MASTER OF SCIENCE IN

FINANCE

MASTERS FINAL WORK

PROJECT

INVESTMENT POLICY STATEMENT:
TEIXEIRA FAMILY

TOMÁS AREZ MANUEL VICENTE

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PROFESSOR PEDRO RINO VIEIRA

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Abstract

The Investment Policy Statement (IPS) is a key communication tool between the advisor and the Oliveira family, outlining the investment strategy, objectives, and the advisor's duties, including progress updates, risk management, and compliance with CFA standards.

The family demonstrates a moderate risk tolerance, with the primary goal of generating sufficient returns to enhance their retirement lifestyle, as they have other savings to support their financial needs. They impose specific constraints on the investment strategy, disallowing short selling, leverage, and cryptocurrency investments. Additionally, they mandate a maximum allowable loss of 10% in any given year.

The investment objective is to grow the initial capital of €300,000 to €500,000 over a 10-year period. When accounting for a 2% annual inflation rate and a 28% capital gains tax, the final target value is €729,857.24. Achieving this goal requires a minimum annualized return of 9.30%.

The investment philosophy is centered on an Index Investing Strategy, utilizing Exchange-Traded Funds (ETFs) to build the portfolio, with a strong emphasis on growth investing principles.

The Strategic Asset Allocation was determined using Markowitz's Modern Portfolio Theory (MPT) in conjunction with Excel Solver to maximize the Sharpe ratio. This approach resulted in a portfolio with an average annualized return of 10.30% and an average annualized standard deviation of 8.53%.

For the risk analysis, several Value-at-Risk (VaR) methods were employed, and a comprehensive risk matrix was constructed to assess long-term cyclical risks.

Resumo

O Investment Policy Statement (IPS) é uma ferramenta de comunicação chave entre o consultor e a família Oliveira, que delineia a estratégia de investimento, os objetivos e os deveres do consultor, incluindo atualizações de progresso, gestão de risco e conformidade com os padrões do CFA.

A família demonstra uma tolerância ao risco moderada, com o objetivo principal de gerar rendimentos suficientes para melhorar o seu estilo de vida na reforma, dado que possuem outras poupanças para apoiar as suas necessidades financeiras. Impõem restrições específicas à estratégia de investimento, proibindo vendas a descoberto, alavancagem e investimentos em criptomoedas. Adicionalmente, determinam uma perda máxima admissível de 10% em qualquer ano.

O objetivo do investimento é crescer o capital inicial de €300.000 para €500.000 ao longo de um período de 10 anos. Considerando uma taxa de inflação anual de 2% e uma taxa de imposto de mais-valias de 28%, o valor alvo final é €729.857,24. Para atingir este objetivo, é necessário um retorno anualizado mínimo de 9,30%.

A filosofia de investimento é centrada numa Estratégia de Investimento em Índices, utilizando Exchange-Traded Funds (ETFs) para construir o portfólio, com um forte foco nos princípios do growth investing.

A Alocação Estratégica de Ativos foi determinada utilizando a Teoria Moderna de Portfólios (MPT) de Markowitz em conjunto com o Excel Solver para maximizar o Sharpe ratio. Esta abordagem resultou num portfólio com um retorno anualizado médio de 10,30% e um desvio padrão anualizado médio de 8,53%.

Para a análise de risco, foram aplicados vários métodos de Value-at-Risk (VaR) e foi construída uma matriz de risco abrangente para avaliar os riscos cíclicos de longo prazo.

Classificação JEL: C6; G11.

Palavras-Chave: Gestão de Ativos; Teoria moderna de portfolios; IPS; Investidores Individuais; ETF; Risco Moderado; Investimento em Índices; Valor em Risco (VaR); Índice de Sharpe; Filosofia de Investimento; CFA.

Acknowledgements

I would like to sincerely thank everyone who supported me during these past few months I spent working on this MFW. While it was a time filled with lots of hardships, it also became a period of personal growth, determination, and hard work.

To my parents, thank you for your all your love and support, not just over these past few months, but throughout my entire life. Without you, I would never have made it this far, and I am forever grateful for everything you've done for me.

To my grandfathers and grandmother, your care and encouragement have meant the world to me. Thank you for always being there.

To my godparents, thank you for all your care and for always showing concern for both my well-being and my work progress.

To my uncle, aunt and cousins – thank you for all the support.

To all my friends, from my hometown and from ISEG, thank you for your friendship, your encouragement, and for always being by my side.

Finally, to Professor Pedro Rino Vieira, my supervisor, thank you for your invaluable guidance, insights, and support throughout the process of writing this IPS.

Thank you all, from the bottom of my heart.

Abbreviations

AI   Artificial Intelligence

CAL   Capital Allocation Line

CFA   Chartered Financial Analyst

CVaR   Conditional Value-at-Risk

ECB   European Central Bank

ESG   Environmental, social, and governance

ETC   Exchange Traded Commodity

ETF   Exchange Traded Fund

ETP   Exchange Traded Product

GBP   British Pound Sterling

IPS   Investment Policy Statement

JPY   Japanese Yen

MFW   Master's Final Work

MPT   Modern Portfolio Theory

MSCI   Morgan Stanley Capital International

NAV   Net Asset Value

PE   Price to Earnings

S&P   Standard & Poor's

SR   Sharpe Ratio

TER   Total Expense Ratio

USD   United States Dollar

VaR   Value-at-Risk

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1 Introduction

An Investment Policy Statement (IPS) is a formal document that defines the guidelines, strategies, and objectives for managing an investment portfolio. It serves as a comprehensive framework for investment decisions, outlining the client's financial goals, risk tolerance, time horizon, and any specific constraints. The IPS details the types of investments that are suitable for the portfolio and sets boundaries to ensure investments are consistent with the client's objectives and preferences. It also establishes a process for regular review and adjustment of the portfolio as circumstances evolve.

The purpose of this IPS is to provide a clear and structured approach to portfolio management, ensuring alignment with the client's long-term financial goals. It serves as a tool for both the advisor and the client to make informed investment decisions, reduce emotional biases, and maintain consistency in the investment strategy. By outlining clear guidelines, this IPS helps minimize the risks associated with market fluctuations, ensures adherence to the client's risk profile, and fosters disciplined decision-making throughout the investment process.

This IPS will employ a combination of investment strategies, asset and security allocations, and risk analysis to ensure that the client's investment goals, risk requirements, and other constraints are effectively met. The strategy will be carefully tailored to align with the client's financial objectives, ensuring the portfolio remains balanced, diversified, and resilient to market changes over time.

2 Executive Summary

2.1 Scope and Purpose

The financial advisor uses this Investment Policy Statement (IPS) as a communication tool with Family Teixeira to define and maintain their investment strategy. The advisor ensures the IPS is updated with tax and legal input, aligns the portfolio with the client's needs, provides impartial advice, discloses conflicts of interest, and adheres to CFA (Charted Financial Analyst) standards.

2.2 Governance

To meet the client's objectives within the given constraints, the financial advisor is responsible for creating and maintaining the IPS, providing updates, and recommending adjustments. The client reviews the IPS periodically to ensure alignment with their goals and provides feedback on quaterly reports. Regular meetings are held to discuss progress and make necessary changes to the portfolio.

2.3 Investment Return and Risk

The Investment Policy Statement (IPS) must achieve a minimum annualized return of 9.30% over a 10-year period to meet the client's objectives. The client exhibits a moderate risk tolerance, with a maximum allowable annualized volatility of 10%. Utilizing Excel Solver and incorporating the client's specified constraints, an optimized portfolio was constructed to maximize the Sharpe Ratio. The resulting portfolio achieves an annualized return of 10.30%, an annualized volatility of 8.53%, and a Sharpe Ratio of 0.931.

2.4 Risk Management

The advisor is responsible for monitoring and reporting portfolio performance in accordance with the CFA's Global Investment Performance Standards (GIPS). Quaterly performance reports will be prepared, and quarterly risk assessments, including metrics such as Value-at-Risk (VaR), will be provided to the client. Additionally, the advisor will propose an semi-annual portfolio rebalancing strategy to the client, subject to their review and approval.

3 Investment Policy Statement

3.1 Scope and Purpose

3.1.1 Context and Investor

This document, the Investment Policy Statement (IPS), serves as a structured contract between Tomás Vicente and Mr. and Mrs. Teixeira. Its purpose is to establish a clear and well-defined investment strategy that aligns with the clients' financial objectives and ensures an effective and disciplined investment process. The IPS provides a foundation for making informed decisions and achieving optimal results tailored to the couple's goals.

Residing in Lisbon, Portugal, Mr. and Mrs. Teixeira are both in their early 50s. Mr. Teixeira is a doctor at a local hospital, while Mrs. Teixeira works as a graphic designer for a multinational corporation. Both have stable careers that provide financial security, and with their only son, now 26 years old, financially independent and well-established, the Teixeira family is shifting its focus toward retirement planning.

Having saved diligently throughout their lives, the couple has decided to allocate €300,000 of their savings into an investment portfolio. Their primary goal is to grow this wealth over time to ensure a more comfortable retirement. This IPS will guide the portfolio management process, balancing their risk tolerance and investment objectives to achieve sustainable long-term growth.

3.1.2 Structure

As the financial advisor to the Teixeira family, Tomás Vicente is entrusted with the responsibility of managing and updating the Investment Policy Statement (IPS) to ensure it aligns with the couple's financial goals. He works closely with their tax and legal advisors to integrate relevant guidance, maintaining consistency with the clients' overall objectives. Tomás is responsible for monitoring the portfolio's adherence to the IPS and promptly communicating any updates or adjustments during the investment period. While he oversees the portfolio's execution, the final approval of the IPS and its revisions remains with Filipe and Sofia Teixeira.

In his fiduciary role, Tomás is dedicated to providing impartial and transparent advice, ensuring that all decisions prioritize the clients' best interests. He adheres to the

highest ethical standards outlined in the CFA Institute Asset Manager Code of Professional Conduct.

Tomás will monitor the portfolio's risk and performance, ensuring it remains consistent with the clients' investor profile. He will provide the Teixeira family with regular updates, including quaterly performance reports and a detailed quarterly review, to ensure they remain informed of their investment's progress and risk scenario. All activities will be conducted in strict compliance with professional and ethical standards.

3.2 Governance

The governance framework of this Investment Policy Statement (IPS) establishes clear roles and responsibilities to ensure effective implementation and ongoing management of the investment strategy. The financial advisor is fully responsible for determining, executing, and monitoring the investment policy, ensuring alignment with the clients' objectives and constraints at all times.

The IPS will be reviewed regularly through collaboration between the clients and the advisor. Quarterly reports will be prepared by the advisor, detailing portfolio performance, risk metrics, and alignment with the IPS. Any proposed adjustments to the investment strategy will be presented by the advisor and require the clients' approval before implementation.

The advisor holds sole responsibility for engaging and discharging external advisors or entities involved in the management of specific aspects of the portfolio. This ensures consistency and accountability in maintaining the portfolio's alignment with the IPS.

Asset allocation is determined entirely by the advisor, who ensures that the allocations match the clients' goals and constraints. The advisor provides full transparency by disclosing the proportions invested in each asset class, expected returns, volatility metrics, macroeconomic considerations, and tax implications, along with the assumptions used to develop the portfolio allocation.

The advisor also oversees all aspects of risk management and monitoring. Portfolio performance and risks are evaluated regularly, with detailed quarterly reports provided to the clients. If necessary, the advisor will propose rebalancing the portfolio to prevent deviations from the clients' objectives. Rebalancing will only proceed with the clients' prior approval.

While there are no general restrictions on asset selection, certain limitations apply, with Cryptocurrencies being excluded entirely at the client's request.

3.3 Investment, Return and Risk Objectives

3.3.1 Investment Objective

The primary investment objective of this IPS is to grow an initial investment of €300,000 to a minimum of €500,000 over a 10-year period, net of taxes and corrected for inflation. This growth is intended to secure their financial stability and provide the necessary resources to support a comfortable and worry-free lifestyle during their retirement years.

3.3.2 Return, Distribution and Risk Requirements

To achieve the target amount of €500,000 by 2035, the portfolio must generate an annual return of at least 5.24%. However, according to Banco de Portugal (2025), the Harmonised Index of Consumer Prices (HICP) is forecasted to reach 2% in 2026 and 2027, which will be assumed as the inflation rate for the entire 10-year period.

Accounting for this 2% annual inflation rate over the next decade and the 28% capital gains tax in Portugal, the target amount increases to €729,857,24. Consequently, the portfolio must achieve a higher annualized return of 9.30% to meet this adjusted goal. Additionally, the Teixeira family has specified that the portfolio's volatility should not exceed 10%. To satisfy both the return and risk constraints, the advisor will aim to optimize the portfolio by maximizing the Sharpe Ratio.

3.3.3 Portfolio Policy

To establish appropriate limitations for the asset classes, the asset allocation plan will undergo periodic reviews through meetings between the advisor and the client. To determine the optimal allocation across asset classes and securities, the advisor will utilize Mean Variance Theory. This approach will set both minimum and maximum allocation thresholds for each asset class and security, with weights based on the client's profile, return and risk objectives, and the prevailing macroeconomic environment. The advisor will then be responsible for maintaining the asset allocation plan, ensuring the actual allocation stays within the established limits. Additionally, the

advisor will provide a quarterly report to the client, summarizing the current asset allocation and confirming that it remains within the acceptable range.

3.3.4 Investor's Risk Tolerance

To evaluate the couple's risk tolerance, the advisor utilized an Investor Questionnaire provided by Vanguard, which consists of 11 questions designed to assess various aspects of the clients' financial profile. These questions helped gauge the couple's risk tolerance, investment experience, financial goals, and time horizon. Based on the responses, Vanguard generated a suggested asset allocation tailored to the client's profile.

From Questions 1, 2, and 4, it was determined that the Teixeira family seeks a long-term investment strategy. Question 3 revealed that the couple has limited experience with stock investing, while Question 5 indicated that they possess some capacity to bear risk. The remaining questions supported the conclusion that the family exhibits a moderately risk-tolerant profile.

After addressing all the questions, the Vanguard Questionnaire recommended a portfolio composition of 70% stocks and 30% bonds, as detailed in Table B in the appendix section. However, due to the absence of Alternative investments and the need to align with the client's return and risk requirements, the suggested allocation was adjusted. The final portfolio allocation, presented in Table E in the appendix, results in an annual volatility of 8.53%, well below the 10% maximum risk tolerance set by the client.

3.3.5 Relevant Constraints

The portfolio will be regularly reviewed and adjusted to maintain alignment with the client's objectives and risk preferences. Furthermore, at the end of each quarter, the investment manager will provide a report detailing the current asset allocations and confirming compliance with the established limits for the period.

Since this investment represents only a portion of the Teixeira family's total savings and considering their overall financial stability, they have no significant liquidity demands, provided that the portfolio can be converted to cash in the long term. Furthermore, the investment strategy will exclusively utilize Exchange-Traded Funds (ETFs) across all asset classes.

The family imposes no restrictions on investments outside Europe and is comfortable with exposure to stable currencies like the USD. While the family permits direct exposure to the USD, all transactions will be executed in Euros. Based on the family's risk tolerance, financial objectives, and investment horizon, the advisor will select ETFs that provide diversified market exposure and align with these constraints. Additionally, although not explicitly required by the clients, any ETFs with underlying assets that pay dividends will be accumulative, simplifying the tax process.

The family also requires the exclusion of leverage and short-selling strategies from the portfolio. As residents of Portugal, the portfolio is subject to a capital gains tax rate of 28%, which applies to all ETF categories, including those focused on stocks, bonds, commodities, and infrastructure.

Lastly, the clients have expressed indifference toward ESG (Environmental, Social, and Governance) considerations, and as such, no restrictions will be imposed based on these factors.

3.4 Risk Management

The advisor is responsible for calculating the performance of each individual asset and the portfolio as a whole. A detailed performance report will be delivered to the clients on a quarterly basis, adhering to the Global Investment Performance Standards (GIPS) set by the CFA Institute.

In addition to performance metrics, the quarterly report will provide a comprehensive risk analysis of the portfolio, incorporating indicators such as volatility and the Sharpe ratio. The report will also include an assessment of portfolio risk using various Value-at-Risk (VaR) methods, offering a detailed evaluation of potential losses. If any discrepancies are identified in the risk positions, such as the information ratio of the portfolio turning negative, the advisor will make the necessary adjustments to ensure that risk remains within acceptable limits.

Furthermore, at the end of each semester, the advisor will review the portfolio's asset allocation to ensure it remains aligned with the targeted risk and return parameters. If the weight of any security deviates by more than +50% or less than -50% from its initial allocation, the advisor will propose a rebalancing strategy to restore the desired distribution. Rebalancing will only be executed once the client's approval is obtained.

This process ensures the portfolio consistently aligns with the client's long-term investment goals.

4 Investment Design

4.1 Investment Philosophy

An investment philosophy is a structured approach to understanding financial markets, their functioning (and occasional inefficiencies), and the recurring errors that often drive investor behavior. In essence, it represents a foundational set of principles that serve as a guiding framework for developing new strategies when existing ones fail to deliver desired results. Furthermore, switching strategies often leads to portfolio adjustments, which incur transaction costs, so having a well-defined investment philosophy provides a reliable foundation, helping to minimize unnecessary changes and associated expenses. Additionally, it is essential to have a strategy that aligns closely with the investor's objectives and constraints, ensuring consistency and effectiveness in achieving long-term goals (Damodaran, 2012).

Based on the client's profile and time horizon, Growth Investing was identified as the most suitable strategy for this IPS. Growth investing, first defined by T. Rowe Price (1973) focuses on identifying companies that are expected to deliver above-average earnings growth relative to their industry peers or the broader market. Growth-oriented firms typically exhibit strong revenue trajectories, innovative business models, and expanding market shares, which attract investor interest despite often trading at elevated valuation multiples, such as high price-to-earnings (P/E) ratios.

In contrast to Growth Investing, there is Value investing, first defined by Benjamin Graham and David Dodd (1934), it is a disciplined approach to investing that seeks to uncover financial assets trading well below their intrinsic value. Rooted in the principles of fundamental analysis, this strategy focuses on identifying robust companies with solid economic foundations and resilient financial performance. By purchasing undervalued assets ,with a low P/E, and exercising patience, value investors aim to capitalize on market inefficiencies, ultimately achieving superior long-term returns while mitigating risk.

There are several compelling reasons to prioritize Growth Investing over Value Investing within the context of this Investment Policy Statement. A key factor is the

recent strong historical performance of growth stocks: over the past decade, growth stocks have consistently outpaced value stocks, as shown in Figure 1, with the MSCI World Growth Index outperforming the MSCI World Value Index in 11 of the past 14 years. Not only have growth stocks outpaced value stocks, but in certain years, the performance gap has been substantial, with the MSCI World Growth Index more than doubling the return of the MSCI World Value Index in 2024, and surpassing it by more than three times in 2023. This outperformance can be largely attributed to the surge in innovation over the past decade, and with the recent breakthroughs in Artificial Intelligence technology, the advisor expects this trend of outperformance to persist in the foreseeable future.

Figure 1- Historical returns of the MSCI World Value and MSCI World Growth Indexes (2011-2024)

Source: msci.com

Furthermore, growth stocks typically offer lower or no dividends compared to value stocks. Over the 10-year horizon defined by the client, this characteristic becomes advantageous, as the lack of dividends allows for greater compounding, thereby enhancing overall returns.

4.2 Strategic Asset Allocation

Strategic asset allocation is a long-term investment strategy that involves setting fixed proportions of asset classes in a portfolio to achieve specific financial goals while aligning with the investor's risk tolerance, return objectives, and time horizon. The allocation is based on the expected risk-return characteristics of each asset class, such as equities, bonds, and alternatives, and is designed to optimize the portfolio's performance over time. The finality of this approach is to provide a structured framework for managing investments, minimising emotional decision-making, and maintaining alignment with the investor's financial objectives.
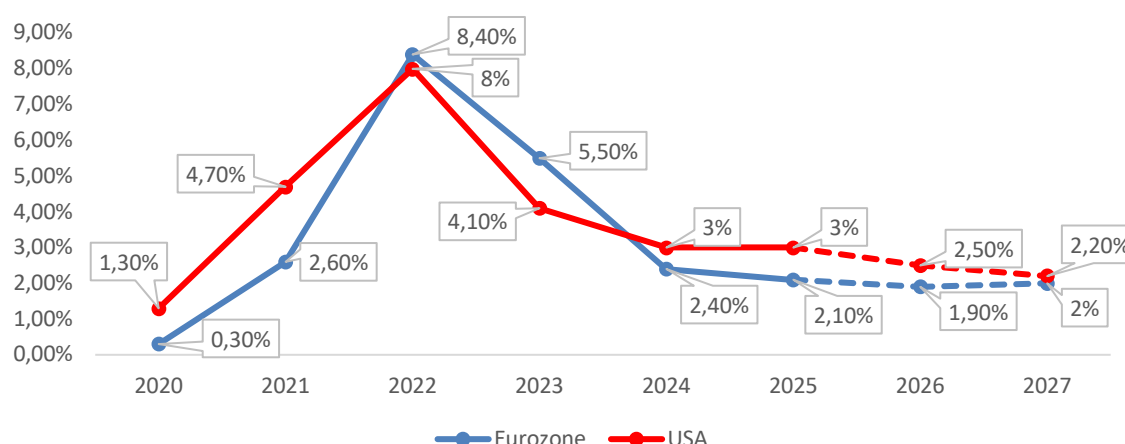
To implement the asset allocation, the advisor will employ a top-down strategy. Initially, a comprehensive macroeconomic analysis will be conducted to evaluate broader economic trends, market conditions, and global factors that could impact the performance of various asset classes.

4.2.1 Macroeconomic Review

When analyzing real GDP growth projections among major developed economies, the United States continues to lead with the highest expected growth rates, despite a slight deceleration attributed to the reintroduction of tariff policies under President Donald J. Trump. According to the International Monetary Fund (IMF), the U.S. economy is projected to grow by 1.8% in 2025, 1.7% in 2026 and 2.0% in 2027, reinforcing its position as the strongest performer among advanced economies. In comparison, the Eurozone is expected to post more moderate growth, with forecasts of 0.8% in 2025, 1.2% in 2026 and 1.3% in 2027. Japan, meanwhile, is projected to experience relatively modest and stable growth of 0.6% annually over the same period.

Turning to inflation, Figure 2 illustrates that the Eurozone's inflation rate for 2025 is projected to decline relative to 2024 levels, with expectations that it will gradually converge toward the European Central Bank's (ECB) target of 2% by 2027. In the United States, inflation is also anticipated to moderate over the next three years, although it is expected to remain higher than in the Eurozone and not fully return to the Federal Reserve's 2% target within the same period.

Figure 2 - Historical and projected inflation for the Eurozone and US.

However, it is important to recognize that these forecasts are subject to macroeconomic uncertainty, particularly in light of the recent shift in U.S. trade policy under President Donald J. Trump. As highlighted by the economists McKibbin and Shuetrim at the Peterson Institute for International Economics (PIIE, 2025), the full impact of these protectionist measures has not yet materialized, and there is growing concern that they may disrupt global supply chains, potentially dampening or reversing the current disinflationary trend.

A resurgence in inflation could prompt both the ECB and the Federal Reserve to reconsider or postpone the interest rate cuts currently planned, a shift that would likely have adverse effects on the broader bond market, particularly by placing downward pressure on bond prices and increasing yield volatility.

Given this inflation outlook, and the historical underperformance of bond ETFs relative to equity ETFs during periods of elevated inflation, as well as their weaker post-inflation recovery dynamics, this IPS will prioritize a majority allocation to equity ETFs. Furthermore, to meet the Teixeira Family's moderate risk tolerance and long-term return objectives, some of the selected bond ETF holdings will incorporate inflation-hedging instruments, helping to preserve purchasing power and ensure portfolio resilience in the face of persistent inflationary pressures.

In addition, alternative investments will be considered as part of the portfolio allocation, given their potential to serve as effective inflation hedges and to enhance

diversification. Asset classes such as commodities have historically shown a low correlation with traditional equities and bonds, while also offering the potential to mitigate the erosive effects of inflation on real returns. Notably, a study by Paul Bosse (2019) found that over the past decade, for every 1% of unexpected inflation, commodities rose by approximately 7% to 9%, reinforcing their relevance in inflation-sensitive portfolio construction.

Regarding currency exchange rates, the ECB's macroeconomic projections, released in March 2025, forecast a decline in the USD/EUR exchange rate from 1.08 in 2024 to 1.04 in 2025, with the value expected to remain relatively stable through 2027. This suggests that the euro is likely to lose value against the dollar. Furthermore, this projection represents a downward revision from the ECB's earlier forecast in December 2024, indicating that the dollar has outperformed the ECB's initial expectations, as shown in Figure 3.

Figure 3 – Historical and Projected USD/EUR Rate
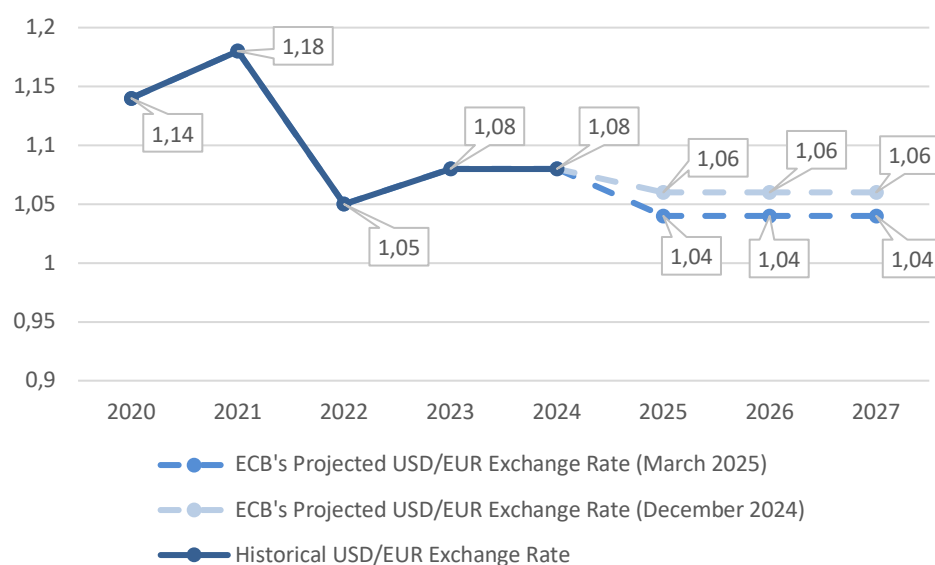
Source: macrotrends.net; ECB (2025)

4.2.2 Asset Allocation

Based on the responses provided by the clients in the Vanguard questionnaire, Vanguard recommended a portfolio allocation of 70% equities and 30% bonds.

However, after conducting a top-down approach and a detailed macroeconomic analysis, the advisor deemed it necessary to revise this allocation.

As mentioned previously, this portfolio will exclusively consist of ETFs, and when analyzing the historical performance of bond ETFs over the past five years, it was evident that many performed poorly, largely due to significant increases in interest rates in 2022, as highlighted in the macroeconomic analysis. Additionally, with the recent re-election of Donald Trump and concerns about potential future interest rate hikes driven by his policies, the advisor concluded that allocating 30% of the risky portfolio to bonds could hinder achieving the desired return and volatility objectives. Another limitation of Vanguard's recommended portfolio was the lack of exposure to alternative assets, which are valuable for enhancing diversification and hedging against inflation.

In response to these considerations, a strategic asset allocation of 70% to risky assets and 30% to a risk-free asset was deemed the most appropriate structure for this portfolio. Within the risky asset component, initial central allocation weights have been defined as 80% equity ETFs, 10% bond ETFs, and 10% alternative ETFs. This translates to an overall portfolio allocation of approximately 56% to equity ETFs (80% of 70%), 7% to bond ETFs, 7% to alternative ETFs, and 30% to risk-free bonds.

To calculate the optimal portfolio that maximizes the Sharpe ratio, the advisor implemented a band constraint approach, allowing for allocation flexibility while maintaining control over risk exposure. Specifically, allocation bands of ±30% of the central weight were applied to all asset classes. Following the definition of initial, maximum, and minimum weights for each asset class and individual security, the Excel Solver optimization tool was employed to determine the portfolio configuration that achieves the highest risk-adjusted return.

The resulting optimal asset class weights are presented in Table 1 and Figure 4, while a detailed breakdown of allocations by individual securities can be found in Table E in the appendix section.

Table 1 – Final Asset Allocation

Asset Allocation	Complete Portfolio		Risky Portfolio		
	Risky Assets	Risk-Free Bond	Equities	Bonds	Alternatives
Min. Weight	49%	21%	56%	7%	7%
Initial Weight	70%	30%	80%	10%	10%
Max. Weight	91%	39%	100%	13%	13%
Final Risky Weight	-	-	**80%**	**7%**	**13%**
Final Weight	**70,58%**	**29,42%**	**56,46%**	**4,94%**	**9,18%**

Source: Author

Figure 4 – Final Asset Allocation
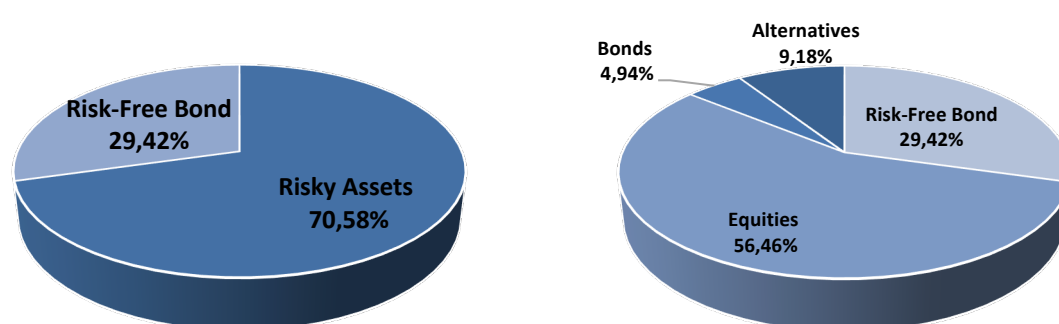
Source: Author

4.3 Security Selection

This IPS will exclusively utilize Exchange-Traded Funds (ETFs) to gain exposure across all targeted asset classes, including equities, fixed income, and alternative investments. ETFs blend features of both mutual funds and individual stocks. Like mutual funds, they provide investors access to a professionally managed, diversified portfolio of assets, however, unlike mutual funds—priced once daily based on their net asset value (NAV)—ETF shares are traded on public exchanges throughout the day, with prices fluctuating continuously in response to market demand.

In addition to offering a broad diversification, which helps reduce unsystematic risk, ETFs provide a higher liquidity and lower transaction costs compared to mutual funds (Ben-David, 2016). Furthermore, ETFs are typically more tax-efficient than traditional stocks (Moussawi, 2022).

Beyond their structural advantages, ETFs can be either passively or actively managed. Passively managed ETFs aim to replicate the performance of a specific index, such as the S&P 500, while actively managed ETFs involve portfolio managers strategically buying and selling securities to outperform a benchmark. For the purposes of this IPS, the portfolio will focus on passively managed ETFs, as they offer a more cost-efficient, transparent, and lower-risk approach that aligns more closely with the client's investment profile.

To further ensure that the selected ETFs align with the Teixeira Family's investment objectives and risk profile, a set of well-defined screening criteria was applied. These guidelines are intended to enhance portfolio transparency, minimize risk, and ensure consistency with the long-term investment strategy outlined in this IPS:

- **Replication Method** – Full or Optimised Sampling: All equity and bond ETFs included in the portfolio must employ either full replication or optimised sampling techniques. These methods closely track the underlying index, offering greater transparency and lower tracking error, which reduces the risk of performance deviation from the benchmark. This feature is essential for meeting the client's risk control requirements. For commodity ETFs, only physical replication is permitted to ensure direct exposure to the asset and to avoid the risks associated with futures markets.

- **Reinvestment Strategy – Accumulating**: All selected ETFs must adopt an accumulating reinvestment strategy, whereby dividends are reinvested into the fund rather than distributed. This approach enhances compound growth, reduces transaction costs, and aligns with the clients' long-term investment horizon, particularly given their lack of short-term liquidity needs.

- **Expense Ratio**: Only Equity and Bond ETFs with a Total Expense Ratio (TER) below 0.40% are eligible for inclusion, ensuring cost efficiency and protecting long-term returns from excessive management fees. For Alternative ETFs, a slightly higher limit of 0.50% was considered acceptable.

- **Fund Size**: A minimum fund size of €400 million is required to reduce liquidity risk and limit bid-ask spreads, thereby improving trading efficiency and reducing slippage during rebalancing.

- **Currency Exposure**: All ETFs must be EUR-denominated and traded on European exchanges. Indirect exposure to foreign exchange risk is permitted for stable, low-volatility currencies such as the USD, GBP, and CHF. However, ETFs with more than 10% exposure to more volatile currencies, like the JPY, must be EUR-hedged to mitigate currency risk and shield the portfolio from unnecessary volatility.

- **Provider Diversification**: To reduce concentration risk, no single ETF provider may account for more than 50% of the total allocation within the risky asset portion of the portfolio.

- **Focus on Industry-Based ETFs**: To enhance portfolio flexibility and enable more efficient risk management, the majority of equity ETF allocations will be directed toward industry-specific ETFs. This allows a more targeted exposure and better adaptability to macroeconomic trends and sectoral dynamics.

- **Growth Investing:** To align with the Investment Philosophy, over 60% of the selected Equity ETFs must have a P/E ratio greater than 20, with a limited allocation to Value ETFs allowed to enhance portfolio diversification.

In the first stage, a broad selection of ETFs meeting the predefined screening criteria was compiled. For each industry and geographic exposure, ETFs with the lowest Total Expense Ratio (TER) and highest market capitalization were prioritized. This approach enhances the portfolio's cost efficiency, tax efficiency, and liquidity, all of which are critical to long-term performance and implementation effectiveness. In cases where multiple ETFs within the same category exhibited similar TERs and comparable market capitalizations, the selection was based on the superior risk-adjusted return profile, ensuring an optimal balance between performance and volatility.

Concerning the reinvestment strategy, only accumulating ETFs were selected primarily to take advantage of the benfits of long-term compounding, which significantly enhances wealth accumulation over time. Supporting this decision, a 2024 study by BlackRock demonstrated the significant impact of dividend reinvestment on long-term returns: an investor who placed £10,000 into an accumulating fund tracking the FTSE at the end of 2003 would have seen the investment grow to £26,379 by the end of

2023, compared to just £17,270 in a distributing version of the same fund. Additionally, it helps reduce transaction costs associated with manually reinvesting distributed dividends, and aligns with the client's long-term horizon and lack of short-term liquidity needs.

With regard to currency considerations, all selected ETFs must be denominated in euros and traded on European stock exchanges. However, this requirement does not eliminate exposure to foreign exchange risk. For instance, an ETF tracking the S&P 500, purchased in euros on a European exchange, still maintains underlying exposure to the U.S. dollar, with a depreciation of the USD relative to the euro would negatively affecting the ETF's valuation in euro terms. While such currency fluctuations can impact short-term performance, foreign exchange risk generally becomes less significant over longer investment horizons. In view of this, and supported by a positive long-term outlook for the USD relative to the euro, the decision was made not to hedge currency exposure for USD-based equity ETFs, as this aligns with both the portfolio's strategic horizon and the client's moderate risk profile. Furthermore, currency risk from stable currencies like the GBP will also be tolerated. However, for ETFs with more than 10% exposure to currencies that are more volatile, like the JPY, currency hedging will be applied to minimize the adverse effects of exchange rate fluctuations. Although hedging cannot fully eliminate currency risk, it is expected to substantially mitigate short-term volatility, and any residual exposure is considered acceptable within the context of the portfolio's long-term investment objectives.

Industry-based ETFs will be prioritized over geographically-based ETFs, as this approach allows for greater control over portfolio risk exposure and the potential to enhance returns through targeted sector allocation. By selecting ETFs based on industry rather than region, the portfolio can exclude high-volatility sectors—such as energy—that are often embedded within broad geographic ETFs, thereby enabling more precise risk management. Nevertheless, a limited number of geographically-based ETFs will still be included to ensure adequate diversification across global markets.

For the equity ETF allocation, exposure will be focused on the United States, Europe, and Japan, with U.S.-based ETFs comprising the majority of the allocation. This

decision is supported by several key factors. First, as previously discussed, macroeconomic forecasts indicate a more favorable growth outlook for the U.S. economy compared to the Eurozone over the investment horizon. Second, the United States maintains a global leadership position in innovation-driven sectors, particularly in technology, artificial intelligence, and robotics. These industries are expected to deliver superior long-term performance, thereby enhancing the portfolio's return potential.

For the bond ETF allocation, only European-denominated ETFs will be included. This decision is based on the fact that, as noted by Beers (2025), currency risk can have a disproportionately large impact on bond investments compared to equities, given the typically lower absolute returns of fixed income instruments. In some cases, the volatility introduced by currency fluctuations may exceed the actual price movement of the bond itself, thereby undermining the role of bonds as stable, low-risk components within a diversified portfolio. Furthermore, to address inflation concerns highlighted in the macroeconomic analysis, one of the selected bond ETFs will be a government inflation-linked bond ETF, offering protection against unexpected rises in inflation and helping to preserve real returns. In addition, a high-yield corporate bond ETF will be included to enhance the portfolio's diversification and return potential.

With respect to alternative investments, the allocation will be limited to commodity ETFs, specifically those tracking gold and silver. This decision is based on several key considerations. Commodity ETFs—particularly those focused on precious metals—tend to offer high liquidity, relatively low total expense ratios (TERs), and have historically served as effective hedges against inflation. Gold and silver, in particular, are widely recognized as safe-haven assets that can provide portfolio stability during periods of heightened market volatility or rising inflation, making them well-suited to the objectives of this IPS.

The complete selection of ETFs that met the screening criteria and strategic decisions outlined in this chapter is presented in Table C in the appendix section.

4.4 Portfolio Composition

4.4.1 Modern Portfolio Theory (MPT)

Modern Portfolio Theory (MPT), developed by Markowitz (1952) in his seminal paper "Portfolio Selection", offers a foundational framework for systematic portfolio construction. The core principle of MPT is that investors can optimize the trade-off between risk and return by constructing a diversified portfolio of assets whose returns are not perfectly correlated. According to the theory, while the expected return of a portfolio is the weighted average of the expected returns of its constituent assets, the portfolio's risk (or standard deviation) is not simply the average of individual asset risks. Instead, it is significantly influenced by the correlation or covariance between asset returns. By combining assets with low or negative correlations, investors can reduce the overall volatility of the portfolio, potentially achieving a lower risk level than any individual asset alone, thereby enhancing portfolio efficiency.

MPT is built on the assumption that investors are risk-averse—that is, given two portfolios with the same level of risk, investors will prefer the one offering a higher expected return. This leads to the concept of the efficient frontier, introduced by Markowitz and illustrated in Figure 5, which represents the set of portfolios that deliver the highest expected return for a given level of risk, or conversely, the lowest risk for a given level of return. Portfolios lying below the frontier are considered suboptimal, while those on the frontier are deemed efficient. Investors are then able to select a portfolio along the frontier that best aligns with their individual risk tolerance.

The theory is further extended with the introduction of a risk-free asset, resulting in the Capital Market Line (CML). The CML illustrates the set of optimal portfolios formed by combining the risk-free asset with a portfolio of risky assets—often referred to as the market portfolio. This framework demonstrates that by mixing a risk-free asset with the optimal market portfolio, investors can achieve superior risk-adjusted returns compared to any inefficient portfolio below the frontier.

Figure 5 – Markowitz's Efficient Frontier
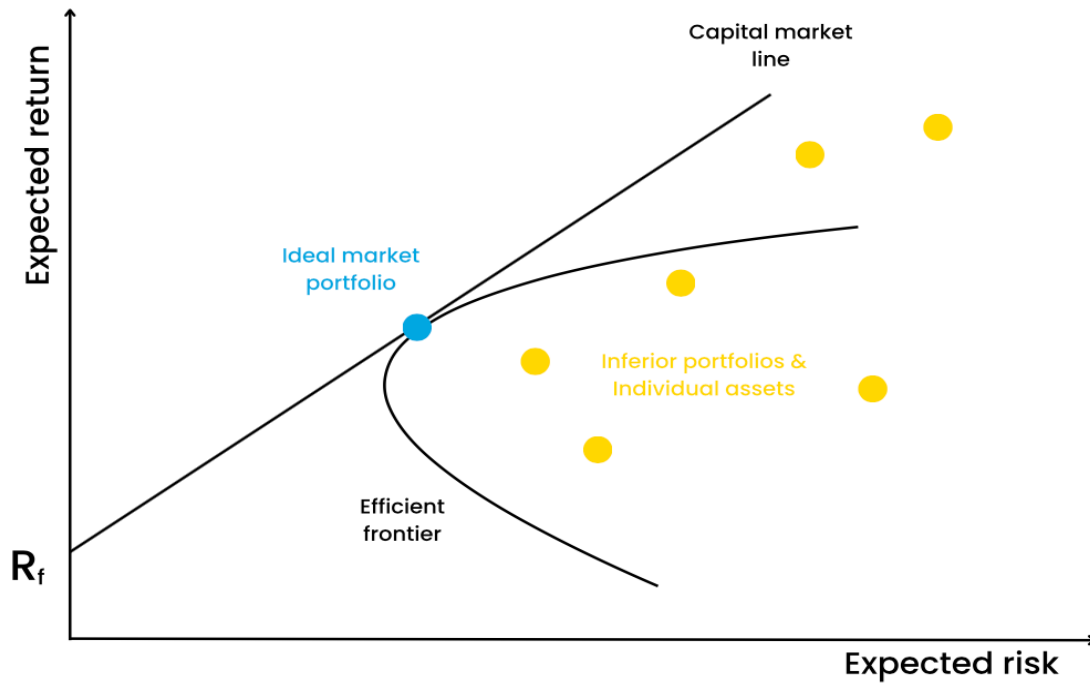
4.4.2 Methodology

To begin the model, the monthly closing prices of the selected ETFs, valued in euros, were retrieved from the Bloomberg Terminal, covering the period from March 31, 2020, to March 31, 2025. Based on this data, monthly logarithmic (log) returns were calculated for each ETF over the full time horizon. Log returns were chosen instead of simple returns due to their time-additive property and their compatibility with continuous compounding, which makes them more appropriate for long-term performance analysis (Longmore, 2023). To compute the log returns for each month, the following formula was used:

$$r_i = \ln\left(\frac{S_{i,T}}{S_{i,T-1}}\right) \tag{1}$$

where $S_{i,T}$ is the close price of the ETF i for any given month of the collected data.

Following this process, the average monthly log returns and standard deviations for each ETF over the five-year period were calculated and subsequently annualised. Then, using Excel's Data Analysis tool, the variance-covariance (Var-Cov) matrix of all selected ETFs was constructed. With this new data, along with the initial portfolio weights assigned to each ETF, the expected annual return and portfolio standard

deviation of the risky portfolio were computed. These figures were then used to calculate the portfolio's Sharpe ratio (SR), using the following formula:

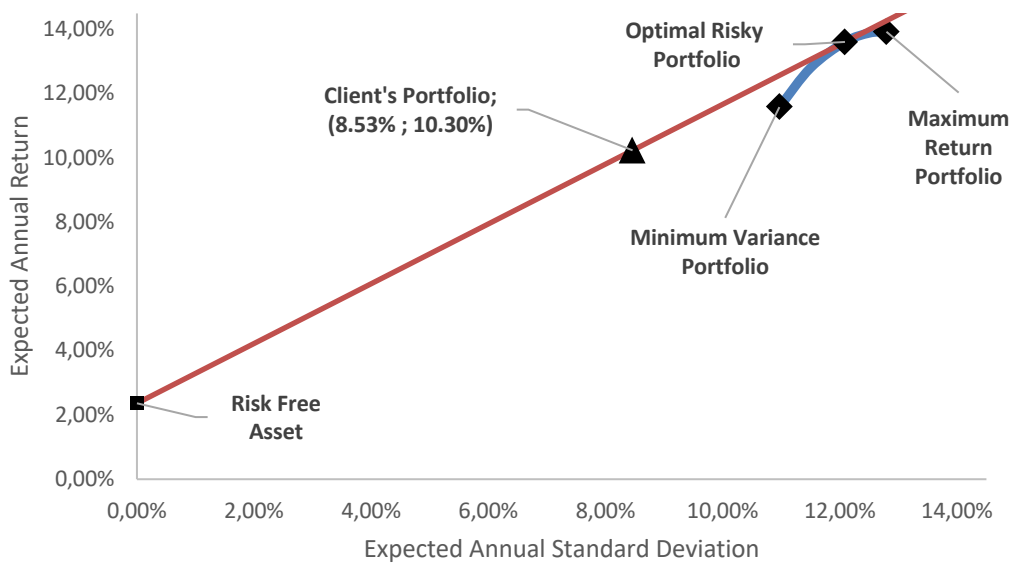$$Sharpe\ Ratio = \frac{R_P - R_f}{\sigma_P} \tag{2}$$

where R_P and σ_P represent the annualised return and annualised standard deviation of the risky portfolio, respectively, and R_f the risk-free rate, which, in the case of this portfolio is represented by the 10-Year German Bund Yield given that the client's residence is in a european country and all the securities traded in this IPS are in euros.

Subsequently, Excel Solver was employed to obtain the optimal risky portfolio by maximizing the Sharpe Ratio, subject to the minimum and maximum weight constraints specified for each ETF and asset class, which are outlined in Table C. Once the optimal weights were determined, Solver was used again to compute the minimum variance portfolio, the maximum return portfolio, and several intermediate portfolios. This allowed for the construction of a graphical representation of the efficient frontier. Then, using the optimal risky portfolio as a point of tangency, the Capital Allocation Line (CAL) was calculated by using the following equation:

$$R_P = R_f + \frac{R_x - R_f}{\sigma_x} \times \sigma_P \tag{3}$$

To determine the optimal combination of risk-free and risky assets, the advisor opted to select a portfolio located on the CAL tangent to the optimal risky portfolio, that delivers a return 1% above the client's required target, as illustrated in Figure 6. This strategy enables a meaningful reduction in portfolio risk, bringing it in line with the client's moderate risk tolerance, while also incorporating a 1% return buffer to serve as a margin of safety against potential market volatility and unforeseen economic shifts.

Figure 6 – Restricted Portfolio Efficient Frontier

Then, the efficient frontier and Capital Allocation Line were recalculated under two different scenarios using Solver once again. The first scenario imposed no asset constraints, while prohibiting short selling; the second allowed for unrestricted asset weights, including the possibility of short selling. Using the results from these two cases, along with the previously computed constrained scenario, the advisor constructed the final efficient frontier overlaid with the corresponding CALs for each scenario, as illustrated in Figure 7, where the optimal risky portfolio lies to the right of the unconstrained efficient frontier, indicating that it is suboptimal when compared to the theoretical maximum efficiency attainable. This divergence is due to the exclusion of Short-Selling (SS) as well as the portfolio restrictions that were applied to ensure sufficient diversification and targeted exposure to key asset classes, in accordance with the client's investment objectives.

Figure 7 – Unrestricted with SS allowed Portfolio Efficient Frontier
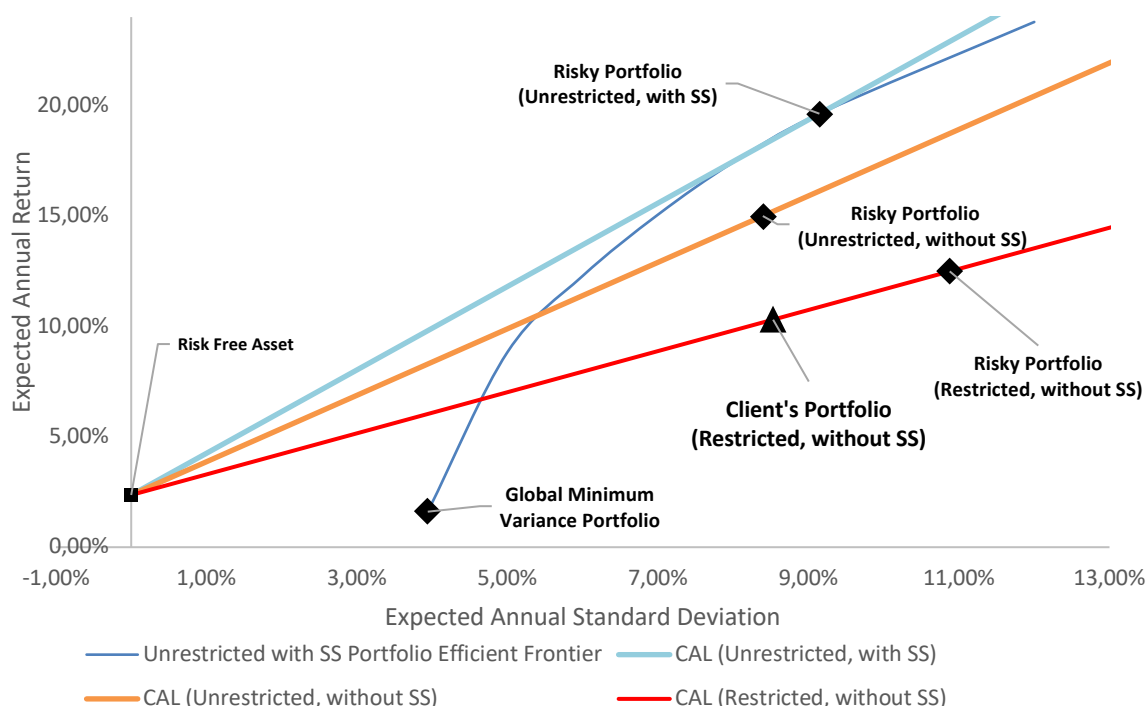
Source: Author

4.4.3 Portfolio Composition

The final portfolio composition is detailed in Figure A and consists of a risk-free asset, which accounts for 29.42% of the total allocation, and 17 exchange-traded products (ETPs), comprising the remaining 70.58%. Among these ETPs, 13 are equity ETFs, 2 are bond ETFs, and 2 are exchange-traded commodities (ETCs). This proposed portfolio yields an expected annual return of 10.30%, with an anticipated annual volatility of 8.53%, resulting in a Sharpe ratio of 0.931, as detailed in Table 2.

Table 2 – Proposed Portfolio

	Client's Portfolio	Risky Portfolio
Annual Expected Return	10,30%	13,61%
Annual Expected Volatility	8,53%	12,09%
Sharpe Ratio	0,931	
Risk Free Rate	2,364%	

Source: Author

4.5 Expected Performance

To assess the expected performance of the portfolio, a Monte Carlo simulation was conducted using previously calculated inputs: an expected annual return of 10.30%, a standard deviation of 8.53%, and an initial investment of €300,000. The simulation followed a geometric brownian motion and generated random annual returns over a 10-year investment horizon to estimate potential outcomes at the end of the period, and this process was repeated 100,000 times to produce a statistically robust distribution of final portfolio values, with the results summarized in Table 3 and illustrated in Figure 8.

Table 3 – Monte Carlos Expected Performance and Percentiles

Monte Carlo Expected Performance	
Median	€777 649,66
Mean	€799 611,63
Standard Deviation	€197 917,70

Monte Carlo Percentiles	
Percentile Table	Value
5%	€515 794,51
25%	€658 561,51
50%	€777 649,66
75%	€917 497,49
95%	€1 156 844,32

Source: Author

Figure 8 - Montecarlo Simulation Distribution Results
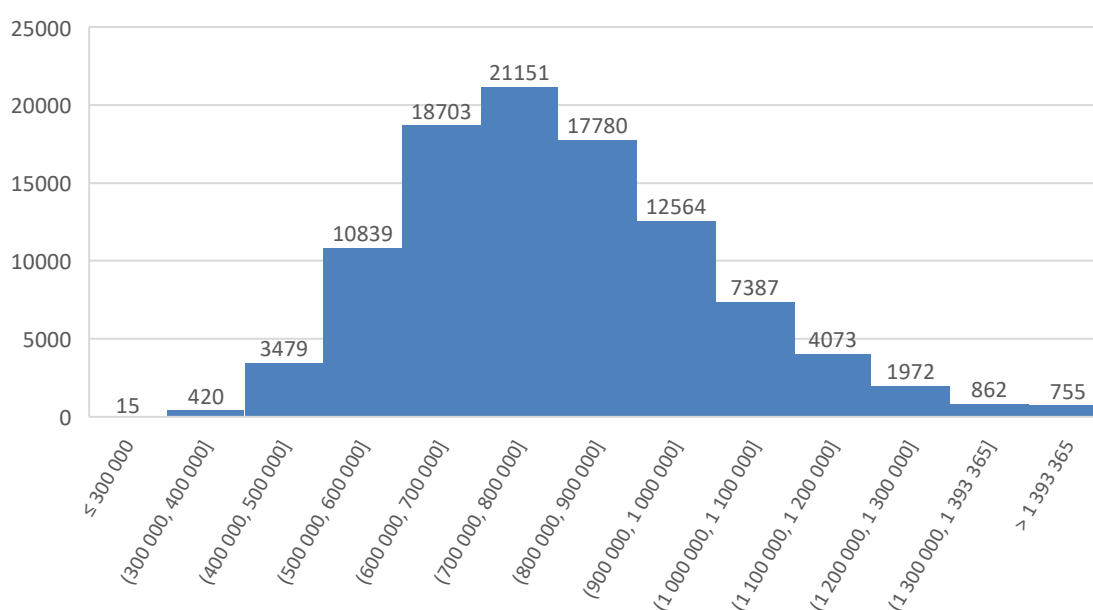
Source: Author

Upon reviewing the results, the median portfolio value of €799,611.63 indicates that the most likely outcome projected by the Monte Carlo simulation exceeds the client's return requirement of €729,857.24. However, as shown in the percentile table, the portfolio has the potential to perform significantly better than the median. For instance, the 95th percentile value of €1,156,844.32 suggests that there is a 5% probability the portfolio could surpass this value. Conversely, the portfolio also faces the possibility of underperforming relative to the median, with the 5th percentile result of €515,794.51, indicating a 5% chance that the portfolio could fall below this threshold. This range of outcomes is expected, reflecting the inherent variability driven by market volatility.

To further assess the expected performance of the portfolio, a benchmark portfolio was constructed based on the benchmarks of the selected ETFs. The advisor first calculated the monthly log returns for each benchmark over the past 5 years, then annualized these returns. These annual returns were subsequently used, in conjunction with the final weights of the respective ETFs, to determine the overall return and standard deviation of the benchmark portfolio. The resulting figures were 13.53% for return and 13.02% for volatility. This indicates that the benchmark portfolio achieved not only a 0.08% lower return than the risky portfolio but also experienced 0.93% more volatility.

To better understand the comparative performance of the portfolio relative to the benchmark, the tracking error and information ratio were calculated using the following formulas:

$$Tracking\ Error = \sqrt{\frac{\sum_{i=1}^{n}(R_{P,i} - R_{B,i})^2}{n-1}} \tag{4}$$

$$Information\ Ratio = \frac{(R_P - R_B)}{Tracking\ Error} \tag{5}$$

where $R_{B,i}$ is the return of the benchmark in period i.

After applying the formulas, the tracking error and information ratio were calculated to be 0.804% and 0.03, respectively. This implies that the portfolio generates only €0.03 for every €1 of risk taken relative to the benchmark. Although this value is low, it is consistent with expectations given that all selected ETFs follow full replication,

optimization, or physical replication methods, which ensure that they closely track their respective underlying indices.

4.6 Risk Analysis

The risk analysis was conducted using four types of Value at Risk (VaR): Parametric VaR, Monte Carlo VaR, Historical VaR, and Conditional VaR, with VaR being chosen for the risk analysis due to its ability to quantify potential financial losses within a portfolio over a specified time frame and confidence interval. For all VaR calculations, confidence intervals of 95% and 99% were employed to ensure the portfolio is adequately prepared for tail risks, as well as to align with regulatory standards such as Basel III, which mandates the use of a 99% confidence interval for VaR calculations in financial institutions.

4.6.1 Parametric VaR

The Parametric VaR is a method used to estimate potential losses in an investment by incorporating the mean and standard deviation of returns as key inputs for the VaR calculation, under the assumption that returns follow a normal distribution. For this analysis, a mean of 10.3% and a standard deviation of 8.53% were applied. The resulting VaR values for the 95% to 99% percentiles at the end of the first year are presented in Table 4 and were calculated using the following formula:

$$\% \, VaR \, (\alpha) = \mu \times T - Z(1 - \alpha) \times \sigma \times \sqrt{T} \tag{6}$$

where μ and σ represent the mean and standard deviation of the normal distribution, respectively, $Z(1 - \alpha)$ the Z-score corresponding to the desired confidence level, and T the number of years elapsed since the initial investment.

Table 4 – Parametric VaR (1st year and 10th year)

		1st Year		10th Year	
Percentiles	Z-Stat	Parametric VaR	Parametric VaR (%)	Parametric VaR	Parametric VaR (%)
99%	2,32635	€28 629,71	9,54%	€0	0%
98%	2,05375	€21 654,08	7,22%	€0	0%
97%	1,88079	€17 228,27	5,74%	€0	0%
96%	1,75069	€13 898,91	4,63%	€0	0%

| 95% | 1,64485 | €11 190,72 | 3,73% | €0 | 0% |

At the 99% confidence level, the one-year VaR is €28,629.71, representing -9.54% of the initial investment. This indicates that there is a 1% probability that the portfolio's return will fall below -€28,629.71 after one year. As the confidence level decreases, the VaR correspondingly increases, with the 95% confidence level one-year VaR being €11,190.72 or -3.73%, meaning there is a 5% probability that the portfolio's return will fall below -€11,190.72 after one year.

In contrast, the computed 10-year VaRs returned positive values across all confidence levels. However, since VaR cannot be positive, the results were rounded to 0. These results suggest that there is a greater than 99% probability the portfolio will avoid losses over the 10-year horizon. As a result, the VaR percentage at this horizon is also effectively zero, reflecting the reduced risk associated with a longer investment period.

4.6.2 Monte Carlo VaR

The second VaR method employed was the Monte Carlo VaR. Unlike other methods that rely on historical data patterns or assume a normal distribution of returns, the Monte Carlo method generates thousands of hypothetical scenarios based on randomly generated Z-scores to simulate various outcomes. For this model, a mean of 10.3% and a standard deviation of 8.53% were used as inputs, which were then applied to calculate the expected returns for both the first and tenth years, followed by the computation of their respective Scenario-VaR values using the following formulas:

$$Expected\ Return = Initial\ Investment \ \times \mu \times T \qquad (7)$$

$$Scenario - VaR = Expected\ R. \ - (Initial\ Investment \ \times \ \sigma \ \times \ Z - stat \ \times \ \sqrt{T}) \quad (8)$$

where the $Z - stat$ is a randomly generated Z-score, created using Excel's NORM.S.INV(RAND()) function, which represents one possible market shock or return deviation within the simulated scenarios.

After these calculations, 100,000 simulations were conducted for both the Scenario-VaRs of the first and tenth years using Excel's What-If Analysis tool, with the results shown in Table 5 and visualized in Figure 9 .

Table 5 – Monte Carlo VaR (1st year and 10th year)

Percentiles	1st Year		10th Year	
	MonteCarlo VaR	**MonteCarlo VaR (%)**	**MonteCarlo VaR**	**MonteCarlo VaR (%)**
99%	€28 060,44	9,35%	€0	0%
98%	€21 474,45	7,16%	€0	0%
97%	€17 286,29	5,76%	€0	0%
96%	€13 820,92	4,61%	€0	0%
95%	€11 067,30	3,69%	€0	0%

Source: Author

Figure 9 – Monte Carlo VaR Distributions (1st year and 10th year)

Distribution of VaR (1st Year)
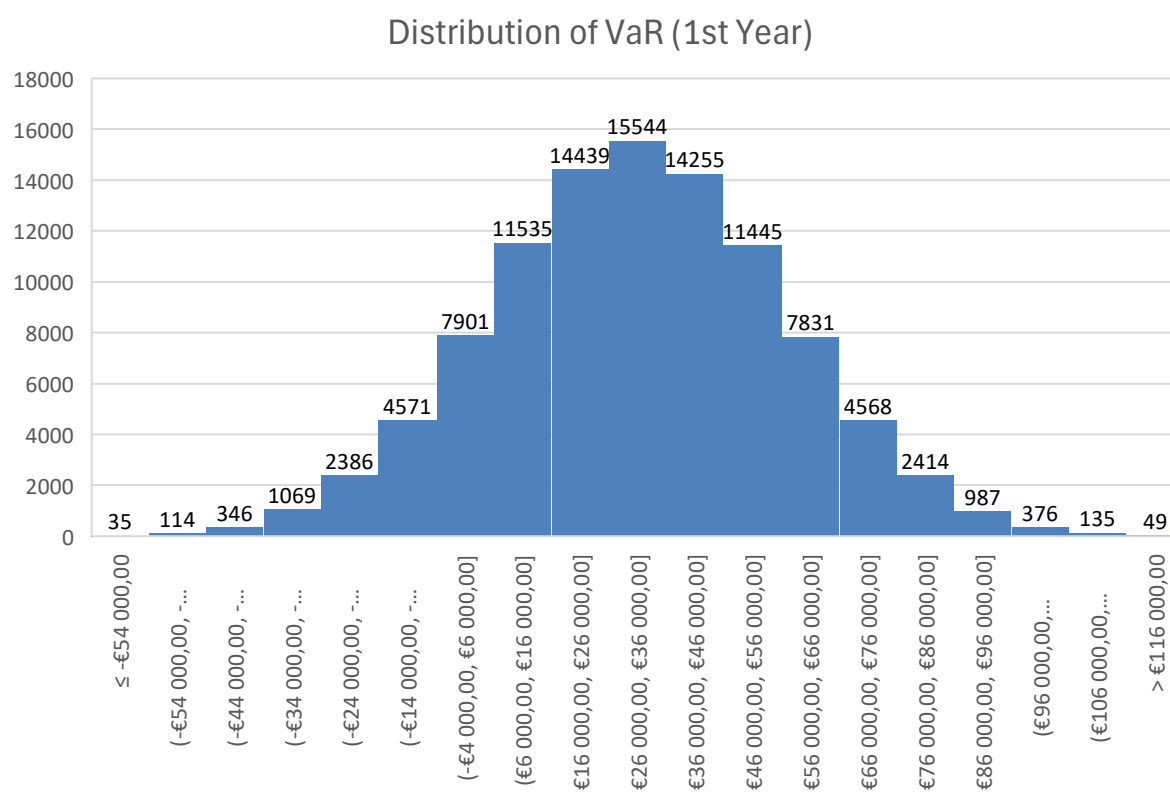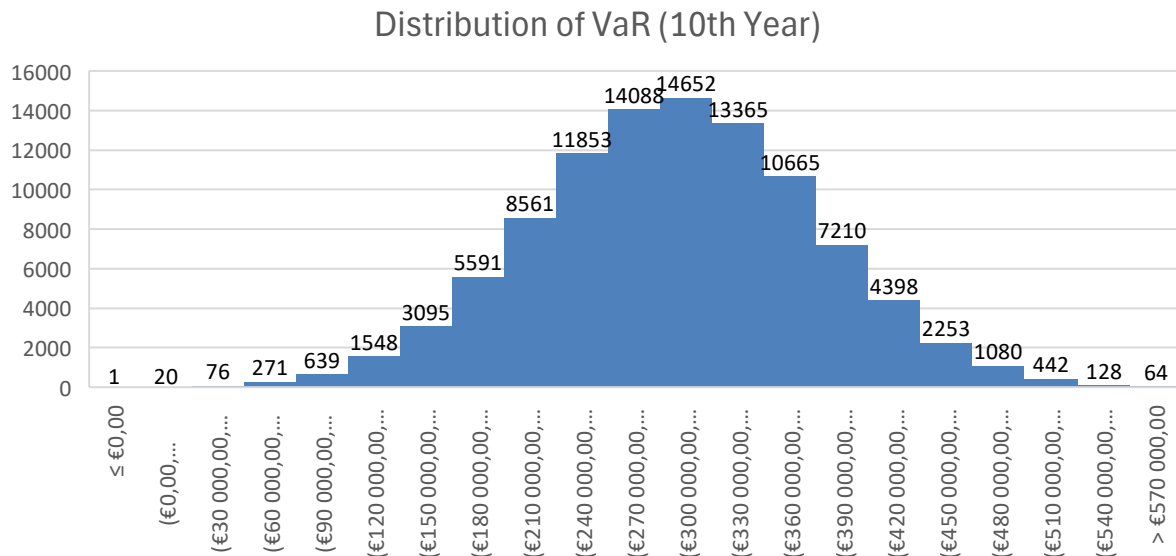
Distribution of VaR (10th Year)

Examining the distribution of outcomes for the first year reveals that negative VaRs constitute only a small portion of the distribution, with extreme losses occurring in a very limited number of simulations. The mode of the distribution is positive, indicating that the most frequent outcomes are gains, although extreme positive returns remain unlikely. In contrast, the distribution for the tenth year shows that negative VaRs are virtually nonexistent, with only 1 out of 100,000 simulations resulting in a loss.

For the percentiles, the results from the Monte Carlo VaR closely resemble those of the Parametric VaR for both the first and tenth years, but they tend to be slightly more favorable. For example, the Monte Carlo VaR at the 99th percentile for the first year is €28,060.44, representing a difference of only €569.27 compared to the Parametric VaR. This pattern is consistent across all computed percentiles.

4.6.3 Historical VaR

The next method employed was the Historical VaR approach. Unlike the parametric method, the Historical VaR does not assume a specific distribution of returns but instead relies directly on observed historical data and operates under the assumption that future returns will exhibit patterns similar to those recorded in the past.

Before calculating the Historical VaR, the monthly historical returns of the portfolio were computed by multiplying the monthly log returns of each ETF by their respective final portfolio weights across the entire historical data period. Using these

portfolio returns, the Historical VaR was then calculated for confidence intervals ranging from 95% to 99%, with the results presented in Table 6.

Table 6 – Historical VaR (1st Year)

Percentiles	Historical VaR	Historical VaR (%)
99%	€17 687,69	5,90%
98%	€15 683,30	5,23%
97%	€12 590,00	4,20%
96%	€10 775,03	3,59%
95%	€9 776,79	3,26%

Source: Author

Compared to the other VaR methods, the Historical VaR provides a more optimistic estimate of potential portfolio losses. At the 99th percentile, it predicts a loss of -€17,687.69, or 5.90% of the initial investment, which—although negative—is significantly less severe than the losses exceeding €28,000 forecasted by both the Monte Carlo and Parametric VaR methods at the same confidence level for the first year. However, this difference narrows as the confidence level decreases; at the 95th percentile, the Historical VaR is €9,776.79, differing by approximately €2,300 from the other two methods, a considerably smaller gap than observed at the 99th percentile.

4.6.4 Conditional VaR (Expected Shortfall)

The final VaR method employed was the Conditional VaR (CVaR), also known as Expected Shortfall. While traditional VaR methods estimate the maximum potential loss at a given confidence level, CVaR extends this by quantifying the average loss occurring beyond the VaR threshold. This makes CVaR especially useful for assessing the severity of losses during rare but significant adverse events that may not be fully captured by VaR alone. Since CVaR depends on an existing VaR threshold, it was calculated using two previously computed datasets: one derived from the Monte Carlo VaR results and the other from the Historical VaR results, with both sets of results presented in Table 7.

Table 7 - Conditional VaR for MonteCarlo and Historical Datasets (1ˢᵗ year)

Percentiles	Monte Carlo Dataset		Historical Dataset	
	MonteCarlo VaR (%)	Expected shortfall	Historical VaR (%)	Expected shortfall
99%	9,35%	12,12%	5,90%	6,40%
98%	7,16%	10,14%	5,23%	5,97%
97%	5,76%	8,90%	4,20%	5,97%
96%	4,61%	7,97%	3,59%	5,25%
95%	3,69%	7,21%	3,26%	5,25%

Source: Author

As with previous analyses, the CVaR calculated using the Monte Carlo VaR dataset presents a much more negative outlook compared to the Historical VaR dataset. At the 99th percentile, the CVaR using the Monte Carlo VaR data is 12.12% of the initial investment, indicating that, on average, if the portfolio incurs a loss greater than -9.35%, the loss would be approximately 12.12%. In contrast, the CVaR for the same percentile using the Historical VaR data is 6.40%, meaning the average loss in the worst 1% of past scenarios is 6.40%. At the 95th percentile, while extreme losses remain significant, they become less severe for both datasets, with the CVaR for the Monte Carlo VaR dataset being 7.21%, and 5.25% for the Historical VaR dataset.

4.6.5 Risk Matrix (10 Year Horizon Risks)

Over the investment horizon, the portfolio will be exposed to various cyclical risks, which, according to JP Morgan (2025), can significantly influence growth, inflation, and long-term asset returns. To develop a comprehensive risk matrix, the advisor focused on the specific risks identified by JP Morgan, prioritizing those most likely to affect the portfolio's performance over time. These selected risks are outlined in Table 8.

Table 8 – 10 Year Horizon Risks

Risks	Description	Implications	Probability & Impact of the risk
Regional conflicts extend or spill over,	The Russia-Ukraine conflict, the war in the Middle East, or other geopolitical tensions escalate or expand, potentially	Potential supply chain and energy shocks, with sanctions disrupting trade. Positive for bonds, USD, and	Medium probability & High impact

		commodities; negative for stocks, especially in Europe.	
sucking in NATO or China (A)	drawing in major global powers.	commodities; negative for stocks, especially in Europe.	
Trade tensions between U.S. and China (B)	Washington and Beijing reignite a trade dispute, exchanging tariffs and sanctions across a wide range of goods.	A shift toward regional blocs which weakens growth and adds mild inflationary pressure. Commodity prices stay high, while industrial sectors struggle due to disrupted supply chains.	Medium probability and impact
Rapid abandonment of USD as key reserve currency (C)	A rival to the USD—whether crypto or another fiat—emerges, drawing reserve assets away, reducing demand for U.S. assets, and highlighting concerns over the U.S. deficit	Negative for growth, USD, bonds, credit and stocks; positive for real assets and commodities	Medium probability & High impact
Worsening climate or environmental situation (D)	Increasingly frequent or severe weather events destroy productive assets and disrupt food and raw material supplies.	Short-term supply disruptions followed by resource strain during rebuilding drive up inflation. Positive for commodities and real assets; Negative for bonds, stocks, and credit.	Low probability and impact
Accelerated adoption of artificial intelligence (E)	Labor scarcity that is limiting growth in some regions is mitigated; scope for productivity to rebound strongly, boosting long-term growth potential	Boosts real GDP with limited inflation impact; supports developed market stocks, credit, and risk assets; reduces extreme inflation risks.	High probability and impact
Concern about rising debt causes a return to post GFC-style austerity (F)	Governments reduce spending plans and cull investment spending to focus on day-to-day current spending	Growth falls and taxes rise to cover government liabilities. Positive for bonds, negative for equities.	Medium probability and Low Impact
Political polarization worsens in developed nations (G)	Drift toward populist political parties quickens or polarization of previously centrist parties becomes more extreme, leading to fiscal commitments or economic policies that are unattainable	Risk premia demanded for government borrowing increases; asset volatility higher at the margin; returns may fall if valuations adjust downward due to growing uncertainty.	High probability and Medium impact

Source: JP Morgan (2025), p.18

After analyzing these risks and assessing each one based on its potential impact and likelihood of occurrence over the 10-year investment horizon, the advisor mapped them onto a risk matrix, as shown in Figure 10.

Figure 10 – Risk Matrix
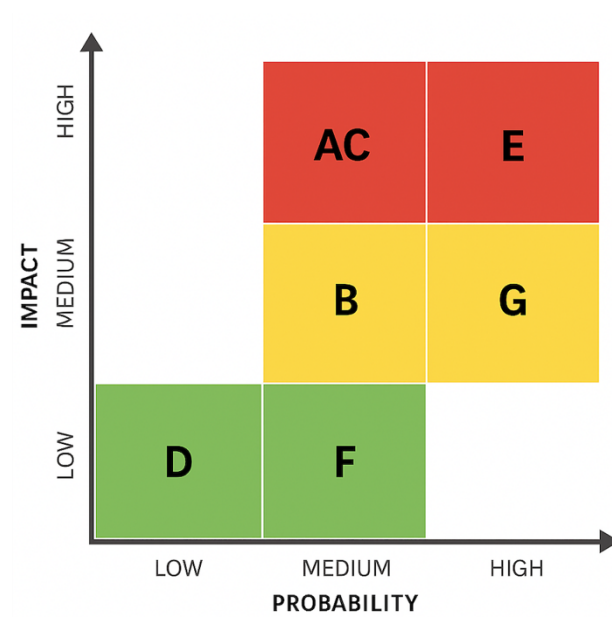
Source: Author

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Appendix

Table A1 - Client's Profile

Names	Filipe Teixeira	Sofia Teixeira
Age	50	51
Children	One 26-year-old son	
Work	Doctor	Graphic Designer
Net Annual Wage	€48 000,00	€45 000,00
Additional Information	•Above average knowledge of financial markets •Moderate understading about financial Volatility	
Investment Constraints	•ETF investing •Maximum annual volatility of 10% •No Leverage or Short selling allowed •No liquidity requirements during holding period •More than 50% of the assets must be traded in euros or Euro Hedged	
Ability to bear Risk	High	
Willingness to take Risk	Moderate	
Risk Profile	Moderate	
Amount to Invest	€300 000,00	
Investment Objective	500,000€ (€729 857,24 accounting for inflation and taxation)	
Time Horizon	10 years (120 months)	
Minimum Rate of Return	9.30%	
Expected Average Annual Return of Portfolio	10.30%	

Source: Author

Table A2 – Profiling Questionnaire

Question	Response	
	Filipe	Sofia
1. As I withdraw money from these investments, I plan to spend it over a period of...	More than 15 years	
2. When making a long-term investment, I plan to keep the money invested for...	More tha 8 years	
3. When it comes to investing in stock or bond mutual funds or ETFs - or individual stocks or bonds - I would describe myself as...	Somewhat experienced	
4. I plan to begin taking money from my investments in...	11-15 years	
5. My current and future income sources (for example, salary, social security, pensions) are...	Stable	
6.From September 2008 through October 2008, bonds lost 4%. If I owned a bond investment that lost 4% in two months, I would...	Hold onto the investment and sell nothing	
7. The chart shows the greatest 1-year loss and the highest 1-year gain on 3 different hypothetical investments of $10,000.* Given the potential gain or loss in any 1 year, I would invest my money in...	B-moderate volatility	
8. During market declines, I tend to sell portions of my riskier assets and invest the money in safer assets.	Strongly agree	
9. I would invest in a mutual fund or ETF (exchanged-traded fund) based solely on a brief conversation with a friend, co-worker, or relative.	Strongly disagree	Disagree
10. From September 2008 through November 2008, stocks lost over 31%. If I owned a stock investment that lost about 31% in three months, I would...	Hold onto the investment and sell nothing	
11. Generally, I prefer an investment with little or no ups and downs in value, and I am willing to accept the lower returns these investments may make.	Somewhat agree	

Suggested Asset Allocation:

Suggested allocation:

- Stocks: 70%
- Bonds: 30%
- Short-term reserves: 0%

Source: Vanguard (https://investor.vanguard.com/tools-calculators/investor-questionnaire)

Table A3 – ETF Screener

| ETFS	Indices	Distribution Policy	Fund Size	Repliation Strategy	Asset Type, Sector, Region	P/E
SPDR MSCI World Technology UCITS	MSCI World Information Technology 35/20 Cap Net USD	Accumulative	€799.53M	Full	Equity, Technology, World	30.38
iShares S&P 500 Financials Sector UCITS	S&P 500 Capped 35/20 Financials Net Total Return	Accumulative	€2.24B	Full	Equity, Financials, USA	17.36
iShares S&P 500 Health Care Sector UCITS	S&P 500 Capped 35/20 Health Care NTR	Accumulative	€2.11B	Full	Equity, Healthcare, USA	27.97
iShares S&P 500 Consumer Discretionary Sector UCITS	S&P 500 Capped 35/20 Consumer Discretionary NTR	Accumulative	€860.27M	Full	Equity, Condumer Discretionary, USA	30.35
iShares S&P 500 Consumer Staples Sector UCITS	S&P 500 Capped 35/20 Consumer Staples Net Total Return	Accumulative	€473.48M	Full	Equity, Consumer Staples, USA	25.42
Ishares V PLC-Ishares S&P 500 Utilities Sector UCITS	S&P 500 Capped 35/20 Utilities Net Total Return	Accumulative	€453.72M	Full	Equity, Utilities, USA	20.72
Xtrackers Artificial Intelligence & Big Data UCITS	Nasdaq Global AI and Big Data NTR	Accumulative	€4.23B	Full	Equity, AI, World	22.53
iShares Automation & Robotics UCITS	STOXX Global Automation & Robotics USD Net Return	Accumulative	€3.08B	Optimized	Equity, Robotics, World	34.32
SPDR S&P 500 ESG Leaders UCITS	S&P 500 ESG Leaders (USD) NTR	Accumulative	€4.68B	Full	Equity, ESG, USA	21.89
Xtrackers Euro Stoxx 50 UCITS	EURO STOXX 50 Net Return EUR	Accumulative	€4.25B	Full	Equity, N/A, Eurozone	15.62
SPDR MSCI Europe Financials UCITS	MSCI Europe Financials 35/20 Capped Net EUR	Accumulative	€405.59M	Full	Equity, Finncials, Europe	10.48
SPDR MSCI Europe Industrials UCITS	MSCI Europe Industrials 35/20 Capped Net EUR	Accumulative	€431.12M	Full	Equity, Industrials, Europe	21.27
Xtrackers MSCI Japan UCITS	MSCI Japan Net Total Return USD	Accumulative	€510M	Full	Equity, N/A, Japan	0.15
Amundi Euro Government Inflation-Linked Bond UCITS	Bloomberg Eurozone - All CPI Total Return Index Value Unhedged EUR	Accumulative	€1.02B	Full	Bonds, Inflation-Protected, Eurozone	-
Xtrackers II EUR High Yield Corporate Bond UCITS	Markit iBoxx EUR Liquid High Yield TRI	Accumulative	€827.93M	Optimized	Bonds, Corporate, Eurozone	-
Xetra-Gold EUR	Gold	Accumulative	€14.30B	Physical	Commodity, Precious Metals, N/A	-
WisdomTree Physical Silver	Silver	Accumulative	€1.41B	Physical	Commodty, Precious Metals, N/A	-

Source: Bloomberg Terminal

Table A4 - ETF Detailed Information (Data as of March 31st)

ETFS	ISIN	TER	Holdings
SPDR MSCI World Technology UCITS	IE00BYTRRD19	0.30%	Top 5 Holdings: Apple Inc (19.780%), NVIDIA Corp (18.277%), Microsoft Corp (16.465%), Broadcom Inc (5.531%) and Salesforce Inc (1.681%). Top 5 Exposing Countries: U.S.(88.77%), Japan (2.79%), Netherlands (2.13%), Germany (1.80%) and Ireland (1.44%).
iShares S&P 500 Financials Sector UCITS	IE00B4JNQZ49	0.15%	Top 5 Holdings: Berkshire Hathaway Inc (12.074%), JPMorgan Chase & Co (10.207%), Visa Inc (7.852%), Mastercard Inc (6.151%) and Bank of America Corp (4.515%).
iShares S&P 500 Health Care Sector UCITS	IE00B43HR379	0.15%	Top 5 Holdings: Eli Lilly & Co (11.427%), UnitedHealth Group Inc (9.714%), Johnson & Johnson (6.778%), AbbVie Inc (5.880%) and Merck & Co Inc (4.917%).
iShares S&P 500 Consumer Discretionary Sector UCITS	IE00B4MCHD36	0.15%	Top 5 Holdings: Amazon.com Inc (31.486%), Tesla Inc (18.699%), Home Depot Inc (8.181%), McDonald's Corp (4.100%) and Booking Holdings Inc (3.242%).
iShares S&P 500 Consumer Staples Sector UCITS	IE00B40B8R38	0.15%	Top 5 Holdings: Costco Wholesale Corp (15.146%), Walmart Inc (14.676%), Procter & Gamble Co (13.917%), Coca-Cola Co (8.865%) and PepsiCo Inc (7.353%).
Ishares V PLC-Ishares S&P 500 Utilities Sector UCITS	IE00B4KBBD01	0.15%	Top 5 Holdings: NextEra Energy Inc (12.090%), Constellation Energy Corp (7.982%), Southern Co (7.655%), Duke Energy Corp (6.977%) and Vistra Corp (4.884%).
Xtrackers Artificial Intelligence & Big Data UCITS	IE00BGV5VN51	0.35%	Top 5 Holdings: Meta Platforms Inc (5.032%), Salesforce Inc (4.892%), Bank of America Corp (4.860%), Amazon.com Inc (4.811%) and Apple Inc (4.729%). Top 5 Exposing Countries: U.S. (82.99%), Germany (4.33%), South Korea (3.90%), Ireland (3.66%) and Canada (1.61%).
iShares Automation & Robotics UCITS	IE00BYZK4552	0.40%	Top 5 Holdings: MicroStrategy Inc (4.572%), Marvell Technology Inc (3.397%), ServiceNow Inc (3.051%), SAP SE (2.864%) and Intuitive Surgical Inc (2.846%). Top 5 Exposing Countries: U.S. (58.03%), Japan (11.91%), Germany (6.94%), Switzerland (5.50%) and Canada (3.16%).
SPDR S&P 500 ESG Leaders UCITS	IE00BH4GPZ28	0.03%	Top 5 Holdings: NVIDIA Corp (10.816%), Apple Inc (10.097%), Microsoft Corp (8.784%), Alphabet Inc (5.396%) and Tesla Inc (4.863%). Top 5 Sectors: Technology (36.361%), Consumer Non-Cyclical (15.537%), Financial (13.383%), Consumer Cyclical (13.207%) and Communications (9.137%).
Xtrackers Euro Stoxx 50 UCITS	LU0380865021	0.09%	Top 5 Holdings: ASML Holding NV (8.159%), SAP SE (7.238%), LVMH Moet Hennessy Louis Vuitton SE (4.767%), Siemens AG (4.179%) and Schneider Electric SE (4.122%). Top 5 Exposing Countries: France

			(38.65%), Germany (28.27%), Netherlands (14.94%), Spain (7.58%) and Italy (7.26%). Top 5 Sectors : Financial (19.794%), Industrial (17.17%), Technology (16.583%), Consumer Cyclical (14.761%) and Consumer Non-Cyclical (14.379%).
SPDR MSCI Europe Financials UCITS	IE00BKWQ0G16	0.18%	Top 5 Holdings: HSBC Holdings PLC (8.240%), Allianz SE (5.575%), UBS Group AG (4.961%), Zurich Insurance Group AG (3.953%) and Banco Santander SA (3.486%)
SPDR MSCI Europe Industrials UCITS	IE00BKWQ0J47	0.18%	Top 5 Holdings: Siemens AG (8.326%), Schneider Electric SE (7.717%), Airbus SE (5.134%), RELX PLC (4.756%) and ABB Ltd (4.677%). Top 5 Exposing Countries: France (27.38%), Germany (17.34%), U.K. (14.95%), Sweden (14.13%) and Switzerland (8.75%).
Xtrackers MSCI Japan UCITS	LU0659580079	0.40%	Top 5 Holdings: Toyota Motor Corp (5.258%), Mitsubishi UFJ Financial Group Inc (3.637%), Sony Group Corp (3.470%), Hitachi Ltd (3.054%) and Recruit Holdings Co Ltd (2.626%). Top 5 Sectors: Consumer Cyclical (27.319%), Industrial (18.772%), Financial (17.648%), Consumer Non-Cyclical (15.518%) and Technology (9.534%).
Amundi Euro Government Inflation-Linked Bond UCITS	LU1650491282	0.09%	Top 4 Exposing Countries: France (43.43%), Italy (30.48%), Germany (13.13%) and Spain (12.96%).
Xtrackers II EUR High Yield Corporate Bond UCITS	LU1109943388	0.20%	Top 5 Exposing Countries: France (18.73%), Italy (18.16%), Germany (10.99%), Netherlands (10.95%) and Luxembourg (9.47%).
Xetra-Gold EUR	DE000A0S9GB0	0.36%	This ETC has exposure to the performance of physical gold (spot) without the expenses incurred on a physical purchase (i.e. transport, storage, etc).
WisdomTree Physical Silver	JE00B1VS3333	0.49%	This ETC has exposure to the performance of physical silver (spot)

Source: Bloomberg Terminal

Figure A1 – Risky Portfolio Composition
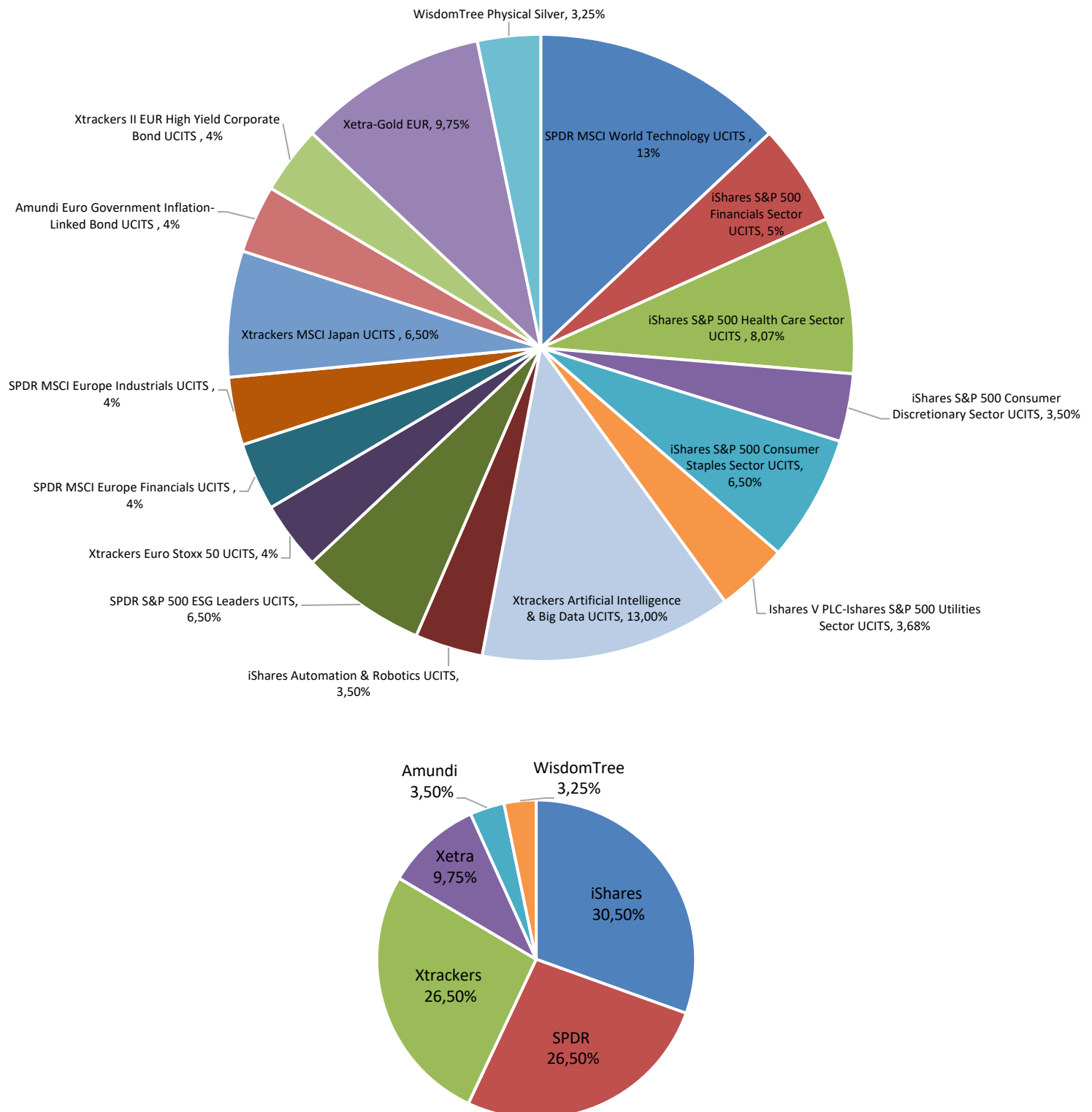
Source: Author

Table A5 – Asset and Security Weights Allocation

Complete Portfolio	Initial Weight	Min. Weight	Max. Weight	Asset Classes	Initial Weight	Min. Weight	Max. Weight	Security	Initial Weight	Min. Weight	Max. Weight	Final Weight	Complete Portfolio Final Weight
Risky Assets	*70%*	*49%*	*91%*	**Equity**	80%	56%	100%	**WTCH**	10,0%	7,00%	13,00%	13,00%	**9,18%**
								QDVH	7,5%	5,25%	9,75%	5,25%	**3,71%**
								QDVG	7,5%	5,25%	9,75%	8,07%	**5,69%**
								QDVK	5,0%	3,50%	6,50%	3,50%	**2,47%**
								2B7D	5,0%	3,50%	6,50%	6,50%	**4,59%**
								2B7A	5,0%	3,50%	6,50%	3,68%	**2,60%**
								XAIX	10,0%	7,00%	13,00%	13,00%	**9,18%**
								2B76	5,0%	3,50%	6,50%	3,50%	**2,47%**
								SPPY	5,0%	3,50%	6,50%	6,50%	**4,59%**
								XESC	5,0%	3,50%	6,50%	3,50%	**2,47%**
								STZ	5,0%	3,50%	6,50%	3,50%	**2,47%**
								SPYQ	5,0%	3,50%	6,50%	3,50%	**2,47%**
								XMK9	5,0%	3,50%	6,50%	6,50%	**4,59%**
				Bonds	10%	7%	13%	**LYQ7**	5,0%	3,50%	6,50%	3,50%	**2,47%**
								XHYA	5,0%	3,50%	6,50%	3,50%	**2,47%**
				Alternatives	10%	7%	13%	**4GLD**	7,5%	5,25%	9,75%	9,75%	**6,88%**
								VZLC	2,5%	1,75%	3,25%	3,25%	**2,29%**
Risk Free Asset	*30%*	*21%*	*39%*	**Government Bond**	100%	100%	100%	**10-Year Bund**	100%	100%	100%	100%	**29,42%**

Table A6 – Security Overview: Name, Ticker and ISIN

ETF/Bond	Ticker	ISIN
SPDR MSCI World Technology UCITS	WTCH	IE00BYTRRD19
iShares S&P 500 Financials Sector UCITS	QDVH	IE00B4JNQZ49
iShares S&P 500 Health Care Sector UCITS	QDVG	IE00B43HR379
iShares S&P 500 Consumer Discretionary Sector UCITS	QDVK	IE00B4MCHD36
iShares S&P 500 Consumer Staples Sector UCITS	2B7D	IE00B40B8R38
Ishares V PLC-Ishares S&P 500 Utilities Sector UCITS	2B7A	IE00B4KBBD01
Xtrackers Artificial Intelligence & Big Data UCITS	XAIX	IE00BGV5VN51
iShares Automation & Robotics UCITS	2B76	IE00BYZK4552
SPDR S&P 500 ESG Leaders UCITS	SPPY	IE00BH4GPZ28
Xtrackers Euro Stoxx 50 UCITS	XESC	LU0380865021
SPDR MSCI Europe Financials UCITS	STZ	IE00BKWQ0G16
SPDR MSCI Europe Industrials UCITS	SPYQ	IE00BKWQ0J47
Xtrackers MSCI Japan UCITS	XMK9	LU0659580079
Amundi Euro Government Inflation-Linked Bond UCITS	LYQ7	LU1650491282
Xtrackers II EUR High Yield Corporate Bond UCITS	XHYA	LU1109943388
Xetra-Gold EUR	4GLD	DE000A0S9GB0
WisdomTree Physical Silver	VZLC	JE00B1VS3333
Germany 10 Year Government Bond	-	-

Source: Author

Disclosures

The total character count for this IPS is 70,182, with 49,600 characters comprising the main body of the text and 20,582 characters dedicated to supplementary content.

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I hereby disclose that AI tools were utilized during the development of this thesis in the following manner:

- AI-based research tools were used to assist in the literature review and data collection.
- Generative AI tools were consulted for brainstorming and outlining purposes.
- AI-powered software was used for English enhancement. However, all final writing, synthesis, and critical analysis are entirely my own work.

I have ensured that the use of AI tools did not compromise the originality or integrity of my work. All sources of information, whether derived from traditional methods or AI-assisted, have been properly cited in accordance with academic standards. Throughout the preparation of this thesis, I adhered to ethical principles regarding the use of AI in research and writing.

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Tomás Vicente, 29/06/2025