0.10%	iShares
iShares Euro High Yield Corp Bond ESG UCITS ETF (EHYA)	IE00BYXYYQ20	Exposure to EUR high yield corporate bonds. ESG screened. Sector mix: Industrials, Financials. Benchmark: Bloomberg MSCI Euro HY SRI.	0.25%	iShares

ETFs	ISIN	Holdings / Sector Info	TER	Provider
SPDR Gold Shares (GLD)	US78463V1070	Physically backed gold ETF. Tracks LBMA Gold Price. Assets held in vaults. USD-denominated.	0.40%	SPDR / State Street Global Advisors
Xtrackers LPX Private Equity Swap UCITS ETF (XLPE)	LU0322253906	Synthetic exposure to global listed private equity via LPX MM TR Index. Swap-based replication.	0.70%	Xtrackers

Figure A1- Portfolio Composition







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