



Lisbon School
of Economics
& Management
Universidade de Lisboa

MASTER OF SCIENCE IN FINANCE

MASTERS FINAL WORK PROJECT

INVESTMENT POLICY STATEMENT: AN ETF-BASED APPROACH

JOÃO DUARTE

JUNE 2023



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Abstract

The Investment Policy Statement (IPS) serves as a communication tool between the advisor and client. The advisor's responsibilities include IPS establishment, progress reports, asset allocation, risk management, and compliance with CFA rules.

The client has a moderately conservative risk tolerance, aiming to preserve capital for their child with limited risk-taking. No leverage, short selling, or investments in non-regulated assets like cryptocurrencies are permitted. No specific liquidity needs exist, but a 5.00% annual loss probability must be minimized.

The investment goal is to grow the initial capital of €500,000 to €750,000 in a 10-year horizon, adjusted for inflation to €960,063.41, requiring a minimum annualized return of 6.74%.

The investment philosophy is centered around Exchange Traded Funds (ETFs) and a preference for value over growth investing, utilizing market timing techniques such as Earnings Yield (EY), Shiller Price to Earnings ratio, the FED Model, and Yield Spread. Various security selection rules were also adopted.

The portfolio's expected return and volatility were computed using Mean-Variance Theory (MVT) to maximize Sharpe Ratio, resulting in an average annualized return of 7.02% and an average annualized volatility of 3.25%.

A risk analysis was performed, employing Value-at-Risk (VaR) and Expected Shortfall to assess potential 10-year horizon risks. A risk matrix was also created.

JEL classification:C6; G11.

Keywords: Asset Management; Portfolio Theory; IPS; CFA; Risk Tolerance; Investment Philosophy; ETF; Value Investing; Earnings Yield; Price to Earnings; Security Selection; MVT; Sharpe Ratio; Risk Analysis; Value at Risk; Risk Matrix

Resumo

Este *IPS* foi criado como uma ferramenta de comunicação entre o consultor de investimentos e o cliente. O consultor tem diversas responsabilidades, como o estabelecimento e manutenção da *IPS*, relatórios de progresso, proposta de solução, recomendação de alocação de ativos, gestão de risco e adesão às regras do *CFA*.

O cliente possui uma tolerância moderadamente conservadora ao risco, com o objetivo de preservar o capital para o seu filho, assumindo uma pequena exposição a risco. Não é permitido o uso de alavancagem nem a venda a descoberto, bem como o investimento em ativos não regulamentados. O cliente não tem necessidades de liquidez, no entanto é necessário mitigar uma probabilidade de perda anual de 5,00%.

O objetivo de investimento é fazer crescer o capital inicial de 500.000,00€ para 750.000,00€ em um horizonte de 10 anos. Ajustado à inflação, essa meta ascenderá a 960.063,41€ ao final do período, exigindo uma taxa de retorno anualizada mínima de 6,74%.

A filosofia de investimento baseia-se em investir em *ETFs*, com preferência pelo investimento em valor em vez de crescimento, e outras técnicas de *timing* de mercado, como o *Earnings Yield (EY)*, *Price to Earnings* de *Shiller*, o Modelo FED e a *Yield Spread*. Também foram adotadas diversas regras de seleção de títulos financeiros.

Para calcular o retorno esperado e a volatilidade da carteira, o consultor utilizou a *MVT*, buscando maximizar o Índice de *Sharpe*. A carteira ótima proposta obteve um retorno médio anualizado de 7,02% e uma volatilidade média anualizada de 3,25%.

Por fim, foi realizada uma análise de risco executando vários tipos de *VaR* e *Expected Shortfall*, bem como uma matriz de risco.

Classificação JEL: C6; G11.

Palavras-Chave: Gestão de Ativos; Teoria da Carteira; *IPS*; *CFA*; Tolerância ao Risco; Filosofia de Investimento; *ETF*; Investimento em Valor; *Earnings Yield*; *Price to Earnings*; Seleção de Instrumentos; *MVT*; Índice de *Sharpe*; Análise de Risco; *Value at Risk*; Matriz de Risco

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I would like to express my deepest gratitude to the people who supported me during the months of writing this MFW. It was a time of uncertainty and stress, but it also proved to be a period of personal resilience, dedication, and hard work. I am confident that I exceeded my limits, which fills me with sincere pride and satisfaction.

To my father and mother, thank you for all the support and confidence you have shown me over the years, providing me with the conditions and love needed for my success.

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1 Executive Summary

1.1 Scope and Purpose

The financial advisor uses the IPS as a communication tool with the client. The advisor's responsibilities include updating the IPS with input from tax and legal advisors, reports any updates or violations to the clients, and obtains their final approval for the IPS and revisions. Acting as a fiduciary, the advisor provides unbiased advice, discloses conflicts of interest, and follows the CFA rules.

1.2 Governance

To achieve optimal results, clear responsibilities are outlined in the IPS. The advisor establishes and maintains the IPS, reports progress, and proposes solutions, while the clients review the IPS regularly. Asset allocation decisions are recommended by the advisor, subject to client approval. Risk management and monitoring are handled by the advisor.

1.3 Investment Return and Risk

The IPS aims to achieve a minimum investment return goal of 6.74% over the 10-year period, utilizing ETFs for asset allocation. The risk tolerance is moderately conservative, with a 5% maximum loss limit. Markowitz's Mean-Variance Theory was employed, and the proposed portfolio was derived by maximizing the Sharpe ratio while adhering to predefined constraints. The proposed portfolio is expected to deliver an annual return of 7.02% with a volatility of 3.25% and a Sharpe Ratio of 1.43.

1.4 Risk Management

The advisor will provide performance measurement and reporting, adhering to CFA's GIPS. Regular reports will be given to the clients, including risk evaluations like VaR and necessary corrections. Quarterly updates on risk metrics will be shared. The advisor will propose portfolio rebalancing annually, awaiting client approval.

2 Investment Policy Statement

2.1 Scope and Purpose

2.1.1 Context and Investor

This agreement, known as an IPS, serves as a clear communication tool between João Duarte and Mr. and Mrs. Lopes da Silva, regarding their investment plan. The clients participating in this agreement and receiving financial advice are Mr. Lopes da Silva, who holds a master's degree in finance and is currently employed as a financial analyst at a Portuguese multinational company, and Mrs. Lopes da Silva, who holds a bachelor's degree in nursing and is currently working as a nurse.

They are both in their early thirties, married, with stable professional status, and residing in Lisbon, Portugal. They are parents to an eight-year-old boy, who is the intended primary beneficiary of this investment, to cover future expenses related to housing, car, and education.

The funds to be invested originate from an inheritance received by Mr. Lopes da Silva from his late grandparents, amounting to 500,000.00€ (five hundred thousand euros).

2.1.2 Structure

As the financial advisor of Mr. and Mrs. Lopes da Silva, João Duarte is responsible for overseeing the updating of the IPS. This involves obtaining input from the tax and legal advisers of Mr. and Mrs. Lopes da Silva. Additionally, the advisor will monitor adherence to the IPS and promptly notify Mr. and Mrs. Lopes da Silva of any updates or violations. The final responsibility for approving the IPS and any revisions lies with the client.

The advisor plays a fiduciary role as all advice and decisions are taken in the best interest of its clients. He must provide unbiased advice, disclose conflicts of interest and must be transparent in terms of reporting. The firm follows the CFA Institute Asset Manager Code of Professional Conduct.

As the designated investment advisor for Mr. and Mrs. Lopes da Silva, the advisor is responsible for assessing and monitoring investment-related risks. Mr. and Mrs. Lopes

da Silva are required to provide regular reports to the advisor based on the agreed-upon reporting format.

The advisor will prepare a quarterly financial report for Mr. and Mrs. Lopes da Silva, serving as the official record of the investment policy and forming the basis for the advisor's risk review.

2.2 Governance

To achieve the optimal outcome for the client with this IPS, the advisor must clearly outline their responsibilities and duties as a financial advisor, as well as the client's responsibilities, to maximize efficiency.

The financial advisor is responsible for establishing, implementing, and maintaining the IPS. He must also report the investment progress to the client and propose and discuss options to reverse any divergences. There will be a quarterly evaluation of the IPS's performance and recommendation of changes if necessary. The clients review the IPS regularly to determine if it aligns with their wishes.

The clients grant unique authority to the advisor to appoint and terminate individuals and/or entities to manage their investment assets.

Regarding asset allocation, the advisor recommends the best financial assets and their allocations to meet the objectives. An annual rebalance of the asset allocation will be conducted, with any necessary changes proposed for the client's final approval. The advisor discloses proportions of investment in each asset class, expected returns, correlations of returns, anticipated changes in inflation rate, marginal tax rate, and selected benchmarks for return/risk comparison. ETFs are the main asset class to be invested in, and the proportion of all sub-classes (equities, fixed income, commodities, and any other alternative investment) must be disclosed.

The advisor is responsible for continuously evaluating and monitoring investment-related risks. They provide a quarterly financial report, serving as the official record of the investment policy and the basis for risk evaluations. The advisor identifies risk position variances and reassesses the clients' risk classification/profile to correct any excess of tolerable limits.

2.3 Investment, Return and Risk Objectives

2.3.1 Investment Objective

The investment goal of the IPS is to generate sufficient income within a 10-year horizon (by 2033) to cover various expenses and secure the future of the clients' child. The objectives are as follows: 750,000.00€ in total, comprising 50,000.00€ for a car, 50,000.00€ for full educational expenses up until university, 500,000.00€ for a house, and an additional 150,000.00€ to be available for their children.

2.3.2 Return, Distribution and Risk Requirements

In terms of overall investment performance, to achieve the target in 2033, a required annual real rate of return of 6.74% is necessary. According to Banco de Portugal (2023), the Harmonised Index of Consumer Prices (HICP) in Portugal is forecasted to decrease to 2.10% by 2025. Therefore, the advisor will assume a conservative inflation forecast of 2.50% for the period.

Considering an average forecasted inflation rate of 2.50% for the next 10 years in Portugal, the target of 750,000.00€ will rise to 960,063.41€. Therefore, if the amount invested is capitalized at this rate for 10 years, it would meet the target. The advisor may seek to maximize the Sharpe ratio, a measure of risk-adjusted return, to optimize the investment strategy.

2.3.3 Portfolio Policy

The asset allocation plan is detailed in Appendix 6 and will undergo periodic reviews through discussions between both advisors and clients. For each asset class, an optimized allocation will be established based on the advisor's model (MVT). Additionally, a maximum and minimum range will be set, allowing for variations in the allocations of each asset class.

The advisor must adhere to the asset allocation plan without surpassing the predetermined ranges for the actual allocation of assets. At the end of every quarter, the investment manager must submit a report to the client, including information on the current asset allocations and confirming that the allocations made during the quarter were within the approved limits.

2.3.4 Investor's Risk Tolerance

The IPS should outline the investor's perspective on risk, recognizing that the portfolio may encounter various risks such as liquidity, legal, political, regulatory, longevity, mortality, business, and health risks, leading to fluctuating returns over time. It should also establish acceptable levels of risk and factor in any known liabilities.

In terms of ability to bear risks, since the client has a long investment horizon, it will provide more scope to recover from potential losses. The client also has no liquidity needs and does not need the invested capital for the investment horizon, as both clients have a stable professional life and good wealth (assets over liabilities) and are expected to continue to earn salary for the next 30 years, while having a relatively conservative lifestyle. However, in terms of willingness to take on risk, since the origin of the money was an inheritance, they wish the preservation capital over being subjected to high risk. The client is aware of the financial markets' volatility as of his academic background and there are also several investment constraints that indicate a lower willingness to take on risks, as can be seen in both chapter 2.3.5. and in the Appendix 1.

As supported by the Charles Schwab's risk tolerance questionnaire provided in Appendix 2, the client's risk tolerance is moderately conservative, very close to moderate on the risk spectrum. The client prioritizes stability and capital preservation, seeking modest return potential with lower volatility than the overall equity market.

The moderately conservative allocation has an average annual return of 8.3%, with 50% invested in fixed income, while the moderate allocation has an average annual return of 9.0% with 35% invested in risk-free assets. The proposed portfolio, detailed in Appendices 4 and 5, has an average annual return of 7.02% with 40.57% invested in risk-free assets.

In summary, the clients can be labeled as moderately conservative risk tolerance investors with a high ability to bear risk and a low willingness to take on risk. However, a 5.00%-year loss would be unacceptable, prompting immediate measures to minimize risk and prevent further losses.

2.3.5 Relevant Constraints

The advisor must provide the clients with a quarterly report, including a performance summary of each asset class.

Given the clients' financial stability from their careers and existing savings not currently invested, there are relatively few restrictions on the liquidity of the investment assets, provided they can be converted into cash within the investment's time horizon. In certain market circumstances, assets may need to be converted to liquidity until rebalancing.

The investments will be conducted through ETFs. When investing in this type of financial product, there are several types of fees and commissions that may be incurred, which are discussed in chapter 3.1.

None of the investments under this IPS should include leverage strategies. There is no specified restriction on the percentage amount of investment denominated in a foreign currency. If any payments are received in a currency other than Euros, the advisor will convert the foreign currency to Euros using the current exchange rate.

The ESG criteria can be considered when selecting financial products, but it should not be the primary or most important consideration in the selection process. Additionally, the client has a skeptical attitude towards financial products that are subject to weak regulations. These constraints are detailed in Appendix 1.

The capital gains tax rate is set at 28%. Additionally, under certain conditions such as holding assets for less than 365 days and having a taxable income of at least €75,000, capital gains and losses from the transfer of shares and other securities must be aggregated. Interest income from bank accounts held by residents in Portugal will also be taxed at 28%. Both dividends and interest are subject to a flat tax rate of 28%.

This IPS is subject to the supervision and regulation of the Portuguese tax authority "*Autoridade Tributária*" and the Portuguese securities exchange commission "*Comissão do Mercado de Valores Mobiliários*."

2.3.6 Specific Portfolio

A predominantly ETF-based investment strategy involves utilizing ETFs to gain exposure to the asset classes. The first step is to analyze the investor's financial goals, risk tolerance, and time horizon. This analysis helps determine the suitable asset

allocation for the portfolio. Subsequently, the advisor will research and select ETFs that provide exposure to the desired asset classes. The chosen ETFs will then be implemented into the investment strategy by allocating the appropriate amount of assets to each ETF, as shown in Appendix 6. Regular reviews and rebalancing of the portfolio will be conducted to ensure it remains in line with the investor's goals and risk tolerance.

2.4 Risk Management

The advisor will calculate the performance of each asset individually, as well as the overall performance of the recommended portfolio. A report will be delivered by the last day of each quarter, complying with the Global Investment Performance Standards published by the CFA Institute. As the designated advisor for the clients, the advisor is responsible for continually assessing and monitoring potential risks associated with their investments. The advisor is authorized to create a quarterly financial report for the clients, which will serve as the official record of their investment policy and provide the basis for the risk evaluations. Additionally, the advisor will identify any discrepancies in risk positions and re-evaluate their risk classification/profile to determine if there are any excesses of tolerable limits and take appropriate action to correct them.

In addition to performance reporting, the advisor will provide quarterly updates to the clients on specific risk metrics. These include risk measured as the annualized standard deviation of portfolio returns in relation to each portfolio's established benchmark, the Sharpe Ratio for each portfolio, the VaR and Conditional VaR.

At the beginning of each year, the advisor will conduct a review of the asset allocation and propose any necessary adjustments to maintain the desired allocation and minimize risks. The advisor will proceed with the rebalancing process only after obtaining the client's approval.

3 Investment Design

3.1 Investment Philosophy

According to Damodaran (2012), an investment philosophy encompasses a consistent thought process regarding financial markets or a collection of fundamental principles upon which an investor can rely to develop new strategies when existing ones fail to yield desired outcomes. An investment strategy flows from the investment philosophy and represents a narrower way of putting the philosophy into practice. If an investor does not rely on an investment philosophy, they may miss out on having a strong set of beliefs, which could potentially lead to switching strategies, resulting in higher costs and taxes.

The investment philosophy behind this IPS incorporates a combination of market timing techniques and specific security selection criteria, favoring value investing over growth investing and utilizing ETFs to cover all required asset classes.

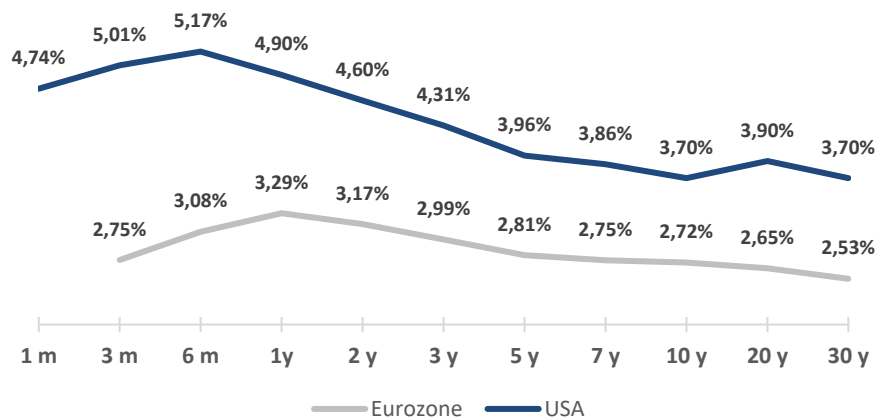
Investors who utilize market timing techniques attempt to predict the future direction of financial markets to make investment decisions. Some of the market timing techniques to be employed in this IPS include a cyclical adjusted Earnings Yield, CAPE ratio (also known as Shiller PE ratio), FED Model, the 10-year 3-month government bond yield spread, and the state of the Central Bank's balance sheet.

This IPS will focus on Value investing, as Value stocks are typically more robust and less impacted by economic downturns compared to growth stocks. They often operate in stable industries that are less sensitive to economic fluctuations, as stated by Chen, Roll, and Ross (1986). Value stocks are often undervalued, with lower PE Ratios, as studied by Fama and French (1998), which means they have the potential for significant price appreciation. Moreover, these stocks have higher chances of distributing attractive dividends, providing a source of income during market uncertainty, and are generally considered less risky than growth stocks.

Value investing is a type of investing made known by Benjamin Graham and then by Warren Buffet, in which, with the help of fundamental analysis, the investors derive the intrinsic value of a stock. If the intrinsic value exceeds the market price, the investor is advised to buy and hold the stock. The principles behind this strategy were made known to the public by Graham (1946).

On the other hand, Growth stocks are often priced at a premium based on future growth expectations, which may lead to price declines during economic downturns when these expectations become less certain, and investors become more risk-averse, seeking safer investments. In times of higher interest rates and yield curve inversion, like the one we are experiencing during the writing of this MFW (Figure 1), these types of stocks may be negatively impacted. Future cash flows will likely suffer from economic downturns and be discounted at higher rates. This relationship between interest rates and performance was studied by Fama and French (1992), who argued that value stocks tend to outperform growth stocks in the long term, especially during times of higher interest rates. Chen, Roll, and Ross (1986) also concluded that value stocks are more resilient during economic downturns.

Figure 1 - Eurozone and US Yield Curves (2023, March 10th)



Source: Statista.com; ECB

Beyond the idea of a value stock, there is also the concept of "Blue-Chip" stocks. The Dow Jones Industrial Average for US equities and the Stoxx 50 for Eurozone companies are two major indices that include these kinds of stocks. According to Chen (2020), the term was coined by Oliver Gingold, a Dow Jones employee, to identify stocks that traded for more than \$200. It can be likened to a stock of a powerful and respected firm with a long history of stable earnings, growth, and dividend payments (not necessarily), drawing its analogy from poker where the blue chips hold the greatest value. Blue-chip companies are typically industry leaders, possess pricing power, and have significant market capitalization. These companies are considered high-quality, low-risk investments that exhibit resilience during market distress, as investors view them as safe havens.

The financial product sought in this IPS is the ETF, which is a diversified investment vehicle that can include stocks, bonds, commodities, and other securities in a single basket. According to Chen (2023), ETFs combine the benefits of both stocks and managed funds, as they can be traded throughout the trading day like individual stocks, while also offering the diversification of a mutual fund.

ETFs can be actively or passively managed and often have lower expense ratios compared to mutual funds, as stated by Fidelity (2011). They can track various indexes or sectors, using different tracking methods such as physical replication, synthetic replication (using derivatives), and sampling and optimized replication. Additionally, ETFs can be distributive, providing income to shareholders through dividends, or accumulative, reinvesting dividends to compound returns.

However, investors should consider the costs and risks associated with ETF investing. Charles Schwab (2021) identifies key costs, including the expense ratio, trading commissions, bid-ask spread, dividend withholding taxes, and the spread between the net asset value (NAV) and market price. The NAV, representing the value of underlying assets minus liabilities divided by shares outstanding, is calculated at the end of each trading day, and serves as a benchmark. The assets under management (AUM) represent the total value of all shares held by investors.

The mechanism for setting the ETF's price in line with its NAV is called creation and redemption mechanism which allows authorized participants (APs) to create or redeem shares by exchanging them with the ETF's underlying assets. If the ETF's price is higher than the NAV, APs can create new shares, increasing supply and putting downward pressure on the price, closing the gap to the NAV. Conversely, if the price is lower than the NAV, APs can redeem shares, putting upward pressure on the price.

Apart from understanding ETF mechanics, investors should also be aware of the risks involved, such as credit, market, leverage, geopolitical, currency, liquidity, and interest rate risks. For example, an ETF holding emerging market securities may face geopolitical risk, while holding bonds or debt securities would expose it to credit risk.

3.2 Strategic Asset Allocation

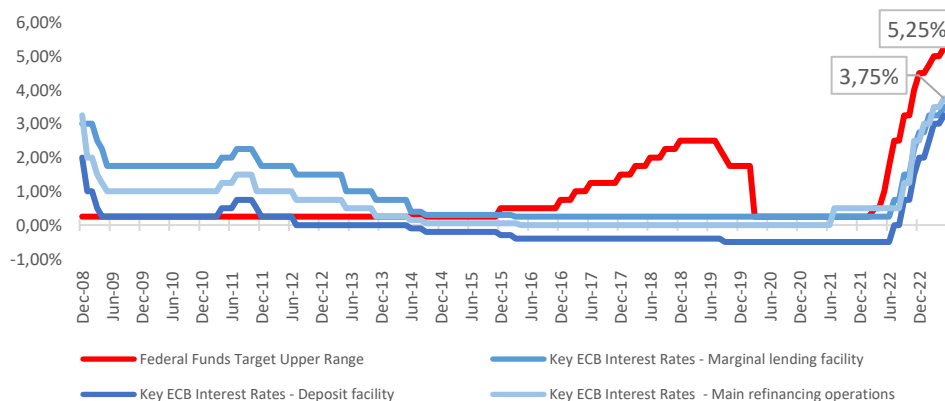
Strategic asset allocation is a long-term approach that seeks to build a diversified portfolio according to the investor's desired returns and risk tolerance. It involves carefully combining various asset classes, considering their historical and expected returns, volatility, and correlations. The ultimate objective is to optimize the Sharpe Ratio, striking a balance between risk and reward.

After presenting the investment philosophy, the advisor will elucidate the assumptions that guided the decisions on asset allocation with a macroeconomic briefing.

3.2.1 Macroeconomic Briefing

The global market is currently experiencing a period of elevated interest rates and core inflation. The fight against inflation forced CBs - like the US Federal Reserve and the ECB - to embrace in hawkish measures to tame inflation, hiking interest rates at the fastest way in monetary policy's history.

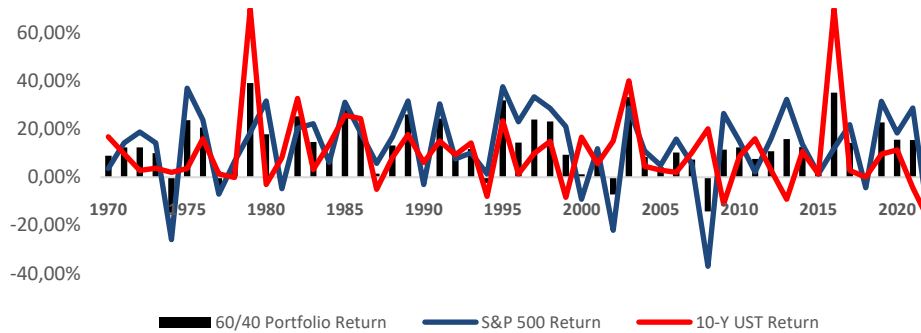
Figure 2 - ECB And USFR Rates Rate History (2023, May 4th)



Source: FRED; ECB

In 2022, both equity and fixed income markets encountered significant declines in returns. According to Bilello (2023) the typical 60/40 portfolio experienced one of its worst performances ever, with a positive correlation between equity and bonds, indicating a lack of effective hedge or diversification characteristics from bonds as seen in Figure 2. However, this situation has resulted in lower valuations and higher yields, presenting favorable prospects for long-term returns compared to the previous decade, as suggested by JP Morgan (2023).

Figure 3 - 60/40 Portfolio (Total Returns, 1970 – 2022)



Source: Bilello Blog

According to JP Morgan (2023), expected equity returns are projected to rise, presenting an attractive entry point for investors. As interest rates reach their terminal rates, they will once again serve as a reliable source of income and diversification for investors. Currency-wise, the USD is currently overvalued, with the highest level since the 1980s nominally and since 2002 in real terms, making the FX factor or exchange rate a significant component in future returns.

JP Morgan (2023) suggests that the 60/40 portfolio will regain its "bedrock" profile for investment portfolios, providing alpha, inflation hedge, and diversification. In the short term, there are several challenging factors to consider, such as the possibility of recession or sluggish quarters of growth in developed markets, the ongoing war in Europe, and persistent inflation in both the United States and Europe. JP Morgan's (2023) forecasts indicate an inflation surge that will converge slightly above the central bank's 2% target in the medium term.

The world has shifted from a time of easy monetary policy and cheap capital that drove asset appreciation in the 2010s to a world with limited capital, higher interest rates, and higher inflation. This highlights the increased importance of fundamentals for investors. Businesses that relied on acquiring cheap capital and promised future growth or earnings may lose favor, while those capable of consistently generating cash flow, such as those following value investing characteristics, will be appreciated.

3.2.2 FED Model, Cyclical Adjusted Earnings-Yield (CAEY) and Yield Spread

The FED Model, also known as the "Fed Stock Valuation Model" (FSVM), was developed by Dr. Ed Yardeni and is a renowned market timing technique used to evaluate the valuation of a given market or index. It involves comparing the earnings yield of the index with the 10-year government bond yield.

This valuation metric has an opposite interpretation to the PE ratio, with a high value indicating undervaluation and a low value indicating overvaluation. The explanation arises because when the stock price increases without a proportional earnings increase, the earnings yield declines. Conversely, if the stock price drops while earnings remain constant or increase, the earnings yield rises, which is the situation value investors hope for.

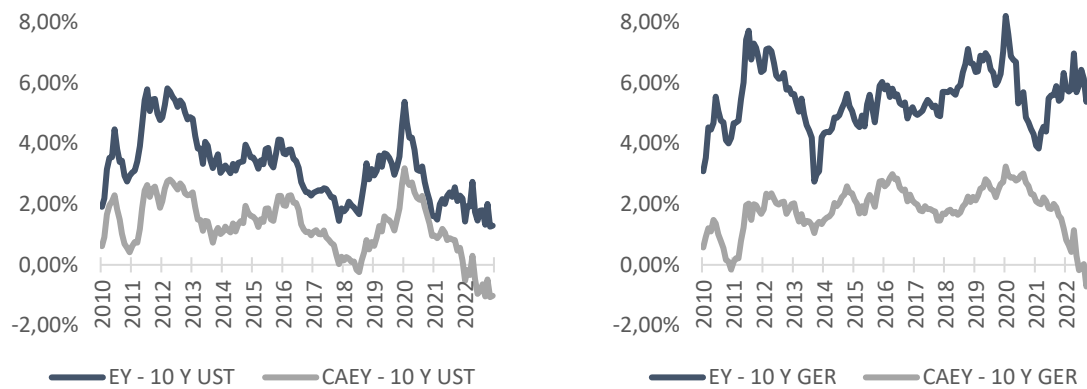
According to Chen (2022), the FED Model suggests that if the index's earnings yield is higher than the 10-year government bond yield, the market is considered "bullish." Conversely, if the scenario is reversed, the market is considered "bearish." However, Kenton (2023) also notes that some people argue that the Earnings Yield has limitations, such as not accounting for inflation. Since it uses nominal earnings, the real value of earnings may not be accurately reflected. For instance, if earnings rise 10% and inflation is also 10%, the real effect on earnings is null.

To address this limitation, investors can consider using the cyclical adjusted price-to-earnings (CAPE) ratio, as described by Kenton (2020). Developed by Robert Shiller, this ratio is also known as the Shiller P/E ratio. It utilizes real EPS (adjusted for inflation) averaged over a 10-year period, which smooths out earnings fluctuations over different stages of the business cycle. This is particularly relevant as earnings tend to increase during expansionary periods and decrease during recessions or in cyclical sectors.

In this IPS, the advisor uses a modified version of the FED Model, referred to as the cyclical adjusted earnings yield (CAEY). Instead of using the standard earnings yield (EY), the advisor calculates the CAEY by adjusting for inflation using the same steps as the CAPE ratio. The formula involves dividing the 10-year average of EPS by the price and then subtracting the 10-year yield on the respective country/index sovereign bond. This modification allows for a more conservative valuation, which helps make

more reliable investment decisions. As illustrated in Figure 3, there is a noticeable difference between the two graphs, demonstrating the benefits of using a model that adjusts for inflation. The CAEY provides more conservative valuations, making it a valuable tool for making investment decisions.

Figure 4 - FED Model Using EY vs CAEY (S&P 500 & Stoxx 600)



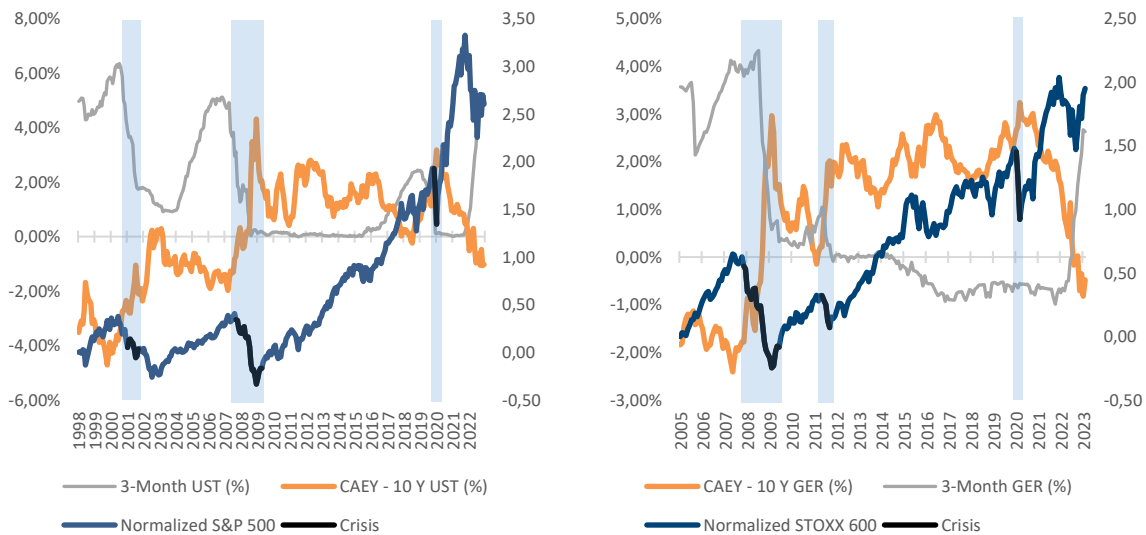
Source: *Investing.com, Bloomberg*

It is important to note that the FED Model considers only the cyclical adjusted earnings yield and the yield on the 10-year government bond. It is a relatively simple model that does not incorporate extensive market information. As a result, it failed to predict some drawdowns caused by other factors, such as the housing bubble burst during the Global Financial Crisis (GFC) in 2007 and the COVID-19 pandemic in 2020. Therefore, this model should be used in conjunction with other metrics when making investment decisions.

Looking at the graph for both the FED Model for the S&P 500 and Stoxx 600, it is evident that they both failed to forecast the GFC in 2007 and the pandemic in 2020. However, the graph for the S&P 500's FED Model showed positive values throughout the 2010s, reflecting the period of very low interest rates promoted by the Federal Reserve, as indicated by the yield on the 3-month government bond. This period was marked by significant growth of 339% from the bottom of the GFC in 2009 to the peak before COVID-19 in 2020. A notable observation from this graph is a negative correlation between the FED Model and the level of interest rates set by central banks (CBs). Higher central bank rates result in lower values of the FED Model. The same relationship can be observed in the FED Model for Stoxx 600.

As of March 2023, both indexes, based on the FED Model, are indicating bearish signs. This situation has not been seen since the era of the GFC. Therefore, this analysis suggests that the current market conditions may be associated with increased risks.

Figure 5 - FED Model S&P 500 (1998–2023) & Stoxx 600 (2005-2023)

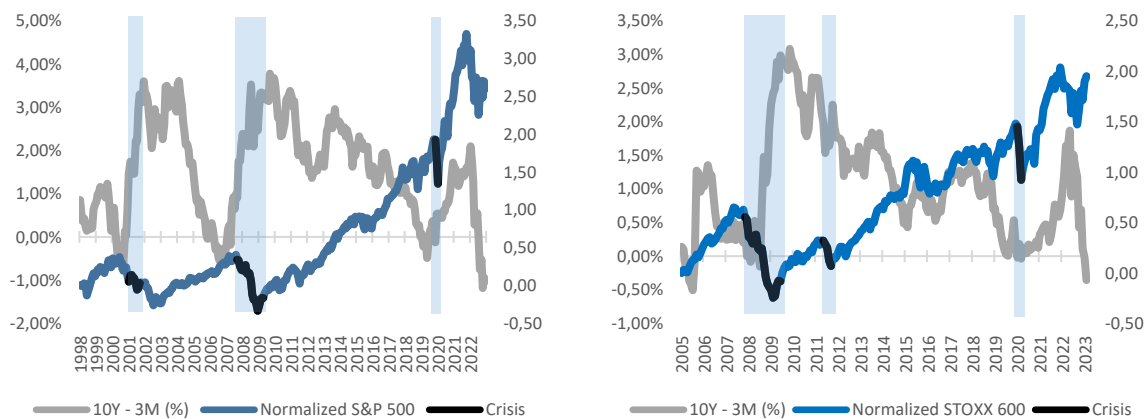


Source: *Investing.com; Bloomberg*

There is another widely used metric by economists to predict economic downturns, known as the 10-year 3-month yield spread. In the US market, this yield spread has turned negative four times since 1990, occurring just before the Dot-Com bubble in 2000, before the GFC in 2006, before the COVID-19 pandemic in 2019, and at the time of writing this MFW. As per Figure 5, on March 1st, 2023, the yield on the 3-month US Treasury bond was 5.0070%, while the yield on the 10-year US Treasury bond was 3.9890%, resulting in a negative yield spread of 1.02%. This negative spread is one of the lowest observed in recent months and the lowest within the period under analysis since 1990.

The data from this and the previous indicators aligns with the advisor's philosophy of predominantly investing in blue-chip indices and value-oriented sectors. These choices are in line with the economic signals provided by the yield spread and reflect a cautious approach in response to potential economic uncertainties.

Figure 6 - Yield Spread vs S&P500 & Stoxx 600 (1998/2005 – 2023)



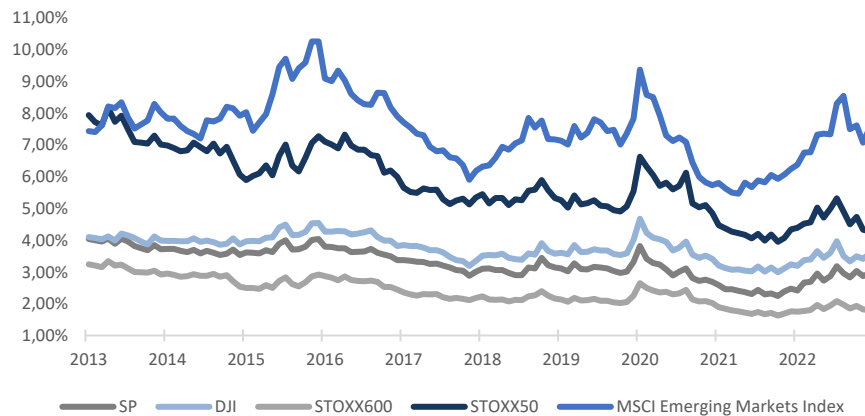
Source: *Investing.com*

In Europe, the yield spread has shown fluctuations over time. It was negative in 2005 at 0.51%, during some periods of the GFC, and nearly 0.00% before the pandemic. More recently, the spread sharply decreased from a 10-year peak of 1.97% in mid-2022 to March 2023, where the yield on the 3-month German bund was 2.847%, and the 10-year yield on the German bund was 2.444%, resulting in a negative spread of 0.403%.

The data also indicates that extensive drawdowns typically occur when central banks (CBs) cut interest rates and the yield spread increases. This event, known as a "Bull Steepener," which according to Hayes (2022), takes place when short-term interest rates fall faster than long-term rates, causing the yield spread to rise. CBs usually implement such rate cuts when the economy is fragile and expected to experience weak growth. However, predicting such events is challenging since they are a consequence of broader economic conditions.

In terms of the cyclical adjusted earnings yield (CAEY), the MSCI Emerging Markets Index had the highest value at 7.53% in February 2023. The two Blue-Chip stock indices followed, with the Stoxx 50 having a CAEY of 4.27% and the Stoxx 600 at 1.80%. The Dow Jones Industrial Average showed a CAEY of 3.57%, while the S&P 500 had a slightly lower CAEY of 2.96%. These figures indicate the relative attractiveness of these indices based on their CAEY values.

Figure 7 - CAEY Comparison of the Indexes (2013 – 2023)

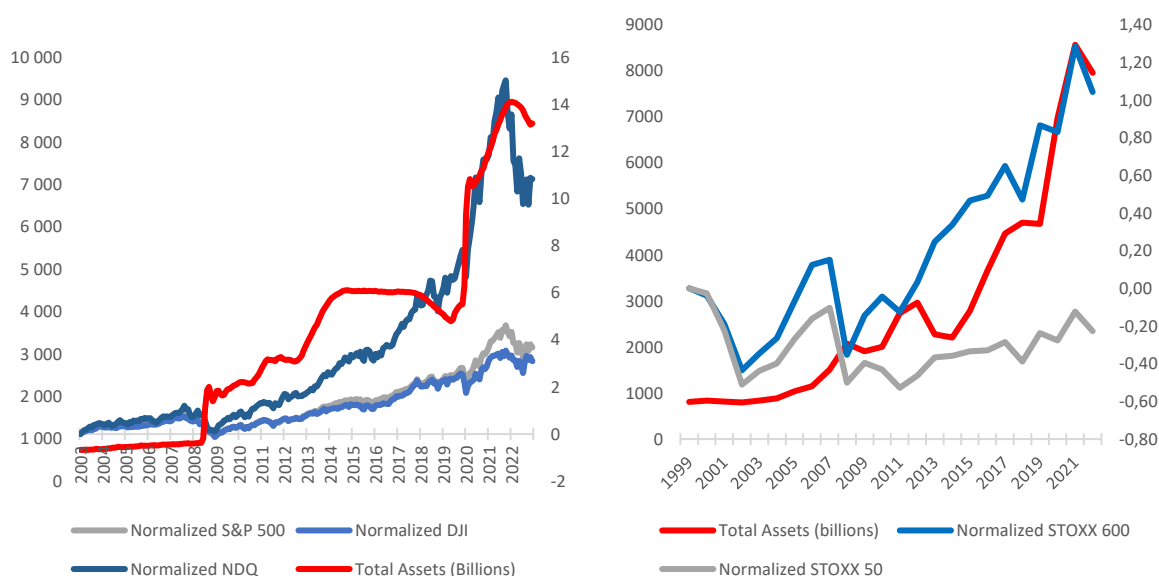


Source: Bloomberg

There is yet, another important metric to take into consideration, which is the level of liquidity that CBs, like the US Federal Reserve and the European Central Bank (ECB), inject into the economy. This is usually implemented with a monetary policy tool called quantitative easing (QE), in which the CBs increase the money supply and lower interest rates to stimulate the economy, by buying government bonds and other securities from banks, injecting money in the economy. The main drawback from this policy is the possibility of causing inflation, by over flooding the economy with money without a parallel increase in production and economic activity. This was one of the main causes of today's inflation surge.

However, there has been a shift towards quantitative tightening (QT) at the time of writing this MFW (beginning of March 2023), which represents the inverse policy aimed at normalizing inflation. Figure 8 illustrates the relationship between the assets held by central banks and some of the main indices closely associated with those banks. This chart clearly shows the impact of both QE and QT policies on the respective indices. During periods of QT, value-oriented sectors are expected to benefit.

Figure 8 - FED's and ECB's Balance Sheet vs Region Main Indices



Source: FRED; ECB

3.2.3 Asset Allocation

The equity class will be allocated 47.54%, and the remaining funds will be allocated to fixed income ETFs (2.38%), commodities (7.13%), and alternative investments (2.38%). As the client does not require liquidity, no allocation will be attributed to it. However, in certain market circumstances, assets may need to be converted to liquidity until rebalancing is performed. The total percentage of risky assets in the portfolio will be 59.43%, while 40.57% will be allocated to the risk-free asset, as shown in Figure 8.

Table 1 establishes the minimum, central, and maximum allocations for each asset class. The advisor follows a typical 60/40 portfolio for the overall portfolio with risky and risk-free assets. The central allocations are adjusted by subtracting 10% to determine the minimum allocation and adding 50% to determine the maximum allocation. For example, the central allocation for the Equity class will be 60% times 80%, which equals 48%. The minimum allocation will then be 48% minus 10% of its value, resulting in 43%, while the maximum will be 48% plus 50% of its value, resulting in 72%. The same methodology was used for all asset classes.

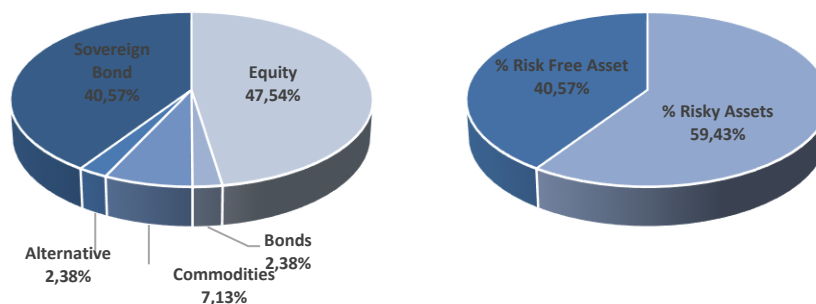
The reader can find a detailed description of the minimum, central, and maximum ranges for asset classes and each ETF in Appendix 6.

Table 1 - Final Asset Allocation

Asset Classes	Final Allocation	Minimum Allocation	Central Allocation	Maximum Allocation
Equity	47.54%	43.00%	48.00%	72.00%
Bonds	2.38%	2.00%	3.00%	5.00%
Commodities	7.13%	5.00%	6.00%	9.00%
Alternative	2.38%	2.00%	3.00%	5.00%
Liquidity	0.00%	0.00%	0.00%	0.00%
Sovereign Bond	40.57%	36.00%	40.00%	60.00%

Source: Author

Figure 9 - Final Asset Allocation



Source: Author

3.3 Security Selection

The ETF selection followed a set of rules, such as:

- accumulate and reinvest its dividends as the clients do not have liquidity needs.
- have a total expense ratio (TER) under 0.40% for broad Markets and 0.80% for specific industry markets while having the largest AUM.
- replication must be physical, either full or sampling (exception for commodity's ETFs).
- be traded in euros.
- do not exceed 50% of allocation with one single provider.

The selection of the screens can be seen in Appendix 3 and was done considering:

- (a) the set of rules presented at the beginning of this chapter.
- (b) the macro analysis done in chapter 3.2.1.

(c) a set of other decisions that will be presented ahead in the analysis.

For all the ETF screens, the results were sorted by lowest TER while having the highest size, except for opting for alternatives when there is the need to diversify providers (L&G AI e.g.) or when there is no ETF that respect to the initial set of rules (SPDR MSCI Europe Industrials e.g.). The “Indices” filter was used for the broad markets and blue-chip markets, the “Use of Profit” filter was used to respect the rule of investing in accumulative ETFs, the “Fund Size” filter was used to guarantee that the ETFs had a high AUM, while the “Replication Method” was used prevent counterparty or liquidity risk. The remaining filters were used to track the type of asset, sector, or region, that will be analysed ahead.

Regarding the currency of the ETFs, its risks extend beyond the currencies of the underlying ETF stocks. Equities are influenced by their denomination in a specific currency, but their business may depend on international sales. According to Banker on Wheels (2023), while hedging can offer some protection against currency risk, it is important to note that it does not eliminate all of the potential risks. Consequently, even with hedging, it may still exist indirect exposure to such risks. If the focus is long-term, then currency risk will have a low impact on returns since it is very difficult to hedge all the underlying currencies in an equity ETF. The other type of currency is the fund currency, this being the one in which the fund reports and distributes dividends. Regarding the selection rule of only investing in accumulative ETFs, this factor is irrelevant. Hedged versions of ETFs are more expensive and often do not offer the possibility of dividend accumulation and so, except for a reasonable low cost hedged ETF, non-hedged ETFs will be chosen.

Industry-based ETFs shall be selected over country/region-based ETFs (e.g., World AI or Cybersecurity ETF), with exception of ETFs that provide exposure to Emerging Markets, broad markets, and indices. Bessler et al. (2021) found that industry-based strategies normally outperform country-based strategies in terms of risk-adjusted returns, regardless of the optimization technique. However, the difference in Sharpe ratio between industry and country portfolios is economically relevant yet statistically insignificant in many analysed settings. Bessler et al. (2021) also investigates the impact of different market conditions and the inclusion of short positions in the portfolio. It suggests that, as countries have become more integrated and highly

correlated, the diversification benefits of industry-based portfolios have become relatively more important.

In the equity class, the focus is on various regions, including the US, Europe, and emerging markets. Europe holds a slightly overweight position due to the overvaluation of the USD and comparatively cheaper valuations in the European market. The allocation also emphasizes growth in US stocks, particularly in the technology sector. According to JP Morgan, the long-term return assumptions for US equity increased from 4.1% in 2022 to 7.9% in 2023 in US dollar terms.

For European equities, JP Morgan (2023) expects the long-term return assumptions to increase from 5.8% in 2022 to 8.4% in 2023, in euro terms. They anticipate investors recognizing the improved quality of the European market, especially in sectors with better growth profiles, such as luxury goods and semiconductors. Additionally, according to Blackrock (2023), European equities are currently undervalued. The market's exposure to China positions the continent well for a reopening boom following China's Covid lockdown, and its resilience against the energy crisis adds to its favorable outlook. Blackrock specifically focuses on three sectors: financial, France's luxury goods, and Germany's industrial sector.

Regarding Emerging Markets, JP Morgan (2023) raised its assumptions of equity returns from 3.2% in 2022 to 10.10% in 2023, in USD terms. According to exhibit 5b on page 72, the long-term returns are projected at 9.4% in China, 7.5% in Taiwan, 8.3% in India, and 12.5% in Brazil, in local currency terms. Bloomberg (2023) reports that Goldman Sachs holds a bullish view on Chinese stocks, anticipating a surge in earnings growth expectations with the reopening of the Chinese economy after the Covid lockdown. Furthermore, they point out that Chinese households possess more than 400 billion USD in excess savings, which is expected to boost spending on consumer sectors.

Certain industries such as Artificial Intelligence (AI), cybersecurity, and semiconductors are believed to have a significant role in the future. The rising digitalization of the world economy and the recent rise of geopolitical conflict has created a necessity for cybersecurity. As security threats get worsen and the world becomes more fragmented, not only companies but also governments will be incentivized to invest in this industry. The industries of Robotics, Automation and AI

should become increasingly important as labour replacement. These technologies are expected to become cheaper in an era where low wage labour becomes limited. AI is expected to be to mark the next significant technological shift in the world since the internet rise.

In terms of sectors, allocations will be made to sectors with resilience during economic distress and strong fundamentals in accordance with value investing such as healthcare, consumer defensive, energy, utilities, European financials, and industrials. In fixed income, the allocation will involve a fund that invests in the aggregate market.

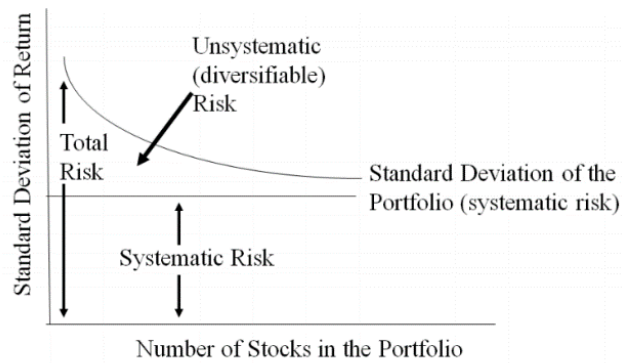
For commodities, the allocation will be divided equally between gold and a fund investing in agriculture, metals, and energy. Alternative investments will be conducted through REITs. According to JP Morgan (2023), there is a rise in global REITs return forecasts as shown in its Exhibit 20. In terms of the energy market, the current geopolitics conflict in Ukraine could fragilize the supply side of this market, while there is a growing demand for energy for the next decade as described by the International Energy Agency (2021). JP Morgan (2023) forecasts a above inflation return for agricultural commodities of 3.10%. There are several factors that might affect this sector such as climate change or, as predicted by OECD-FAO (2021), the increase of food supply by 1.10% against the increase of food demand by 1.40%, over the next decade. On the other hand, a NASA study published in Nature Foods by Jägermeyr et al. (2021) forecasts corn crop yield to decline 24% until 2030.

3.4 Portfolio Composition

3.4.1 Modern Portfolio Theory (MPT) and Mean-Variance Theory (MVT)

According to Markowitz (1952) in his paper entitled "Portfolio Selection," Modern Portfolio Theory (MPT) is a mathematical method used to develop a portfolio that maximizes the expected return for a given level of risk. One of the key principles of MPT is diversification, where investors aim to achieve the best results by choosing an optimal mix of risk and return based on their risk tolerance. As stated by Corporate Finance Institute (2023), investors can benefit from diversification by mitigating idiosyncratic or unsystematic risk, which refers to the risk inherent to specific securities and can be eliminated by holding low/negatively correlated securities, as observed in Figure 11. MPT assumes that investors are risk-averse, meaning that if they have two portfolios with the same level of risk, they will prefer the one with a higher return.

Figure 10 - Impact of Diversification in Total Risk



Source: Seeking Alpha

According to Chen (2021), Mean-Variance Theory (MVT) is a simplified version of Modern Portfolio Theory (MPT). It involves weighing how much risk (variance) investors are willing to take on in exchange for different levels of return. The goal is to manage this risk-reward trade-off to find the highest return for a given level of risk or the lowest risk for a given level of return. MVT comprises two components: variance, which indicates how returns are spread over a period of time, and expected return, which is an estimated return that a security is expected to yield.

3.4.2 Methodology

The returns used in the model are monthly and are computed using the historical price of the last day of each month for the last five years (from 30/04/2018 to 30/04/2023) and the data is retrieved from YahooFinance! (2023). The monthly returns are then converted to annual returns and volatility and a variance covariance matrix of the set of assets is computed.

The Efficient Frontier, which is a hyperbolic function, is given by the following equations:

$$\sigma_P^2 = \frac{A\bar{R}_P^2 - 2B\bar{R}_P + C}{AC - B^2} \quad (1)$$

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

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

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

The Efficient Frontier (EF) represents the set of optimal portfolios that offer the highest expected return for a certain level of risk or, conversely, the lowest level of risk for a given expected return. Any portfolio lying below the EF is considered sub-optimal

because there exists another portfolio with the same risk but higher return, while portfolios to the right of the EF are sub-optimal because there is another portfolio with lower risk and the same return.

To compute the minimum variance (MV) portfolio, the Excel Add-in Solver was used to minimize the variance. For finding the portfolio of risky assets that maximizes the Sharpe Ratio (SR) and lies tangent to the EF on the Capital Allocation Line (CAL), the Solver is utilized by maximizing the SR. In case the matrix produces negative security weights, it indicates the potential for short selling in the optimal portfolio, which is not allowed in this IPS. The Solver was used once again to maximize the SR but, this time, the weights of each security are restricted by the inner and outer allocations defined in Appendix 6.

The approach chosen to determine the optimal combination of risky and risk-free assets was the intersection point of the CAL of each risky portfolio with the Safety-First Frontier. Roy's safety-first criterion was applied, which according to Roy (1952) sets a minimum required return for a given level of risk or, in other words, minimizes the probability of returns falling below a pre-defined threshold level (RL). The advisor utilizes this method as a risk management criterion to ensure the probability of annual losses over 5% is mitigated, as described in section 2.3.4, "Investor's Risk Tolerance." The safety-first frontier is a variation of the EF used in MPT and comprises portfolios that achieve a given safety target defined by a minimum acceptable return while maximizing expected return. Portfolios lying on this line are considered efficient as they provide the highest level of return for a given level of downside risk or safety threshold.

The intersection was computed as follows:

$$\bar{R}_T = R_f + SR_T \sigma^* \quad (5)$$

$$\bar{R}_{Roy} = RL + SR_{Roy} \sigma^* \quad (6)$$

$$\sigma^* = \frac{(R_f - RL)}{(SR_{Roy} - SR_T)} \quad (7)$$

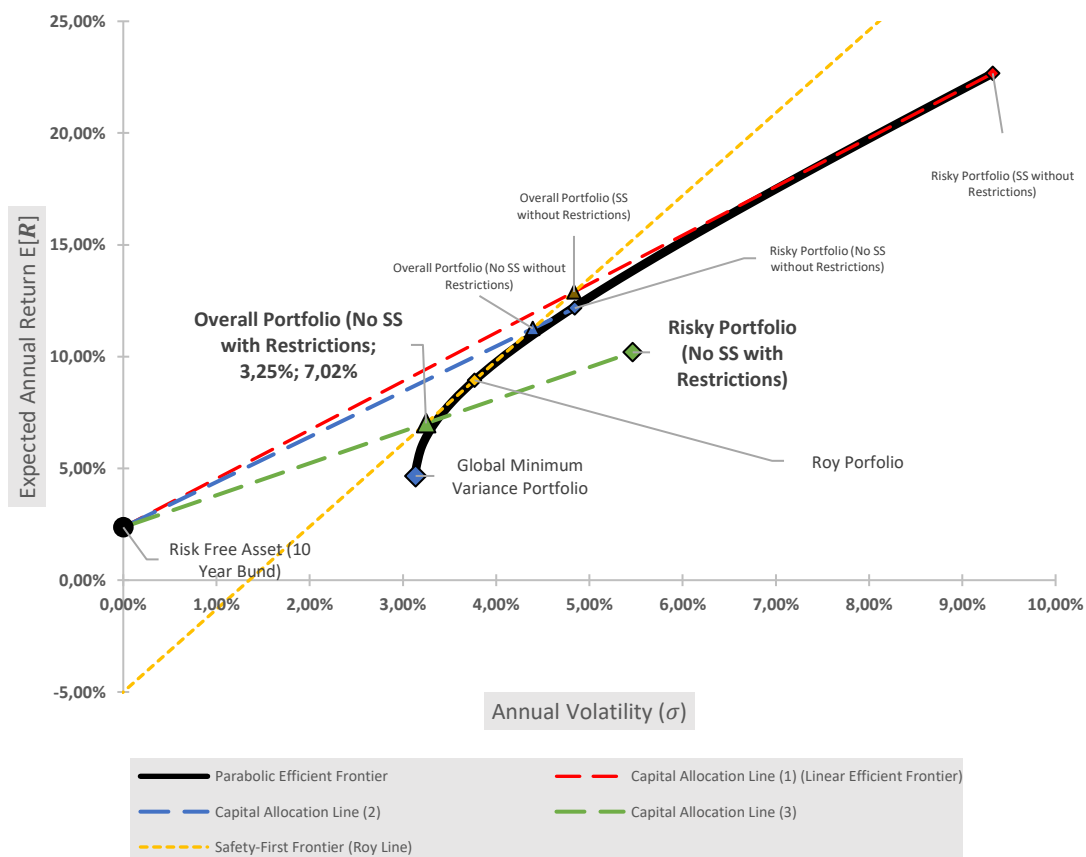
3.4.3 Portfolio Composition

The portfolio composition is disclosed in Appendix 5. As can be seen in Figure 11, the risky portfolio lies to the right of the EF, by being sub-optimal, since it does not allow for short selling and fits in with the weight ranges pre-established in Appendix 6. The

final portfolio corresponds to 40.57% of the risk-free asset and 59.43% of the risky portfolio and is expected to return 7.02% annually, while having an annual volatility of 3.25% and SR of 1.43, as seen in Table 2.

The risk-free asset chosen for this portfolio is the 10-Year German Government Bond (Bund), considering that the client is European, and all securities are traded in euros. Additionally, a significant portion of the risky portfolio is exposed to the European market.

Figure 11 - Risk/Reward Set, Portfolios



Source: Author

3.5 Expected Performance

The expected annual risk/return performance for all the portfolios is described in Table 2. While the proposed portfolio may not have the highest Sharpe Ratio among the computed portfolios, it is the only one that respects the pre-established ranges and does not allow any short selling.

Table 2 - Portfolios' Expected Annual Performance Comparison

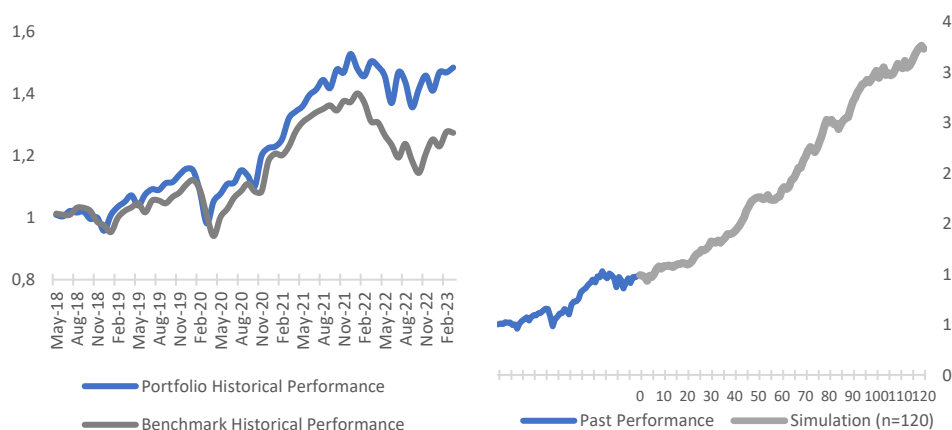
	Global MV Portfolio	Risky Portfolio (SS without Restrictions)	Risky Portfolio (No SS without Restrictions)	Risky Portfolio (No SS with Restrictions)
\bar{R}	4.66%	22.67%	12.17%	10.19%
σ	3.14%	9.33%	4.84%	5.46%
SR	0.73	2.18	2.02	1.43
Risky Assets (%)	79.12%	51.83%	90.70%	59.43%
Risk Free Asset (%)	20.88%	48.17%	9.30%	40.57%
\bar{R}^*	4.18%	12.89%	11.26%	7.02%
σ^*	2.48%	4.83%	4.39%	3.25%
	Does Not Maximize SR	SS Allowed; Does Not Respect Restrictions	Does not allow SS; Does Not Respect Restrictions	Does not allow SS; Respects Restrictions

Source: Author

According to Figure 12, the risky portfolio outperforms the benchmark in the 5-year time frame, yielding 1.49€ for each 1€ invested, compared to the benchmark's 1.29€. The benchmark was computed by performing a weighted average based on the weights of the risky portfolio and the returns from each index that the ETFs track. In this analysis, only the risky portion of the portfolio is considered, as the risk-free asset is expected to be held until maturity instead of being actively traded.

In Figure 12, a 120-month Monte Carlo simulated performance is depicted, assuming returns follow a normal distribution with a mean equal to the monthly average return of the risky portfolio (0.81%) and a standard deviation equal to the monthly average standard deviation of returns (1.40%). According to the simulation, the risky portfolio is expected to yield 3.73€ for each 1€ invested over the specified time frame.

Figure 12 - Performance Against Benchmark & Simulation of Performance



Source: Author

3.6 Risk Analysis

The risk analysis was conducted by performing several types of VaR, among which are the Parametric or Variance-Covariance VaR, the Monte Carlo VaR, and the Conditional Value-at-Risk (CVaR), also known as Expected Shortfall.

3.6.1 Parametric VaR

The Parametric VaR is a method with the objective of estimating losses in an investment, assuming that returns follow a normal distribution. This analysis was made by assuming that returns follow a Gaussian distribution with mean equal to 7.02% and standard deviation equal to 3.25%. In the Table 3 there is the comparison between the Parametric and Monte Carlo VaR for the investment in the end of the period, in which there is the evidence that both analyses retrieve similar results.

Table 3 - Parametric and Monte Carlo VaR Comparison in the 10th Year

Percentiles	Z-Stat	Parametric		Monte Carlo	
		Cumulative VaR	Annualized VaR	Cumulative VaR	Annualized VaR
5.00%	-1.6449	80.15%	6.06%	80.22%	6.07%
10.00%	-1.2816	83.88%	6.28%	83.67%	6.27%
25.00%	-0.6745	90.11%	6.64%	90.20%	6.64%
50.00%	0.0000	97.04%	7.02%	97.16%	7.02%
75.00%	0.6745	103.96%	7.39%	103.91%	7.39%
90.00%	1.2816	110.20%	7.71%	110.14%	7.71%
95.00%	1.6449	113.93%	7.90%	113.78%	7.89%

Source: Author

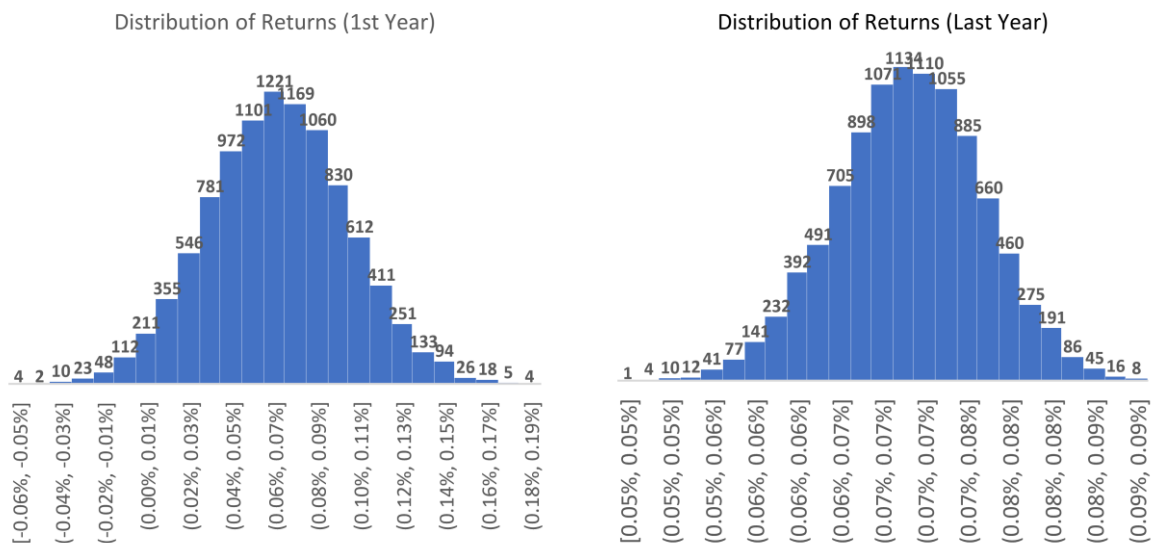
3.6.2 Monte Carlo VaR

A Monte Carlo simulation was conducted for the annual returns over a 10-year period, assuming a Gaussian distribution with a mean of 7.02% and a standard deviation of 3.25%.

By looking at Table 4, there is the distribution of annualized returns in the first and last periods of the simulation. In the first period, there was a 98.47% probability of positive returns and a 17.92% probability of returns over 10%. There is also confirmation of the effectiveness of Roy's Safety-First Criteria by minimizing the probability of returns lower than minus 5%.

On the other hand, looking into the last period under analysis, it is evident that returns are expected to exceed 5% annually, with over 50% of the times yielding returns of over 7%. Additionally, there is over a 90% chance that annual returns will fall between 6% and 8% over the 10-year period.

Table 4 - Distribution of Annual Returns (1st and 10th Years)



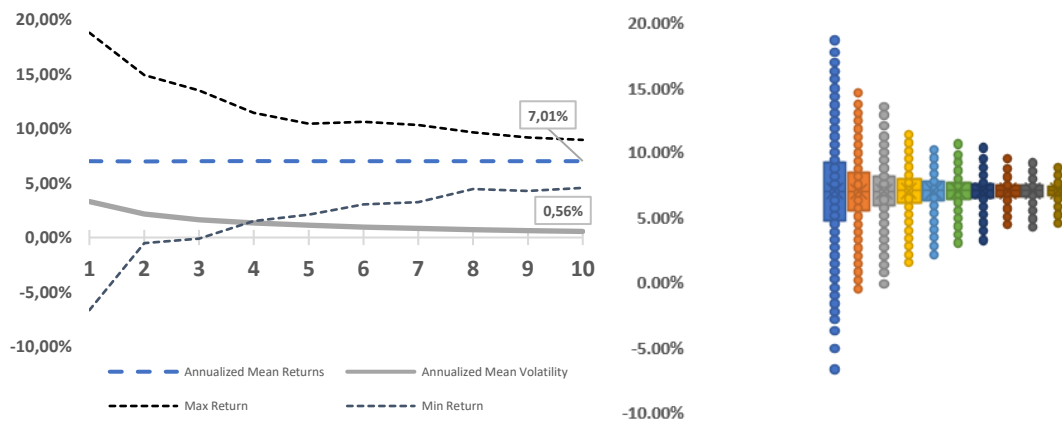
$\bar{R}(\%)$	Prob ($\bar{R} \geq x$)	$\bar{R}(\%)$	Prob ($\bar{R} < x$)	$\bar{R}(\%)$	Prob ($x \geq \bar{R} > x$)	$\bar{R}(\%)$	Prob ($\bar{R} \geq x$)	$\bar{R}(\%)$	Prob ($\bar{R} < x$)	$\bar{R}(\%)$	Prob ($x \geq \bar{R} > x$)
0.00	98.47	-5.00	0.01	-10.00;-5.00	0.01	5.00	99.98	5.00	0.02	5.50;6.00	3.34
2.50	91.79	0.00	1.53	-5.00;0.00	1.52	6.00	96.28	6.00	3.72	6.00;6.500	14.82
5.00	73.28	5.00	26.72	0.00;5.00	25.19	7.00	50.23	7.00	49.77	6.50;7.00	31.23
7.50	44.09	7.50	55.91	5.00;10.00	55.36	7.50	18.84	7.50	81.16	7.00;7.50	31.38
10.00	17.92	10.00	82.08	10.00;15.00	17.22	8.00	3.81	8.00	96.19	7.50;8.00	15.03
15.00	0.70	12.50	95.43	15.00;20.00	0.69	8.50	0.39	8.50	99.61	8.00;8.50	3.42
20.00	0.00	15.00	99.30	20.00;25.00	0.00	9.00	0.02%	9.00	99.98	8.50;9.00	0.37

Source: Author

As shown in Figure 13, having a long-term horizon, in this case, 10 years, offers several benefits, including the smoothing of short-term fluctuations and volatility by staying invested over an extended period. Short-term market fluctuations are typically temporary, and long-term investments provide portfolios with the opportunity to recover from downturns and market corrections. Over the 10-year horizon, there is a clear negative trend in the annual volatility of the portfolio, decreasing from 3.29% in the first year to 0.56%.

The figure also indicates that after the third year, there is no probability of annual returns falling below 0% (assuming returns follow a Gaussian distribution and that a "Black Swan event" will not take place). This reinforces the resilience of the portfolio over the long term, reducing the likelihood of significant negative returns.

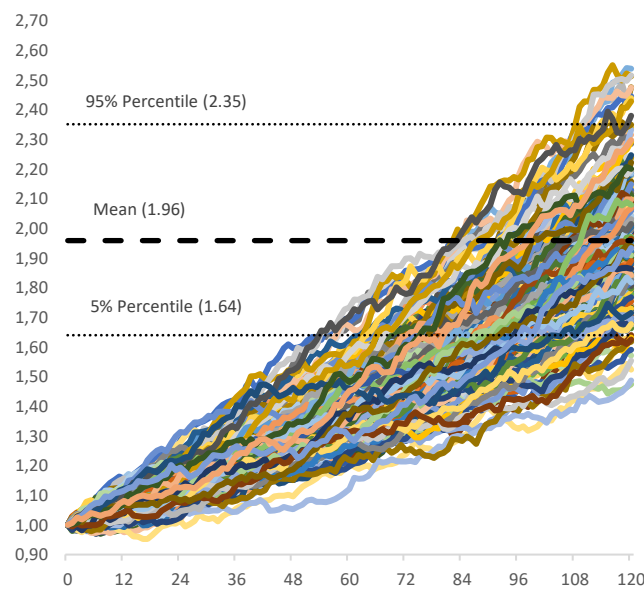
Figure 13 - Evolution of Annual Mean Return and Volatility & Box Plot



Source: Author

There was conducted another Monte Carlo approach, this time a monthly one assuming normal distributed monthly returns with mean equal to 0.57% and standard deviation of returns equal to 0.94%. This simulation contained 200 single iterations in which, each one contained 120 monthly simulations with the characteristics above, that were, afterwards compounded on previous one to simulate the evolution of 1€ in the 120 months (10 years), 200 times.

Figure 14 - 200 Monthly Monte Carlo Simulations



Source: Author

The table below compares the final accumulated returns of both approaches in which there are discrepancies. The most prominent is the standard deviation of returns of the 2nd approach, which is twice as high as the other approaches, making it have more extreme observations, seen in higher percentile values. However, the 1st approach evidences a higher accumulated mean return.

Table 5 - Comparison of Approaches

Percentiles	\bar{R} (2 nd Approach)	\bar{R} (1 st Approach)
5.00%	64.00%	80.22%
25.00%	82.53%	90.20%
50.00%	92.84%	97.16%
75.00%	109.05%	103.91%
90.00%	122.73%	110.14%
95.00%	135.18%	113.78%
Mean	95.94%	97.07%
Median	92.84%	97.16%
St Dev	20.89%	10.24%
Max	153.84%	135.67%
Min	47.36%	56.05%
Simulations	200	10.000
Timeframe	monthly	annual

Source: Author

3.6.3 Monte Carlo Value at Risk and Conditional Value at risk

The Value at Risk (VaR) is a statistic that measures the potential loss in a portfolio given a confidence level and a time frame. According to Kenton (2023), this metric has some disadvantages, such as assuming that past returns will repeat themselves, providing a wide range instead of a specific value (ignoring all returns worse than the given VaR level), and potentially understating risk by assuming normal distribution probabilities. On the other hand, the Conditional Value at Risk (CVaR), also known as expected shortfall, is another risk measure that quantifies the average expected loss in the value of a risky portfolio given a specified time frame and confidence level. As VaR represents a worst-case loss associated with a probability and a time horizon, CVaR is the expected loss if that worst-case threshold or VaR breakpoint is surpassed, as stated by Chen (2020).

In Table 6, the advisor provides the VaR and CVaR values for the given confidence levels. For instance, by analyzing the Monte Carlo VaR and CVaR, if the analysis falls into the 5.00th percentile, it means that there is a 95% confidence level that the potential annual return captured by the VaR estimate will not be lower than the 5th percentile value of 1.67% in the first year and 6.27% in the tenth year, or, in

accumulated terms, 80.22%. On the other hand, the CVaR indicates that if the VaR threshold is surpassed, the expected average annual return will be 0.40% in the first year and 5.83% in the last year, or 76.34% in accumulated terms.

Table 6 - Monte Carlo VaR and CVaR Comparisons for the 1st and 10th Year

Percentile	1st Year Returns		Last Year Returns (N=10)			
	VaR	CvaR	VaR	CVaR	VaR	CVaR
0.10%	-3.08%	-3.08%	66.32%	66.32%	5.22%	5.22%
1.00%	-0.44%	-1.39%	73.39%	71.01%	5.66%	5.51%
2.50%	0.67%	-0.43%	77.11%	73.77%	5.88%	5.68%
5.00%	1.67%	0.40%	80.22%	76.34%	6.07%	5.83%
10.00%	2.74%	1.34%	83.67%	79.23%	6.27%	6.01%
31.00%	5.37%	1.38%	91.94%	79.39%	6.74%	6.02%
Mean	7.02%		97.04%		7.02%	

Source: Author

If the analysis falls within the 31% worst-case scenarios, the average annual returns in the last year will be 6.74%, which represents the minimum rate of return. Therefore, even if the returns fall within the 31% worst-case scenarios, the minimum target will be accomplished, providing a safety buffer to the client's portfolio.

3.6.4 10 Year Horizon Risks

It is crucial to remain aware of potential risks that may impact growth or inflation within the established horizon of this IPS. Table 7 presents some of these risks along with their implications and opportunities.

According to JP Morgan (2023), there are several cyclical risks that should be taken into consideration. The adviser's analysis will focus on the ones that are expected to have a significant impact on the investments, and he should aim for asset classes that can exploit those opportunities.

Table 7 - 10 Year Horizon Risks

Risks	Implications	Opportunities
Climate change (A)	More frequent extreme weather events. Destruction of production assets and disruptions to food and basic materials supply.	Positive for bonds, commodities (except energy), and real assets.
Spillover effects of Russia/Ukraine war (B)	Disruptions of supply chains. Uplift in cyberconflict.	More volatility in asset classes. Positive for USD, commodities, and the cybersecurity sector.
Accelerated adoption of technology and AI (C)	Increase in productivity and possible increase in unemployment. Good for real GDP and control over inflation.	Positive for stocks, bonds, and risky assets. Positive for technology and AI sectors.
Abandonment of the USD as key reserve currency (D)	Outflow of reserves away of USD. Less demand for US assets and focus on US deficit and debt.	Bad for growth, USD bonds, credit, and stocks. Good for commodities and real assets.
Inflation expectations become embedded (E)	Forces tighter monetary policy. Higher interest rates discourage investment. Employers demand wage growth. Bad for margins.	Higher yields are bad for bonds and equity multiples contract. Better performers might be real assets and infrastructure.
Global economic recession (F)	Contraction in economic activity. Reduced investment and consumption. Unemployment. Drawdowns in markets. CBs cut rates consequently.	Lower valuations may offer attractive entry points. Good for fixed income as yield go down and are seen as safer investment. Good for commodities. Good for innovative companies.
Health crises or pandemics (G)	Contraction in economic activity. Reduced investment and consumption. Disruptions of supply chains. Social Unrest.	Bad for stocks except health care and other value-oriented sectors. Bad for growth and credit

Source: Based on JP Morgan (2023), p. 18.

In Figure 15 can be seen a risk matrix containing the impact and probability of these five risks measured in three categories (“Low”, “Medium” and “High”). The analysis is done taking in consideration the probability of each event occurring during the 10-year time frame, so the advisor assumes that climate change e.g., will have low impact/probability because its effects will not be totally felt in the time frame, even though its importance is universally accepted.

Figure 15 - Risk Matrix



Source: Author

Appendices

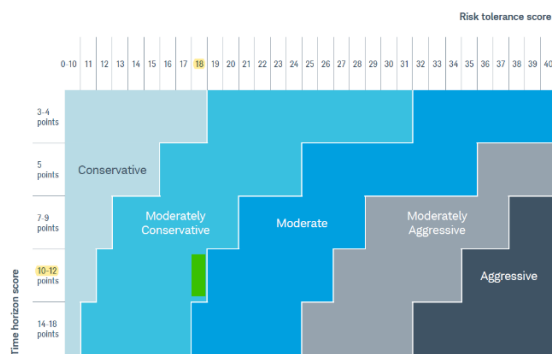
Appendice 1. Client's Profile (detailed)

Names	Mr. and Mrs. Lopes da Silva
Age	33 years old (both)
Children	1 eight-year-old boy
Work (Net Annual Wage)	<ul style="list-style-type: none">•Mr. Lopes da Silva – Financial Analyst (30,000.00€)•Mrs. Lopes da Silva – Nurse (20,000.00€)
Academic Background:	<ul style="list-style-type: none">•Mr. Lopes da Silva – Master's Degree in Finance•Mrs. Lopes da Silva – Bachelor's Degree in Nursing
Additional Information	<ul style="list-style-type: none">•Relatively conservative lifestyle.•Awareness about financial markets' volatility.
Investment Constraints	<ul style="list-style-type: none">•ETF investing.•No annual loss over 5% is allowed.•No liquidity requirements during the period.•ESG can be considered but is not the primary concern.•No Leverage or Short selling allowed.•No investment in non-regulated financial products.
Ability to Bear Risks / Willingness to Take on Risk	High / Low
Risk Profile	Moderately Conservative (Questionnaire in Appendix 2)
Amount to Invest	500,000.00€ (inheritance)
Investment Objective	750,000.00€ (960,063.41€ in 10 years assuming 2.50% average inflation)
Time Horizon	10 years (120 months)
Minimum Rate of Return	6.74%
Exp. Average Annual Return / Volatility of Proposed Portfolio:	7.02% / 3.25%

Source: Author

Appendice 2. Profiling Questionnaire

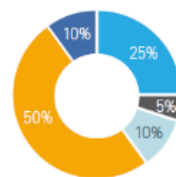
Time Horizon (11 Points)	I plan to begin withdrawing money from my investments in: 11 years or more (10)	Once I begin withdrawing funds from my investments, I plan to spend all of the funds in: 2–5 years (1)
Risk Tolerance (18 Points)	I would describe my knowledge of investments as: Good (7)	What amount of financial risk are you willing to take when you invest? Take lower than average risks expecting to earn lower than average returns. (0)
		Select the investments you currently own or have owned: Stocks and/or stock funds (6)
		Consider this scenario: Imagine that in the past three months, the overall stock market lost 25% of its value. An individual stock investment you own also lost 25% of its value. What would you do? Sell some of my shares (2)
		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? 4.1% 19.2% -10.6% (3)



Moderately conservative

Average annual return: 8.3%
Best year: 27.0%
Worst year: -13.3%

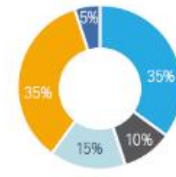
For investors who seek current income and stability, with modest potential for increase in the value of their investments.



Moderate allocation

Average annual return: 9.0%
Best year: 30.9%
Worst year: -20.9%

For long-term investors who don't need current income and want some growth potential. Likely to entail some fluctuations in value, but presents less volatility than the overall equity market.



■ Large-Cap Equity ■ Small-Cap Equity ■ International Equity ■ Fixed Income ■ Cash Investments

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

Appendice 3. ETFs Selection Screens

Chosen ETFs	Indices	Use of Profit	Fund Size	Replication Method	Asset	Sector/Theme	Region
iShares Dow Jones Industrial Average UCITS	DJIA	Acc.	>€500M	Full or Sampl.	Equity	N/A	N/A
Xtrackers Euro Stoxx 50 UCITS	EURO STOXX 50	Acc.	>€500M	Full or Sampl.	Equity	N/A	Europe
Vanguard S&P 500 UCITS Acc	S&P500	Acc.	>€500M	Full or Sampl.	Equity	N/A	N/A
Lyxor Core STOXX Europe 600 (DR) UCITS	STOXX Europe 600	Acc.	>€500M	Full or Sampl.	Equity	N/A	Europe
iShares NASDAQ 100 UCITS EUR Hedged	Nasdaq	Acc.	>€500M	Full or Sampl.	Equity	N/A	N/A
iShares Core MSCI Emerging Markets IMI UCITS	N/A	Acc.	>€500M	Full or Sampl.	Equity	N/A	Emerging Markets
Lyxor EURO STOXX Banks	N/A	Acc.	>€500M	Full or Sampl.	Equity	Financial	Europe
L&G Artificial Intelligence UCITS	N/A	Acc.	N/A	Full or Sampl.	Equity	AI	World
L&G Cyber Security UCITS	N/A	Acc.	>€500M	Full or Sampl.	Equity	Cyber Security	World
VanEck Semiconductor UCITS	N/A	Acc.	>€500M	Full or Sampl.	Equity	Semiconductors	World
Xtrackers MSCI World Health Care UCITS	N/A	Acc.	>€500M	Full or Sampl.	Equity	Health Care	World
Xtrackers MSCI World Consumer Staples UCITS	N/A	Acc.	>€500M	Full or Sampl.	Equity	Consumer Staples	World
Xtrackers MSCI World Energy	N/A	Acc.	>€500M	Full or Sampl.	Equity	Energy	World
SPDR MSCI Europe Industrials	N/A	Acc.	N/A	Full or Sampl.	Equity	Industrials	Europe
Xtrackers MSCI World Utilities UCITS 1C	N/A	Acc.	N/A	Full or Sampl.	Equity	Utilities	World
iShares Core Global Aggregate Bond UCITS EUR Hedged (Acc)	N/A	Acc.	>€500M	Full or Sampl.	Bonds	Aggregate	World
Xetra-Gold (ETC)	N/A	Acc.	>€500M	Full or Sampl.	Precious Metals	N/A	N/A
iShares Diversified Commodity Swap UCITS	N/A	Acc.	>€500M	N/A	Commodities	Broad Market	N/A
iShares Developed Markets Property Yield UCITS	N/A	Acc.	N/A	Full or Sampl.	Real State	N/A	World

Source: Author; Note: (<https://www.justetf.com/en/find-etf.html>), “Acc” stands for “accumulative”, “Sampl” stands for “sampling”

Appendice 4. ETF's Information (as per March 7th 2023)

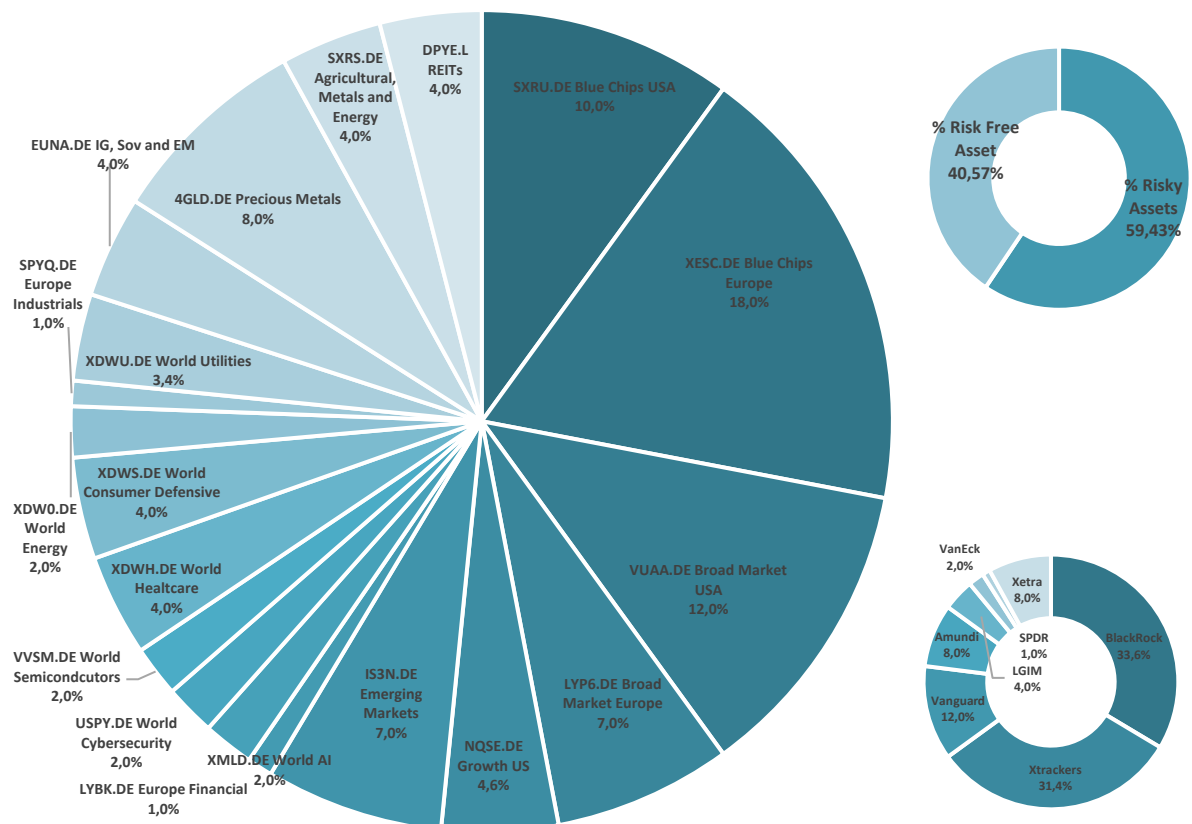
ETF	ISIN/Symbol	Info	Holdings
iShares Dow Jones Industrial Average UCITS	IE00B53L4350 SXRU	An accumulative ETF with a 0.09% TER, with 921 million USD of AUM and physical (full) replication. It has P/E ratio of 19.67 and a P/B of 3.77. It tracks the Dow Jones Industrial Average, which consists of 30 US Blue-Chips companies.	The top 5 sectors: technology (20.20%), healthcare (19.27%), financials (16.73%), industrials (15.06%) and consumer discretionary (13.48%). The top 5 holdings: United Health (9.43%), Goldman Sachs (6.89%), Home Depot (5.79%), Mc Donalds (5.32%) and Microsoft (5.06%).
Xtrackers Stoxx 50 UCITS	Euro LU0380865021 XESC	An accumulative ETF with a 0.33% TER, with 5.29 billion euros of AUM and physical (full) replication. It tracks the Euro Stoxx 50, which consists of 50 Eurozone leading Blue Chips companies.	The top 5 sectors: financials (16.24%), consumer discretionary (15.65%), industrials (15.21%), technology (13.95%) and basic materials (9.24%). The top 5 holdings: ASML (7.51%), LVMH (6.91%), Total Energies SE (5.01%), SAP (3.68%) and Siemens (3.55%).
Vanguard 500 UCITS	S&P IE00BFMXXD54 VUAA	An accumulative ETF with a 0.07% TER, with 5.46 billion USD of AUM and physical (full) replication. It tracks the S&P 500, which consists of the 500 largest companies in the US by market capitalization, with a tracking error of 0.03%.	It has a reasonable exposure to sectors that are resilient to economic downturns such as healthcare (14.70%), financials (11.70%) and industrials (8.40%), and companies such as Exxon Mobil (1.39%), United Health (1.36%) and Johnson & Johnson (1.25%). On the other hand, it has also a high exposure to companies that are in the vanguard of the technology sector, in industries like semiconductors and IA, such as Microsoft (5.38%), Alphabet (1.70%) and Nvidia (1.41%).
LYXOR STOXX EUROPE 600 UCITS	CORE LU0908500753 LYP6	An accumulative ETF with a 0.07% TER, with 5.50 billion euros of AUM and physical (full) replication. It tracks the STOXX Europe 600 index which tracks the 600 largest European companies.	The top 5 exposing countries: UK (23.86%), France (28.21%), Switzerland (14.21%), Germany (12.50%) and Holland (6.50%). The top 5 sectors: financials (17.72%), industrials (15.57%), healthcare (14.37%) and consumer staples (11.60%). The top holdings: HSBC (1.43%), Novo Nordisk (2.25%), AstraZeneca (1.90%) or Nestlé (2.93%). It is also worth mentioning the exposure to the semiconductor industry by ASML (2.33%) and the France's luxury by LVMH (2.14%), among others.
iShares NASDAQ 100 UCITS ETF Hedged	IE00BYVQ9F29 NQSE	An accumulative ETF with a 0.36% TER, with 377 million euros of AUM and physical (full) replication. It tracks the Nasdaq 100 Index, which consists of the 100 of the largest and most innovative non-financial companies on the Nasdaq Stock Market based on market capitalization.	Over half of the exposure of this fund is the technology sector (50.62%), with companies such as Apple, Microsoft, Amazon, Nvidia and Tesla making over 39% of the fund composition.
iShares MSCI EM UCITS	Core IE00BKM4GZ66 IS3N	An accumulative ETF with a 0.18% TER, with 15.18 billion euros of AUM and physical (optimized sampling) replication. It tracks the MSCI Emerging Markets Investable Market Index.	The top 5 exposing countries: China (29.78%), Taiwan (15.69%), India (14.30%), South Korea (12.03%) and Brazil (4.25%). It has a reasonable exposure to sectors such as financials (20.23%), technology (19.51%) and consumer discretionary (13.45%), by companies such as Taiwan Semiconductor (5.47%), Tencent (3.85%) and Alibaba (2.19%).

Lyxor STOXX (DR) UCITS	EURO Banks	LU1829219390 LYBK	An accumulative ETF with a 0.30% TER, with 2.04 billion euros of AUM and physical (full) replication. It tracks financial institutions in the eurozone banking sector.	The top 5 holdings: BNP Paribas (13.79%), Banco Santander (11.85%), and ING Groep (9.42%).
L&G Intelligence UCITS	Artificial	IE00BK5BCD43 XLMD	An accumulative ETF with a 0.49% TER, with 288 million USD of AUM and physical (full) replication. It tracks the ROBO Global Artificial Intelligence Index.	The top 5 exposing countries: United States (81.5%), Taiwan (4.4%), Cayman Islands (2.8%), Israel (2.7%), and Canada (1.7%). The top 5 holdings: Alteryx (2.1%), Alibaba Group (1.9%), Atlassian (1.9%), Rapid7 (1.9%), and Nvidia (1.9%).
L&G Security UCITS	Cyber	IE00BYPLS672 USPY	An accumulative ETF with a 0.69% TER, with 2.40 billion USD of AUM and physical (full) replication. It tracks the ISE Cyber Security UCITS Index .	The top 5 exposing countries: United States (70.8%), Israel (11.0%), Canada (6.5%), Japan (5.4%), and United Kingdom (4.0%). The top 5 holdings: Blackberry (5.1%), Cloudflare (4.6%), Palo Alto Networks (4.4%), Ziff Davis (4.4%), and Splunk (4.3%).
VanEck Semiconductor UCITS		IE00BMC38736 VVSM	An accumulative ETF with a 0.35% TER, with 832 million USD of AUM and physical (full) replication. It tracks the MVIS US Listed Semiconductor 10% Capped ESG index.	The top 5 holdings: Nvidia Corp (13.15%), Taiwan Semiconductor (9.94%), ASML (9.48%), Broadcom Inc (8.74%), and Texas Instruments (7.43%). The top 5 exposing countries: United States (77.0%), Netherlands (11.5%), Taiwan Region (9.9%), and Switzerland (1.6%).
Xtrackers World Care UCITS	MSCI Health	IE00BM67HK77 XDWH	An accumulative ETF with a 0.25% TER, with 1.64 billion euros of AUM and physical (full) replication. It tracks the MSCI World Health Care index.	The top 5 exposing countries: United States (71.09%), Switzerland (7.30%), Japan (4.21%), United Kingdom (4.08%), and Denmark (3.68%). The top 5 holdings: UnitedHealth (6.80%), Johnson & Johnson (6.41%), Eli Lilly & Co (4.07%), Pfizer (3.95%), and AbbVie (3.94%).
Xtrackers World Staples UCITS	MSCI Consumer	IE00BM67HN09 XDWS	An accumulative ETF with a 0.25% TER, with 804 million euros of AUM and physical (full) replication. It tracks the MSCI World Consumer Staples index.	The top 5 exposing countries: United States (58.58%), United Kingdom (11.38%), Switzerland (8.84%), Japan (5.60%), and France (5.20%). The top 5 holdings: Procter & Gamble (8.68%), Nestlé (8.29%), Coca-Cola (6.31%), PepsiCo (6.19%), and Costco (5.41%).
Xtrackers World UCITS	MSCI Energy	IE00BM67HM91 XDWO	An accumulative ETF with a 0.25% TER, with 1.08 billion euros of AUM and physical (full) replication. It tracks the MSCI World Energy index.	The top 5 exposing countries: United States (63.23%), Canada (11.49%), UK (11.16%), France (5.59%), and Australia (2.45%). The top 5 holdings: Exxon Mobil (16.60%), Chevron (10.83%), Shell (7.81%), Total Energies SE (5.57%), and ConocoPhillips (4.84%).
SPDR Europe Industrials UCITS	MSCI	IE00BKWQ0J47 SPYQ	An accumulative ETF with a 0.18% TER, with 285 million euros of AUM and physical (full) replication. It tracks the MSCI Europe Industrials 20/35 Capped index.	The top 5 exposing countries: France (22.18%), Germany (16.18%), UK (14.73%), Sweden (14.66%), and Switzerland (8.90%). The top 5 holdings: Siemens (8.01%), Schneider Electric (5.82%), Airbus (5.31%), Vinci (4.07%), and Relx (4.04%).
Xtrackers World UCITS	MSCI Utilities	IE00BM67HQ30 XDWU	An accumulative ETF with a 0.25% TER, with 147 million euros of AUM and physical (full) replication. It tracks the MSCI World Energy index.	The top 5 exposing countries: United States (65.45%), Spain (6.59%), UK (5.16%), Italy (4.03%), and Canada (3.59%). The top 5 holdings: NextEra Energy (10.26%), Duke Energy (4.96%), Southern Ord (4.88%), Iberdrola (4.41%), and Dominion Energy (3.19%).
iShares Global Aggregate Bond UCITS	Core	IE00BDBRDM35 AGGH	An accumulative ETF with a 0.10% TER, with 1.35 billion euros of AUM and physical (sampling) replication. It tracks the Bloomberg Global Aggregate Bond Index (USD). It invests in a diversified portfolio of bonds, including government	The top 5 exposing countries: US (40.06%), Japan (12.29%), China (9.29%), France (5.06%) and UK (4.21%). In terms of maturities, the fund holds 1.38% in 0-1 years, 41% in 1-5 years, 31% in 5-10 years, 15% in 10-20 years and 10.75% in 20+ years. In terms of rating the distribution is the following: AAA (40.44%), AA

		and corporate bonds, with a worldwide focus and varying maturities. The underlying bonds are rated both investment grade and sub-investment grade.	(13.15%), A (27.24%), BBB (14.27%) and "Not Rated" (4.42%).
Xetra-Gold	DE000A0S9GB0 4GLD	An accumulative ETC with a 0.00% TER, with 12.79 billion euros of AUM and physical (physically backed) replication that invests in gold	n.d.
iShares Diversified Commodity Swap UCITS	IE00BDL4P12 SXRS	An accumulative ETF with a 0.19% TER, with 1.64 billion euros of AUM and synthetic (unfunded swap). It aims to replicate the performance of the Bloomberg Commodity index, which monitors the futures prices of energy, precious metals, industrial metals, livestock, and agriculture.	n.d.
iShares Developed Markets Property Yield UCITS	IE00BDZVHD04 DPYE	An accumulative ETF with a 0.64% TER, with 37 million euros of AUM and physical (optimized sampling) replication. It tracks the FTSE EPRA/NAREIT Developed Dividend+ Index (USD).	The top 3 exposing countries: United States (60.49%), Japan (10.13%), and Hong Kong (5.07%). The top 3 holdings: Prologis REIT (7.77%), Public Storage REIT (3.17%) and Realty Income REIT (2.68%).

Source: Author

Appendice 5. Portfolio Composition: Risky and Total Portfolio



Source: Author

Appendice 6. Allocation Weights Computation

Initial Asset Allocation													
60/40	Initial Weight	Min Limit	Max Limit	Asset Classes	Initial weight	Min Limit	Max Limit	Focus	Focus Weight	Final Weight	Min Limit	Max Limit	
Risky Assets	60.00%	30.00%	75.00%	Equity	80.00%	40.00%	100.00%	Blue Chips USA	15.00%	7.20%	6.00%	11.00%	
								Blue Chips Europe	25.00%	12.00%	10.00%	18.00%	
								Broad Market USA	10.00%	4.80%	4.00%	8.00%	
								Broad Market Europe	10.00%	4.80%	4.00%	8.00%	
								Growth US	5.00%	2.40%	2.00%	4.00%	
								Emerging Markets	10.00%	4.80%	4.00%	8.00%	
								Europe Financial	2.00%	0.96%	0.00%	2.00%	
								World AI	3.00%	1.44%	1.00%	3.00%	
								World Cybersecurity	3.00%	1.44%	1.00%	3.00%	
								World Semiconductors	3.00%	1.44%	1.00%	3.00%	
								World Healthcare	3.00%	1.44%	1.00%	3.00%	
								World Consumer Defensive	3.00%	1.44%	1.00%	3.00%	
								World Energy	3.00%	1.44%	1.00%	3.00%	
								Europe Industrials	2.00%	0.96%	0.00%	2.00%	
World Utilities	3.00%	1.44%	1.00%	3.00%									
				Bonds	5.00%	2.00%	7.00%	IG, Sov and EM	100.00%	3.00%	2.00%	5.00%	
				Commodities	10.00%	5.00%	13.00%	Precious Metals	50.00%	3.00%	2.00%	5.00%	
								Agricultural, Metals and Energy	50.00%	3.00%	2.00%	5.00%	
				Alternative	5.00%	2.00%	7.00%	REITs	100.00%	3.00%	2.00%	5.00%	
				Liquidity	0.00%	0.00%	0.00%	Liquidity	100.00%	0.00%	0.00%	0.00%	
Risk Free Assets	40.00%	20.00%	50.00%	Sovereign Bond	100.00%	100.00%	100.00%	10-Year Bund	100.00%	40.00%	36.00%	60.00%	

Focus	ETF/Bond	ISIN
Blue Chips USA	iShares Dow Jones Industrial Average UCITS ETF	IE00B53L4350
Blue Chips Europe	Xtrackers Euro Stoxx 50 UCITS ETF 1C	LU0380865021
Broad Market USA	Vanguard S&P 500 UCITS ETF (USD) Accumulating	IE00BFMXXD54
Broad Market Europe	Lyxor Core STOXX Europe 600 (DR) UCITS ETF Acc	LU0908500753
Growth US	iShares NASDAQ 100 UCITS ETF EUR Hedged ETF (Acc)	IE00BYVQ9F29
Emerging Markets	iShares Core MSCI Emerging Markets IMI UCITS ETF	IE008KM4G266
Europe Financial	Lyxor EURO STOXX Banks (DR) UCITS ETF	LU1829219390
World AI	L&G Artificial Intelligence UCITS ETF	IE00BK5BCD43
World Cybersecurity	L&G Cyber Security UCITS ETF	IE00BYPLS672
World Semiconductors	VanEck Semiconductor UCITS ETF	IE00BMC38736
World Healthcare	Xtrackers MSCI World Health Care UCITS ETF	IE00BM67HK77
World Consumer Defensive	Xtrackers MSCI World Consumer Staples UCITS ETF 1C	IE00BM67HN09
World Energy	Xtrackers MSCI World Energy UCITS ETF 1C	IE00BM67HM91
Europe Industrials	SPDR MSCI Europe Industrials UCITS ETF	IE00BKWQ0J47
World Utilities	Xtrackers MSCI World Utilities UCITS ETF 1C	IE00BM67HQ30
IG, Sov and EM	iShares Core Global Aggregate Bond UCITS ETF EUR Hedged (Acc)	IE00BD8RDM35
Precious Metals	Xetra-Gold (ETC)	DE000A0S9GB0
Agricultural, Metals and Energy	iShares Diversified Commodity Swap UCITS ETF	IE00BDFL4P12
REITs	iShares Developed Markets Property Yield UCITS ETF	IE00BDZVHD04
Liquidity	(not defined)	(not defined)
10-Year Bund	10-Year German Bund	(not defined)

	Min	Central	Max
Equity	43.00%	48.00%	72.00%
Bonds	2.00%	3.00%	5.00%
Commodities	5.00%	6.00%	9.00%
Alternative	2.00%	3.00%	5.00%
Liquidity	0.00%	0.00%	0.00%
Sovereign Bond	36.00%	40.00%	60.00%
	100.00%		

Source: Author

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Abbreviations

AI	Artificial Intelligence
AP	Authorized Participants
AUM	Assets Under Management
CAEY	Cyclical Adjusted Earnings Yield
CAL	Capital Allocation Line
CAPE	Cyclical Adjusted Price to Earnings
CFA	Chartered Financial Analyst
CML	Capital Market Line
CVaR	Conditional Value at Risk
DJI	Dow Jones Industrial
ECB	European Central Bank
EF	Efficient Frontier
EPS	Earnings per Share
ESG	Environmental, Social, and Governance
ETF	Exchanged Traded Funds
EY	Earnings Yield
FED	Federal Reserve
FSVM	Fed Stock Valuation Model
FX	Foreign Exchange
HICP	Harmonised Index of Consumer Prices
GFC	Global Financial Crisis
GIPS	Global Investment Performance Standards
IPS	Investment Policy Statement
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
NASA	National Aeronautics and Space Administration

NDQ Nasdaq

OECD-FAO Organization for Economic Co-operation and Development and the Food and Agriculture Organization

PE Price to Earnings

PPP Purchasing Power Parity

QE Quantitative Easing

QT Quantitative Tightening

REITs Real Estate Investment Trusts

RL Return Level

S&P Standard & Poor's

SPDR Standard & Poor's Depository Receipts

SR Sharpe Ratio

SS Short Selling

TER Total Expense Ratio

UCITS Undertakings for Collective Investment in Transferable Securities

UK United Kingdom

US United States

USD United States Dollar

USFR United States Federal Reserve

VaR Value at Risk

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