Lisbon School of Economics & Management
Universidade de Lisboa

MASTER OF SCIENCE IN
FINANCE

MASTERS FINAL WORK
PROJECT

INVESTMENT POLICY STATEMENT:
KAREN SMITH

DAVID SANTOS

JUNE, 2024

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PROF. PEDRO RINO VIEIRA

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Abstract

The Investment Policy Statement (IPS) is a document that outlines the client's investment policy and serves as a communication bridge between the advisor and the client.

Ms. Karen Smith aims for a minimum annual return of 4.32%, adjusted for 2% inflation, over a ten-year period. Her primary objective is to increase the initial investment of €1,000,000 to €1,526,000 in ten years, accounting for inflation. With a moderate risk tolerance, the client aims to primarily preserve capital for their children's education.

The investment philosophy focuses on value investing through Exchange Traded Funds (ETFs) to maximize the Sharpe ratio, employing a diversified asset allocation based on macroeconomic projections and industry constraints. The strategy excludes leverage and short-selling investments, and there are no specific liquidity needs. The proposed portfolio aims to achieve an expected annual return of approximately 9.1% with a standard deviation of 10.2% and a Sharpe ratio of 0.68.

The advisor is responsible for monthly performance reports, quarterly risk assessments, and annual rebalancing proposals to ensure the portfolio remains aligned with the client's objectives. A comprehensive risk analysis includes Value-at-Risk (VaR) assessments and the construction of a risk matrix to identify and prioritize potential risks, evaluating their likelihood and impact. Back testing was also employed to reinforce the risk assessment.

JEL classification: C6; G11.

Keywords: Asset Management; Portfolio Theory; IPS; Individual Investors; ETF.

Resumo

Um *IPS* é um documento que delineia a estratégia de investimento da cliente, servindo também como uma ferramenta de comunicação entre o consultor e a cliente.

A Sra. Karen Smith pretende obter um retorno mínimo anual de 4.32% ao longo do período de 10 anos, tendo em conta uma taxa de inflação de 2 %. A cliente possui uma tolerância moderada ao risco, com o objetivo de preservar capital para a educação dos filhos. O objetivo do investimento é fazer crescer o capital de €1,000,000.00 para €1,526,000 num horizonte de 10 anos, ajustada inflação.

O investimento será efetuado através de ETFs com foco em investimentos de valor ao invés de crescimento. O foco passa por maximizar o Índice de *Sharpe* com o apoio de uma alocação financeira fundamenta por projeções económicas de longo prazo. A estratégia de investimento delineada não recorre a técnicas de alavancagem e de venda a descoberto, em adição não existia necessidades de liquidez durante o horizonte de investimento. A carteira ótima proposta tem um retorno esperado anual de 9.1% e uma volatilidade anual de 10.2%, com um Índice de *Sharpe* de 0.68.

O consultor é responsável por apresentar relatórios mensais de performance, avaliações de risco trimestrais e propostas de rebalanceamento de forma que a carteira de investimento se mantenha alinhada com os objetivos da cliente. A análise de risco foi desenvolvida através de métodos de *Value-at-Risk* e de *Back Testing.* Adicionalmente, foi construída uma matriz de risco de forma a identificar e priorizar potenciais riscos.

Classificação JEL: C6; G11.

Palavras-Chave: Gestão de Ativos; Teoria da Carteira; *IPS*; Investidores Individuais; *ETF.*

Abbreviations

AI	Artificial Intelligence
AUM	Assets Under Management
ECB	European Central Bank
EF	Efficient Frontier
EPS	Earnings Per Share
ESG	Environmental, Social and Governance
ETC	Exchange Traded Commodity
ETF	Exchange Traded Funds
ETP	Exchange Traded Product
EY	Earnings Yield
FED	Federal Reserve
IPS	Investment Policy Statement
LTCMA	Long-Term Capital Market Assumptions
MFW	Master's Final Work
MPT	Modern Portfolio Theory
MSCI	Morgan Stanley Capital International
MV	Minimum Variance
MVT	Mean Variance Theory
NAV	Net Asset Value
PE	Price to Earnings
REITs	Real Estate Investment Trusts
S&P	Standard & Poor's
SR	Sharpe Ratio
TER	Total Expense Ratio
UK	United Kingdom
USD	United States Dollar
VaR	Value at Risk

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I would like to express my heartfelt appreciation to everyone who has supported me over the past few months of writing my project. These past 6 months were filled with challenges, countless moments of stress and uncertainty and many sleepless nights, but it was significantly necessary for personal and academic growth.

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Lastly, I extend my gratitude to Professor Pedro Rino Vieira for all the valuable insights and support given during the development of this MFW.

Grateful for having you with me,

David

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1. Executive Summary

1.1. Scope and Purpose

The IPS, developed by the financial advisor, represents the communication bridge with the client. The purpose of this Investment Policy Statement (IPS) is to assist the client in effectively supervising, regulating and evaluating the client's IPS. The written document aims to outline the client's attitudes, expectations, objectives and guidelines for the appropriate management of the client's assets.

The financial advisor is responsible for the creation of, approval of and updates to the IPS. The financial advisor acts as well as a fiduciary, complying with the CFA boards and rules, as well as adhering to the local, national and international regulations that may affect the client's investment. In addition, an unbiased advisory must be provided to the client, disclosing any possible conflict of interests.

1.2. Governance

To maximize the synergies of the client's investment, is imperative to clearly outline the responsibilities of the party's involved. The advisor is tasked with developing the IPS, reporting and informing of any updates or setbacks on the investment. The client, on the other hand, is responsible for a regular review of the IPS to ensure alignment with their goals. Every quarter, the financial advisor will conduct a meeting with the client, to assess any rebalancing of the portfolio or propose updates to the asset allocation establishing a regular communication environment with the client.

1.3. Investment Return and Risk

To fulfill the client's mission over the long term, the IPS aims to achieve a minimum return of 4.32% after adjusting for inflation (2%) over the time horizon of 10 years. The client's risk tolerance is moderate, and the proposed portfolio was derived by maximizing the Sharpe ratio, adhering to the asset allocation constraints based on macroeconomic projections. After applying the Mean-Variance Theory concepts developed by Markowitz, a final portfolio was crafted, expected to return approximately 9.1% annually, with a standard deviation of 10.2%, and a Sharpe ratio of 0.68.

1.4. Risk Management

The advisor's responsibilities include preparing monthly performance measurements, adhering to the Global Investment Performance Standards developed by the CFA. On a quarterly basis, a risk assessment report will be disclosed to the client, and annually a rebalancing policy will be presented to the client, pending their approval.

2. Investment Policy Statement

2.1. Scope and Purpose

2.1.1. Context and Investor

Karen Smith, a 45-year-old single mom and esteemed professor at a prestigious college, strongly believes that investing in undervalued assets presents significant opportunities. Recently, Karen received a €1,000,000 grant from a philanthropic organization dedicated to advancing women's financial empowerment. This grant was awarded to Karen in recognition of her contributions to the field of economics and her commitment to innovative ways of teaching. This unexpected financial boost provides her with a unique opportunity to invest in a way that will secure her children's future and her own financial stability. Karen's investment plan aims to fund her sons' university education and secure her retirement. The strategy focuses on value-oriented growth and income generation to meet both short-term and long-term financial needs. Additionally, Karen seeks to enjoy a comfortable retirement with enough capital to travel and to buy a house near the beach in the Algarve. Her commitment to academic excellence supports the third objective of funding research projects and fostering scholarly advancement within the economics department. This document serves as an Investment Policy Statement (IPS) outlining the guidelines for Karen Smith’s investment portfolio. As Ms. Smith’s financial advisor, this IPS will act as a communication tool with the client to ensure an adequate investment process achieving the optimal results for the goals set.

2.1.2. Structure

As Karen Smith's financial advisor, I, David Santos, am dedicated to overseeing regular updates to the Investment Policy Statement (IPS). Collaborating with Karen's tax and legal advisors, I ensure seamless alignment with her financial goals. My responsibilities include diligently monitoring adherence to the IPS and promptly communicating any updates or deviations to Karen Smith. However, it is important to note that Ms. Smith, as the client, holds the final authority for approving the IPS and its proposed adjustments. Embedded within my fiduciary role, I am committed to providing unbiased advice, disclose any potential conflicts of interest, and maintain transparency in the reporting process.

I adhere to the highest standards set by the CFA Institute Asset Manager Code of Professional Conduct. As Karen's designated investment advisor, I undertake the responsibility of assessing and monitoring investment-related risks tailored to her investor profile. Karen is expected to provide regular reports, based on a mutually agreed-upon format, to facilitate this ongoing assessment. Quarterly, I compile a comprehensive financial report, serving as the official record of the investment policy. This forms the basis for our collective review of the portfolio's risk scenario. This commitment ensures a continuous and transparent evaluation of the investment strategy, fostering a robust and client-centric communication channel with the client.

2.2. Governance

To ensure the efficiency of this Investment Policy Statement (IPS) for Karen Smith, clearly defined roles and responsibilities are essential. This framework outlines both the financial advisor's duties and Karen's involvement, fostering a transparent and effective approach. The financial advisor takes primary responsibility for establishing, implementing, and maintaining the IPS. This includes providing regular reports on investment progress and proposing adjustments if performance deviates from expectations. The client grants the advisor the unique authority to appoint and terminate investment managers. For asset allocation, the advisor recommends a mix of financial assets tailored to meet Karen's goals and risk tolerance. An annual rebalancing will be conducted, with proposed changes requiring Karen's final approval. Full transparency is maintained throughout the process. The advisor discloses the proportions invested in each asset class, along with expected returns, volatility computations, macroeconomic updates and tax consequences.

This ETF-based portfolio highlights the client’s assumption regarding undervalued assets focusing on a value-oriented approach. The specific allocations across sub-classes like equities, fixed income and alternative investments will also be clearly outlined.

Quarterly financial reports serve as the official record of the investment strategy, forming the basis for risk assessments. The advisor will identify and address any deviations exceeding Karen's risk tolerance. If necessary, Karen's risk profile may be reassessed to ensure the IPS remains a dynamic and effective tool in achieving her financial aspirations.

2.3. Investment, Return and Risk Objectives

2.3.1. Investment Objective

The main goal of this investment is to produce a return that is sufficient to meet various financial objectives for the client over the next decade. By 2034, the client aims to achieve a total of €1,432,000. This total amount is required to fulfill specific financial goals, which are disclosed according to their priority:

Firstly, Karen wants to cover the costs associated with her children's university education. The full tuitions costs €8,000 each (€16,000 both) with housing costs of €36,000 (€1,000 monthly rent for a 2-bedroom apartment in Lisbon for the duration of their bachelor's degree). Subsequently, Karen intends to acquire a beach house in the Algarve for her retirement, currently valued at €350,000. Additionally, she seeks to reserve €20,000 for travel expenses by the end of the ten-year period. Finally, there's a desire to invest €10,000 in initiatives to improve the economics department, though it's considered a lower priority. The combined total of these expenses, before inflation adjustments over the 10-year period, amounts to €432,000.

2.3.2. Return, Distribution and Risk Requirements

The decision to employ a forecasted inflation rate of 2% aligns with the European Central Bank's (ECB) strategic objective of maintaining price stability within the economy. To achieve these financial objectives, the investment portfolio must generate a minimum annual return of 4.32%. The initial target investment value of €1,432,000 corresponds to a projected value of €1,526,000 in 10 years, factoring in inflation.

Consequently, each anticipated expense was inflation-adjusted and aggregated. To meet the minimum required returns necessary to achieve the financial objectives, the financial advisor will conduct a thorough risk assessment. This assessment will be aligned with the goal of maximizing the Sharpe ratio to optimize the investment strategy.

2.3.3. Portfolio Policy

The transparency-focused asset allocation plan will undergo regular joint reviews by the advisor and client. The goal of the plan is to set up a varied and safe portfolio by implementing different limitations to allocate assets among various classes. The advisor's model (MVT) will determine the best allocation for each asset class by

considering the client's profile, time horizon, risk tolerance, and macroeconomic forecasts. To remain flexible, there will be set maximum and minimum ranges for each asset class. It is necessary for the advisor to follow thoroughly the asset allocation plan designed and verify that allocations remain within the designated ranges. The client will receive quarterly reports that outline the current asset allocations and ensure they are within the approved limits for that quarter. It is necessary to communicate with the client before making any changes that exceed the predetermined limits.

The continuous process of monitoring and reporting is intended to make sure that the investment strategy stays in line with the client's financial goals and risk preferences.

2.3.4. Investor's Risk Tolerance

The current investment is exposed to several risks, underscoring the need to determine the investor's risk tolerance. The IPS will emphasize the client's ability and willingness to take on risks considering the client's circumstances. Considering the client's risk tolerance, especially due to their 10-year investment horizon, they have significant flexibility to bounce back from possible losses. The client has no need for immediate cash and does not expect to use the invested money until the time horizon matures. This assurance comes from their secure career with an anticipated steady income up to retirement (about 10 to 15 years).

Despite the client's financial security, their main priority continues to be safeguarding capital to achieve their financial objectives. While the client has a strong knowledge background in economics, their understanding of finance is lacking, leading to a moderate level of risk tolerance. A thorough risk tolerance questionnaire, particularly the Charles Schwab assessment, was administered to assess the client's level of risk tolerance. The findings suggest a tendency towards moderate risk appetite, resulting in an investment plan of 60% in stocks, 35% in bonds, and 5% in cash. Notably, the Charles Schwab moderate allocation has an average annual return of 9.10%, with 35% invested in risk-free assets, whereas the proposed portfolio offers a similar average annual return of 9.101%, with 38.95% allocated to risk-free assets.

2.3.5. Specific Portfolio and Relevant Constraints

Given that the client's financial stability is derived from their employment income and uninvested savings, there are few constraints on the frequency at which investment assets can be converted to cash, as long as it is consistent with the investment timeline. Certain market conditions may require assets to be converted into cash to rebalance. The primary focus of the investment strategy will be on utilizing Exchange-Traded Funds (ETFs) to access different asset classes.

The first step involves evaluating the client's financial goals, risk tolerance, and investment horizon. This assessment helps decide the right allocation of assets for the portfolio. The advisor will choose and examine ETFs that offer the needed exposure, making sure to convert all US-traded ETFs to Euros at the correct exchange rates. All transactions with currencies other than Euros will be changed at the time they happen. The chosen ETFs will be accumulating, so they won't be paying out dividends, making it easier to understand the tax effects of dividends.

The investment strategy is directed by numerous limitations. It first rules out leverage strategies, hedge funds, options, or futures. Moreover, although there is no specific limit on the proportion of funds invested in a foreign currency, any income obtained in currencies other than Euros will be converted into Euros. The portfolio is subject to a flat capital gains tax rate of 28% in Portugal. This applies to equity or bond ETFs held for over one year, as well as ETFs investing in precious metals and commodities, irrespective of their holding period.

Periodic evaluations and adjustments of the portfolio will be done to ensure it stays aligned with the client's goals and risk tolerance. At the conclusion of every quarter, the investment manager will offer the client an extensive report on the existing asset allocations and verify that the allocations adhered to the approved limits for the quarter.

2.4. Risk Management

As a financial advisor, it is my responsibility to calculate how well the client's assets are performing and the overall performance of the recommended portfolio. An extensive evaluation of risks will be carried out, employing multiple Value at Risk (VaR) approaches, and guaranteeing adherence to the stringent Global Investment Performance Standards set by the CFA Institute.

Every three months, a thorough report is prepared and delivered to the client containing clear information about their investment performance and level of risk. Any discrepancies found in risk positions are thoroughly reassessed, and corrective actions are promptly taken to ensure risk stays within acceptable limits.

Additionally, the client will be provided with monthly performance evaluations according to CFA guidelines and quarterly reports on various risk factors, such as the annualized standard deviation of portfolio returns, VaR metrics and corresponding back testing evaluations. Every year, I conduct a thorough assessment of asset distribution, suggesting changes to maintain desired distributions and minimize risks, with rebalancing done after receiving permission from the client.

3. Investment Design

3.1. Investment Philosophy

The essence of any IPS resides in the investor’s philosophy, which entails developing a way of thinking regarding the markets, how they function and the possible anomalies underlying an investor’s decision-making process. It often represents a client’s risk appetite, investment objectives, and investment time horizon. The philosophy serves as the foundation for crafting an investment behavior providing a reliable framework for investors to develop new strategies when current ones fall short of achieving desired outcomes (Damodaran, 2012).

An approach to implementing the client's set of beliefs is through the investment strategy. An inadequately defined investment philosophy can compromise the success of a portfolio, putting investors in a worse position than before the investment. Therefore, it's crucial to select a strategy that harmonizes with the chosen philosophy to prevent frequent portfolio changes and subsequent increases in transaction costs and tax charges.

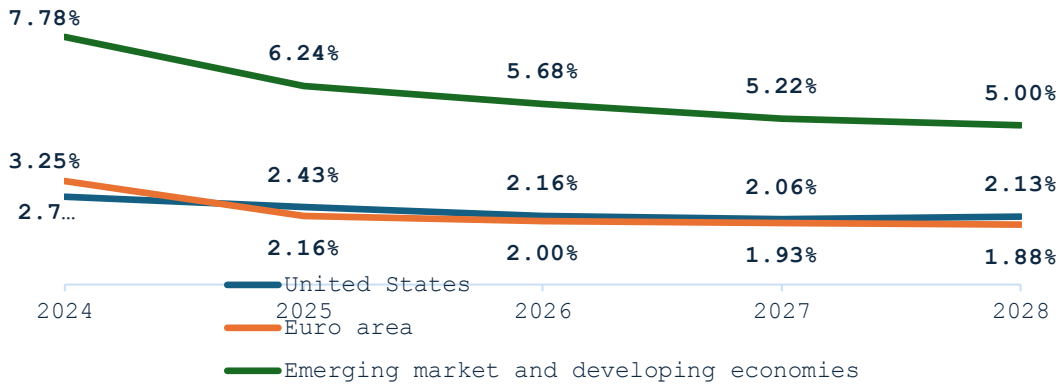
The client's emphasis on stability and long-term growth reflects her primary goals, which include capital preservation and financial security. The IPS reflects this, emphasizing value investing instead of growth-oriented approaches. It also incorporates market timing strategies and builds the portfolio entirely with exchange-traded funds (ETFs) and an exchange-traded commodity (ETC), favoring an investment approach with lower risk and higher tax efficiency.

According to Damodaran (2003), one of the distinguishing features of value investors is that they are inclined to acquire companies at prices lower than the intrinsic value of their existing assets, often identified as experienced bargain hunters. Value investing is based on the following fundamental elements found in financial markets: financial markets endure dynamic variations in security prices, but many securities have stable underlying economic values, resulting in a value-price divergence. Value investing focuses on superior long-term returns by purchasing securities when market prices are significantly lower than their intrinsic value, a concept famously labeled the "margin of safety" by Benjamin Graham (Bruce C. Greenwald, 2020).

Value investing tends to be resilient during economic downturns, rooted in the observation that value stocks exhibit greater stability compared to growth stocks in challenging market conditions. Additionally, it capitalizes on opportunities for significant price appreciation, given that these stocks are often undervalued with lower price-to-earnings (PE) ratios. Moreover, value stocks frequently offer attractive dividends, providing a reliable income stream for investors even during market uncertainty (Piotroski, 2000). A growth investor exhibits a preference for companies that are positioned to experience substantial growth by focusing on stocks that possess high price-to-earnings or price-to-book ratios. They actively look for undervalued growth opportunities, using metrics like revenue growth rate and return on equity to identify suitable investments. Unlike value stocks, which emphasize current book value, growth stocks target future growth prospects, giving them the potential to increase their cash flow and generate higher asset returns over time.

Examining the macroeconomic landscape, value investing tends to shine during periods of high inflation, robust economic growth, and elevated interest rates. In such conditions, value stocks, characterized by their stable earnings and solid fundamentals, offer resilience against inflationary pressures, and may deliver strong returns. Conversely, growth stocks typically shine in environments of low inflation, moderate economic growth, and declining interest rates. During these stages, investors drift towards growth stocks, which often exhibit higher earnings growth potential and thrive in low-interest-rate environments conducive to borrowing and investment.

Figure 1 – Inflation (Consumer Price Index) Forecast 2024 - 2028

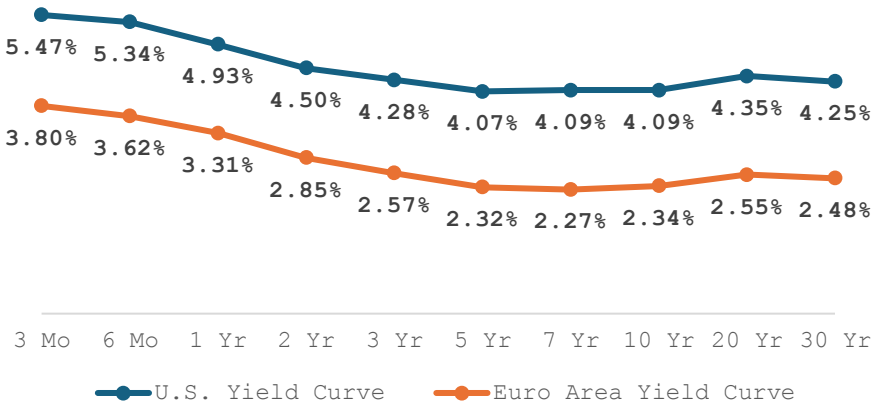


Source: Statista.com. Data as of 2024, March 8th.

Since 2022, the macroeconomic outlook has shifted in favor of sustained Value outperformance. Although inflation decreased, it is projected to remain over the central bank's targets through the end of 2024 (Figure 1). During his latest declarations, Federal Reserve Chair Jerome H. Powell hinted at the possibility of lower interest rates in 2024 but emphasized the significance of efficiently managing inflation before making any policy adjustments. Despite the anticipation of interest rate decreases, Powell's cautious approach suggests that the Fed will proceed with deliberation, implying that monetary policy adjustments may not be implemented immediately.

On the other hand, the European Central Bank (ECB) decided to keep its key interest rates unchanged during its most recent meeting. Despite a persistent decrease in inflation and weak economic growth expectations for 2024, the ECB remains committed to meeting its 2% medium-term inflation objective. Future policy decisions will be data-driven, with a focus on inflation expectations, economic statistics, and monetary policy transmission strength. Key ECB policy rates will remain steady, and the ECB will continue to reduce its asset purchase program portfolio.

Figure 2 - Yield Curves (U.S. and Euro Area)



Source: European Central Bank; U.S. Department of The Treasury. Data as of 2024, March 8th.

Combining value investment with market timing is critical for managing the uncertainty ahead stated by the Federal Reserve and the European Central Bank. While value investing provides a solid basis, market timing increases adaptability. Market timing involves the practice of anticipating future market movements to guide investment decisions, and strategically adjusting asset allocations based on these forecasts.

The ultimate objective is to capitalize on expected market shifts, aiming to optimize returns or mitigate potential losses through timely portfolio adjustments. Investors that follow this approach seek to outperform the market by holding a long position (buying) at market bottoms and a short position (selling) at market tops, hoping to profit from price fluctuations.

3.2. Strategic Asset Allocation

Strategic asset allocation is a fundamental investment strategy that involves constructing a portfolio based on long-term performance projections of various asset classes. This approach recognizes the ever-changing nature of the market and aims to achieve maximum risk-adjusted returns over an extended period. An integral component of strategic asset allocation is the consideration of established portfolio models such as the 60/40 portfolio. Consisting of 60% stocks and 40% bonds, this classic strategy provides a foundational framework for balancing growth potential with income stability. The allocation to stocks aims to capture growth opportunities in favorable market conditions, while bonds offer stability and income during market downturns. Alternative investments may reshape the 60/40 portfolio as global economic conditions evolve, reaffirming its resilience in managing volatility and optimizing returns across diverse markets.

The key to effective strategic asset allocation lies in accurate long-term predictions of asset class performance, which require a thorough understanding of macroeconomic trends and market dynamics. Consequently, to make well-informed decisions on asset allocation, it is essential to consistently monitor and analyze economic data, global political developments, and market changes. This continuous monitoring guarantees that the investment portfolio stays in line with the investor's long-term objectives and can adjust to changing market circumstances.

The investment advisor will use a top-down approach to asset allocation, fixed in the adjusted 60/40 framework that incorporates rising allocations to alternatives. This process begins with an analysis of the macroeconomic landscape followed by an overview of long-term asset class assumptions, guiding the strategic allocation decisions.

3.2.1. Macroeconomic Overview

In the current macroeconomic context, investors are meeting persistent threats such as inflation, possible economic downturns, and geopolitical disturbances (Ukraine War and the Israel-Hamas conflict). Despite these challenges, the S&P 500 continues to rise, while the Federal Reserve remains cautious in its monetary policy adjustments.

Given the Federal Reserve's promise to maintain high-interest rates for a significant amount of time, market evaluations across different asset types will face the difficulty of enduring prolonged high rates.

Importantly, expected equity returns have been decreased, especially in the US market, because of high valuations that offer limited growth opportunities. Conversely, higher initial returns have led to improved outlooks for various fixed-income investment categories (J.P. Morgan, 2023).

Shifting focus to Europe, the eurozone experienced a deceleration in the latter part of 2023 due to stricter financing, decreased confidence, and weakened competitiveness. Despite an unimpressive start in the last quarter of 2023, growth is expected to accelerate in early 2024 due to increased disposable income, lower inflation, strong salary increases, and a steady employment landscape. Nevertheless, the immediate expansion continues to be influenced by the ECB's implementation of restraining monetary policy and constraints on credit disposal. In general, it is predicted that the GDP growth will decrease initially before levelling off, while inflation keeps dropping (European Central Bank, 2023).

Looking ahead to 2024, it is crucial to consider the potential impacts of major events on various sectors. The market is expected to experience changes in 2024 partially due to the US presidential election, with candidate speeches and policies affecting sector performance and investor confidence. Investors will closely monitor healthcare, technology, and energy policies, anticipating heightened volatility typically observed in election years. Despite the importance of elections, economic indicators and global events also play a crucial role. Geopolitical factors remain prominently influential, impacting areas like energy, supply chains, and economic stability, especially seen with events like the Ukraine War. Escalations or resolutions of this conflict, along with tensions in areas like the Middle East (such as the Israel-Hamas conflict), are expected to influence sectors such as energy and defense.

Moreover, concerns regarding China's economic trajectory, including issues with debt and potential growth slowdowns, are significant globally due to its substantial role in trade and production. US trade relationships with important partners like China and the EU will be carefully monitored, potentially impacting industries that depend on trades (Nasdaq, 2023).

3.2.2. Long-term Capital Market Assumptions

In the strategic asset allocation process, the investment advisor will develop a recap on the Long-Term Capital Market Assumptions incorporated in the IPS. These assumptions provide forecasts for the performance of various asset classes over the time horizon of the investment. Ultimately, LTCMAs complement the macroeconomic briefing by detailing the primary expectations for each asset class over the specified period.

Long-term expected returns on equity have slightly decreased due to market surges and growing cyclical challenges. Current valuations have a stronger negative impact now, with margins being less significant than before. In the U.S. market, expectations for returns on both large-cap and small-cap stocks have declined due to increasing valuation pressures and a smaller small-cap premium compared to large-cap stocks. Globally, stocks from countries other than the U.S. are expected to do better than U.S. stocks due to better valuations and higher dividends. Even though American stocks may show stronger earnings and revenue growth, non-U.S. developed equities present attractive investment prospects, especially given the possible backing from a depreciating dollar (J.P. Morgan, 2023).

According to J.P. Morgan (2023), fixed income returns remain attractive for the upcoming years. It is expected that interest rates in key developed markets, particularly in Europe and Japan, will align due to the projected effects of inflation trends in the United States. This aligns with the widely expected move to normalize monetary policy and return to interest rates that are typically seen in history. Additionally, forecasts of an increase in long-term inflation suggest anticipations of substantial growth in 10-year bond rates, especially apparent in Europe and Japan.

Even tough higher risk premiums and a steeper yield curve may occur, it is anticipated that the demand for long-term bonds will rise as investors seek to realign their investment portfolios. Therefore, it is expected that the yield curve's slope will remain

consistent, but there may be a change in level for many economies. However, certain segments of the credit markets, such as leveraged loans, may face increased vulnerability to refinancing risk, leading to adjustments in spread assumptions to reflect changing market conditions in the coming year.

Looking at the alternative investments outlook, although faced with obstacles such as interest rate adjustments and worries about inflation, these assets continue to be crucial for diversification and consistent performance in the long run. In the future, real assets like property and infrastructure are expected to provide consistent profits and safeguard against inflation. Private equity and hedge funds are anticipated to provide higher returns than public markets, as financial alternative assets. In general, as traditional portfolio returns decrease slightly, there is an expectation that alternatives will become more important, offering appealing returns and diversification advantages. According to J.P. Morgan (2023), the classic 60/40 portfolio might change to 50/30/20 soon, with a decrease of 10% in equities and fixed income weights and a 20% addition of alternative investments.

3.2.3. Asset Allocation

The strategy for allocating assets in the portfolio was developed using a thorough top-down method that combined macroeconomic analysis, long-term market assumptions, and an assessment of the 60/40 portfolio. Weightings were first calculated using information obtained from Vanguard's investor profile survey, with 60% assigned to risky assets and 40% to risk-free assets, primarily government bonds.

Following JP Morgan's outlook on balanced portfolios, changes were implemented to the standard structure, shifting towards a 50/40/10 distribution in the risky assets segment. To the equity class, a weight of 36.63% was allocated, while the rest was divided between alternatives (7.94%) and fixed income ETFs (16.48%). A final allocation of 38.95% is designated for risk-free assets.

Based on data collected on the lowest and highest allocations in Millenium Private Banking's portfolios, the first reference point was set. A follow-up cross-reference was conducted with other sources such as Charles Swabb and Vanguard. After the allocation research process, an initial weight was set for the asset classes, including the risk-free asset. At a first stage, the minimum allocation would be calculated by deducting 50% of the original benchmark weight, on the other hand to achieve a

maximum limit an addition of 25% would be added to the benchmark. As an example, the Alternatives start with an initial weight of 10%, a minimum limit of 5% and a maximum limit of 12.5%.

Table 1 - Initial Allocation Constraints

	Portfolio (60/40)		Risky Assets				Risk Free Asset
Initial Allocation	Risky Assets	Risk Free Asset	Equity	Bonds	Alternatives	Liquidity	Sov. Bonds
Initial Weight	60%	40%	50%	40%	10%	0%	40%
Min Limit	30%	20%	25%	20%	5%	0%	100%
Max Limit	75%	50%	62,5%	50%	12,5%	0%	100%

Source: Author

To accurately normalize the weightings, a follow-up calculation is essential to account for the 60/40 portfolio structure. In Figure 4, the core allocations are calculated by multiplying the initial weights of each risky asset class by 60%, while the risk-free asset was adjusted proportionally to the 40%.

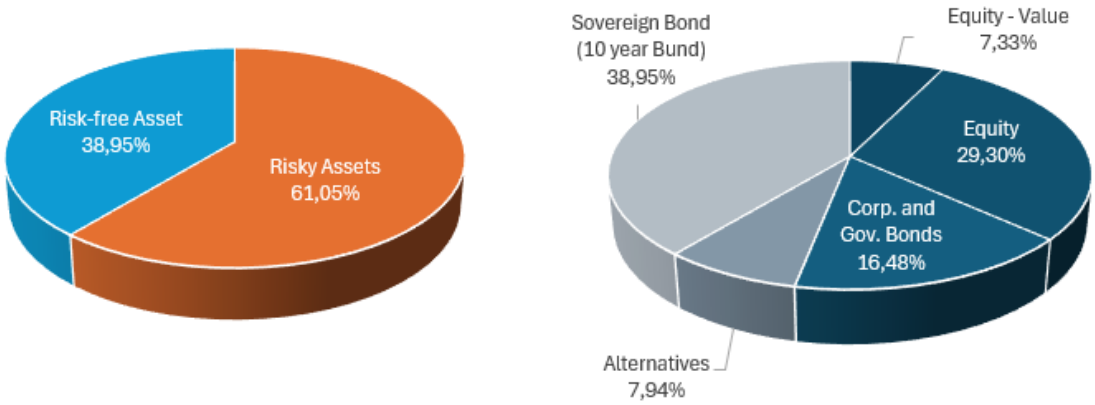
After determining the central weights, an additional adjustment was made for the upper and lower constraints: 50% of the benchmark value was subtracted from the core weight (minimum allocation), and an increase by a factor of 50% of the benchmark value (maximum limit). The asset allocation optimization process was completed with the use of Excel Solver, considering necessary limitations to achieve the specified weights. More information regarding the minimum, maximum, and central ranges for each asset class can be found for consultation in the Appendix section.

Table 2 - Final Allocation Constraints

	Portfolio (60/40)		Risky Assets				Risk Free Asset
Final Allocation	Risky Assets	Risk Free Asset	Equity	Bonds	Alternatives	Liquidity	Sov. Bonds
Central Allocation	60%	40%	30,0%	24,0%	6,0%	0,0%	40,0%
Min Limit			15,0%	12,0%	3,0%	0,0%	20,0%
Max Limit			45,0%	36,0%	9,0%	0,0%	60,0%

Source: Author

Figure 3 - Asset Allocation (Solver Optimization)



Source: Author

3.3. Security Selection

The IPS focuses solely on Exchange-Traded Funds (ETFs), giving the client a simplified framework to invest in several markets. ETFs provide investors with a distinctive mix of benefits, incorporating features from both individual stocks and managed funds. ETFs, as opposed to single stocks, encompass a varied range of assets like stocks, bonds, and commodities. ETFs, as well as mutual funds, are distinct legal entities from the companies that manage them. This legal separation ensures that in the event of the parent company's dissolution, the assets of the ETF will remain separate, safeguarding investors' ownership rights (Charles Schwab, 2023). Unlike managed funds, which often aim to outperform a benchmark index through active management, ETFs are designed to track the performance of specific indexes. This approach offers investors predictability in returns, as ETFs strive to replicate the performance of their underlying index rather than attempting to surpass it through active management.

ETFs are also known for being cost-effective when compared to managed funds. Managed funds often have higher fees due to active management to beat the index, whereas ETFs usually have lower costs by passively following the index. ETFs are appealing to investors looking to gain market exposure and reduce costs due to their cost-effectiveness (Charles Schwab, 2019). Additionally, exchange-traded funds offer flexibility for investors when it comes to entering and exiting the market. Investors have the flexibility to purchase and sell ETF shares at any time during market hours,

providing improved liquidity and convenience compared to traditional managed funds with redemption period restrictions (BlackRock, 2021).

Investors should carefully evaluate the different risks associated with investing in Exchange-Traded Funds (ETFs). Market risk is a major concern, as ETF performance is impacted by market changes. Even though ETFs offer advantages like diversification, they are still at-risk during market declines, which could lead to significant losses for investors. Additionally, investors might face exotic-exposure risk from ETFs, especially when they are investing in specialized sectors. Although ETFs offer exposure to various asset classes apart from standard stocks and bonds, such as commodities and options strategies, investors need to be aware of the intricacies linked with these investments. Increased volatility and liquidity risks may be present due to these elements, requiring a thorough comprehension of the underlying assets and investment strategies. Lastly, tax risk may also arise, particularly when it comes to ETFs that have non-traditional assets or that use complicated trading tactics. The tax understanding of ETFs differs based on the type of assets they hold, with some assets facing higher tax rates or being labelled as "collectibles" by tax authorities.

To ensure the chosen ETFs closely align with the client's investment goals, a meticulous screening process was conducted based on several key criteria:

- **Replication Method: Full or Optimized Sampling -** Priority was given to ETFs that employ Full Replication or Optimized Sampling methods. These strategies aim to accurately reflect the underlying index, ensuring the clients' returns closely track the target benchmark. For commodity ETFs, swap-based replication was considered, as it provides exposure to the asset class without the logistical complexities of direct ownership.
- **Expense Ratio -** A cap of 0.30% was established for broad-market ETFs, while a slightly higher limit of 0.50% was deemed acceptable for industry-specific ETFs. Minimizing these fees allows the client to retain a greater portion of the returns. According to Investment Company Institute (2024), the average expense ratio for index equity ETFs in 2023 was around 0.15%. Setting a cap at 0.30% for broad-market ETFs ensures competitiveness and cost efficiency. Industry-specific ETFs often have higher expense ratios due to the specialized nature of the markets they track, justifying the 0.50% cap.

- **Reinvesting for Growth: Accumulation Method -** Accumulation ETFs, which automatically reinvest their dividends back into the fund, were prioritized. This process leverages the power of compounding, accelerating the growth of the client's investment over time.
- **Fund Size: Minimizing Risk Through Diversification -** A minimum fund size of 100 million euros was imposed during the screening process. This threshold helps ensure the ETF is liquid and actively traded, minimizing potential bid-ask spreads, and enhancing the client's ability to buy and sell shares efficiently. For industry-specific ETFs, a higher minimum threshold of €500 million was employed to further mitigate risk.
- **Currency Flexibility: Euros or US Dollars -** The screening process considered ETFs denominated in either euros or US dollars. This flexibility allows the client to tailor its portfolio to the preferred currency and potentially manage currency exposure as part of the overall investment strategy.
- **Diversification Across Providers -** To safeguard against potential risks associated with a single provider, the investment portfolio will be spread amongst several ETF providers. An additional cap of 50% was placed on the exposure to any single provider, promoting diversification and reducing reliance on any one issuer.
- **Focus on Value ETFs and Industry-Specific Constraints –** In alignment with the value investing philosophy, the screening process specifically targeted value ETFs. Furthermore, industry-specific constraints were applied to identify sectors such as energy, information technology, and robotics, which are poised for expansion based on macroeconomic trends and industry forecasts.

The process of choosing ETFs was designed to give priority to ETFs with lower total expense ratios (TERs) and higher assets under management (AUM). The objective was to improve cost-efficiency and liquidity in the securities selection by prioritizing ETFs with lower TERs and higher AUM. Selecting cumulative ETFs based on the "profit utilization" factor shows a strategic choice to reinvest dividends automatically, resulting in compounded returns over time. This approach is in line with investment techniques that prioritize long-term objectives, emphasizing the significance of compounding to increased generated wealth.

According to Morningstar (2023), in the context of currency risk, adjusting the prices of foreign-based ETFs to the investor's base currency helps mitigate the impact of currency fluctuations on investment performance. Even though currency hedging could be a logical choice for investors who are averse to risk, it involves tangible expenses and does not offer the possibility of higher-than-expected returns. That said, the financial advisor has chosen not to employ currency hedging or any other form of hedging in the portfolio.

At first, the providers' requirements remained flexible to promote variety and maximize possibilities for investment. However, modifications were made to prioritize prudent risk management by limiting exposure to any single provider to 50% cap. Following the information provided under the long-term capital market assumptions and the macroeconomic outlook, the financial advisor was given freedom to select between the US and Europe for investment, allowing them to thoughtfully weigh regional market dynamics and economic trends.

Selecting value ETFs and utilizing niche screening in the equity asset class is consistent with the IPS investment strategy and capital market projections. In a first stance, the screening process exclusively targeted value ETFs (iShares MSCI Europe Value e.g.), leveraging fundamental analysis to uncover undervalued assets and potential opportunities for long-term growth. This meticulous assessment delved into sectors such as energy, information technology, and robotics, analyzing economic indicators and industry forecasts to identify areas poised for expansion. By analyzing general market trends and specific industry outlooks, this approach anticipates future market movements and adjusts investment portfolios, accordingly, exemplifying a forward-thinking strategy aimed at maximizing returns over time.

Moreover, when choosing fixed income ETFs, matching the maturity of bonds with the investor's investment timeline, like the indicated periods of 1-5 years, 5-7 years, and 7-10 years, can lower the risk of fluctuations in interest rates and uphold a well-rounded risk-return balance. Furthermore, the emphasis on AAA and investment-grade bonds shows a dedication to protecting capital and efficiently handling credit risk, matching the investor's risk tolerance and long-term goals. According to Morgan Stanley (2024), the outlook for 2024 highlights a pathway for intermediate maturity bonds to remain attractive, aligned with Europe's growth slows more quickly than that

of the U.S. economy, European fixed-income markets may be relatively more attractive, this being the focus of our fixed income portion of the portfolio.

The alternatives screening process focused on REITs[1] and commodities to improve portfolio diversification and reduce risks related to market volatility. REITs give investors a chance to invest in real estate, offering opportunities for generating income and increasing capital value. Commodities offer a way to invest in physical assets, such as precious metals, that have inherent worth, serving as a safeguard against inflation and devaluation of currency. This varied strategy seeks to strengthen the portfolio's ability to withstand challenges and take advantage of opportunities in different market environments.

3.4. Portfolio Composition

3.4.1. Markowitz's Modern Portfolio Theory

According to Markowitz (1952), the Modern Portfolio Theory (MPT) is a portfolio allocation theory based on risk and return. The theory states that a portfolio's risk can be reduced through diversification - holding many different assets with low or negative covariance. The low/negative covariance reduces the volatility of the portfolio by eliminating the idiosyncratic/unsystematic[2] risk inherent in individual securities. Also referred to as mean-variance analysis (simplified model), MPT takes an aggregate view in that each asset is less important than its impact on the portfolio. The theory takes on the assumption that investors are risk-averse, meaning that between two portfolios with the same volatility, investors prefer the one that generates a higher return.

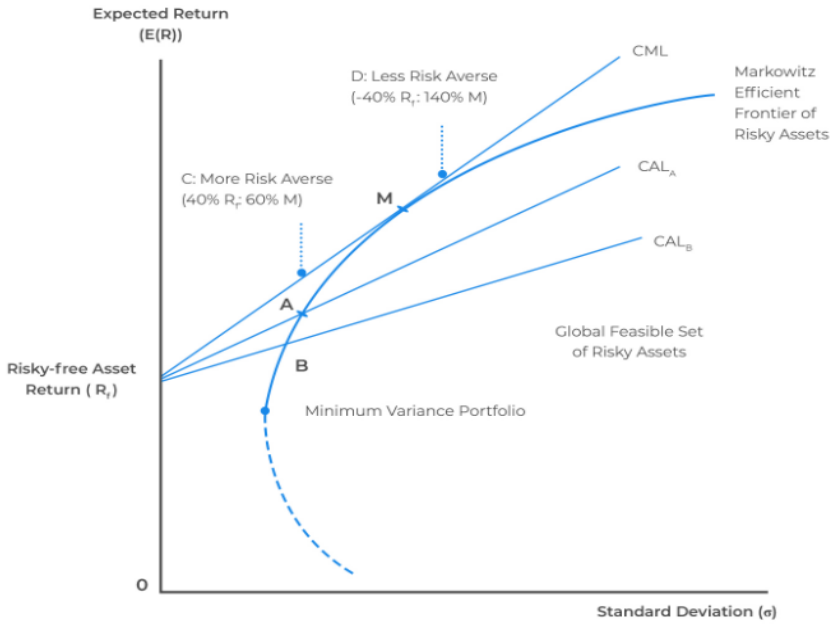
Due to different risk tolerances, Markowitz developed the efficient frontier to attain the best asset combinations in a portfolio for highest expected return compared to risk. The frontier is created by evaluating anticipated returns in several asset allocations, plotting risk on the X-axis and returns on the Y-axis. Portfolios stationed under the

[1] REITs - A real estate investment trust (REIT) is a firm that possesses, manages, or funds income-generating real estate. Similar to mutual funds, REITs aggregate capital from investors who receive dividends from real estate investments. Investors do not directly purchase, oversee, or finance individual properties (Chen, 2024).

[2] Idiosyncratic Risk - Unsystematic risk or risk that is uncorrelated to the overall market risk. In other words, the risk that is firm-specific and can be diversified through holding a portfolio of stocks (Nasdaq, 2018).

curve are considered non-optimal, either showing reduced returns for a given level of risk or enhanced risk for a specific return.

Figure 4 – Efficient Frontier by Markowitz



Source: AnalystPrep

3.4.2. Methodology

The process of developing the Modern Portfolio Theory (MPT) model started with collecting the monthly adjusted close prices of ETFs from Yahoo Finance! from March 31, 2019, to March 31, 2024. To maintain uniformity in a portfolio denominated in Euros, ETFs that were traded in USD were meticulously converted into Euros by multiplying the adjusted closing price of each interval by the relevant exchange rate, which standardized the data.

Following the retrieval and normalization of data, lognormal returns were computed for every ETF. This procedure includes calculating the natural logarithm of the monthly percentage shift, allowing for the standardization of the time series information and making it easier to compare different price levels. Lognormal returns are in accordance with the statistical assumptions of Modern Portfolio Theory, especially in terms of future price probabilities, and it is computed as follows (Elton, Gruber, Brown, & Goetzmann, 2014):

$$r_i = \log\left(\frac{S_i(T)}{S_i(0)}\right) \quad (1)$$

which has the convenient property: suppose 0 = $t_0 < t_1 < t_2 < \cdots < t_m$ = T, the log return over [0, T]

$$r_i = \log\left(\frac{S_i(T)}{S_i(0)}\right) = \log\left(\frac{S(t_1)}{S(t_0)} \times \frac{S(t_2)}{S(t_1)} \times \ldots \frac{S(t_m)}{S(t_{m-1})}\right) = r^{(1)} + r^{(2)} + \cdots + r^{(m)} \quad (2)$$

where $r^{(k)}$ is the log return for the period (t_{k-1}, t_k).

The subsequent process included calculating the yearly profits for every ETF. This was accomplished by using a formula that computes the exponential average of lognormal returns during the timeframe and converts the outcome into an annual rate. Furthermore, the volatility for each ETF was calculated by taking the square root of the variance of the lognormal returns adjusted to the time span. For further calculations, a variance-covariance matrix was computed, providing insights into the interdependencies and movements between different assets within the portfolio, consequently smoothing risk assessment, diversification strategies and portfolio optimization.

Next, Excel's Add-In Solver was employed to calculate the Minimum Variance Portfolio (MVP) and the portfolio that maximizes the Sharpe ratio (SR), a fundamental principle in Modern Portfolio Theory. The Sharpe ratio evaluates investment performance by factoring in risk. It compares an investment's return to the additional risk it bears beyond a risk-free asset, in this case the 10-year German Bund. The Sharpe Ratio formula goes as follows:

$$Sharpe\ Ratio = \frac{R_P - R_f}{\sigma_P} \quad (3)$$

The constraints for the Solver calculation are represented by the lower and upper limits of the allocation for each asset class, following the insights stated in section 4.2.3. of the IPS. In addition, since this IPS does not allow for any short selling in the optimal portfolio, an additional constraint was added to prevent negative weights during the simulation. The full optimization constraints are described below:

$$25\% \leq \sum_{i \in\ Equity\ ETFs} w_i \leq 62.5\%$$

$$20\% \leq \sum_{i \in Fixed-Income\ ETFs} w_i \leq 50\%$$

$$5\% \leq \sum_{i \in Alternatives\ ETFs} w_i \leq 12.5\%$$

$$\sum_i w_i = 1$$

$$w_i > 0$$

A detailed description of the strategy and industry constraints for the risky portfolio is disclosed below:

1. *Value Investing:* To ensure this strategy is adequately represented, a weighting constraint between 10% and 20% has been attributed to all value equity ETFs. This range ensures that value equities have a significant yet balanced presence, preventing over-concentration while exploiting on potential market corrections and undervalued opportunities.
2. *Corporate and Government Bonds:* The fixed income portion of the risky portfolio is concentrated on intermediate maturity and European government and corporate ETFs (Amundi Euro Government Bond and JPMorgan EUR Corporate Bond). A weighting range constraint of 25% to 40% has been set, following the 50/40/10 portfolio layout. This decision is driven by the necessity for stability and reliable returns, where intermediate maturities strike a balance between yield and interest rate risk.
3. *Tech Industry:* ETFs in the tech sector have been carefully selected to ensure diversification among providers and to avoid overexposure to any single entity. Therefore, the range for tech industry ETFs is set between 15% and 25%, with no single ETF exceeding 10%. This approach exploits the sector's growth while mitigating risks related to provider concentration and sector volatility.
4. *Energy ETF's:* To manage the uncertainties related to the energy sector, a constraint of weights between 4% and 6% has been applied to energy-related assets. This conservative allocation limits exposure to volatile energy markets and geopolitical tensions.
5. *Healthcare:* The healthcare sector is anticipated to benefit from economic recovery, leading to increased spending. However, it faces challenges such as

resource limitations, regulatory changes, and labor strikes. To balance these opportunities and risks, an exposure limit between 4% and 6% has been set for healthcare assets.

6. *Utilities:* Exposure to utilities is limited to 6% of the risky portfolio to manage risks associated with geopolitical events and market fragmentation. Utilities, while generally stable, can be significantly disturbed by external political and regulatory factors.
7. *Industrials and Industrial Metals:* Industrial metals are expected to benefit from supply chain disturbances and sustained demand growth in China, driven by green infrastructure projects. A constraint between 4% and 6% individually for industrial and industrial metals ETFs ensures that the portfolio captures these growth opportunities while managing the risks associated with commodity price volatility.
8. *Agricultural Sector:* Agriculture ETFs offer a hedge against inflation, as agricultural commodity prices typically rise during inflationary periods. To leverage this inflation protection, a limit between 3% and 5% was set for the WisdomTree Agriculture ETF.
9. *Financials Sector:* The financials sector has been allocated a limit between 4% and 8%, balancing the potential for growth with inherent sector risks, such as regulatory changes and economic cycles.

A simulation was performed to create the Efficient Frontier, which consists of portfolios that provide the highest expected returns based on a specified level of risk. This required analyzing different mixes of weights between the maximum Sharpe ratio portfolio and the minimum variance portfolio. Every mix of assets depicted a unique portfolio makeup on the Efficient Frontier. Through continuously modifying the weighting of each portfolio, a range of portfolios was created, each having a distinct risk-return profile. To ensure clarity and relevance, the financial advisor will focus on the portfolios essential for identifying the optimal allocation, noting that the detailed disclosure of the efficient frontier is not mandatory in every Investment Policy Statement (IPS), as outlined by the CFA Institute guidelines.

3.4.3. Portfolio Composition

The portfolio composition is available for consultation in the Appendix Section, with the specified asset allocation represented in Figure 5. As stated before, the constraints set to find the optimal portfolio were previously determined as well as the non-short-selling criteria. The proposed portfolio is expected to yield an annual return of 9.101% with a volatility of 10.24%, as seen in Table 3.

Table 3 - Proposed Portfolio

Maximum Sharpe Ratio Portfolio	
Expected Return	9.101%
Standard Deviation	10.240%
Risk Free Rate	2.505%
Sharpe Ratio	0.64
Variance	1.049%

Source: Author

The portfolio comprises 19 ETPs, including 12 equity ETFs, 3 bond ETFs, 1 ETC, and 3 alternative ETFs. A detailed portfolio composition is available for consultation in the Appendix Section. The final portfolio corresponds to 61.15% of the risky portfolio and 38.95% of the risk-free asset. The risk-free asset selected for this portfolio is the 10-Year German Government Bond (Bund), given the client's European domicile and the euro-denominated trading environment of all securities. Furthermore, a substantial portion of the risky portfolio is positioned within the European market.

3.5. Expected Performance

To assess the portfolio's expected performance, a Monte Carlo simulation was conducted. This model is used to assess the likelihood of several outcomes and achieve a greater grasp of the uncertainty risk. The necessary inputs for the Monte Carlo calculation are the following: initial investment of €1,000,000, expected return of the portfolio of 9.101% and the portfolio's volatility of 10.24%. Random returns for the 10-year period were simulated to determine the ending value of the portfolio, which was then used to conduct 10,000 simulations of ending values. The inputs for the computation as well as the statistics results can be found disclosed in Table 4.

Table 4 - Expected Performance (Monte Carlo)

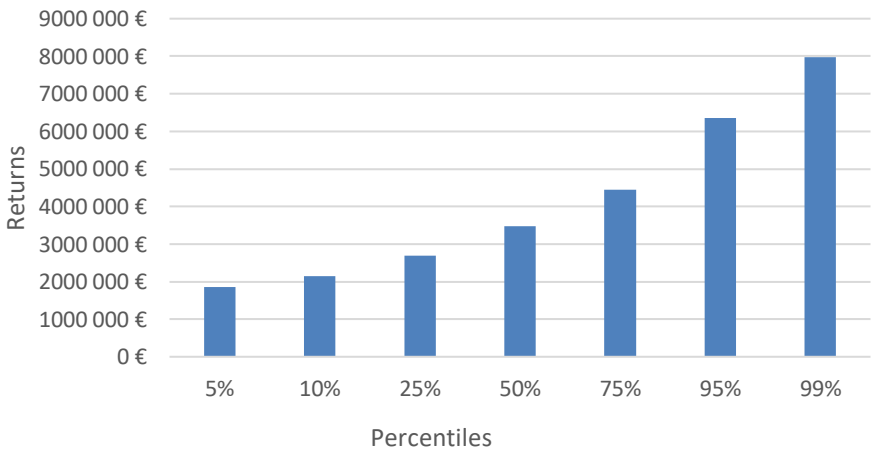
Expected Performance (Monte Carlo) Inputs	
Mean	3,696,399.75 €
Median	3,467, 959.19 €
Standard Deviation	1,377,713.89 €

Expected Performance per Percentile	
Percentile	Return
5%	€ 1,880,069.28
10%	€ 2,169,159.44
25%	€ 2,724,498.14
50%	€ 3,467,959.19
75%	€ 4,420 091.12
95%	€ 6,278 305.83

Source: Author

The most probable scenario, reflected by a median ending value, suggests a possible portfolio growth to €3,467,959.19. This translates to a significant increase from the initial investment of €1,000,000. However, the standard deviation underscores the possibility of substantial variation in the final value. Figure 6 further emphasizes the range of potential ending portfolio values highlighted in the simulation. It visually depicts a range of possible ending points, with the median representing the most likely outcome.

Figure 5 – Returns per percentile



Source: Author

In addition, alongside the Monte Carlo simulation results, a benchmark was established to serve as a reference point for evaluating the portfolio's performance. A benchmark provides a standard against which investment outcomes can be compared. Given the portfolio's structure composed of ETFs using full or optimizing replication method, the financial advisor opted for a weighted benchmark approach, as disclosed in the Appendix section. This method involved aggregating historical monthly data for each underlying index according to the respective ETF weights in the

portfolio. The Sortino Ratio, Information Ratio, and Tracking Error were chosen to compare the portfolio's performance against the benchmark since they provide comprehensive insights into risk-adjusted returns and the consistency of performance relative to the benchmark, their formulas go as follows:

$$Tracking\ Error = \sqrt{\frac{\sum_{i=1}^{n}(R_P - R_B)^2}{N-1}} \quad (4)$$

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

$$Sortino\ Ratio = \frac{R_P - R_B}{Standard\ Deviation\ of\ Negative\ Returns\ (Downside)} \quad (6)$$

The Information Ratio evaluates the excess return of the portfolio relative to the benchmark per unit of risk, measured by the Tracking Error. The Information Ratio of 1.35 implies that the portfolio chosen achieved 1.35€ of excess return for every euro of risk taken relative to the benchmark. The Tracking Error measures the difference between the return fluctuations of the portfolio and those of the benchmark, providing insight into the consistency of performance. An annualized Tracking Error of 9.65% reveals the extent to which the portfolio's performance deviates from the benchmark over time (Corporate Finance Institute, 2024).

The Sortino Ratio measures risk-adjusted return, focusing solely on downside risk, which is the risk of negative returns. This metric is particularly important as it provides a clearer picture of the risk investors most want to avoid, unlike the Sharpe Ratio, which considers both upside and downside volatility. The Sortino Ratio computed at a value of 1.13 indicates that the portfolio has achieved good returns adjusted for the downside risk, indicating that the investment strategy effectively manages negative returns.

3.6. Risk Analysis

After assessing the portfolio’s expected performance along the time horizon, it’s crucial to develop a critical examination of potential financial risks that could impact said performance. Risk analysis is essential in identifying, measuring, and managing the uncertainties that may lead to financial losses.

The analysis will employ several Value at Risk (VaR)[3] calculations, including Historical VaR, Monte Carlo VaR, Parametric VaR and Conditional VaR, to provide a comprehensive assessment of the portfolio's risk profile offering diverse perspectives on the evaluation of risk. This financial metric (*V*) is a function of two parameters: the time horizon, *T*, and the confidence level, *X*. In clearer terms, the objective is to ensure with X% certainty that we do not exceed a loss of V euros within time T. When calculating Value at Risk, the evaluations were performed at higher confidence levels, specifically between 95% and 99%, for the following reasons:

- Provide a stricter measure of potential losses. For instance, a 99% confidence level means that there is only 1% chance that losses will exceed the VaR estimate.
- Regulatory bodies and financial industry standards often mandate the use of higher confidence intervals for risk reporting. For instance, the Basel Accords recommend using a 99% confidence level for market risk assessment.
- Higher confidence intervals are more sensitive to the tail risk of the distribution of returns. This sensitivity is particularly important for identifying and managing rare but harsh events (tail risks) that could impact the portfolio's value.

3.6.1. Variance-Covariance VaR (Parametric Method)

The variance-covariance method (VCV VaR), also known as parametric method, is a risk management technique that uses the mean (expected value) and the standard deviation of an investment as a starting point for the VaR calculations. The goal is to estimate the loss of a certain investment, if stock price returns and volatility follow a normal distribution. The calculation of the VCV VaR can be achieved through the following formula:

$$VCV\ VaR(\alpha) = \mu\ * \mathrm{Z}\,(1-\alpha) * \sigma \qquad (7)$$

The analysis was made under these assumptions, with mean equal to 9.1% and a standard deviation of 10.2%. The results of the analysis, presented across several confidence levels, illuminate the range of potential outcomes in terms of portfolio losses.

[3] Value at Risk (VaR) - Financial metric that estimates the risk of an investment, measuring the amount of potential loss possible to happen over a specified period in an investment portfolio. VaR gives the probability of losing more than a certain limit in a given portfolio (Corporate Finance Institute, 2024).

Table 5 - Parametric VaR

Confidence Interval	Z-Stat	Parametric VaR (%)	Parametric VaR (€)
99.0%	2.32634787	-14.720%	- € 147,204.50
98.0%	2.05374891	-11.929%	- € 119,290.29
97.0%	1.88079361	-10.158%	- € 101,579.63
96.0%	1.75068607	-8.826%	- € 88,256.58
95.0%	1.64485363	-7.742%	- € 77,419.31

Source: Author

At the 99% confidence level, the portfolio could incur losses of approximately 14.720% of its total value, equivalent to a substantial monetary loss of €147,204.50. On another words, there's 1% chance that the losses could exceed that amount. As the confidence level decreases, the projected losses follow a downwards trend, but the risk remains substantial.

At the 98% confidence level, the projected loss is approximately 11.929% of the portfolio's value, amounting to a monetary loss of €119,290.29. Similarly, at the 97% confidence level, the projected loss decreases to approximately 10.158% of the portfolio's value, with a corresponding monetary loss of €101,579.63.

3.6.2. Historical VaR (Non-parametric method)

The Historical Method for computing Value at Risk (VaR) operates under the premise that future investment performance will mirror past patterns. This non-parametric approach, was studied by John C. Hull in "Risk Management and Financial Institutions," involves simulating future outcomes based on historical performance data. To simulate the historical returns of the previously weighted risky portfolio, each asset's lognormal returns were multiplied by the optimal weight allocated to that security. This process is applied to all monthly data used in previous calculations, ensuring a comprehensive analysis of the portfolio's historical performance trends.

After weighing the several monthly lognormal returns, a final array is computed consisting of the historical portfolio returns already weighted and per monthly date. Afterwards the following formula was applied to reach the final values:

$$Percentile.EXC\big(array\ of\ historical\ returns, \mathrm{Z}(1-\alpha)\big) \qquad (8)$$

Table 6 – Historical VaR

Percentile	Z-Stat	Historical VaR (%)	Historical VaR (€)
98.0%	2.05374891	-9.178%	- € 91,784.97
97.0%	1.88079361	-6.837%	- € 68,371.62
96.0%	1.75068607	-5.591%	- € 55,909.92
95.0%	1.64485363	-4.892%	- € 48,924.04

Source: Author

The Historical VaR results reveal critical insights into the potential risks facing the investment portfolio. At a 98% confidence level, the Historical VaR indicates a loss of approximately 9.178% of the portfolio's total value, amounting to €91,784.97. Comparatively, this represents a lower risk level than the parametric VaR values previously obtained, suggesting a more conservative estimation of potential losses based on historical performance. However, even at lower confidence intervals, such as 95%, the Historical VaR remains substantial, indicating a monetary loss of €48,924.04.

3.6.3. Monte Carlo VaR

The last model presented in the risk analysis process is the Monte Carlo Value at Risk (VaR) used to estimate the potential loss in value of a portfolio under normal market conditions over a specified period. Unlike the other VaR methods computed, the Monte Carlo method employs stochastic modeling to simulate a wide range of possible future states of the market (10,000 simulations), allowing for a more flexible and comprehensive analysis of risk. A mean of 9.1% and a portfolio standard deviation of 10.2% were considered as inputs.

The expected return over the 10-year period (120 months period) was computed as follows:

$$Expected\ Return = Capital\ Invested * \mu * \left(\frac{120}{12}\right) \quad (9)$$

The simulation uses random Z-stats to perform the several scenarios. The Z-Stat can be calculated in Excel using the formula: NORM.S.INV (RAND ()). The final input for the simulations, the Scenario VaR, is computed as follows:

$$Scenario\ VaR = Expected\ Return - \left(Capital\ Invested * \sigma * Z - stat\sqrt{\left(\frac{120}{12}\right)}\right) \quad (10)$$

A total of 10,000 simulations were conducted using the Scenario VaR as the primary input, based on the assumption of normally distributed returns. The process started with the Scenario VaR as the initial simulation, followed by the use of the "What-If Analysis" add-in in Excel to generate other scenarios. The simulation results highlight the possible VaR outcomes corresponding to the formerly stated random Z-stat. After the input calculation and the simulations concluded, the Monte Carlo VaR was computed using the following excel formula: PERCENTILE.INC ().

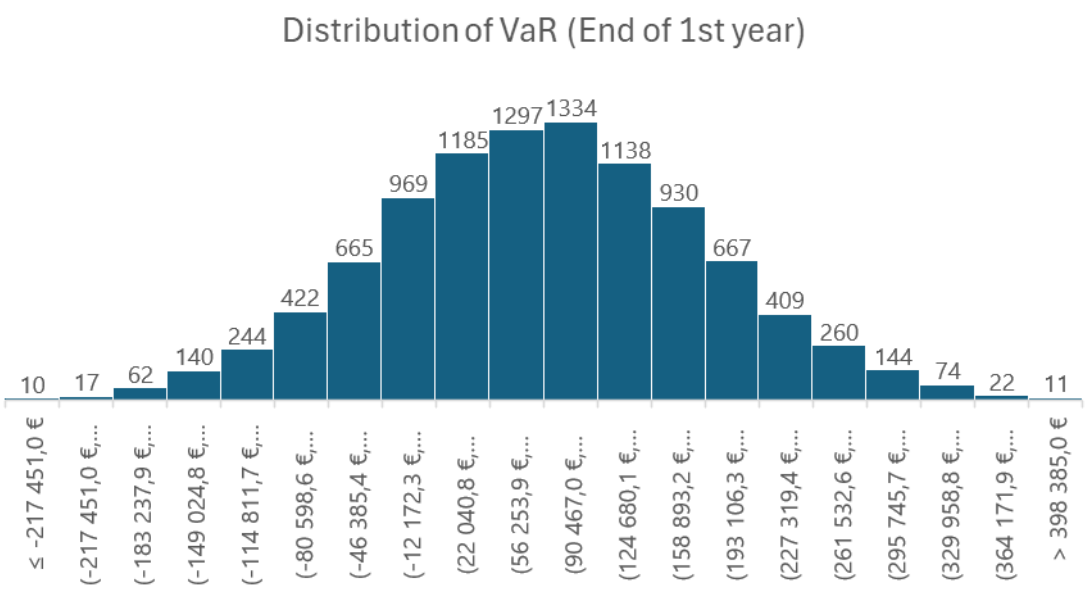
Table 7 – Montecarlo VaR (1st year and 10th year)

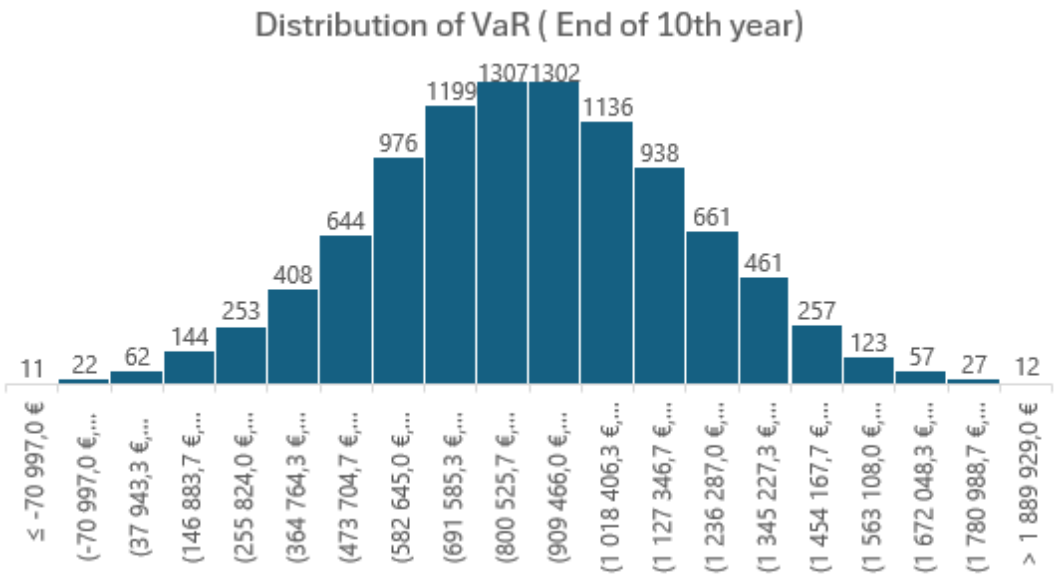
120 months (10 years)	
Percentile	MonteCarlo VaR %
99%	14,43%
98%	23,79%
97%	30,50%
96%	34,16%
95%	37,96%

12 months (1 year)	
Percentile	MonteCarlo VaR %
99%	-14,96%
98%	-11,94%
97%	-10,26%
96%	-9,02%
95%	-7,91%

Source: Author

Figure 6 - Distribution of VaR (End of 1st year and End of 10th year)





Source: Author

To assess the outcomes thoroughly, a two-way analysis computation took place: first, looking at first year VaR (12 months) and then, projecting the final standings after the 10-year (120-month) period. The distribution of VaR, as depicted in Figure 7, presents a skewness towards higher losses after the first year, indicating a greater likelihood of outcomes surpassing the average VaR. The negative kurtosis is represented by thinner tails than those of a standard distribution. In simpler terms, this means that extreme losses, whether exceptionally high or low, are less likely compared to what might be expected in a typical scenario.

This characteristic suggests a more moderate level of risk, with shortfalls tending to cluster around the average, making it less likely to harsh shifts and extreme outcomes over the specified time frame. Over the 120-month period, a slight leftward skewness suggests that there is a greater likelihood of VaR falling below the mean.

3.6.4. Backtesting VaR: Kupiec's Proportion of Failures Test

The effectiveness of a model depends on its validation process, highlighting the essential role of thorough validation in assessing the accuracy of model predictions. Validation involves analyzing historical data to evaluate effectiveness, particularly in the context of VaR estimation. This method compares projected losses with actual losses incurred over a specified time frame. The insights gained from this analysis reveal periods where VaR may have been underestimated or where actual losses exceeded anticipated VaR values. (Hull, 2015).

The Backtesting process will be applied to both the parametric and non-parametric VaR, to give a complete understanding of VaR estimations. The goal is to test the proportion of failures, so the test employed will be the Kupiec's Proportion of Failures (POF) test. For instance, if the level of confidence used is 95% to calculate the monthly VaR, we expect five failures to occur once every 100 months, on average. To perform Kubiec's calculations, several inputs are necessary such as the sample size (number of monthly returns), the confidence interval (5%), portfolio's return and volatility and lastly the variance-covariance value-at-risk. The violations/failures were assessed using the COUNTIF formula from Excel. Kubiec's Chi-Squared formula, also known as likelihood ratio test, goes as follows:

$$\chi^2 = 2\ln\left[\left(\frac{1-\hat{\alpha}}{1-\alpha}\right)^{n-I(\alpha)}\left(\frac{\hat{\alpha}}{\alpha}\right)^{I(\alpha)}\right] \quad (11)$$

$$\hat{\alpha} = \frac{1}{\bar{n}} I(\alpha) \quad (12)$$

$$I(\alpha) = \sum_{t=1}^{n} I_t(\alpha) \quad (13)$$

Table 8 - Kupiec Chi Squared Back Testing

Confidence Interval	VCV VaR	Violations	Kupiec Chi-Squared	P-Value
1.00%	-14.72%	0.98%	0.0040	0.949571
2.00%	-11.93%	1.52%	1.4575	0.227328
3.00%	-10.16%	2.23%	2.5012	0.11376
4.00%	-8.83%	3.03%	2.9705	0.084796
5.00%	-7.74%	4.55%	0.4932	0.482503

Source: Author

The high p-values observed at the 1%, 2%, 3%, and 5% confidence intervals indicate that the VaR model's predicted risks align closely with the actual outcomes, suggesting accurate model performance. These p-values, all well above the 5% threshold, imply that there is no significant deviation between the expected and observed violations at these confidence levels. However, the p-value at the 4.00% confidence interval, though still above the critical threshold, is closer to 0.05 at 0.084796.

This proximity suggests that the model's accuracy at this level is somewhat less robust and may require additional adjustments. In summary, the results from Kupiec's Chi-

Squared test validate the reliability of the VaR model in predicting risk across most confidence levels, ensuring its efficacy for practical application.

3.6.5. Risk Matrix (10-year panorama)

According to the World Economic Forum (2024) and J.P. Morgan (2023), the 10-year outlook reveals several cyclical risks that could affect investors' portfolios. The financial advisor has grouped the identified risks into four categories that could impact the client's portfolio performance, disclosed in Table 8:

- Economic Risks (E): E1 and E2
- Geopolitical Risks (G): G1 and G2
- Environmental Risks (EN): EN1
- Technology and Structural Risks (T): T1 and T2.

Table 9 - Structural Risks (2024-2034)

Risks	Upside or Downside?	Description	Asset Class Impact
Fiscal Largesse and Debt Sustainability Concerns (E1)	Downside	Increased fiscal spending and an aging population raise debt sustainability concerns	Potential for higher interest rates, negatively impacting bonds and stocks. Currency devaluation may occur if concerns are region-specific
Worsening Climate or Environmental Situation (EN1)	Downside	More extreme weather events disrupt supply chains and damage assets	Higher inflation benefits commodities and real assets; bonds and stocks could suffer from increased economic instability
Russia-Ukraine War Accelerates or Expands (G1)	Downside	Conflict escalation affects NATO members or leads to cyberattacks	Supply chain disruptions and sanctions would boost bonds and the USD, while negatively impacting stocks and supporting commodity prices
Trade Tensions Between U.S. and China Reignited (G2)	Downside	Renewed tariffs and sanctions between the U.S. and China	Global growth slows, inflation rises, commodity prices remain high, and industrial sectors face pressure. ASEAN and India could benefit
Debt Default by U.S. (E2)	Downside	U.S. debt ceiling issues lead to default	Negative for risk assets, positive for non-U.S. bonds, gold, CHF, and JPY
European Energy Independence Through Renewables Investment (T1)	Upside	Increased investment in renewable energy in Europe	Reduced energy uncertainty, boosted productivity, and infrastructure improvements positively impact the euro and EU equities
Accelerated Adoption of Artificial Intelligence (T2)	Upside	AI adoption improves productivity and mitigates labor shortages	Enhanced GDP growth, limited inflation, and support for developed market stocks, credit, and risk assets

Source: Based on World Economic Forum (2024) and J.P. Morgan (2023).

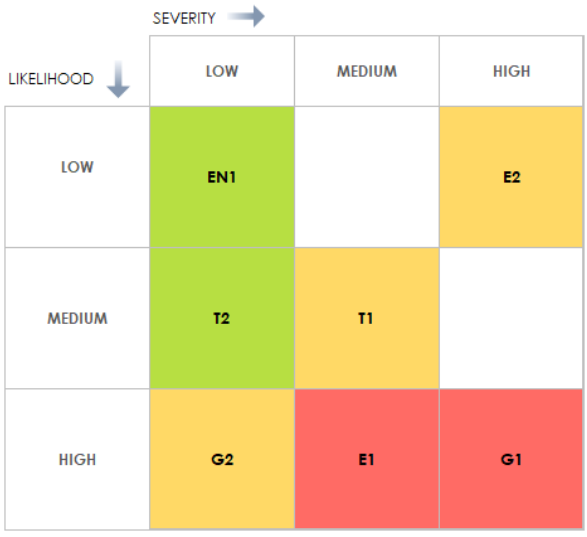
In Figure 7, a risk matrix was created to evaluate and prioritize potential risks. It illustrates the probability and impact of each risk, categorizing them as “Low”, “Medium” or “High” based on their likelihood and potential consequences. The likelihood and severity of the risks were evaluated using BlackRock’s Geopolitical Risk Dashboard (BlackRock, 2024). Detailed probabilities of likelihood and severity are provided below:

- *E1 (Likelihood: High | Severity: Medium):* Rising government expenditure and growing elderly populations are frequent challenges in numerous countries, leading to a high probability of concerns regarding debt sustainability. Nevertheless, diversification helps reduce the impact on a moderately risk-tolerant portfolio made up of ETFs from Europe and the US. Hence, even though there is a possibility of increased interest rates and devaluation of currency, the overall impact is moderate because of the diversified nature of the portfolio.
- *EN1 (Likelihood: Low | Severity: Low):* The occurrence of more extreme weather events is a low likelihood risk with minimal impact within the investment horizon. Since the client's ETFs do not focus on ESG or environmental factors, these disruptions are unlikely to significantly affect returns, resulting in low severity.
- *G1 (Likelihood: Medium | Severity: High):* The current conflict has a strong chance of intensifying, possibly impacting NATO nations or resulting in cyber assaults. These advancements have the potential to result in significant disruptions to supply chains and escalations in sanctions, leading to adverse effects on global markets. In an ETF-centered portfolio, there is a high level of severity resulting from possible widespread economic and market volatility.
- *G2 (Likelihood: High | Severity: Low):* Renewed tariffs and sanctions between the US and China are likely due to ongoing geopolitical frictions. While this can slow global growth and raise inflation, the direct impact on a diversified ETF portfolio is relatively low. The portfolio’s exposure to various sectors and regions can cushion the blow, resulting in low severity.

- *E2 (Likelihood: Low | Severity: High):* Although the likelihood of the US defaulting on its debt is low due to historical precedence and efforts to avoid such a scenario, the severity of this event would be extremely high. A default would significantly disrupt global financial markets, impacting risk assets and causing major economic instability. This would severely affect any portfolio, including one with ETFs from both Europe and the US.
- *T1 (Likelihood: Medium | Severity: Medium):* There is a medium likelihood of increased investment in renewable energy in Europe due to policy shifts and technological advancements. This transition can reduce energy uncertainty and boost productivity, positively impacting the euro and EU equities. For a moderately risk-tolerant ETF portfolio, the benefits are balanced, making the overall severity medium.
- *T2 (Likelihood: Medium | Severity: Low):* The medium likelihood of accelerated AI adoption can significantly improve productivity and mitigate labor shortages. This technological advancement supports developed market stocks, credit, and risk assets. For a portfolio consisting of ETFs, the severity is low as the positive impacts of AI adoption are likely to be gradual and manageable within the investment horizon.

The risk matrix is contextualized for the client, where what may pose a significant downside risk for one individual could represent a favorable outcome for another.

Figure 7 – Risk Matrix



Source: Author

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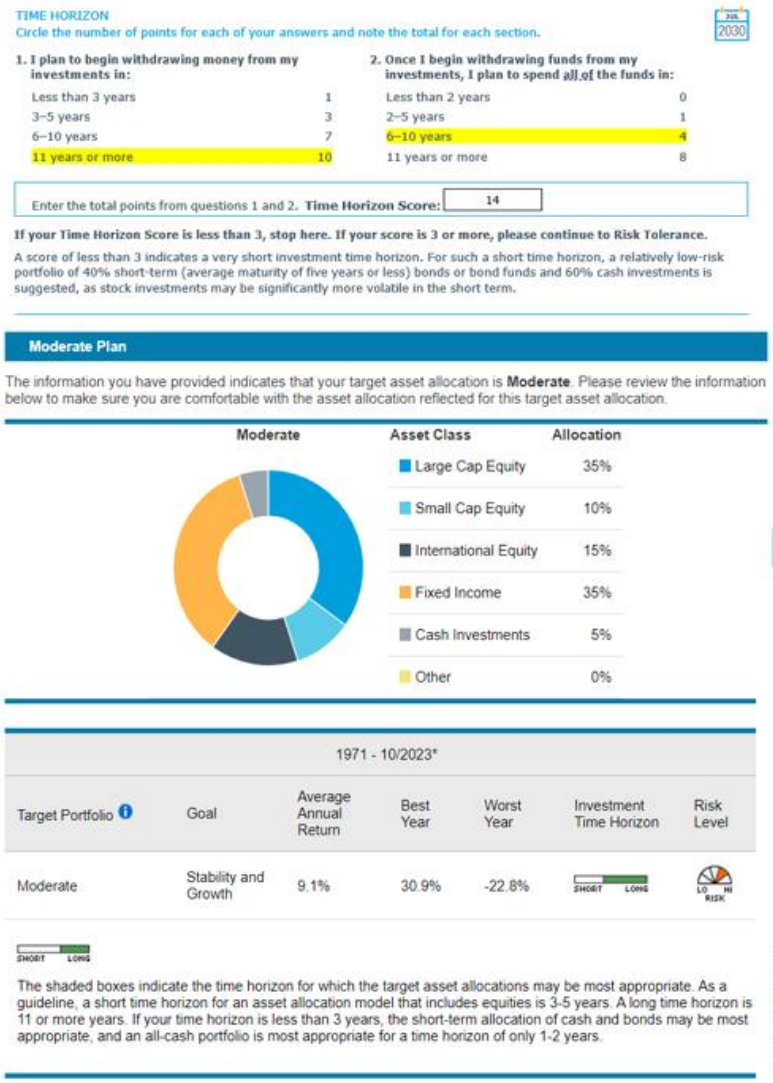
Appendices

Appendice 1. Client's Profile (detailed)

Name	Karen Smith
Age	45 years old
Children	2 eight-year-old boys
Work	Economics College Professor
Net Annual Wage	40,000.00€
Additional Information	1.Limited knowledge of financial markets 2.High understanding of macroeconomic implications 3.Conservative and career-dedicated lifestyle
Investment Constraints	1. ETF investing with value-oriented approach 2. No liquidity requirements during the holding period 3. No leverage or short selling allowed 4. Portfolio currency in euros (€)
Ability to Bear Risks / Willingness to Take on Risk	High / Low
Risk Profile	Moderate (Investor Profile in Appendix 2)
Capital to Invest	1,000,000.00€ (Professional Grant)
Investment Objective	1,526,000.00€ in 10 years, factoring in inflation (2%)
Time Horizon	10 years (120 months)
Minimum Rate of Return	4.32%
Expected Average Annual Return (Portfolio)	9.101%
Standard Deviation (Portfolio)	10.240%

Source: Author

Appendice 2. Profiling Questionnaire (Karen Smith)



TIME HORIZON

Circle the number of points for each of your answers and note the total for each section.

1. I plan to begin withdrawing money from my investments in:		2. Once I begin withdrawing funds from my investments, I plan to spend all of the funds in:	
Less than 3 years	1	Less than 2 years	0
3–5 years	3	2–5 years	1
6–10 years	7	6–10 years	4
11 years or more	10	11 years or more	8

Enter the total points from questions 1 and 2. **Time Horizon Score:** 14

If your Time Horizon Score is less than 3, stop here. If your score is 3 or more, please continue to Risk Tolerance.

A score of less than 3 indicates a very short investment time horizon. For such a short time horizon, a relatively low-risk portfolio of 40% short-term (average maturity of five years or less) bonds or bond funds and 60% cash investments is suggested, as stock investments may be significantly more volatile in the short term.

Moderate Plan

The information you have provided indicates that your target asset allocation is **Moderate**. Please review the information below to make sure you are comfortable with the asset allocation reflected for this target asset allocation.

Moderate	Asset Class	Allocation
	Large Cap Equity	35%
	Small Cap Equity	10%
	International Equity	15%
	Fixed Income	35%
	Cash Investments	5%
	Other	0%

1971 - 10/2023*

Target Portfolio	Goal	Average Annual Return	Best Year	Worst Year	Investment Time Horizon	Risk Level
Moderate	Stability and Growth	9.1%	30.9%	-22.8%	SHORT LONG	LO HI RISK

SHORT LONG

The shaded boxes indicate the time horizon for which the target asset allocations may be most appropriate. As a guideline, a short time horizon for an asset allocation model that includes equities is 3-5 years. A long time horizon is 11 or more years. If your time horizon is less than 3 years, the short-term allocation of cash and bonds may be most appropriate, and an all-cash portfolio is most appropriate for a time horizon of only 1-2 years.

RISK TOLERANCE

3. I would describe my knowledge of investments as:

None	1
Limited	3
Good	7
Extensive	10

4. What amount of financial risk are you willing to take when you invest?

Take lower than average risks expecting to earn lower than average returns	0
Take average risks expecting to earn average returns	4
Take above average risks expecting to earn above average returns	8

5. Select the investments you currently own or have owned:

Bonds and/or bond funds	3
Stocks and/or stock funds	6
International securities and/ or international funds	8

Example: You now own stock funds. In the past, you've purchased international securities. Your point score would be 8.

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?

Sell all of my shares	0
Sell some of my shares	2
Do nothing	5
Buy more shares	8

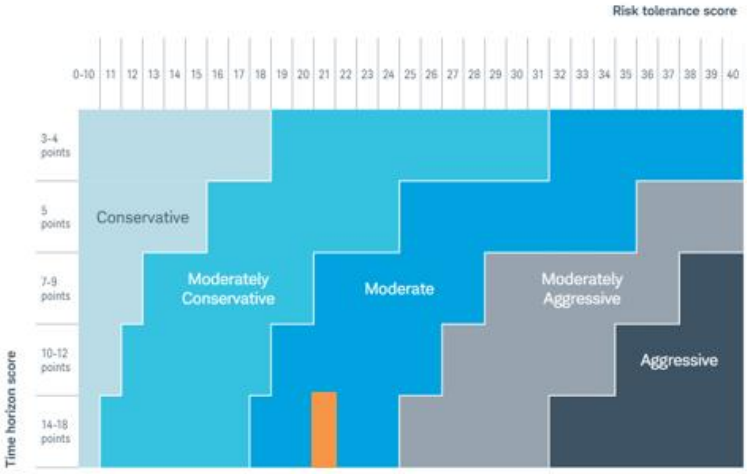
7. Review the chart below.

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?

The figures are hypothetical and do not represent the performance of any particular investment.

Plan	Average annual return	Best-case	Worst-case	Points
A	7.1%	22.8%	-9.5%	0
B	8.3%	27.0%	-13.3%	3
C	9.2%	30.9%	-20.9%	6
D	9.8%	34.4%	-29.5%	8
E	10.1%	39.9%	-36.0%	10

Enter the total points from questions 3 through 7. **Risk Tolerance Score:** 21



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

Appendice 3. ETFs Selection Screens

ETFs	Fund Size	Index	Distribution Policy	Investment Focus	Replication Method
iShares Edge MSCI Europe Value Factor UCITS ETF	€1481 M	MSCI Europe Enhanced Value	Accumulating	Equity, Europe, Value	Physical (Optimized sampling)
iShares Edge MSCI USA Value Factor UCITS ETF	$1,808 M	MSCI USA Enhanced Value	Accumulating	Equity, United States, Value	Full replication
iShares Edge MSCI World Value Factor UCITS ETF	$3,496 M	MSCI World Enhanced Value	Accumulating	Equity, World, Value	Physical (Optimized sampling)
iShares S&P 500 Energy Sector UCITS ETF (Acc)	$971 M	S&P 500 Capped 35/20 Energy	Accumulating	Equity, United States, Energy	Physical (Full replication)
iShares S&P 500 Financials Sector UCITS ETF (Acc)	$1,065 M	S&P 500 Capped 35/20 Financials	Accumulating	Equity, United States, Financials	Physical (Full replication)
iShares S&P 500 Information Technology Sector UCITS ETF USD (Acc)	$6,919 M	S&P 500 Capped 35/20 Information Technology	Accumulating	Equity, United States, Technology	Physical (Full replication)
Xtrackers MSCI World Value Factor UCITS ETF 1C	$1,612 M	MSCI World Enhanced Value	Accumulating	Equity, World, Value	Physical (Optimized sampling)
iShares S&P 500 Industrials Sector UCITS ETF	$272 M	S&P 500 Capped 35/20 Industrials	Accumulating	Equity, United States, Industrials	Physical (Full replication)
WisdomTree Artificial Intelligence UCITS ETF USD Acc	$811 M	Nasdaq CTA Artificial Intelligence	Accumulating	Equity, USD, World, Technology, Social/Environmental	Physical (Full replication)
iShares S&P 500 Health Care Sector UCITS ETF (Acc)	$2,036 M	S&P 500 Capped 35/20 Health Care	Accumulating	Equity, United States, Health Care	Physical (Full replication)
iShares S&P 500 Utilities Sector UCITS ETF USD (Acc)	$258 M	S&P 500 Capped 35/20 Utilities	Accumulating	Equity, United States, Utilities	Physical (Full replication)
Amundi MSCI Robotics & AI ESG Screened UCITS ETF Acc	€959 M	MSCI ACWI IMI Robotics & AI ESG Filtered	Accumulating	Equity, World, Technology, Social/Environmental	Physical (Full replication)
Amundi Euro Government Bond 5-7Y UCITS ETF Acc	€431 M	Bloomberg Euro Treasury 50bn 5-7 Year Bond	Accumulating	Bonds, EUR, Europe, Government, 5-7	Physical (Full replication)
Amundi Euro Government Bond 7-10Y UCITS ETF Acc	€1,377 M	Bloomberg Euro Treasury 50bn 7-10 Year Bond	Accumulating	Bonds, EUR, Europe, Government, 7-10	Physical (Full replication)
JPMorgan EUR Corporate Bond 1-5 yr Research Enhanced Index (ESG) UCITS ETF	€138 M	JP Morgan EUR Corporate Bond 1-5 Research Enhanced Index (ESG)	Accumulating	Bonds, EUR, World, Corporate, 3-5, Social/Environmental	Physical (Sampling)
EUWAX Gold II	€1,238 M	Gold	Accumulating	Precious Metals, Gold	Physical (Physically backed)
WisdomTree Agriculture	$208 M	Bloomberg Agriculture	Accumulating	Commodities, Agriculture	Synthetic (Swap-based)
Xtrackers Bloomberg Commodity ex-Agriculture & Livestock Swap UCITS ETF 2C	$152 M	Bloomberg ex-Agriculture and Livestock 15/30 Capped 3 Month Forward	Accumulating	Commodities, Broad market	Synthetic (Unfunded swap)
Amundi Index FTSE EPRA NAREIT Global UCITS ETF DR	€213 M	FTSE EPRA/NAREIT Developed	Accumulating	Real Estate, EUR, World	Physical (Full replication)

Source: Author

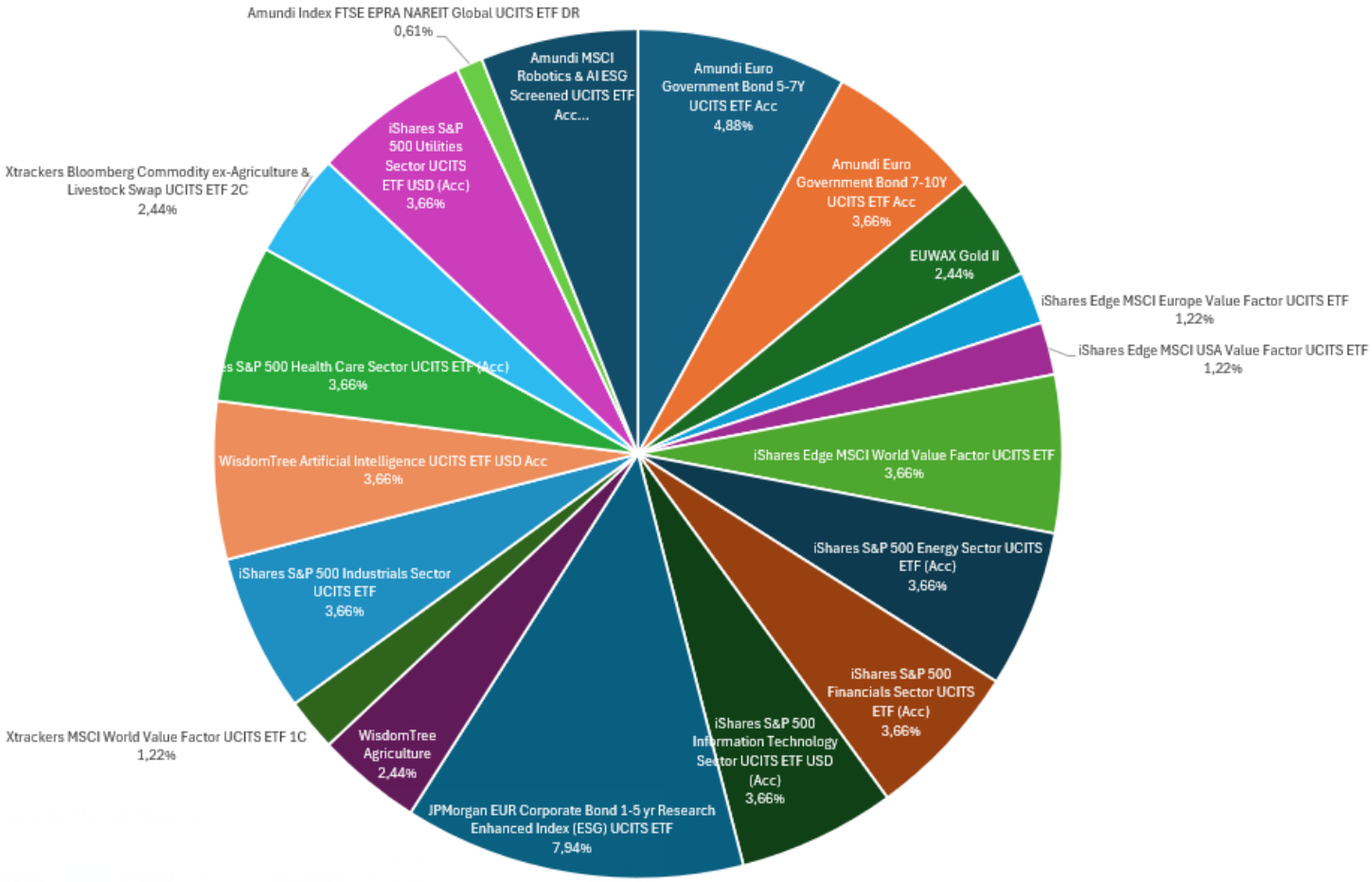
Appendice 4. ETFs Detailed Information (Data as of March 31st)

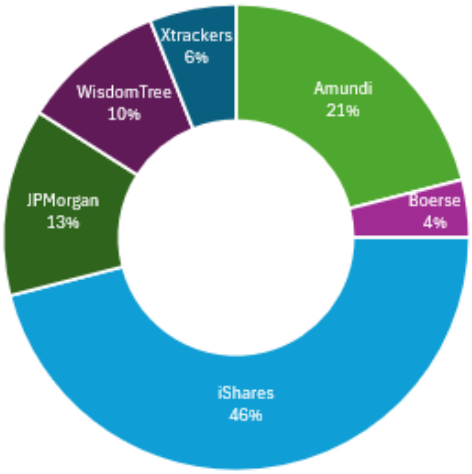
ETFs	ISIN	Holdings	TER	Provider
iShares Edge MSCI Europe Value Factor UCITS ETF	IE00BQN1K901	Top 5 sectors: Financials (18.8%), Industrials (15.56%), Healthcare (14.38%), Consumer Discretionary (10.76%) and Consumer Staples (10.66%). 151 holdings. Top 3 countries: UK (24.32%), Germany (21.47%), France (18.54%).	0.25%	iShares
iShares Edge MSCI USA Value Factor UCITS ETF	IE00BD1F4M44	Top 4 sectors: Tecnhology (28.02%), Financials (13.39%), Consumer Discretionary (12.16%) and Healthcare (11.26%). Top 3 Holdings (out of 150): AT&T, Inc. (4.86%), Cisco Systems, Inc. (4.80%), Intel Corp. (4.68%)	0.20%	iShares
iShares Edge MSCI World Value Factor UCITS ETF	IE00BP3QZB59	Top 3 sectors: Technology (22.04%), Financials (15.8%), Industrials (11.65%). 396 holdings. Top 3 countries: US (36.28%), Japan (24.80%), UK (9.61%).	0.30%	iShares
iShares S&P 500 Energy Sector UCITS ETF (Acc)	IE00B42NKQ00	Top 3 Holdings: Exxon Mobil (27.11%), Chevron (16.15%), ConocoPhilips (8.54%). Sector: Energy (99.71%)	0.15%	iShares
iShares S&P 500 Financials Sector UCITS ETF (Acc)	IE00B4JNQZ49	Top 2 sectors: Financials (80.54%) and Technology (18.79%). 71 holdings. Top 3 Holdings: Berkshire Hathaway, Inc. (12.97%), JPMorgan Chase & Co. (9.96%), Visa, Inc. (7.64%).	0.15%	iShares
iShares S&P 500 Information Technology Sector UCITS ETF USD (Acc)	IE00B3WJKG14	Top 3 Holdings: Microsoft Corp. (23.44%), Apple (19.78%), NVIDIA Corp. (17.37%). 66 Holdings.	0.15%	iShares
Xtrackers MSCI World Value Factor UCITS ETF 1C	IE00BL25JM42	Top 3 Countries: US (36.97%), Japan (24.29%), UK (9.65%). 394 holdings. Top 3 Sectors: Technology (22.34%), Financials (15.92%), Consumer Discretionary (11.64%). Holdings: Cisco, Intel, Toyota, AT&T, Verizon, Shell, HSBC.	0.25%	Xtrackers
iShares S&P 500 Industrials Sector UCITS ETF	IE00B4LN9N13	Top Sector: Industrials (92.61%). 80 Holdings, including: GE Aerospace, Caterpillar, Uber Technologies, Union Pacific.	0.15%	iShares
WisdomTree Artificial Intelligence UCITS ETF USD Acc	IE00BDVPNG13	Top Sector: Technology (84.11%). Top 3 Holdins (out of 71): Micron Technology (2.91%), Microchip Technology (2.55%), NVIDIA Corp. (2.54%). Top Countries besides US: Taiwan, Japan, South Korea.	0.40%	WisdomTree

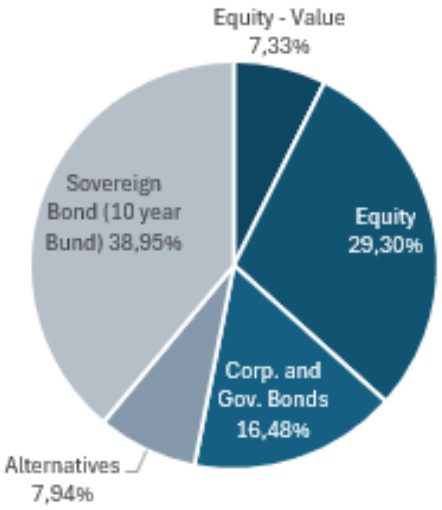
iShares S&P 500 Health Care Sector UCITS ETF (Acc)	IE00B43HR379	Top 3 Holdings (out of 65): Eli Lilly & Co. (11.98%), UnitedHealth Group (8.61%), Johnson & Johnson (6.69%). Healthcare Sector (98.71%).	0.15%	iShares
iShares S&P 500 Utilities Sector UCITS ETF USD (Acc)	IE00B4KBBD01	30 holdings, of which the 10 highest holdings represent 60.08%. Utilities Sector, US.	0.15%	iShares
Amundi MSCI Robotics & AI ESG Screened UCITS ETF Acc	LU1861132840	Top 3 Sectors: Technology (67.42%), Healthcare (13.43%), Industrials (10.03%). Top Holdings: NVIDIA Corp., Alphabet Inc, Microsoft Corp, Oracle Corp.	0.40%	Amundi
Amundi Euro Government Bond 5-7Y UCITS ETF Acc	LU1287023003	Top 4 countries: France (24.98%), Germany (15.21%), Italy (15.01%), Spain (13.77%). Rating: Investment Grade.	0.17%	Amundi
Amundi Euro Government Bond 7-10Y UCITS ETF Acc	LU1287023185	Top 4 countries: France (17.45%), Germany (13.71%), Italy (19.54%), Spain (12.31%). Time to maturity: 7-10 years. Rating: Investment Grade.	0.17%	Amundi
JPMorgan EUR Corporate Bond 1-5 yr Research Enhanced Index (ESG) UCITS ETF	IE00BF59RW70	Top 3 countries: US (21.05%), France (11.49%), UK (10.14%). The securities included are filtered according to ESG criteria (environmental, social and corporate governance). Time to maturity: 1-5 years.	0.04%	JPMorgan
EUWAX Gold II	DE000EWG2LD7	The ETC replicates the performance of the underlying index with a collateralised debt obligation which is backed by physical holdings of the precious metal.	0.00%	Boerse Stuttgart Commodities
WisdomTree Agriculture	GB00B15KYH63	he Bloomberg Agriculture index tracks the price of futures contracts on corn, coffee, cotton, wheat, sugar, soybeans, soybean meal and soybean oil.	0.49%	WisdomTree
Xtrackers Bloomberg Commodity ex-Agriculture & Livestock Swap UCITS ETF 2C	LU0460391732	The Bloomberg ex-Agriculture and& Livestock 15/30 Capped 3 Month Forward index tracks an investment in a diversified portfolio of commodity futures contracts across the following sectors: Energy, Precious Metals, and Industrial Metals.	0.29%	Xtrackers
Amundi Index FTSE EPRA NAREIT Global UCITS ETF DR	LU1437018838	Top 2 Countries: US (60.88%) and Japan (10.40%). 357 holdings. Tracks the largest real estate companies of the worlds developed equity markets.	0.24%	Amundi

Source: Author

Appendice 5. Portfolio Composition







Source: Author

Focus	ETF	ISIN	Provider	Weights
Corp. and Gov. Bonds	Amundi Euro Government Bond 5-7Y UCITS ETF Acc	LU1287023003	Amundi	4,88%
Corp. and Gov. Bonds	Amundi Euro Government Bond 7-10Y UCITS ETF Acc	LU1287023185	Amuni	3,66%
Precious Metals	EUWAX Gold II	DE000EWG2LD7	Euwax	2,44%
Value EU	iShares Edge MSCI Europe Value Factor UCITS ETF	IE00BQN1K901	iShares	1,22%
Value US	iShares Edge MSCI USA Value Factor UCITS ETF	IE00BD1F4M44	iShares	1,22%
Value World	iShares Edge MSCI World Value Factor UCITS ETF	IE00BP3QZB59	iShares	3,66%
Energy	iShares S&P 500 Energy Sector UCITS ETF (Acc)	IE00B42NKQ00	iShares	3,66%
Financials	iShares S&P 500 Financials Sector UCITS ETF (Acc)	IE00B4JNQZ49	iShares	3,66%
Information (Technology)	iShares S&P 500 Information Technology Sector UCITS ETF USD (Acc)	IE00B3WJKG14	iShares	3,66%
Corp. and Gov. Bonds	JPMorgan EUR Corporate Bond 1-5 yr Research Enhanced Index (ESG) UCITS ETF	IE00BF59RW70	JPMorgan	7,94%
Agricultural	WisdomTree Agriculture	GB00B15KYH63	WisdomTree	2,44%
Value World	Xtrackers MSCI World Value Factor UCITS ETF 1C	IE00BL25JM42	Xtrackers	1,22%
Industrials	iShares S&P 500 Industrials Sector UCITS ETF	IE00B4LN9N13	iShares	3,66%
AI (Technology)	WisdomTree Artificial Intelligence UCITS ETF USD Acc	IE00BDVPNG13	WisdomTree	3,66%
Healthcare	iShares S&P 500 Health Care Sector UCITS ETF (Acc)	IE00B43HR379	iShares	3,66%
Energy, Precious Metals, and Industrial Metals	Xtrackers Bloomberg Commodity ex-Agriculture & Livestock Swap UCITS ETF 2C	LU0460391732	Xtrackers	2,44%
Utilities	iShares S&P 500 Utilities Sector UCITS ETF USD (Acc)	IE00B4KBBD01	iShares	3,66%

REITs	Amundi Index FTSE EPRA NAREIT Global UCITS ETF DR	LU1437018838	Amundi	0,61%
Robotics & Automation (Technology)	Amundi MSCI Robotics & AI ESG Screened UCITS ETF Acc	LU1861132840	Amundi	3,66%

Appendice 6. Risky Portfolio Weights (Asset Allocation)

Source: Author

Disclosures

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

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

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David Santos, 30/06/2024