Our Investment Strategy

moneyfarm

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Preface

Moneyfarm's key aim is to help people achieve their financial goals both easily and efficiently. Naturally, our investment strategy, as it appears in this document, is a central element of our proposition and was built solely for the purpose of achieving our key aim.

Investors have never had as much choice as they do today. Technological advancements and developments within finance have made it possible to access myriad investment opportunities from any given corner of the globe. The financial system is complex, though, so this increase in options brings with it an increase in the opportunities to make mistakes.

At Moneyfarm, we decided to add some much-needed simplicity to the increasing noise. We chose to focus on the primary drivers of long-term returns and to nail down a set of fundamental principles. These are, essentially, rules for investors to live their financial lives by, principles that have guided our investment philosophy and served as a basis for the entirety of our service. These are, broadly, as follows.

Asset allocation is where long-term returns are won and lost

Asset allocation - by which we mean the process of selecting a diverse range of assets - is at the core of our strategy. Research has shown that, over the long term, asset allocation choices are responsible for around 90% of the variation in returns, while only 10% can be put down to timing or instrument selection.

This means that the choice of which asset classes to invest in, and how much to allocate to each one, is at the heart of the portfolio construction process. It's here that we make sure we're fully diversified, which we believe is one of the most effective ways of managing risk. We don't make passive investments - we take a dynamic approach to asset allocation that adapts to short, medium and long term trends.

Controlling costs is key to successful investing

It goes without saying, but costs are one of the key factors that determine the success of an investment. Thus controlling them becomes becomes vital in any good investment strategy. Choosing a low-cost management tool is a key part of the construction of our portfolios and the decisions we make from there, particularly with regard to how often we rebalance. Every decisions we make is informed by careful cost/benefit analysis.

As well as offering diversification and simplicity, passive funds are also great from a cost perspective - this is why we build our portfolios around them. There's plenty of academic literature that questions the ability of more active managers to generate enough returns to offset their high management costs. Not everyone has the time or the resources to choose an active manager that can offer real value, while the ability for these managers to perform over the long-term is limited.

We have faith in the growth of the economy

The relationship between markets and wider economic and social trends is the main factor that influences the price of financial assets over the long term. Properly analysing these factors helps you build a sustainable investment strategy before and during your exposure to global economic growth - which has, incidentally, been reasonably consistent for decades.

Our asset allocation process - and by extension our portfolios - are based on the regular assessment of the medium-term macro factors affecting the economic environment. The relationships between things like capital and credit, fiscal and monetary policy and economic growth all need to be taken into account for a rounded view of the situation.

An investor's greatest asset: time

The long and short of it is that, historically, financial markets have grown. It is our firm belief that the best thing an investor can do is to invest consistently over the long term, taking advantage of both this historical trend of growth and of compounding interest.

Unpredictability in the markets is, generally, a short-term problem, but it can be a dangerous distraction from an investor's long-term goals. Investors who have the patience and the discipline to stay the course, even when the markets hit turbulence, are rewarded - historically, this has always been the case and we don't see this changing any time soon.

So, investors have more choice than ever at their fingertips, and we are delighted to be a part of the wave of positive change happening in personal finance. We invite anyone who's interested in investing or in the personal finance industry more broadly to read our Investment Strategy in full. The document gives a comprehensive breakdown of our approach and has been created with simplicity and accessibility in mind - if you'd like more detail about anything we've touched on, feel free to reach out and ask. Together, we will keep striving to make investing better and redefining what wealth management means in 2021.

Giovanni Daprà
Co-Founder & CEO Moneyfarm

CHAPTER

01.

SUBTITLE THE PRINCIPLES THAT GUIDE OUR WORK

TITLE

What we believe in

What we believe in

The principles that guide our work

Our wealth is important because it helps us lead a better life; we all miss out on too much by badly managing our money and worrying about it. Everyone should be able to protect, promote and pursue their wealth, without it hanging over them.

"Our mission is to give our customers the best solutions and support to **protect and grow their wealth** through time; we combine human empathy, financial expertise and innovative technology to provide a superior wealth journey for our customers."

We invest for the future. For our clients' goals, their hopes, their peace of mind. And the future is uncertain – an unknowable range of outcomes that no one can predict with absolute clarity.

These simple statements underpin how we build portfolios. It's a rigorous process that uses quantitative techniques and qualitative judgement to construct a robust set of multi-asset portfolios for our clients.

We consider a broad universe of liquid investments – global equities, corporate bonds, government bonds and commodities. We aim to provide our customers with a low-cost globally diversified portfolio that will help them to achieve their goals. We believe that this type of exposure represents a core holding that is as relevant for the largest sovereign wealth fund as it is for the individual investor.

We typically implement that using exchange-traded funds ('ETF'). We believe that they are transparent and cost-effective tools. We use a broad set of criteria to evaluate the most suitable ETFs for our clients.

But we always need the humility to recognise our limitations, that our judgement is not infallible. If it were, there'd be no need for risk management. Our portfolios must not only prosper in the good times but remain resilient when markets are tougher.

The value of **saving and investing**

Why do we think that people should invest in financial markets?

As we've established, wealth helps us lead a better life. We all miss out when we badly manage our money or we worry about it. Everyone should be able to comfortably grow their wealth without having to worry about it.

"Today people who hold cash equivalents feel comfortable. They shouldn't. They have opted for a **terrible long-term asset, one that pays virtually nothing and is certain to depreciate in value.**"

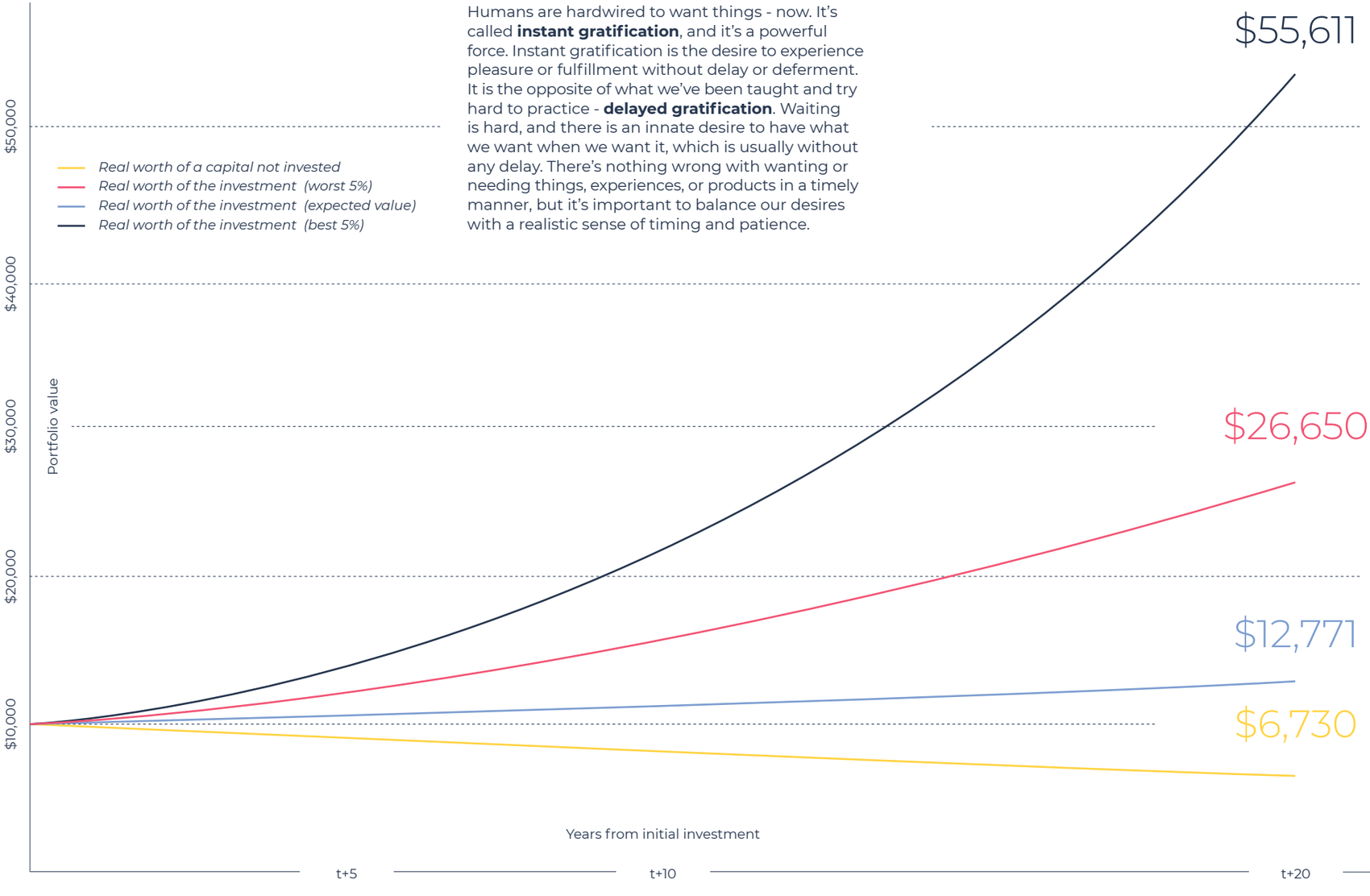
— Warren Buffett

Having some savings is the best weapon against unexpected events and for preserving the financial independence of each of us over time. But saving without return is inefficient, particularly in a world where the inflation rate is positive. In our proposition, the most important element is protecting the real wealth of the investor over time. Only by getting a positive real rate on their savings can people maintain their purchasing power over time. By investing, the probability of losing money is, of course, more than 0%. If inflation is positive, by not investing, the probability of losing money is 100%.

We would like to do more than preserve wealth. Financial markets can catalyse savings and increase the probability of reaching goals that would be difficult to achieve without a strong rate of return. Investing with a longer time horizon can help people to achieve their goals, like growing their pension or saving for university fees.

The importance of investing

The chart shows the value of a portfolio that isn't invested over a period of 20 years. Inflation (assumed at an average of 2%) will erode more than 30% of the initial wealth. Over 20 years, even investing in bad financial markets is better than not investing your money at all.



Instant vs Delayed gratification

Humans are hardwired to want things - now. It's called **instant gratification**, and it's a powerful force. Instant gratification is the desire to experience pleasure or fulfillment without delay or deferment. It is the opposite of what we've been taught and try hard to practice - **delayed gratification**. Waiting is hard, and there is an innate desire to have what we want when we want it, which is usually without any delay. There's nothing wrong with wanting or needing things, experiences, or products in a timely manner, but it's important to balance our desires with a realistic sense of timing and patience.

A growing body of literature has linked the ability to delay gratification to a host of other positive outcomes, including academic success, physical health, psychological health, and social competence. Delayed gratification describes the process that the subject undergoes when the subject resists the temptation of an immediate reward in preference for a later reward. A person's ability to delay gratification relates to other similar skills such as patience, impulse control, self-control and willpower, all of which are involved in self-regulation.

*One particularly influential research study on delayed gratification is the **Stanford marshmallow experiment**: The marshmallow experiment was led by psychologist Walter Mischel, a professor at Stanford University. In this study, children were offered a choice between one small but immediate reward, or two small rewards if they waited for a period of time. The reward was either a marshmallow or pretzel stick, depending on the child's preference.*

In follow-up studies, the researchers found that children who were able to wait longer for the preferred rewards tended to have better life outcomes, as measured by SAT scores, educational attainment, body mass index (BMI), and other life measures. A replicated attempt with a more diverse sample population - over 10 times larger than the original study - showed that the original study accounted for half of these outcomes. The study suggested that economic background, rather than willpower, explained the other half.

What does this teach us?

First, the ability to delay gratification is one of the most important personal traits of successful people. Studies show that people who learn how to manage their needs to be satisfied in the moment thrive more in their careers, relationships, health, and finances than people who give in. Second, being able to delay satisfaction isn't the easiest skill to acquire. It involves feeling dissatisfied, which is why it's impossible for people who haven't learned to control their impulses. Instant gratification is a powerful force - waiting is hard for human beings because there is an innate desire to have what we want without any delay.

Why is all this relevant to us?

Life is full of intertemporal choices. One of the main ones is: should I save or should I consume now? Since Moneyfarm was created to help people make better decisions with their money, we try to help people answer this question. As Modigliani argued, individuals need to smooth their consumption profile over their life. Labour income varies substantially over a lifetime, starting out low, increasing until the 50'th year of a person's life and then declining until 65, with no labour income after 65.

A return for your investments

It is important to get a return from an investment. The question to answer is how we get that return and why we think that financial markets can provide a positive return to the portfolio.

When we think about investors we rely on two key assumptions:

- **Investors are risk averse**.
  In economics and finance, risk aversion is the behavior of humans (especially consumers and investors) who, when exposed to uncertainty, attempt to reduce that uncertainty. It means that the investor wants a risk-premium to invest;
- **Cash availability is a privilege**.
  To give up this privilege, there must be compensation. This compensation is paid by the borrower to the lender.

Given these assumptions, if an investor lends some money at a risk, the investment should remunerate them appropriately:

1. **The time value of money**:
   investors give up their endowments only if there is a reward;
2. **Liquidity preference**:
   the more the asset is liquid, the better it is. To move from cash to securities, investors require a reward;
3. **Current risk-free rate**:
   due to the previous reasons, investing in risk-free assets also provides a return. To invest in risky assets, investors must be appropriately rewarded;
4. **Borrower credit-worthiness**:
   lending money comes with the risk that the value of the investment could decrease. Investors will only take on this risk if they are rewarded;
5. **Inflation**:
   due to inflation, the same amount of money will buy you fewer goods tomorrow than it does today. Investors ask for a remuneration.

"Financial markets basically exist to bring people together so money flows to where it is needed most."[1]

[1] Bank of England

LIGHT DIVE

Risk aversion and risk-premium

Company A needs to borrow $100,000 to finance the building of a new factory. Company A asks for $100,000 from Investor B.

Company A can provide a return on the investment of 10%. The probability that Company A defaults and is able to repay only $10,000 of the initial debt is 10%. This means that the investment provides a return of 10% with a probability of 90% and a loss of 90% with a probability of 10%. Since the investment has an expected return of $0 ($10,000 * 90% + -$90,000 * 10%), the investor is expecting to maintain its initial wealth.

However, by lending money, the investor enters a world of uncertainty. They are not guaranteed to preserve their initial wealth: there is a scenario where the investor is better off and a scenario in which they lose most of their initial wealth.

Will Investor B lend the money?

It depends on Investor B's risk attitude. Some people are *risk-takers*, so they are happier in uncertain environments and are willing to risk losing some wealth. Other people are *risk-neutral*, so they are indifferent about investing their money or keeping the wealth in the bank account. The final type of investor falls under 'risk-averse'. Since there is a possibility of losing their money, the investor is not willing to invest; the uncertainty makes some investors uncomfortable.

Does this mean that, if Investor B is *risk-averse*, they will never lend to Company A? No, it simply means that the investor requires a risk-premium to invest in an uncertain scenario. Company A can still get the money from Investor B, but it needs to increase the interest rate. If Company A provides a return of 20%, for instance, the expected gain becomes $9,000 (20% * $100.000 * 90% + -90% * $100.000 * 10%), and Investor B will start thinking about lending the capital. Whether Investor B invests or not depends on their risk aversion level.

To get a rate of return, it is possible to invest both in financial markets and in private placements. Every investment has its strengths and weaknesses. Financial markets are the aggregation of investors' preferences, investors' evaluations and investor risk premiums.

Financial markets connect the needs of the global business to the needs of investors:

- **Companies need money to invest in their futures**. Using financial markets, they can access a broader set of liquidity sources, so they can finance themselves at better value. The liquidity helps them to invest and to create value;
- **Investors have a liquidity surplus and need to preserve their purchasing power over time**. Through financial markets, investors have the chance to boost their savings and reach goals that can be difficult without the magic of compounded interest.

When we invest money in financial markets, both with equity or bonds, we get access to assets with a positive risk-premium. In our investment process, we analyse the risk and return of assets and the quality of their risk-premium and, from them, we select the best assets to create portfolios that can preserve customer wealth.

Missing the opportunities of investing in the market is a big risk. But these opportunities have to be carefully analysed and only those that are in line with the risk profile of the investors should be mixed to create the best and the most suitable investment solutions.

Our economic foundations

First, we believe that focusing our attention on the global macroeconomic environment and broad asset classes is the most effective way to serve our clients. The interaction between macroeconomic variables and financial market expectations is an important driver of financial market returns. But that relationship is neither constant nor easy to predict. We look to translate our analysis into portfolios that provide the best risk-adjusted outcome for our clients.

While portfolio performance is, per se, pivotal to a better financial outcome, our core value proposition is to take what we know about each client and translate that into a suitable portfolio. We assess our clients' financial goals, financial knowledge and attitude to risk. These inputs, along with our assessment of financial markets, drive our process for delivering a better outcome for our customers.

We don't spend much time analysing individual companies. Sticking to our core beliefs, we think that generating alpha *(performance uncorrelated with the general market trend)* by selecting stocks is very difficult and, too often, any gains have been eaten away by fees and costs. It's not that we wouldn't consider using strong active fund managers to implement our macro views, but only at the right price.

Managing risks

Managing risk is as important as hunting for returns. We don't have perfect foresight – no one does. We need to build portfolios that reflect the uncertainty of investment outcomes. Managing risk isn't the same as eliminating risk – but we want to be clear what risks we're taking on behalf of our clients and why. Understanding and evaluating the sources of risk in portfolios helps to ensure that our portfolios reflect our investment views. Risk management can sometimes result in lower short-term absolute returns, but over time we believe that it's a critical component in ensuring a better outcome in line with an investor's goals.

We think in terms of probabilities rather than absolutes. We typically forecast a range of outcomes rather than single points and reflect that in our portfolio construction. We test our portfolios across a range of different scenarios. In an uncertain world, we think this will produce better outcomes for our customers over time.

Thinking long term

Time horizon is the best "edge" you can have. Investors talk a lot about their investing "edge" – the insight / process they have that will allow them to outperform. History tells you that a consistent edge is very difficult to find.

After all, why would some aspect of financial markets (a factor, an industry, or market) be consistently mispriced? We'd argue that the time horizon is the best edge out there – focus on the long-term as much as you can and allow compounding to do its work.

LIGHT DIVE

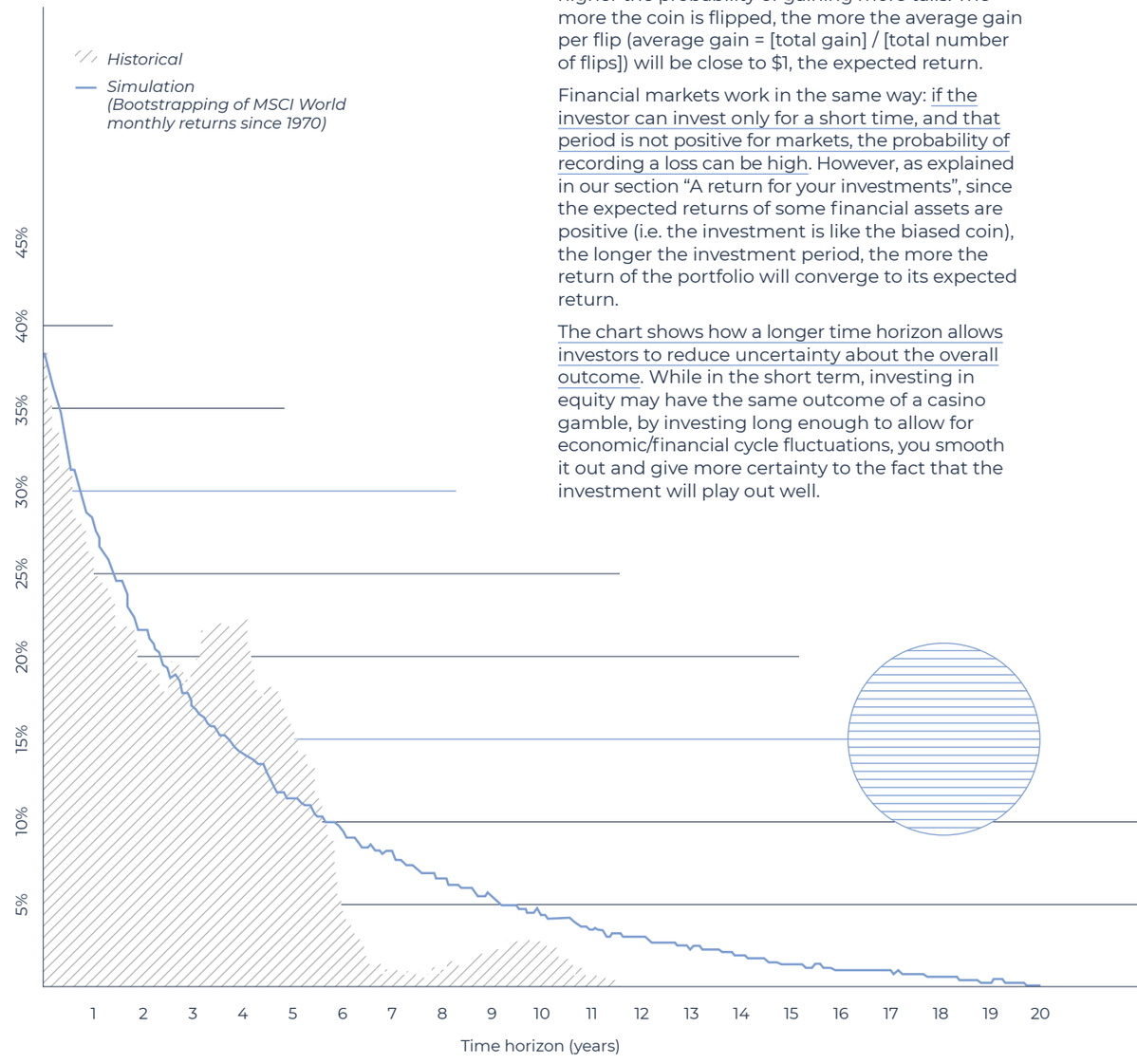
Financial markets and the bias coin

Let's think about flipping a fair coin.
If you flip the coin one time and you get a head, the probability of the head might appear to be 100%. If you flip the coin a number of times, the number of tails will be similar to the number of heads, i.e. 50% each.

Let's assume now that the coin is biased and the probability of tails is 60%. You gain $5 from tails and lose $5 with heads (the expected return of the bet is $1 = $5 x 60% + -$5 x [100% - 60%]). After the first flip, you have a head and you lose $5. If you can flip the coin only once (i.e. you have a short time horizon) you might go home with a loss. But since the coin is biased, the more you play the game, the higher the probability of gaining more tails. The more the coin is flipped, the more the average gain per flip (average gain = [total gain] / [total number of flips]) will be close to $1, the expected return.

Financial markets work in the same way: if the investor can invest only for a short time, and that period is not positive for markets, the probability of recording a loss can be high. However, as explained in our section "A return for your investments", since the expected returns of some financial assets are positive (i.e. the investment is like the biased coin), the longer the investment period, the more the return of the portfolio will converge to its expected return.

The chart shows how a longer time horizon allows investors to reduce uncertainty about the overall outcome. While in the short term, investing in equity may have the same outcome of a casino gamble, by investing long enough to allow for economic/financial cycle fluctuations, you smooth it out and give more certainty to the fact that the investment will play out well.



Why broad diversification is vital

Investors shouldn't think about "beating the market".
Too many investors try to game the market – what institutional investors usually refer to as 'generating alpha'. Not only is it difficult to do consistently, we also think it's a distraction. We're more concerned with helping our customers achieve their goals. We want to manufacture positive real returns over the long-term, rather than worrying about doing better than a particular index over 12 months. If we focus on that over time, we think we'll stack up well compared to other providers.

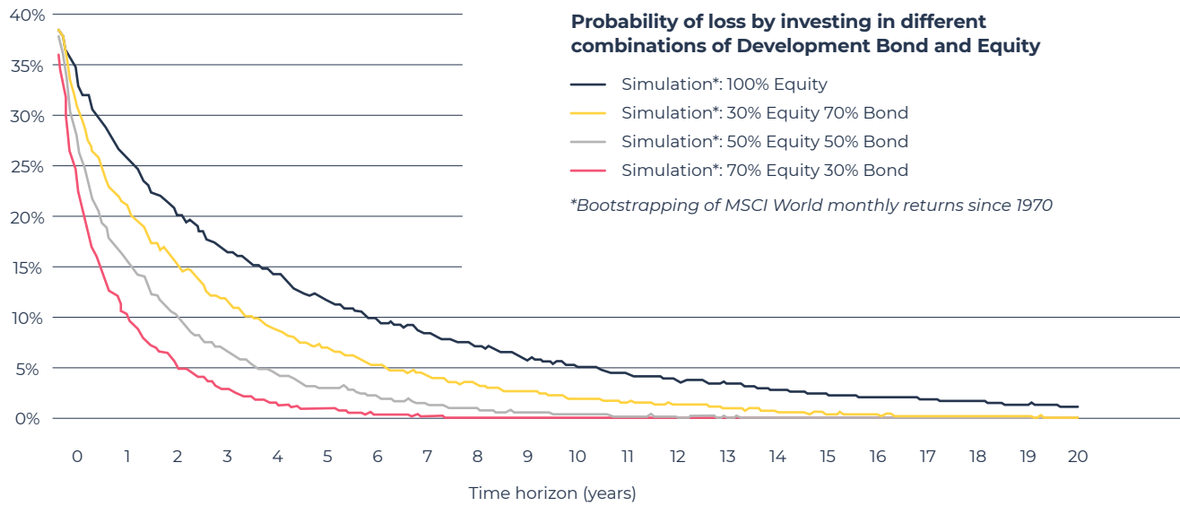
Our current available investment universe comprises:

- **Cash and Short Term Government Bonds**
- **Developed Countries Government Bonds**
- **Inflation Linked Government Bonds**
- **Investment Grade Corporate Bonds**
- **Speculative Grade Corporate Bonds and Emerging Countries Sovereign Bonds**
- **Developed Markets Equity**
- **Emerging Markets Equity**
- **Commodities**

Given the investment beliefs we outlined earlier, we decided to broaden our investment universe as much as possible. A truly diversified multi-asset portfolio will have a good mix of many or even all these because any of them could outperform at any given time. Moreover, if one asset performs poorly, the overall portfolio can be protected by the strength of other assets. Having a diversified multi-asset portfolio can protect against volatility and major market swings. This is particularly beneficial during times of high market uncertainty.

When we look at the historical performance of the different asset classes we see the benefits of broad multi-asset exposure.

As the table below shows, if we rank the yearly performance (since 1992, in USD) of each asset class, it is clear that there's no unambiguous winner.

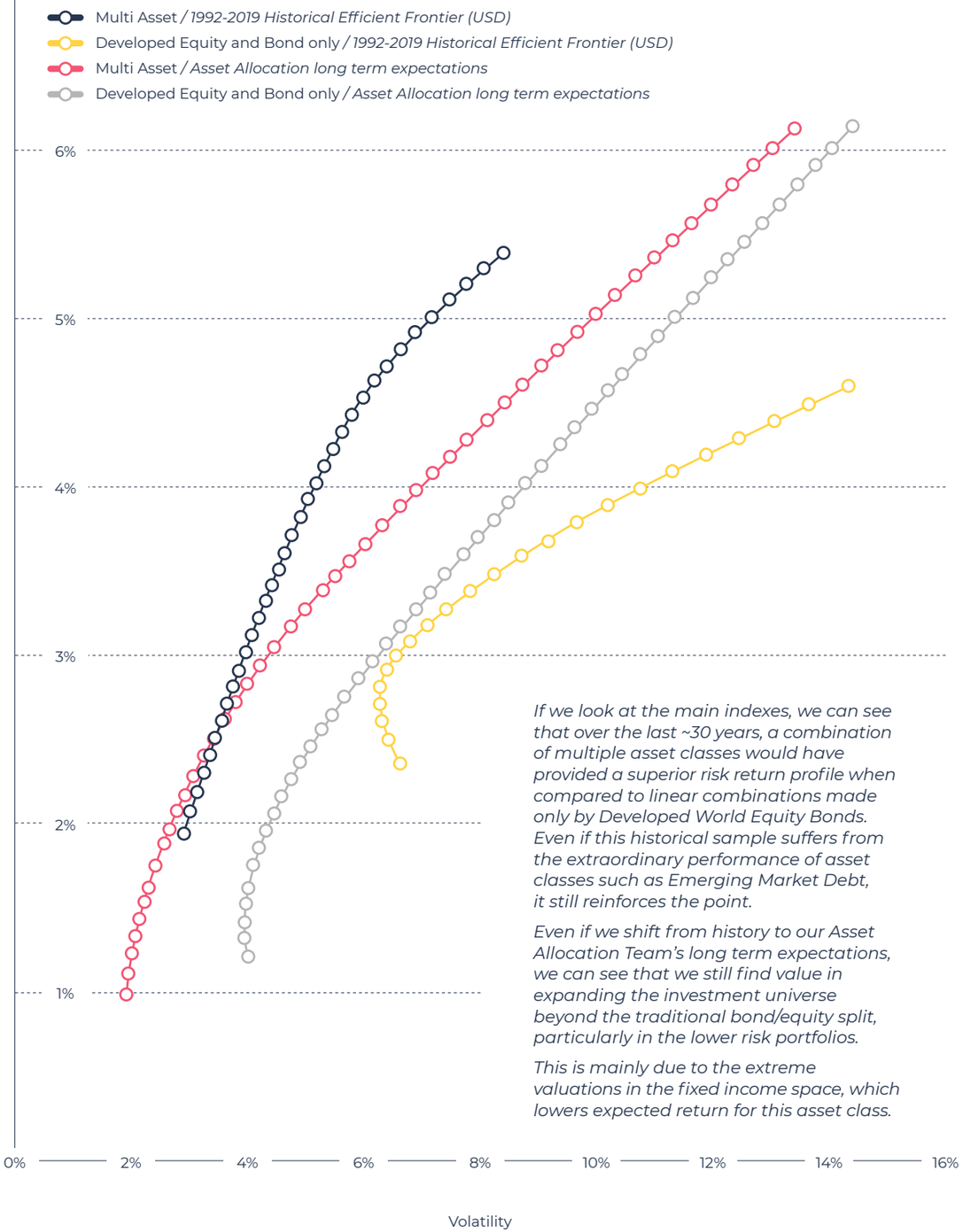


By diversifying across asset classes and risk factors, we can reduce the client's probability of loss. Again, clients' profiles are key. If a customer is more concerned about loss, a portfolio more tilted towards bonds is more suitable.

On the other hand, this portfolio is very likely to have a lower outcome. So if a customer values gains more they fear losses, it may be better to move towards an equity-tilted portfolio.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Cash	6	7	2	7	6	5	4	5	4	2	5	8	8	5	6	6	2	8	8	5	7	3	6	1	8	8	1	8
Global Government	4	5	4	5	7	6	2	8	5	5	2	6	5	8	5	3	1	7	7	2	6	7	5	5	7	5	2	6
US Corp	2	6	6	2	8	4	3	7	3	1	4	7	7	7	7	7	3	5	5	1	5	4	1	3	6	6	4	2
US HY 100	1	4	5	4	3	3	5	6	6	3	6	4	4	6	4	8	5	2	3	3	4	2	4	6	1	4	3	3
EM Ext Debt	5	2	8	1	1	2	6	4	2	4	3	3	3	4	3	5	4	4	6	4	2	6	3	4	5	3	5	4
MSCI WORLD	8	3	3	3	4	1	1	2	7	7	8	2	2	3	2	4	7	3	4	6	3	1	2	2	4	2	6	1
MSCI EM	3	1	7	8	5	8	7	1	8	6	7	1	1	1	1	1	8	1	1	8	1	5	7	7	3	1	8	5
BBG Commodity TR	7	8	1	6	2	7	8	3	1	8	1	5	6	2	8	2	6	6	2	7	8	8	8	8	2	7	7	7

Efficient Frontiers



If we look at the main indexes, we can see that over the last ~30 years, a combination of multiple asset classes would have provided a superior risk return profile when compared to linear combinations made only by Developed World Equity Bonds. Even if this historical sample suffers from the extraordinary performance of asset classes such as Emerging Market Debt, it still reinforces the point.

Even if we shift from history to our Asset Allocation Team's long term expectations, we can see that we still find value in expanding the investment universe beyond the traditional bond/equity split, particularly in the lower risk portfolios.

This is mainly due to the extreme valuations in the fixed income space, which lowers expected return for this asset class.

LIGHT DIVE

Diversification and roulette

Imagine you're playing roulette.

The game seems fun, so you start playing and bet on a single number. Realising it isn't paying off, you start to choose black or red, even or odd, in an attempt to increase your chances of winning.

Relying on a single stock is much like placing a bet on a single number. On the other hand, diversification is a little bit like betting on pairs or red numbers, or groups. The chance of winning increases.

Of course, investing is not as straightforward as playing roulette. There are a lot of advantages driven by diversification and the expected return is positive - with roulette, the house almost always wins.

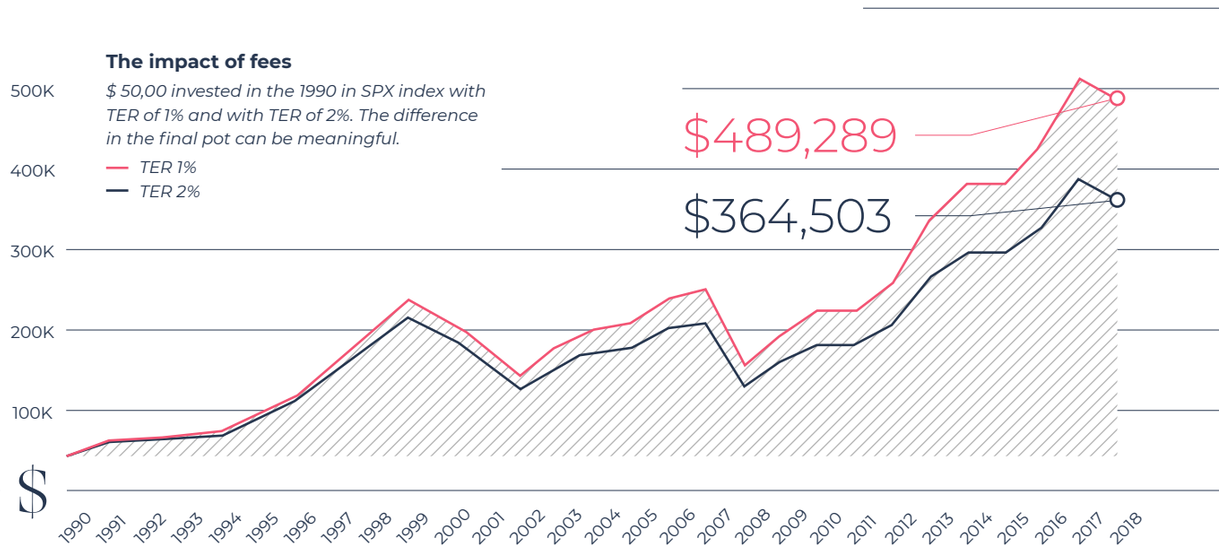
Low fees:
A farsighted move

It's important to keep your costs low. Markets are difficult to predict, but costs are much more visible. And, fortunately, regulations are likely to make it even easier to see all the fees you pay as an investor - not just the management fee, but advisor fees and trading costs, etc. A lower fee may not make a big difference over a short time period, but just as returns compound over time, so do fees. If you keep your fees low over the years, it could have a significant impact on how much you actually end up with.

Also, trading costs are not negligible.
The frequency with which you trade can have a big impact on the final performance of the portfolio. History suggests that most investors lose out when they trade once commissions and spreads are considered. One additional benefit of a long-term focus is that it tends to reduce portfolio turnover.

The impact of fees

$ 50,00 invested in the 1990 in SPX index with TER of 1% and with TER of 2%. The difference in the final pot can be meaningful.



Guidance for **your emotions**

Traditional financial modelling is based on the assumption that individuals act rationally, processing all available information in their decision-making process, and follow a risk averse utility function. However, research conducted on the ways that human beings arrive at decisions and choices when faced with uncertainty has uncovered that this is not necessarily the case. People often make systematic errors, the so-called cognitive biases, which lead them to less rational behaviour than the classical economic paradigm assumes.

Moreover, people attribute excessive significance to events with low probabilities and insufficient significance to events with a high probability.

For example, individuals may unconsciously treat an outcome with a probability of 99% as if its probability was 95%, and an outcome with probability of 1% as if it had a probability of 5%.

Providing a good investment solution is not enough, even if the portfolio is aligned to the investor's risk profile and goals. This is because cognitive bias can significantly affect the assessment of the risk profile, or drive the investor to take decisions that affect the management of the portfolio, such as so-called "panic selling". All of these mistakes can greatly affect the performance of the portfolio.

When financial markets drop, customers become scared and want out. If they sell, the loss is crystallised and they cannot recover from it.

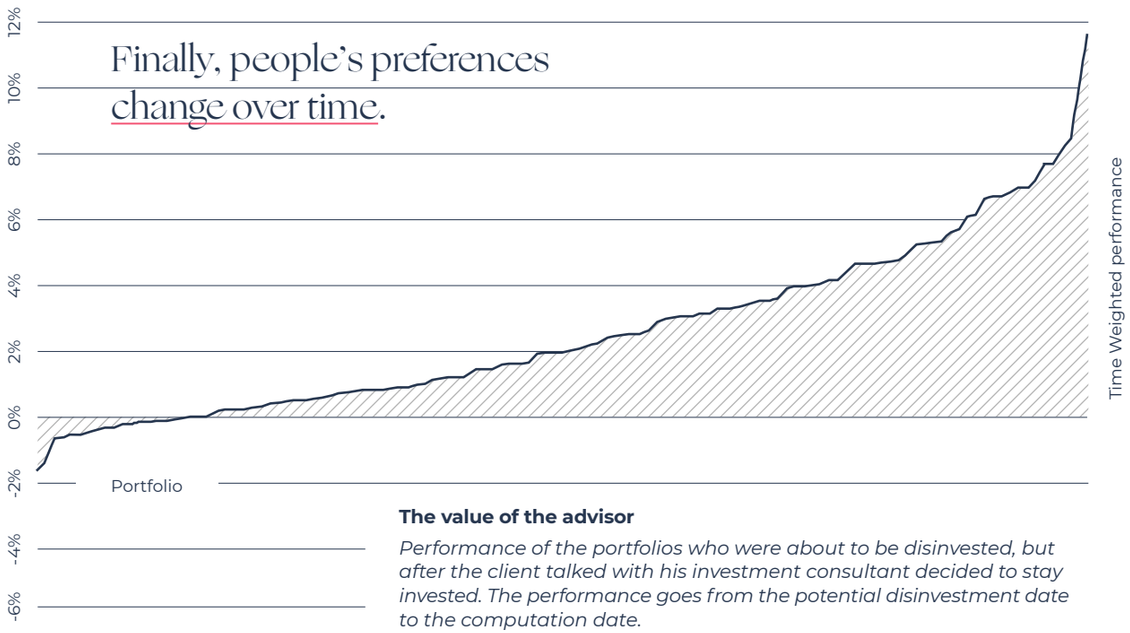
The losses derived from bad market timing can have a meaningful impact on performance.

We know that behavioural biases exist and cannot be fully eliminated, but we can manage them to protect overall performance.

For this reason, we support the whole investment journey of our clients with an investment consultant. The digital platform and our financial analyses are important, but our work can be wasted.

Our investment consultants help our customers to understand their goals, define the appropriate risk level for them and support them through periods of market volatility.

Our Tactical Asset Allocation also plays an important role in this process. Knowing that the typical investor feels investment losses more keenly than they do gains, we monitor the risk level of the portfolios, trying to keep it within controlled ranges.



The value of the advisor

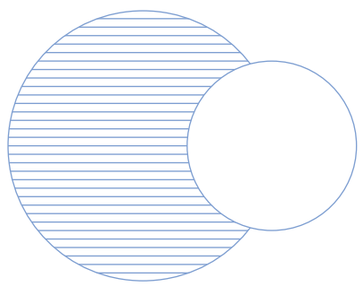
Performance of the portfolios who were about to be disinvested, but after the client talked with his investment consultant decided to stay invested. The performance goes from the potential disinvestment date to the computation date.

LIGHT DIVE

Prospect theory

Prospect theory was developed by psychologists Daniel Kahneman and the late Amos Tversky, as a theory of decision-making under conditions of risk and uncertainty. It is the founding theory of behavioural economics and behavioural finance, and it constitutes one of the first economic theories built using experimental methods.

There are two key pillars of prospect theory:



1. Relativity of the situation

Prospect theory starts with the concept of loss aversion, an asymmetric form of risk aversion derived from the observation that people react differently to potential losses and potential gains. Thus, people make decisions based on the potential gains or losses relative to their specific situation (the reference point) rather than in absolute terms:

- Faced with a risky choice leading to gains, individuals are risk-averse, preferring solutions that lead to a lower expected utility but with a higher certainty (concave value function).
- Faced with a risky choice leading to losses, individuals are risk-seeking, preferring solutions that lead to a lower expected utility as long as it has the potential to avoid losses (convex value function).

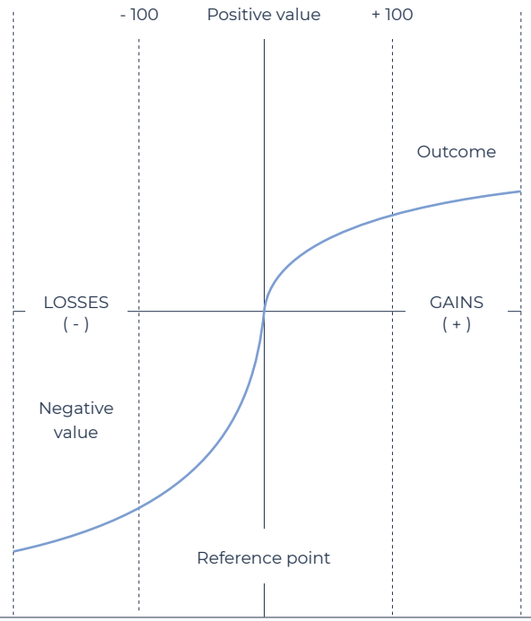
These two examples are thus in contradiction with the expected utility theory, which only considers choices with the maximum utility.

2. Probability bias

People attribute excessive weight to events with low probabilities and insufficient weight to events with high probability.

For example, individuals may unconsciously treat an outcome with a probability of 99% as if its probability was 95%, and an outcome with probability of 1% as if it had a probability of 5%.

The under- and over-weighting of probabilities is importantly distinct from under- and over-estimating probabilities, a different type of cognitive bias observed for example in the overconfidence effect.



- *We feel the gain of $100 less*
- *We feel the loss of $100 more*

Reference Point

Problem 3:

In addition to whatever you own, you have been given $1,000. You are now asked to choose one of these options:

- *50% chance to win $1,000*
- *Get $500 for sure*

The majority of the respondents preferred to receive $500 for sure in Problem 3 and accept the gamble to lose $1,000 in Problem 4. Even though the final states of wealth are identical in both scenarios, the comparison between them underscores the dominant role of a reference point from which the options are evaluated.

The reference point of Problem 3 is higher than the current wealth by $1,000, and it is considered a gain of $500 if you were to increase your wealth by $1,500. Conversely, the reference point for Problem 2 is higher than the current wealth by $2,000 and increasing your wealth by $1,500 is considered a loss of $500.

Problem 4:

In addition to whatever you own, you have been given $2,000. You are now asked to choose one of these options:

- *50% chance to lose $1,000*
- *Lose $500 for sure*

Therefore, an individual views monetary consequences in terms of changes from a neutral reference point. For financial outcomes, the common reference point is the status quo. For most investors, the entry prices at which they have taken position for their investment may be a reference point.

In other situations, it can be the outcome that you have expected or feel entitled to, for example the increment or bonus that your colleagues receive. Outcomes that are better than the reference point are considered gains and consequently outcomes below the reference point are losses.

Certainty

Problem 1:

Which do you choose?

- *Get $900 for sure*
- *90% chance to get $1,000 and a 10% chance to get $0*

Despite both options having the same expected return, most people are likely to choose to receive the $900 for sure. This is because we tend to overweight options that are certain, as a result, adopt a risk averse attitude towards gains.

Problem 2:

Which do you choose?

- *Lose $900 for sure*
- *90% chance to lose $1,000 and a 10% chance to lose $0*

If you are like most other people, you will probably choose to gamble in this scenario. The certain loss of $900 is very unpalatable and this drives people to be risk-seeking in the realm of losses. Fundamentally, the contrasting attitudes towards risk with favourable and unfavourable prospects depends largely on the way we frame outcomes as gains or losses.

Loss Aversion

One basic tenet of prospect theory is loss aversion. It reflects a prevalent avoidance behaviour involving choices that could lead to losses. To most people, losses loom larger than gains when weighted against each other, resulting in an asymmetrical impact in our decision-making process.

Many of the choices that we frequently come across are presented as an ambivalent shade of grey instead of a strictly dichromatic palette of black and white. There is a risk of loss and opportunity for gain. These scenarios, with the element of mixed prospects, can range from an investor evaluating the feasibility of investing in a company to the strategy employed in a football match.

Problem 5:

You are offered a gamble on the toss of a coin. Would you accept it?

- *Tail: Lose $100*
- *Head: Win $150*

Even though the expected value of the gamble is positive (an individual stands to gain more than he can lose), most people are likely to reject the game. This is because the fear of losing $100 is more intense than the hope of winning $150.

For most of us, the amount we could possibly win has to be at least twice as large as the amount we could lose before we are willing to accept the gamble.

Interestingly, our sensitivities to losses can be traced back to evolutionary history in which organisms that initiated urgent action in response to threats (when compared to opportunities) have a better chance of survival and procreation. As such, it would make sense that we experience greater pain of loss than joy of gain of comparable magnitude.

CHAPTER

02.

SUBTITLE A SET OF SOLUTIONS FOR THE CUSTOMER YOU ARE TODAY

AND THE ONE YOU'LL BE TOMORROW

TITLE

The Moneyfarm proposition

The Moneyfarm proposition

A set of solutions for the customer you are today and the one you'll be tomorrow

To offer the optimal portfolio, Moneyfarm has implemented a multi-stage process, where every step is taken to provide the best experience and detect the different risks that are undertaken through the investment process:

1. **Understanding the goal and the profile of the investor**: it means assessing their risk tolerance, their risk capacity and their financial goal, in order to provide them a solution that maximises their utility by controlling the risk, during the whole investment path.
2. **Continuing to review the products**
We ensure that Moneyfarm offers an appropriate range of alternatives for our customers;
3. **Selection of the best possible solution**
in terms of return, for each risk profile;
4. **Support the investor cash-flow management**, to avoid inefficient behaviours that could affect the final outcome of the portfolios (such as panic selling or bias expectation on the portfolios).

How we've structured the Moneyfarm proposition

We combine the personal attitudes of the investors with the best outcomes in terms of risk and return.

Understanding your risk profile

"What is a good investment?"

It depends on the financial goals and on the profile of the investor. An investment with a low return and low risk can be a bad recommendation for a high risk taker client who needs to integrate their pension, but can be a good investment for those who want their pension pot to not depreciate over time. The quality of an investment cannot be evaluated without considering the utility the investor will gain from it.

"Utility represents the satisfaction that consumers receive for **choosing and consuming a product or service**"

LIGHT DIVE

Good investments and investor preferences

Suppose we have two financial assets:

- **Asset A** provides a return of 13% with a 50% probability and -10% with a 50% probability
- **Asset B** provides a return of 20% with a 50% probability and -15% with a 50% probability.

After some math, Asset A has an expected return of 1.5% (13% * 50% + -10% * 50%) and a volatility of 1.3%, so the Sharpe Ratio[4] is 1.13.

Asset B has an expected return of 5% and a volatility of 4%, so the Sharpe Ratio is 1.25.

It could be argued that, since Investment B has a higher Expected Return and a higher Sharpe Ratio, this is a better investment overall. This is only partially true, since some investors are not willing to lose 15% of their investments and they prefer to give up some Sharpe Ratio to reduce their maximum loss. In economics, it means that for the investor the Utility of Asset A is greater than the Utility of Asset B.

[4] The Sharpe Ratio is defined as the ratio between the excess expected return over the risk free rate and the volatility.

To maximise utility for the investor, we need to know how an investment is affected by gains, losses and the investor's financial goals. For this reason, we analyse our clients through several different lenses:

- **Risk tolerance and financial experience**: through the MIFID questionnaire, we assess the personal attitude of the investor, their capacity to take on risk and face losses, both to provide them the best experience and to understand their capacity for recovering from losses. Moreover, understanding a person's financial experience is important for assessing how a client might react in a stressed market environment.
- **Estimated acceptable loss**: whatever the risk appetite of the client, the protection of their financial stability is our primary goal. We ask our clients to provide us with information on their liquid assets, their saving capacity, their income sources and other financial measures to understand how to protect them from stressed market environments and the unexpected need for liquidity.
- **Financial goals**: the time horizon of the investment allows us to get a clear view of the capacity of the investor to undertake short-term volatility in favour of greater returns in the future.

Risk tolerance and financial experience

With a set of 5 questions we understand the investor sensitivity to market fluctuation and to the loss capacity.

Acceptable loss

Assessing the financial condition of the customer is important to be sure that a Moneyfarm investment provides value to the customer.

Financial goals

Shorter term goals mean less time to recover from eventual losses. The longer the time horizon, the higher the capacity for adapting to the market changes.

Investor Risk Profile

To aggregate the characteristics of each investor into a unique score, we use a multi-step algorithm that evaluates the customers' answers:

- **Risk tolerance** locates the client's risk profile within a range from 1 (high risk aversion) to 6 (low risk aversion).
- **Financial knowledge** and experiences tells us if there's any product the customer does not have the tools to understand.
- **Estimated acceptable loss** represents a cap for the risk level. Whatever the risk appetite, if the investor's financial capacity does not tolerate the expected loss of the portfolio, we cannot provide a high risk portfolio.
- **Financial goals** are represented by the time horizon. The length of the investment provides the so-called "time - diversification": despite the volatility, the longer the time-horizon, the higher the probability that the returns follow their long term trend, which is expected to be positive. A longer time horizon allows the investor to recover from short term losses, so their risk profile increases with the expected duration of the investment.
- **Risk tuner**: we leave some flexibility to the composure of the customer, allowing them to increase their risk level or reduce it, by a maximum of one level. This is often the result of conversations between the customer and one of our consultants.

Last but not least, we know that, even with all the possible information about the investor, it would be impossible to precisely define their risk appetite. There are a few reasons for this:

1. The same investor could perceive the same return or loss in different ways, based of their psychological state at the time of realisation;
2. The investor might have an expectation of the probability of returns from the product. In this case the ex-ante utility can be different to the one perceived ex-post[5];
3. An investor might incur losses that are greater than they might have expected at the time of the risk profiling - often a result of a lack of financial experience. On the other hand, the more the customer invests, the more financial experience they gain;
4. Investor characteristics - risk tolerance, acceptable loss and time horizon - can change over time.

[5] See, for instance, the so-called "Prospect Theory", by Daniel Kahneman and Amos Tversky, 1979.

Our task is supporting the customer throughout the investment journey and helping them when they need it. To do this, we periodically assess the client's situation to ensure that we're on track. We do this automatically on an annual basis and, if the customer prefers, they can discuss it with one of our consultants. We still think that the support of a human consultant is vital in helping customers navigate financial markets and focus on their goals - particularly during periods of uncertainty.

Our model portfolios

Since the number of investor preferences is potentially infinite, theoretically we would need an infinite set of portfolios to match all our customers' expectations. However, offering a specific portfolio for each preference would be effective only in a world with no uncertainty. In the real world, we need to move from an infinite universe of solutions to a discrete one.

To define our set of portfolios, we followed two key steps:

1. Defining the number of discrete portfolios: In Technical deep dive I - Delimiting risky-assets levels, we estimated that a set of 9 model portfolios allows us to cover the risk spectrum. For the most risk averse clients, we build the model portfolio with little to no exposure to risky assets, the P1. If P1 is compared with portfolios with a risky asset weight lower than 22%, the probability that the two allocations have similar losses is extremely high, so we exclude these portfolios from the investment solutions. Once the exposure is 22%, we cannot say with 95% confidence that the losses of the portfolio are similar, so the 22%+ risky asset allocation is selected as P2. We iterate this process until the risky asset weight is 100%[6].

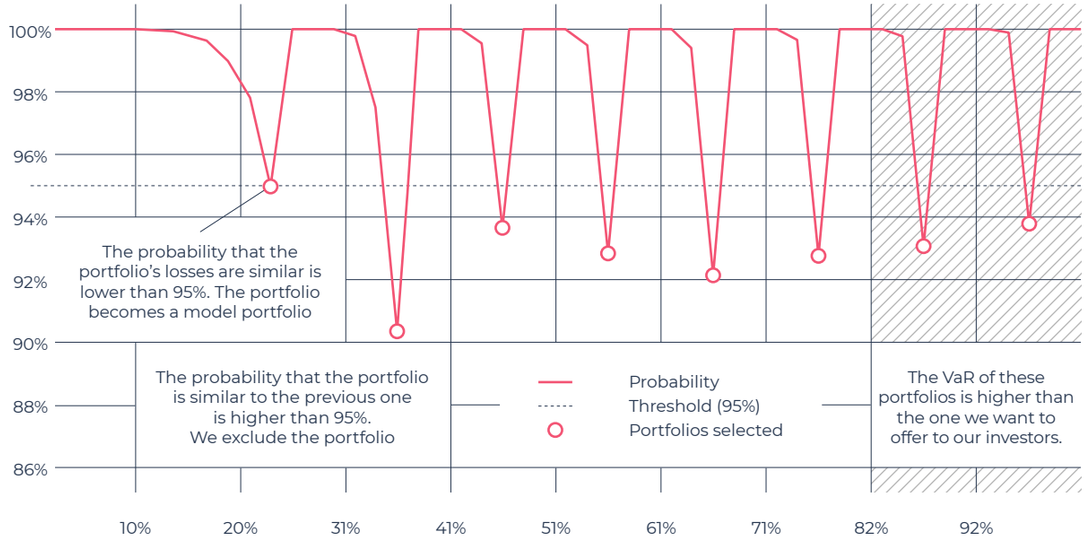
2. Ensuring that the portfolios fit within our defined risk parameters, which could vary over time. Since we offer a wealth management service, our first goal is to preserve the financial condition of our clients. As shown in the chart below, among the solutions chosen, a further screening is needed in order to exclude those portfolios with a risk level we consider too high. This maximum risk level is calculated on the base of the VaR, but can vary over time on the basis of our product offering and market conditions.

[6] We highlight that the final aim of this work is to estimate the distance between the exposure to risky assets and not to provide definitive numbers.

Probability that the losses of two portfolios are similar

If the probability that the portfolio VaR is close to the previous model portfolio is greater than 95%, the allocation is not selected among the model portfolio.

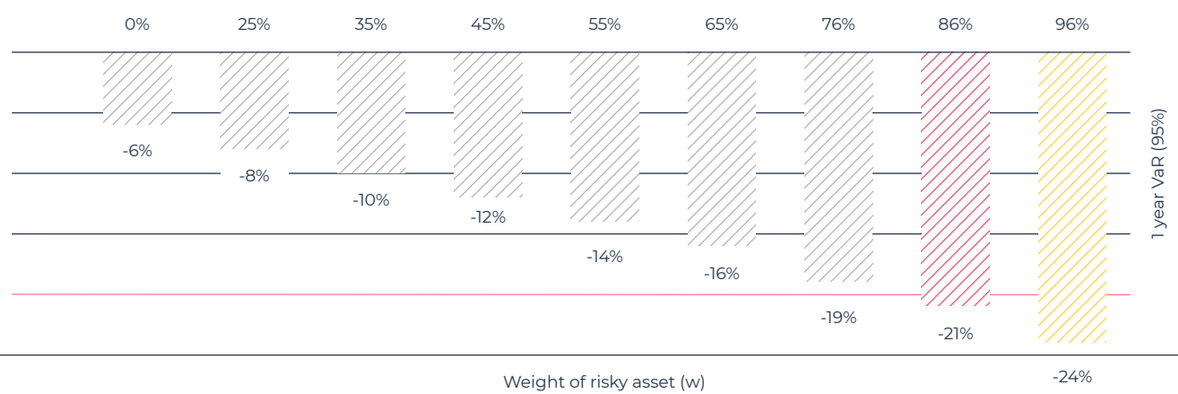
When we are not sure that the portfolios are similar, i.e. the probability is lower than 95%, we include the allocation in the investible universe.



VaR for different levels of risky asset weight

The chart shows different levels of the value at risk for the model portfolios identified.

Once understood the distance among model portfolios, the second step is to remove those assets deemed too risky for investors.



Find the best solution for each risk level

Let's turn now to our investment process.
At its most basic level, the objective is to find the best portfolio solution for each risk level at a particular point in time. We'll provide a brief summary now and go into greater detail in the following chapters.

The investment process can be summarised as described below:

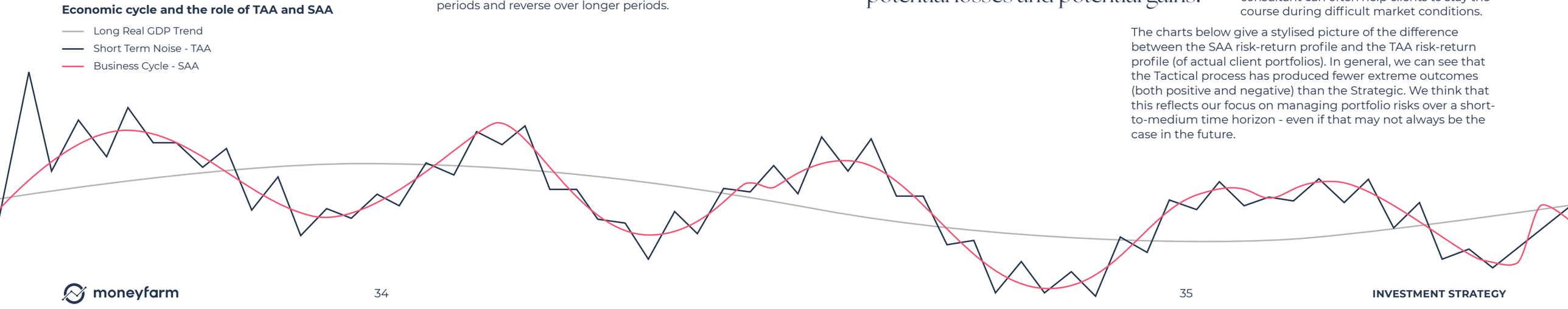
1. It begins with forming **long-term expectations for risk and return** for each asset class.
2. Combining them in order to create a set of portfolios (one for each risk profile) is the second step; this is called **Strategic Asset Allocation** (SAA), since it relies on long-term assumptions.
3. FInally, we adjust this Strategic Asset Allocation to reflect our tactical view, in what we call the **Tactical Asset Allocation** (TAA).

When building expectations around each asset's return and risk, we need to consider different perspectives. Fundamental considerations around starting expectations, the global economy and the business cycle will be key in driving long term average returns. Recent developments, be they economic, political or policy-related, may have more impact on short-term performance, but are less relevant over the long-term. Empirical evidence indicates that market returns tend to continue over short periods and reverse over longer periods.

We begin to implement clients' guidelines with the Strategic Asset Allocation. The SAA is the outcome of a mechanical process which relies on long-term expectations to derive ideal asset allocations to maximise returns. While the output of the SAA does not simply translate into client portfolios, it is an important part of our investment process, since:

- It provides a baseline and a benchmark for client portfolios;
- It provides a long-term framework for debating expected returns and portfolio positioning;
- It provides guardrails within which client portfolios should sit.

Economic cycle and the role of TAA and SAA



Loss aversion is one of the most widely recognised behavioral biases. It starts from the observation that **people react differently** to potential losses and potential gains.

Loss aversion is one of the most widely recognised behavioral biases. It starts from the observation that people react differently to potential losses and potential gains.

We can see the Tactical Asset Allocation as the behavioural translation of the Strategic Asset Allocation. That's why, when building portfolios for our customers, we take into account the loss aversion of our customers. At the end, we want to ensure not only that our portfolios perform well, but that our customers reap the benefits of that performance. In that sense, the investment consultant can often help clients to stay the course during difficult market conditions.

The charts below give a stylised picture of the difference between the SAA risk-return profile and the TAA risk-return profile (of actual client portfolios). In general, we can see that the Tactical process has produced fewer extreme outcomes (both positive and negative) than the Strategic. We think that this reflects our focus on managing portfolio risks over a short-to-medium time horizon - even if that may not always be the case in the future.

Tactical vs Strategic Asset allocation

The charts demonstrate how we've tried to decrease the risk of our Tactical portfolios with respect to the SAA, since we know how losses can affect the customer investment journey. The risk can be calculated in different ways, but the graphs below both take into account all outcomes.

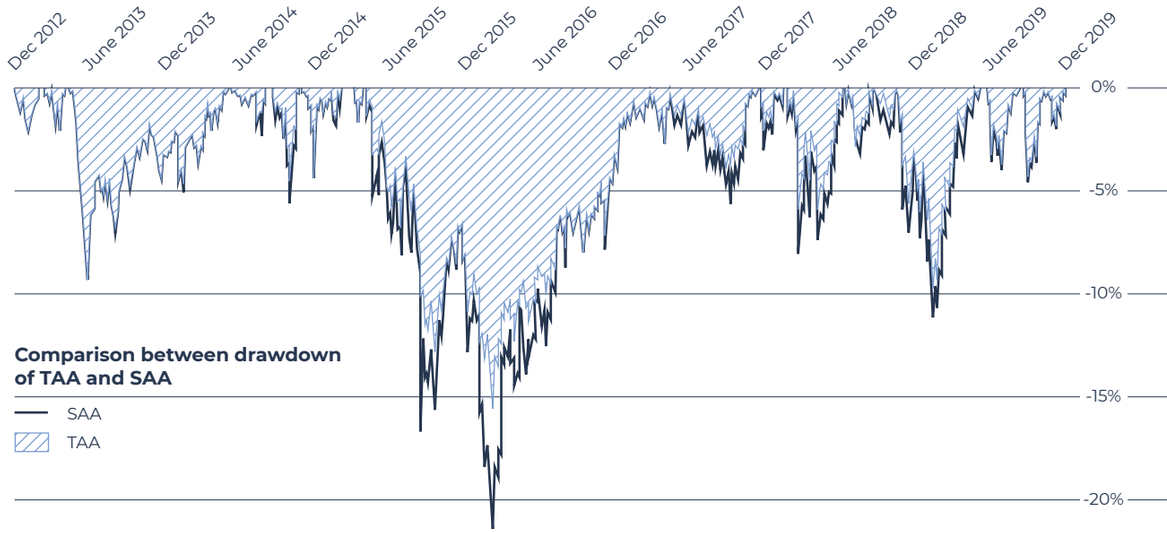


Chart 2

TAA and SAA Drawdown

In this chart we can see the difference between the strategic and tactical allocations, since we have the data for both. We can clearly see the benefits of the TAA in terms of loss reduction.

Chart 1

TAA and SAA distributions

The first chart shows the historical frequency distribution of the returns of the Strategic Asset Allocation vs the Tactical one. The x axis shows the range of outcomes of the SAA in blue, which is far wider than the TAA. It ranges from c -3% to c + 2%. The blue area, the TAA, had a tighter range of outcomes but the expected return is essentially the same.

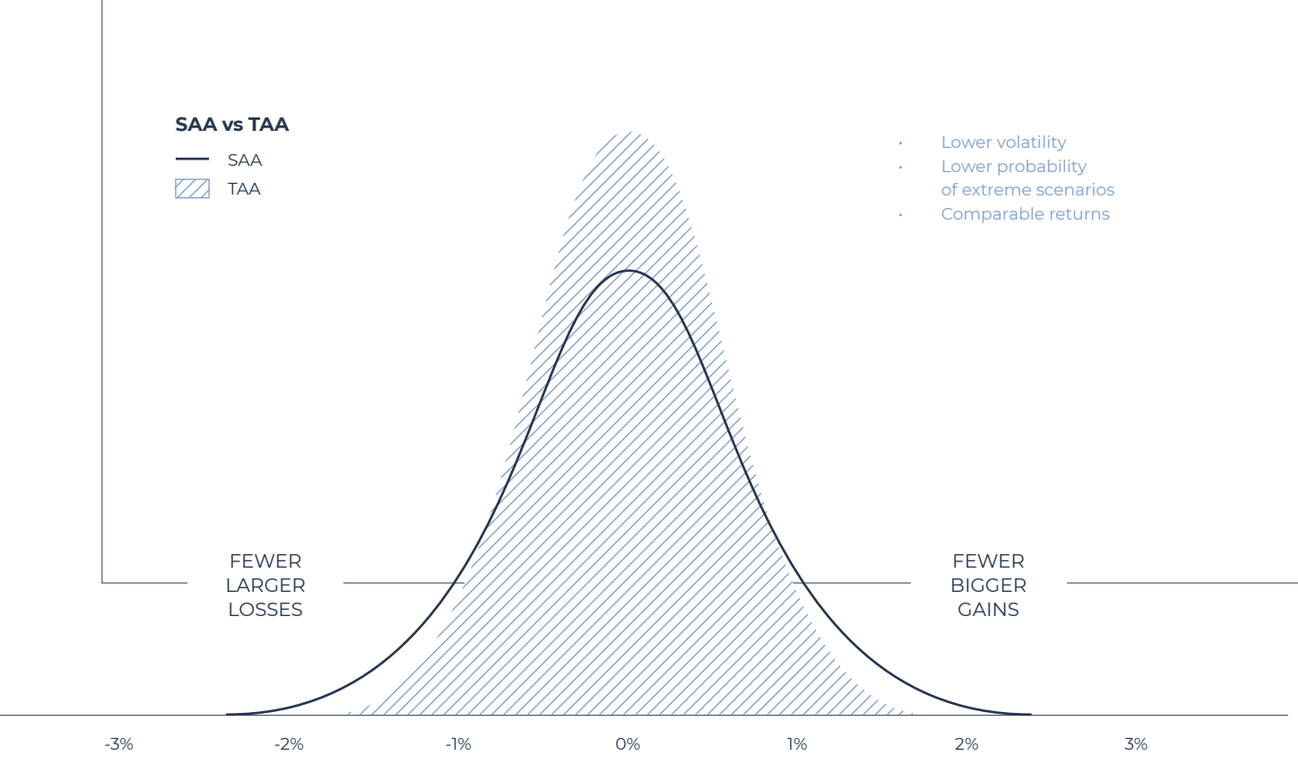
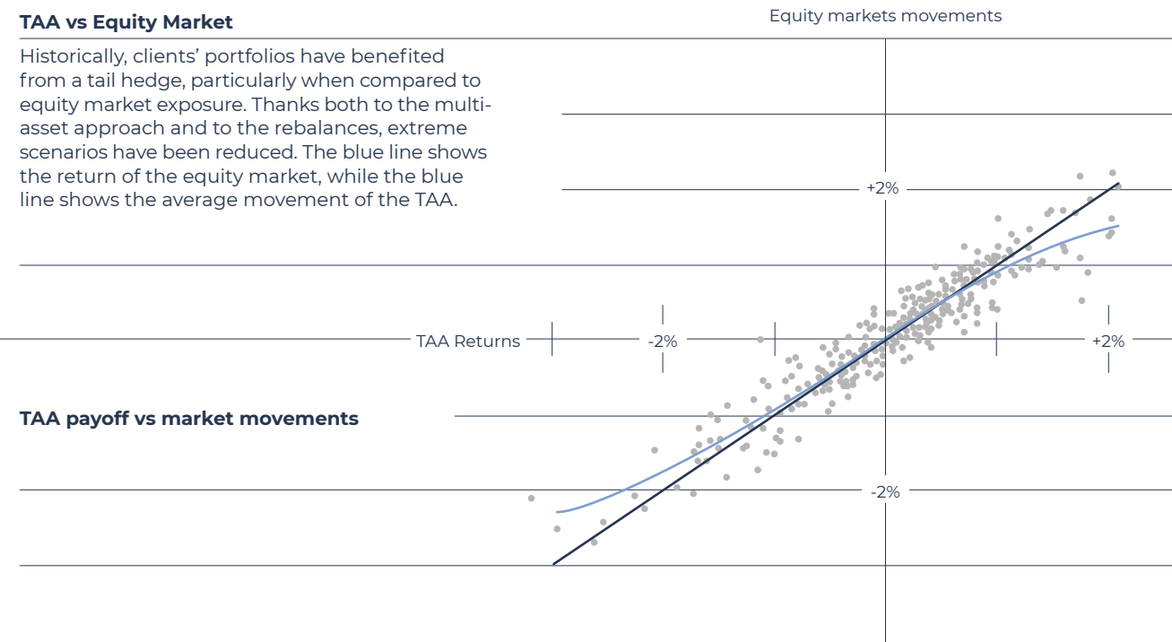


Chart 3

TAA vs Equity Market

Historically, clients' portfolios have benefited from a tail hedge, particularly when compared to equity market exposure. Thanks both to the multi-asset approach and to the rebalances, extreme scenarios have been reduced. The blue line shows the return of the equity market, while the blue line shows the average movement of the TAA.



CHAPTER

03.

SUBTITLE

HOW WE STRUCTURE OUR WORK

TITLE

Governance

Governance

How we structure our work

All of the decisions that can have an impact on the customer journey are taken at Investment Committee level.

We built our governance with the aim of creating a structure that:

- addresses in an efficient and secure way any issues with the client experience, from the suitability algorithm to the investment process;
- can quickly react to changing market conditions and formulate market views on the base of a solid background;
- can adequately control any risk in the portfolios, both the operational (e.g. the ETF selection) and the market risk.

Every decision around modification of the Moneyfarm portfolios is analysed by the Asset Allocation Team and approved by the Investment Committee.

1. "AAT"

The **Asset Allocation Team** ("AAT"), led by our Chief Investment Officer, is composed of portfolio managers and is responsible for building and managing client portfolios on a day-to-day basis – monitoring markets, developing investment ideas and proposing changes to the portfolios.

2. "IC"

The **Investment Committee** ("IC") is composed of a number of senior professionals, including members of the Asset Allocation Team, leaders of the Investment Advisory teams, the Chairman and the CEO.

The Investment Committee

The Investment Committee does make occasional changes to the wider investment process, but its primary responsibility is to debate and approve every decision related to client portfolios.

- **Strategic Asset Allocation**:
  the main task of the IC is to monitor the choice of the model and the quality of the input and output. The IC also manages the risk of the SAA portfolios, by selecting the boundaries of each asset class and by reviewing the output of the optimisation algorithm. The IC is also responsible for the final decision on the optimisation objective, the ultimate goal of the SAA (maximising returns, the risk adjusted return etc...)
- **Tactical Asset Allocation**:
  the IC analyses the proposals of the Asset Allocation Team, the risks and opportunities and actively supports and approves the decisions made as part of the rebalance process. The IC monitors the risk exposure of any proposed rebalance;
- **Instrument selection**:
  the IC approves the instruments selected by the Asset Allocation Team, providing a second level of quality control;
- **Suitability algorithm**:
  the IC reviews the aggregate results of the suitability algorithm; every change made to the suitability algorithm must be approved by the IC.
- **Performance review**:
  the IC also periodically reviews portfolio performance, both in absolute terms and relative to peers.

The IC meets formally each month, but it does meet more frequently when necessary, to analyse the markets and expectations on the asset classes we use.

CHAPTER

04.

SUBTITLE

LET US TELL YOU ABOUT EACH STEP OF THE WAY

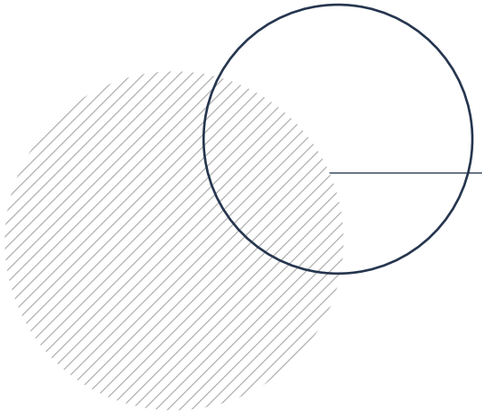
TITLE

Our investment process

Our investment process

Let us tell you about each step of the way

Our process begins with our SAA. This is an annual process that takes a 10-year view of financial markets and develops a risk-return framework for a broad range of asset classes. Our investment universe is broader than you might typically find in a client portfolio – including not just traditional sovereign fixed income and global equities, but also corporate bonds (both investment grade and high yield) and emerging markets (fixed income and equities).



Risk Management

Instrument Selection

TAA

SAA

MACRO

Asset pricing

VALUTATIONS

Portfolio definition

Investment Process

Asset class **pricing**

The first step in creating a portfolio is the evaluation of the returns available in the wider investment landscape. The return of any given financial instrument depends on different factors, such as:

- The instrument valuation at the start and at the end of the investment
- The cash flows paid in the period

Both depend on a wide range of factors, such as the macroeconomic environment, the mood in the market, and monetary policy. The relevance of each driver and the assumptions underlying the forecasting depends also on the length of the time horizon we are forecasting. When the forecasting period is 10 years, for instance, the expected macroeconomic environment has a significant influence on the forecasting, while when we forecast on a short-term horizon, other factors, such as valuations and market sentiment, have more weight.

Another crucial factor is the valuation of the uncertainty around the returns. If we could know the future value of the return of each asset class before investing, we would not need any market risk assessment. Unfortunately, for most of the asset classes, we only know their returns after they are realised, so there is a risk that they will be lower or more positive than expected.

Like the coin flip example, the return in probability and statistics would be called a "random variable":

"A random quantity, aleatory variable, or stochastic variable is described informally as a variable whose values depend on **outcomes of a random phenomenon**."

To deal with this uncertain framework, we need to give a probability to every possible scenario of returns. In this way, it is possible to understand the expected return, the risk and the dependencies between the asset classes. These are the inputs of our decision making process, both if we need the input for the Strategic Asset Allocation, and to formulate the tactical choices.

The Strategic Asset Allocation

The aim of the strategic asset allocation (SAA) is to find portfolios that, in the long term, should maximise the utility of each risk profile. For us, “maximise the utility” means providing the highest possible return for each risk level. The SAA starts with a traditional risk - return analysis used to answer the following question:

> “How can I **maximise** the **long-term return** for any risk level?”

Analysing the SAA process helps the investor to understand why a portfolio is made up of 70% equity or 70% high yield. For each risk level, there is an infinite combination of portfolios that could maximise the return. In "Why broad diversification is vital", we discussed the importance of diversification across risk factors. SAA helps us to understand how the relation among assets, their expected returns and their risk can be combined in the most efficient way.

While the output of the SAA does not simply translate into client portfolios, it is an important part of our investment process, since:

- The SAA provides a **baseline and a guideline for evaluating the long-term performance** of the Investment Committee and the Asset Allocation Team.
- The SAA provides a **long-term framework for debating expected returns and portfolio positioning**. One great virtue is that it is a largely automated process. The human inputs are fairly limited, as is the scope for behavioural bias.
- The SAA provides **guardrails within which client portfolios should fall**. Those guardrails are quite broad, to give the Investment Committee significant flexibility, but they exist to enforce a long-term focus and discipline to the Tactical Asset Allocation process.

The SAA process can be summarised in a few main blocks:

1. We estimate the long term distribution of the returns. This means estimating the expected returns of the asset classes, their volatility and correlations;
2. Aware of the uncertainty of the inputs, we set up the boundaries of concentration of each asset class for each risk level;
3. We run a robust optimisation to manage the model risks and to gather portfolios that should behave better in risky scenarios;
4. Both the inputs and the output are overviewed by the Investment Committee, who validate them.

The SAA process

We mix macro expectations and market valuations to forecast the long term distribution of the returns, the input of our robust optimisation. Both the input and the output are reviewed and approved by the Investment Committee.

A portfolio for any scenario

As with all quantitative processes, the output of the SAA can only be as accurate as the information entered into it (garbage in, garbage out). We know that the SAA process can be affected by two main risks:

- **Model selection**:
  different models, assumptions and objective functions can lead to different portfolios;
- **Quality of the inputs**:
  we know that every quantitative model depends on the input used for its calibration; nevertheless, since forecasting is uncertain by definition, we need to minimise the extent to which a wrong forecast leads to inconsistent portfolios.

Since we are generally wary of point estimates which can create a false sense of precision, we consistently apply scenario analysis and stress-testing to our assumptions. The goal here is to ensure that our portfolio construction is robust under a broad range of scenarios. Both the inputs and outputs of these models are debated and approved within the Investment Committee.

Expected returns

To estimate the expected distributions of the returns, we consider both asset class-specific characteristics (e.g. the price / earnings ratio for equity and the yield curve for fixed income) and long-term expected macroeconomic figures (e.g. GDP and inflation). There are four key drivers we consider when we develop our long-term return assumptions for each asset class:

- **Historical returns**:
  As you might expect, historical annual returns provide an important guide when thinking about long-term future returns. But in general we are cautious about simply projecting historical returns into the future.
- **Starting valuations**:
  Starting valuation may not be the greatest predictor of short-term returns, but they are much more significant when we start to think about long-term expected returns. In our SAA process, we assume that valuations mean revert over time towards a long-term average.
- **Profitability**:
  When we look at history, we see that levels of corporate profitability aren't stable. They ebb and flow, not least with the economic cycle. When we think about long-term valuations, we also need to consider the normalised earnings or cash flow that businesses generate. We want to avoid using either peak or trough profitability when valuing asset classes.
- **Growth**:
  Assumptions around growth are an important factor in assessing the expected return, particularly for equities.
  We recognise that the relationship between GDP growth and equity returns has historically been weak, but the relationship between growth in GDP and corporate earnings is more robust.

LIGHT DIVE

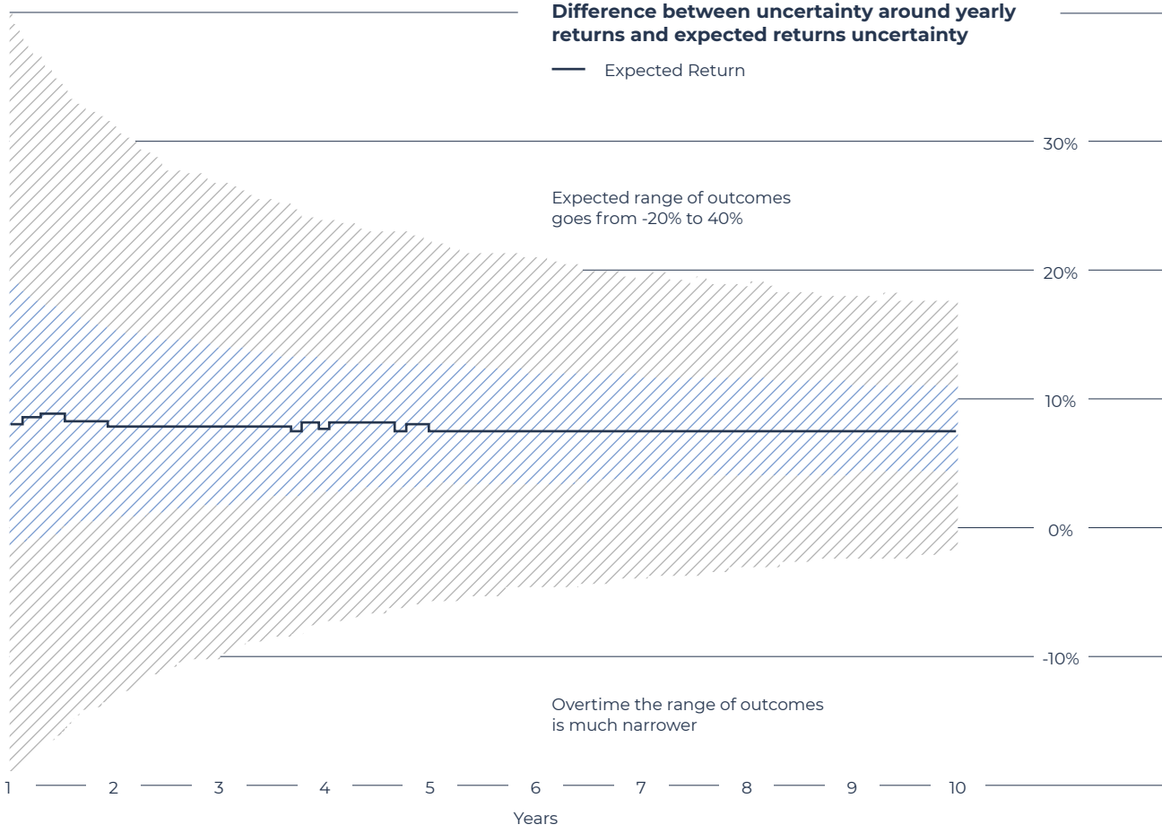
Forecasting error

There's a level of uncertainty around the expectations we build, which needs to be taken into account. We try to minimise the impact of this uncertainty with:

1. **Long time horizon forecasting:**
   even if it may sound counterintuitive, we think that forecasting in the long term is easier. Let's think about forecasting the inflation rate for the next two years, because the short term shocks can significantly affect the outcomes of some economies. However in the long term, we think that the economy will grow, and with it the financial assets (see Our Economic foundations).
2. **Expected return stress:**
   we know that sometimes, we will get things wrong. For this reason, we stress the expected returns and we build robust portfolios.

Every year, this asset class can return between -20% and 38%. The Expected Return is the average projected trajectory over the next 10 years for any given asset class.

Difference between uncertainty around yearly returns and expected returns uncertainty



The covariance matrix

The *covariance matrix* is the input that drives the risk management of the portfolios. The *covariance matrix* is basically a table that contains:

- **The expected volatility** of the asset classes, which is a measure of the dispersion of the returns around their expectations. This is a measure of risk, because the higher the dispersion, the higher the risk that the outcome will be unexpected (both downside and upside).
- **The expected correlation**, which is a measure that summarises how two different asset classes will move relative to each other.

The *covariance matrix* can be manipulated in order to compute different risk measures of the portfolio, such as the expected shortfall, which focuses on the losses. Risk modelling is crucial because, generally, the behaviour of volatility tends to be consistent over time[8]. If adequately modelled, the forecasting on a covariance matrix can be accurate. The most straightforward model is to simply calculate the sample covariance matrix based on historical returns, but recent research indicates that there are much more robust statistical estimators.

We use several methods (sample covariance, semi-covariance, minimum covariance determinant, shrunk covariance matrices) and we always try to apply the ones which better reflect the correlation structure among time series. We analyse the historical behaviour of the forecasts and optimise our portfolios under different assumptions to assess the impact the choice of the model has on the portfolios. We analyse the input and outcome at Investment Committee level to assess their feasibility. The final choice of the model will be the outcome of a dialectical process, which is monitored over the course of a few years to be sure to maintain consistency over time.

[8] In fact, research by Kritzman et al. (2010) suggests that minimum variance portfolios, which neglect to provide expected returns, actually perform much better out of sample.

Tactical Asset Allocation

Implementing a well-constructed, long-term, static portfolio can go a long way toward helping our clients achieve their goals. However, the Strategic Asset Allocation is only the beginning. Even if our 10-year forecasts for financial markets prove to be correct, the path to get there probably won't be smooth. With that in mind, we constantly evaluate market conditions and look to add value by introducing tactical tilts to the portfolios.

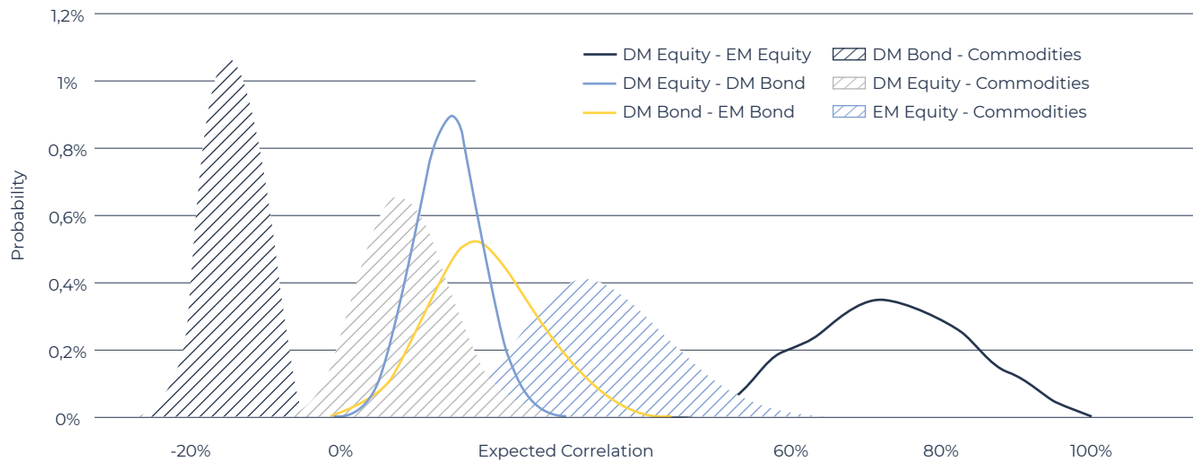
Specifically for shorter time horizons, this may require extra attention on the negative side of the possible outcomes. Our tactical decisions are as focused on containing losses as they are on chasing extra returns. You'll see a much higher focus on measures like the probability of loss in the Tactical Asset Allocation framework compared to the strategic process, which is more focused on finding the right combinations to maximise returns.

LIGHT DIVE

Covariance uncertainty

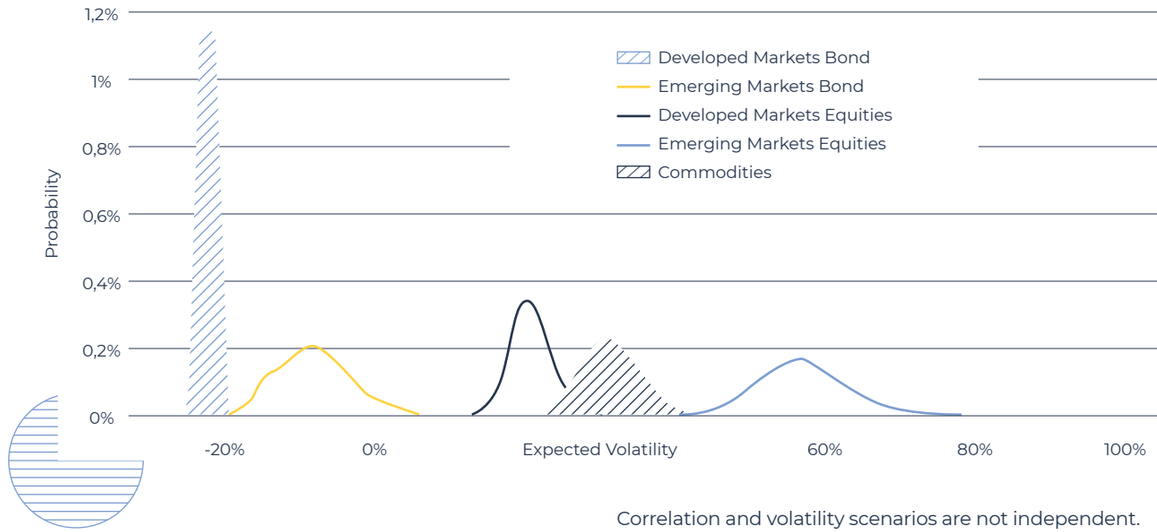
Different correlation scenarios for some of our asset classes

We can have scenarios in which Developed and Emerging Equities are very correlated, (~1) or much less correlated (~ 0.5).



Different volatility scenarios for some of our assets

We can have scenarios where the volatility of Emerging Equities is 30% or where the volatility is 20%.



Correlation and volatility scenarios are not independent. Scenarios where volatility is higher will imply a higher average correlation among asset classes.

The TAA goals

We typically rebalance our portfolios 3-5 times per year. Our tactical decisions are driven by two core considerations:

1. **Seek target risk:** keep the risk of the portfolio aligned to the target;
2. **Increase returns** by identifying and exploiting opportunities over a shorter (12 month) time horizon.

From a tactical perspective, we are focused on risk-adjusted returns - what level of return we generated for a given level of risk and if we are able to improve that ratio consistently over time.

1. How we manage portfolio risk

One purpose of our tactical rebalances is to manage the overall portfolio risk and keep it in line with customer expectations. If we consider risk as financial market volatility, we see that perceptions of financial market risk change over time, which impacts asset prices. In practical terms, the Investment Committee poses a series of questions.

- *"Is risk in financial markets going to change in the coming months? Will it change in some markets more than others? Will those movements impact our overall portfolio risk?"*
- *"Are those changes significant enough for us to consider changing the composition of our portfolios? How can we change the weight of the asset classes to keep the portfolio risk aligned to our risk target?"*

The process involves evaluating the risks and opportunities we see in financial markets and modelling the expected returns and correlations among asset classes.
The goal here is not to provide a point estimate, and the illusion of certainty, but rather to consider and quantify a range of outcomes, and their impact on our portfolios. Our aim is to focus on the most significant drivers of risk in our portfolios and not get distracted by the daily noise of financial markets. We want to take risk for our clients, but do so in a measured way, consistent with their goals.

2. How we improve absolute returns

Risk and return are two sides of the same coin. That is to say that we aren't simply focused on managing risk in our portfolios. We research individual asset classes extensively, considering valuation and macroeconomic variables as well as underlying fundamentals (including credit quality, corporate fundamentals etc). We use a range of internally-developed models to help us evaluate this. When we see a particular opportunity, we will tilt our portfolios to reflect that view. We aim to take advantage of what we see as mispricings in financial markets that can result from short-term noise (we're not alone in this goal!).

LIGHT DIVE

Historical volatility of tactical choices

The chart shows the historical realised annual volatility of our model portfolio compared to the strategic one for a risk level with a volatility target of 10%. As shown, the range of the tactical volatility is narrower than the corresponding strategic portfolio, which broke the upper bound of the volatility target in 2017. The tactical portfolio volatility is generally lower.

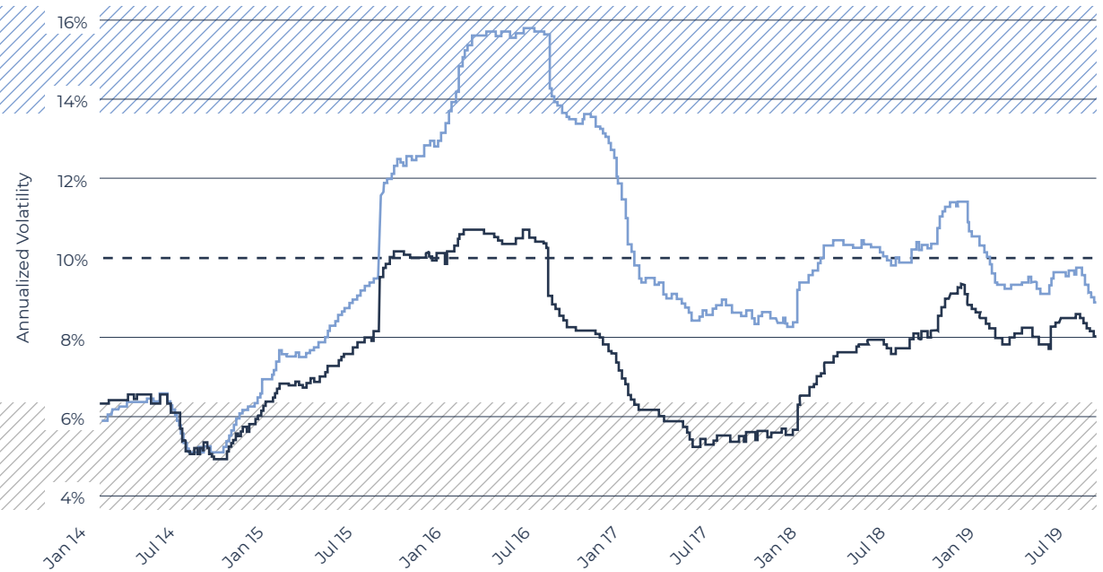
If not controlled, there are periods when the volatility of the portfolio is higher than expected.

Volatility of the Strategic portfolios vs Tactical portfolios

One of the objectives of the TAA is to keep the risk of the portfolio within the expected target. It is worse if the volatility is higher than expected than if it is lower.

SAA realised volatility
TAA realised volatility
Volatility Target

If not controlled, there are periods when the volatility of the portfolio is lower than expected.



The TAA process

We focus on a broad range of macroeconomic and asset class data (growth, inflation, interest rates, corporate earnings, leverage, sentiment indicators, etc). Given our focus on risk management, we evaluate the sources of risk within each portfolio to ensure that they are consistent with our investment views.

The process we follow is a combination of quantitative analysis and investment debate. We believe that quantitative analysis should remain at the heart of the investment process since it helps to summarise the huge amount of information on the market and formulate a view.

The core of the TAA process is the Investment Committee, supported by a set of proprietary models that assess risks and returns across a range of financial markets. These models typically have a one-year time horizon, in contrast to the SAA, which looks ahead 10 years. Their forecasts provide an important input for the Investment Committee, but not the only one. The purpose is not to provide a single point estimate but rather a range of potential outcomes and a set of probabilities that inform the investment debate. We believe that attempting to quantify the uncertainty in financial markets is an important part of constructing robust multi-asset portfolios.

In the TAA process, the quantitative analyses are used to help the Investment Committee to formulate the views, filter information, forecast expected returns and perform the market risk assessment. Quantitative and qualitative analyses are mixed up to get the portfolio tactical positioning.

The TAA models

We approach our Tactical Asset Allocation from the same principles as the Strategic Asset Allocation - by building a probability distribution of the expected returns for the main asset classes. However, the weight we give to some drivers like valuations and the weight we give to loss probability changes over time.

Forecasting short-term returns implies that expected returns are much more volatile and the noise around structural economic trends are much higher.

LIGHT DIVE

Tactical Asset Allocation and machine learning

We are always researching and developing new models. We are currently evaluating artificial intelligence and machine learning tools. We remain wary of going too far down the road of 'black-box' investing, but we recognise that machine learning is often an extension of well-known statistical methods. Ultimately, it's focused on establishing a relationship between two datasets, one representing what you're trying to explain and the second one representing how you're trying to explain it.

Finally, we do not want to lose or relinquish our understanding of what is driving expected returns. So, machine learning could help us in understanding how the different drivers of expected return are moving, but in the end those drivers should be aggregated in the simplest possible way, so that our grip on our portfolios is always solid.

Instrument selection

Once we've finalised a set of portfolio weights, we can turn to instrument selection. Currently, we build our portfolios using Exchange Traded Funds (ETFs) and Exchange Traded Commodities (ETCs)[9]. We believe that they provide low-cost exposure to a broad range of financial markets in a liquid and transparent way. We're conscious, however, that there are a very large number of ETFs available. We follow a rigorous evaluation process to ensure that we focus on the most suitable instruments for our clients.

While we think that ETFs and ETCs fulfil our requirements today, we would consider alternatives such as active mutual funds or index funds in the future, but only if they prove a cost-effective and transparent solution for our customers.

We don't currently use ETFs that "go short" an index (i.e. bet that a market is going to fall). We don't think it's appropriate at this point to effectively borrow money on behalf of our clients to invest in financial assets - which is how we would think about owning a short-ETF. With perfect foresight, you might make money betting on market declines, but that would be true for any asset class. Over the long-term, shorting indices has proven a difficult investment. We typically prefer to use cash instruments to protect our clients' wealth when markets are tougher.

Our selection process

The market for ETFs has proven quite competitive in recent years, and we've seen a significant increase in the number of ETFs available from a range of providers. At the same time, ETF costs have fallen. For most asset classes, there is a good range of instruments to select from. We use a quantitative framework to evaluate ETFs - we go into more detail on that below.

According to our beliefs, our first screening criteria consists of excluding ETFs that use leverage or "go short" particular markets.

The index selection criteria are strictly related to the exposure to each asset class, so are determined in the Tactical Asset Allocation phase. This will always depend on the risk factor exposure that we want to achieve.

The instrument selection has to be managed carefully to avoid hidden costs and minimise liquidity risk. We have developed a process for screening and evaluating ETFs that relies on a quantitative score. It aggregates the variables we consider to be significant to evaluate an ETF. The score is a starting point that is analysed qualitatively during the selection process.

ETF SCORE

QUALITY	LIQUIDITY AND CREDIT RISK	OPERATIONAL FACTORS	COST
PREMIUM/ DISCOUNT	UNDERLYING COMPOSITION	QUALITY OF ETF PROVIDER	BID-ASK SPREAD
TRACKING ERROR	ETF LIQUIDITY	REPLICATION STRATEGY	MANAGEMENT FEE
	SECURITY LENDING		

While costs are an important consideration, they are not the only one. We focus on four key drivers which need to be analysed:

1. Quality

Metrics related to the replication ability of the ETFs. Big tracking errors can lead to a difference between the preferred exposure of the portfolio and the real performance.

- **Premium/discount**
- **Tracking error and tracking difference**

2. Liquidity and credit risk

We look for ETFs that can easily be made liquid without incurring higher costs than expected. Also, the number of issues in the index and their liquidability is a key factor we consider in our index and ETF selection.

- **Underlying composition**:
  A good number of issuers is needed to minimise credit risk. Also, the liquidity of the underlying securities has to be high, to avoid a situation in which the scarce liquidability can negatively affect the prices;
- **ETF liquidity**:
  Not only is the liquidity of the underlying securities important, but also the liquidity of the ETF itself. A big secondary market of ETFs allows us to expand our choices when we trade, between the primary market and secondary market.
- **Security lending**:
  Often, issuers lend the securities underlying the ETF to increase their revenues and to reduce the cost for customers.
  Security lending can only be done with swap counterparties that offer a collateral in exchange, which minimises the counterparty's risk in the transaction.

3. Operational factors

- **Quality of ETF provider**:
  We only use ETFs issued by top-tier providers. We know that, sometimes, an ETF provider can stop offering specific ETFs. This isn't a problem from a portfolio point of view, but we want to contain operational risk that can negatively affect the user experience. The AUM of the ETF and its inception date helps us to understand its importance to the issuer.
- **Replication strategy**:
  In general, we prefer to hold ETFs that are constructed using physical replication. This means that the ETF buys the underlying instruments in the index rather than using other financial products to mimic the performance of that index. Physically replicated ETFs can either use 'full' replication, where they buy every instrument in the index, or 'optimised', where they buy a sample of those instruments.

4. Cost

- **Bid-ask spread**:
  The volume of the ETF and the liquidity of the underlying securities affect the cost for the client associated with the trading. The lower the bid-ask, the higher the ETF will rank.
- **Management fee**:
  The lower the cost, the higher the potential returns, and the faster we'll help to maximise your wealth.

[9] We will refer to both simply as "ETF"

Risk management and measures

Monitoring risk is a key part of portfolio management. Understanding and evaluating the sources of risk in portfolios helps to ensure that our portfolios reflect our investment views. Risk management can sometimes result in lower short term absolute returns but, over time, we believe that it's a critical component in ensuring a better outcome in line with our clients' goals.

"A risk management process should aim to **minimise the cost** of being wrong"

We can identify a few main sources of risk in our portfolios:

- **Market risk**:
  The risk of prices changing, which can affect the value of the portfolios. Market risks include, for example, interest rate risk, FX risk and equity risk.
- **Credit risk**:
  The risk that the companies or governments we invest in cannot continue their business. To manage credit risk we only invest in indices with a high number of issuers and not on single stocks or bonds. Secondly, we set contractual limits for investments with issuers that have a credit rating lower than BBB. We can also identify credit risk in the security lending practice.
- **Liquidity risk**:
  The risk that the assets are not easily liquidable, and that market participants ask for prices that are not representative of the market value of the asset. The first level of control takes place in the ETF selection process. We try to exclusively select ETFs with a high level of total assets in order to have more liquidity on the secondary market. In our ETF selection and monitoring, we also look at the average bid-ask spread and analyse how it has moved over time.
- **Volatility risks**:
  The risk that the client sells 'badly'. Very often, customers tend to close the position when the market falls. This has, historically, proven to be a mistake. It's rare for investors to be able to time the market (both when they exit and when they re-enter - you need to get both of those decisions correct!). As a result, portfolios may miss out on gains as markets recover, as they have tended to do in the past. We manage the risk by trying to contain volatility with the help of financial advisors.

Market risk measurement

Market risk is the risk of losses on financial investments caused by adverse price movements. Examples of market risk are: changes in equity prices or commodity prices, interest rate moves or foreign exchange fluctuations.

Market risk can be due to:

- **Specific risk or idiosyncratic risk**:
  The risk of a specific company (e.g. the expected revenues of the company decrease, reducing its prices).
- **Systematic risk**:
  The effect of the overall performance of financial markets on the specific security.

Within the context of an investment portfolio, idiosyncratic risk can be minimised through diversification, because the impact that a single security can have on the portfolio can be negligible.

Example:

Idiosyncratic risk and systematic risk

Think, for example, about the Cambridge Analytica scandal for Facebook in July 2018. The scandal caused the stock to lose more than 20% in just a few days. The S&P 500 was, in those few days, basically unchanged.

In the third quarter of 2018, the S&P 500 lost more than 10% due to trade wars and monetary policy expectations, so factors that affect the whole financial market - Facebook lost more than 20%.

Holding a concentrated portfolio with a small number of stocks can give upside opportunities, but exposes the investors to both systematic and idiosyncratic risk (in the example, the investor would have lost both in July and December 2018). By buying the S&P Index, the idiosyncratic risk would have been hedged in July 2018.

We manage systematic risk through our Strategic and Tactical Asset Allocation processes, so we need to monitor it both at the portfolio creation and on an ongoing basis. The risk measurement is performed on a single risk factor sensitivity, to understand how the portfolio would move if we stress only its specific returns and on portfolio level, and at the portfolio level to include the expected dependencies among asset classes.

We measure risk in different ways:

- Traditional risk measures such as volatility, value at risk and drawdown.
- Volatility contribution and attribution.
- Scenario analysis: we analyse how portfolios would have behaved during periods of market stress, such as the global financial crisis, the Eurozone crisis or the dot-com bubble.
- Stress testing

The process to analyse market risk consists of two main steps:

1. **Risk exposure assessment**
2. **Risk factors modelling and simulation**

1. Risk exposure assessment

Knowing the risk exposures of the portfolio is crucial to avoid taking on unintended risk. Once we know that, we can stress the risk factors to compute and decompose value at risk, volatility, stress tests and so on.

Working with funds instead of single stocks has a lot of advantages, but requires some additional computation to understand the risk exposure. When we think in terms of exposure, we are not interested in knowing the quote of the ETF in the portfolio. We are interested in the risk factors.

Decomposing the underlying index of the ETF is crucial. For instance, saying that we are exposed to the fluctuations of the ETF replicating the Bloomberg Barclays Global Aggregate is not enough. The index is made up of US Corporate bonds, European Corporate bonds, US Governative bonds and many others. These securities are exposed to different types of risks, such as US interest rate risk, European Corporate credit spreads, US Dollar and Yen. Exchange rates, govies and credit spreads have different levels of risk that also change among countries.

When we build a portfolio, we want to understand the true range of risks embedded there. Saying that we are exposed to Bloomberg Barclays Global Aggregate does not tell us enough information about the portfolio risk.

By only looking at past index movement, it is not possible to ascertain whether there is any latent risk that might explode in the future. The definition of the risk factors depends on the level of detail the portfolio manager wants to get.

Once the decomposition of the index is performed, we need to aggregate the risk exposures that are shared by more indices to gather the overall portfolio risk exposure. Suppose that we add in our portfolio with the Bloomberg Barclays a global equity ETF replicating the MSCI All Country World. The MSCI world securities are stocks from different countries with different currencies: US Equity, Emerging Market Equity, Dollar, Yen and Emerging Market currencies. As we've seen, some of the risk factors like Yen and US Dollar are common to the two ETFs. So, when we compute the total exposure, we need to aggregate the common exposure across the ETF to understand our total positioning.

The result of the process is a risk exposure matrix that shows the sensitivity of every portfolio to the risk factor shift. Once the exposure is computed a number of analyses can be performed:

- **Stress testing**
- **Sensitivity analyses**
- **VaR**
- **Volatility attributions**

> "The **risk factors** of a financial instrument are the **market parameters** (interest rates, foreign currency exchange rates, commodity and stock prices), which, through their **fluctuation**, produce a change in the price of the financial instrument."

Risk factor matrix

*The table below is an example of risk factor matrix. The value of 0.32 for FX-Dollar for P7 tells us that if the US Dollar appreciates 1%, the portfolio will have a return of 0.32% (0.32 * 1%).*
The value of 1.02 for Govies - Euro - Short term in P1 indicates that if short term rates in Europe increase by 1%, the portfolio loses 1.02%.

	P1	P2	P3	P4	P5	P6	P7
FX - Emerging Market Debt	-	-	0.06	0.05	0.04	0.04	0.04
FX - Emerging Market Equity	-	0.03	0.04	0.06	0.07	0.08	0.08
FX - Pound	-	0.01	0.01	0.02	0.03	0.03	0.04
FX - Yen	-	0.01	0.02	0.03	0.04	0.04	0.07
FX - Dollar	0.06	0.18	0.18	0.23	0.29	0.35	0.32
Commodity	-	-	-	-	0.05	0.05	0.03
Equity - Emerging	-	0.03	0.04	0.05	0.06	0.06	0.07
Equity - Euro	-	0.03	0.05	0.07	0.08	0.09	0.12
Equity - UK	-	-	-	0.02	0.03	0.03	0.04
Equity - Japan	-	0.01	0.02	0.03	0.04	0.04	0.07
Equity - US	-	0.10	0.16	0.23	0.29	0.32	0.45
Govies - Emerging - Mid term	-	-	0.39	0.34	0.28	0.27	0.26
Govies - Euro - Mid term	0.77	0.83	0.48	0.57	0.50	0.81	0.45
Govies - UK - Mid term	0.14	0.17	0.10	0.10	0.08	0.15	0.09
Govies - Japan - Mid term	0.18	0.32	0.14	0.10	0.05	0.21	0.18
Govies - US - Mid term	0.37	0.56	0.29	0.24	0.16	0.43	0.29
Govies - Euro - Short term	1.02	0.48	0.42	0.27	0.13	0.00	-
Govies - US - Short term	0.11	0.14	0.02	-	-	0.05	-
High yield spread - Euro - Mid Term	0.27	0.14	0.09	0.21	0.27	0.22	0.13
High yield spread - UK - Mid Term	0.03	0.01	0.01	0.02	0.03	0.02	0.01
High yield spread - US - Mid Term	0.06	0.08	0.03	0.02	0.03	0.07	0.01
Investment Grade spread - Euro - Mid Term	0.18	0.12	0.14	0.18	0.14	0.21	-
Investment Grade spread - UK - Mid Term	0.04	0.02	0.03	0.04	0.03	0.04	-
Investment Grade spread - US - Mid Term	0.07	0.04	0.05	0.07	0.05	0.08	-
Inflation Europe	1.21	1.37	1.73	1.40	1.04	-	-

Interest rate exposure

An additional level of complexity comes when you consider exposures that are not "delta one". "Delta one" means that, if the return of the risk factor is 1%, the security will move 1%. This is the case with Equity, for instance: if the underlying stocks move 1%, the portfolio exposure to equity will move 1% too. This is not the case for bonds. If interest rates move by 1%, the return of the bond can be approximated to the product of its duration and the interest rate delta. This means that the sensitivity of the risk factor is different from 1.

2. Risk factor modelling and simulation

We assess the risk of our portfolios using a range of what are considered traditional financial measures. We start with volatility and drawdown, which allow us to measure the dispersion of our return and the maximum loss incurred in the past. We evaluate them over different time frames, since it is important to keep an eye on how portfolio risk has evolved through time.

In the SAA, we think about risk primarily in terms of volatility and aim to manage risk through diversification. In that case, the historical correlations between asset classes underpin our long-term thinking.

But when we think about portfolios within a tactical time horizon, two points become relevant. Firstly, we use a range of tools to evaluate the overall level and direction of volatility in order to manage risk effectively. Secondly, we consider that the correlations between asset classes may not be stable over the short or medium-term. We reflect these two considerations in our tactical rebalancing process by testing any proposed changes across a range of market environments. When we rebalance portfolios, we are making some important assumptions about how we expect market risk to change over the following 12 months – not just in terms of market volatility but also regarding the relationship between different asset classes.

We also monitor skewness and kurtosis, statistical measures which give us an idea of the asymmetry of the returns and the likelihood of extreme scenarios. For example, a very high kurtosis means that extreme returns for the portfolios become more likely, and if it is associated with a negative skewness (negative returns, when they happen, are larger in magnitude of the positive returns) it may be a dangerous indicator. If high kurtosis is paired with positive skewness (positive returns, when they happen, are larger in magnitude of the negative returns) it may not be a bad thing.

Finally, we complete our set of daily risk measures by looking at VaR and CVaR. We use several techniques to get our estimate - here, we also like to have a view on what different estimation methods and time frames tell us about the risk of our portfolio.

The analyses are performed on the risk exposure and on the index time series.

FX hedging considerations

1. Forecasting expected return for currencies

If forecasting the *expected returns* is a tricky job, it becomes even more difficult when we enter the world of exchange rates.

When investing in bonds or equities, we are essentially 'lending' money. For several reasons, such as risk premium or liquidity preferences, we ask the borrower for a return, which is paid in the form of coupons for bonds and dividend and capital gain for equities.

Since the risk of investing in an asset is the same for the local currency investor as it is for the foreign currency investor, it is more difficult to define why an FX currency exposure should provide a carry. In the forex space, the *expected returns* are driven by the supply-demand of the currency, which depends on fundamental factors and behavioral aspects, like the 'flight to quality' effect. This makes forecasting both the sign and the magnitude of long term *expected returns* more tricky.

From an expected volatility point of view, foreign currency fluctuations are generally meaningful, with volatility somewhere between that of bonds and equity[10]. As with every risk, this can also represent a big opportunity. An exposure to USD can make a huge difference in the returns of a portfolio.

2. The cost and the risk of hedging

Investing in global assets represents an opportunity, but it exposes the portfolio to currency fluctuations[11]. These fluctuations can be hedged, but can still erode a part of the excess returns. Suppose that the investor can invest in a foreign bond with a higher return than its domestic counterpart. The investor hedges the FX exposure via derivatives. For non-arbitrage rules, the cost of the derivatives (what we call the "*cost of hedging*") offsets the excess return of the foreign currency. In other words, the FX hedged foreign bond and the domestic bond must have the same rate of return. Usually, the *cost of hedging* can be rounded as the delta of the riskless interest rates of the two currencies.

However, two interest rates are different for various reasons, such as different interest rates expectations or the risk premium. This can be driven from different expected monetary policy or inflation and economic trajectories. The shape and the level of the curves are aimed to remunerate the foreign investor only for interest rate risk, but not for currency risk. When we hedge a foreign exposure with higher rates, we are reducing the risk premium associated with the interest rate movements.

If we do not hedge, particularly for short term and low risk bonds, the volatility of the FX rates is generally higher than that of the bond, so the position risks being transformed from a bond investment to a view on the currency.

[10] EUR/USD volatility of the last 10 years was around 9%.

[11] We can think about Emerging Market Debt or US Treasury that can provide a much higher coupon than the European and UK bonds.

3. FX opportunities and how we reduce risk

For multi-asset portfolios, we identify three types of FX currency management approaches:

- **Uniform hedge ratio**: Every currency has hedged on one fixed percentage;
- **Asset class specific hedge ratios**: As we explained, the FX volatility lays between bonds and equities. So, each asset class has its specific hedge ratio. Fixed income is generally hedged, while equity is unhedged;
- **Currency specific hedge ratio**: Currency risk is managed independently from other risk factors and every currency has a specific level of hedge ratio.

We apply the *currency specific hedge ratio* approach, because:

1. Every currency is its own specific risk factor, with specific properties and hedging costs;
2. It allows us to think in terms of risk factors and simplifies portfolio management[12];
3. It improves the efficient frontier, providing a bigger investable universe;
4. It increases the number of ETFs we can invest in, because of the possibility of investing in asset classes with no availability of currency hedged ETFs[13];
5. It optimises the cost of the portfolio, since we can invest in cheaper ETFs[14].

The first point is the most important. Each currency has different drivers so requires ad-hoc management. For instance, the US Dollar and the Yen historically provided a source of diversification when equity markets were falling. On the other hand, emerging markets exchange rates generally increase the level of risk in a portfolio, but are bought to enhance short term returns.

FX currency exposure is currently managed under two main levels:

Risk reduction purpose. When we select the level of FX exposure, we aim to exploit the safe-haven behaviours of some currencies, in order to increase portfolio diversification.

Short term returns enhancement. The Investment Committee can have tactical views on some specific currencies.

When we select the portfolio FX exposure we analyse:

- **The overall risk of the portfolio**
- **The specific risk of the exposure for every currency**
- **The cost of hedging the currency**

[12] When we think the US Treasury is a good instrument, we can focus on US rates, while FX will be managed separately.

[13] If we want US Treasury but there's no EUR-Hedged ETF and we want to hedge USD, we can buy US Treasury, SP500 and SP500 EUR-Hedged.

[14] If the TER of EUR -Hedged Treasury is greater than the TER of SP500 EUR-Hedged, by buying SP500 EUR-Hedged, we maintain the same Risk factor Exposure but with a lower TER.

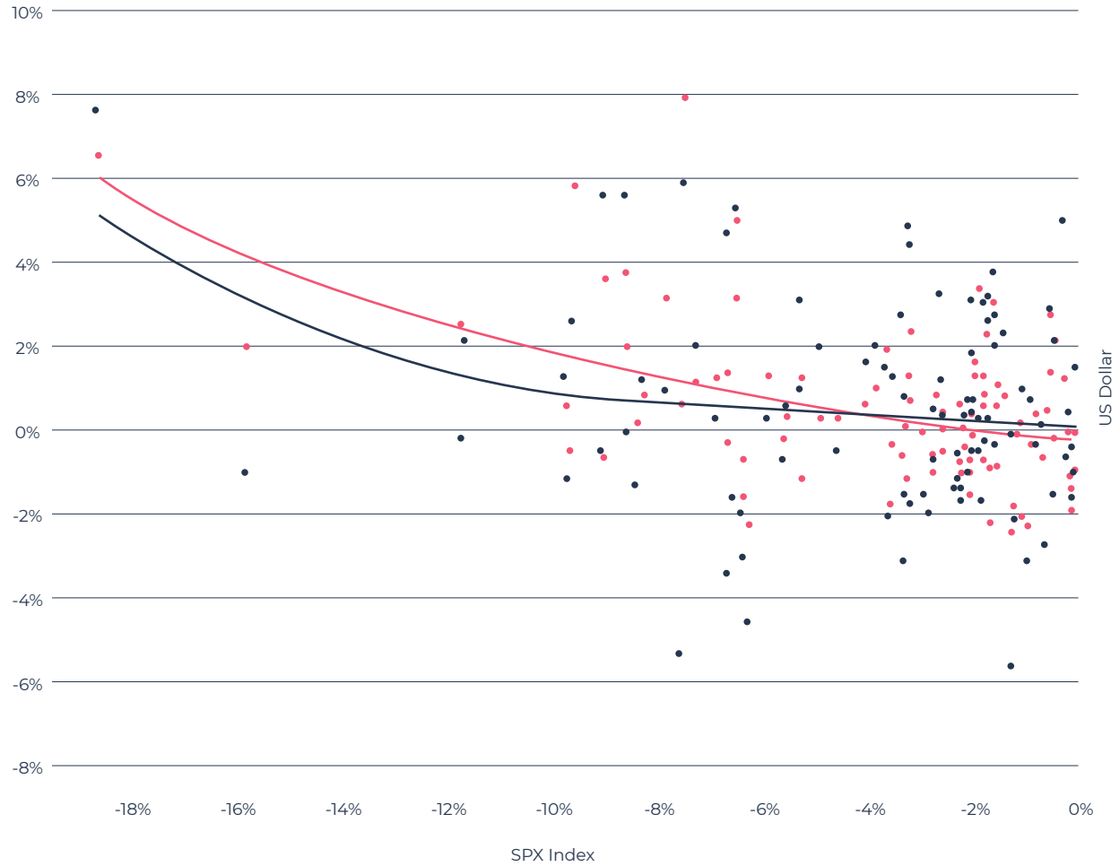
4. Risk reduction purposes

Despite expected returns for FX being more difficult to predict than for other asset classes, we can leverage the correlation and volatility of those that have more predictable movements. Every currency has specific behaviours. One important behaviour of the US Dollar, for instance, is its high decorrelation with equity, when the latter is in a stress situation.

US Dollar returns vs negative returns of SPX Index

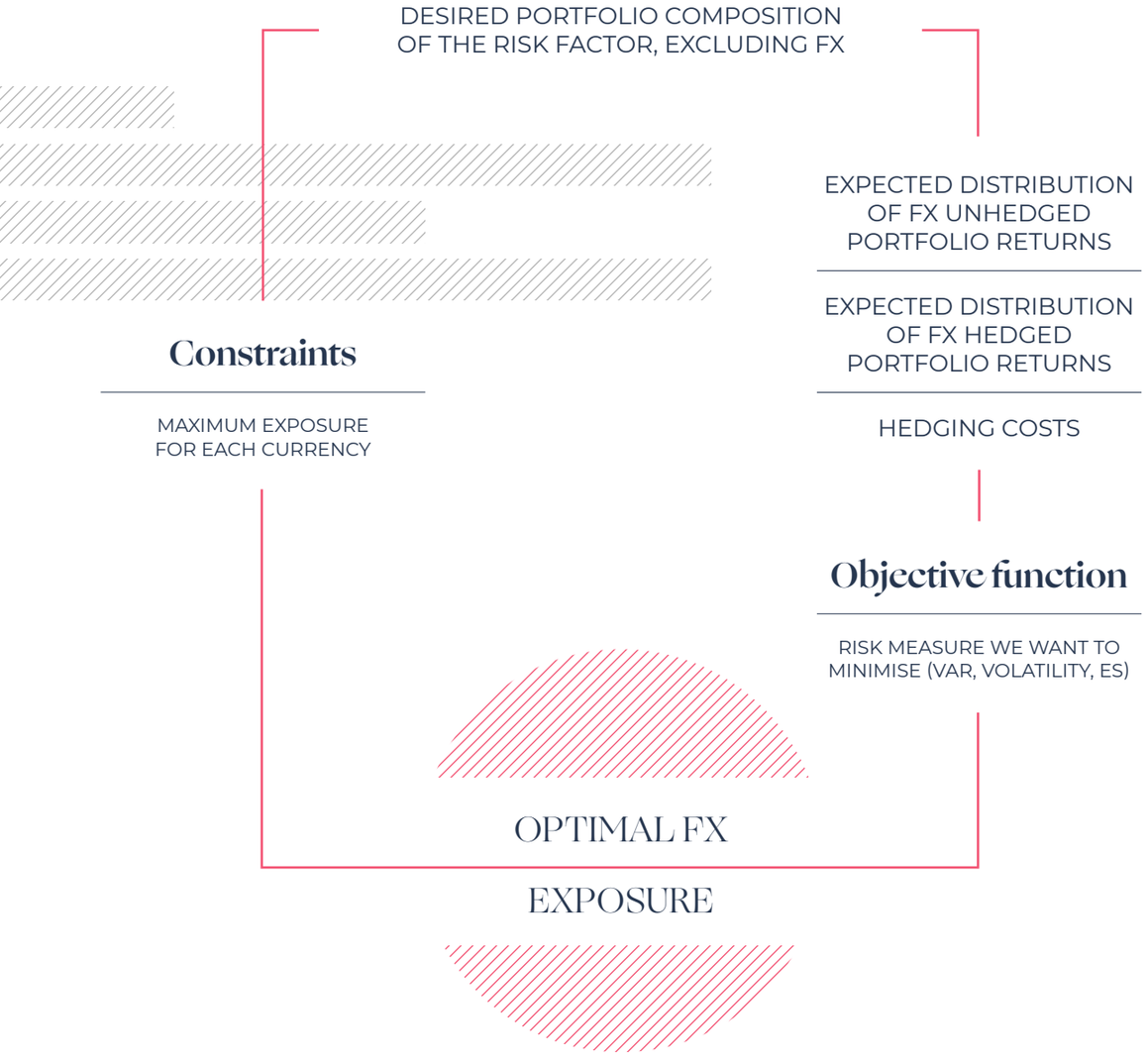
As we can see from the trend lines of the SPX index the US Dollar tends to appreciate. This relation is stronger for EM currencies, highlighting the different behaviour of risky vs safe-haven currencies.

- Dollar Index
- Emerging market currencies (vs USD)



Forex exposure management flow

Starting from the desired composition, we estimate the possibile distributions of the portfolios with different hedge ratio, and take those that minimise the risk.



LIGHT DIVE

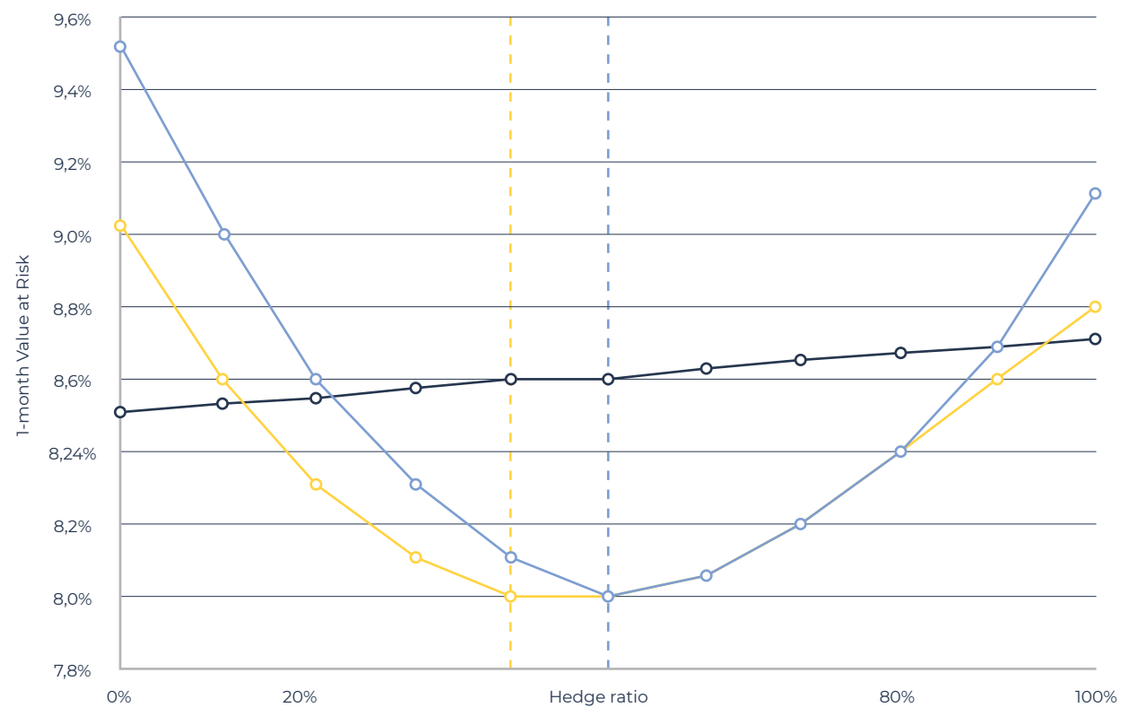
The effect of different currencies on the portfolio

The chart below shows a 50% EUR Equity portfolio CVaR versus the FX exposure to three main currencies. For EUR/JPY and EUR/USD, the CVaR decreases up to an optimal level of fx hedging ratio and then it increases. This is because the diversification effect reduces the risk of the portfolio up to a point, but when the FX exposure becomes too high, the diversification benefit becomes smaller than its risk contribution.

The chart shows, once again, that each currency has specific behaviours: increasing EUR/GBP cannot provide any diversification for any level of exposure, so the GBP cannot be considered a safe haven asset for Euro portfolios.

Effect of different currencies on the portfolio losses

Expected loss of a 50% equity portfolio subject to different hedge ratios.



CHAPTER

05.

SUBTITLE

THE MEASURES WE TAKE IN ASSESSING OUR PORTFOLIOS

TITLE

Moneyfarm's portfolios

Moneyfarm's portfolios

The measures we take in assessing our portfolios

The evaluation of Moneyfarm's portfolios can be done at several levels:

- **Absolute return**;
- **Portfolio return versus peers**;
- **Portfolio return versus benchmark**;
- **Effectiveness of the investment process** (tactical asset allocation);
- **Ex-post risk analysis**.

Absolute return evaluation

We start by evaluating the absolute return of our portfolios - meaning that we don't, at this stage, compare the portfolio to any benchmark or peers.

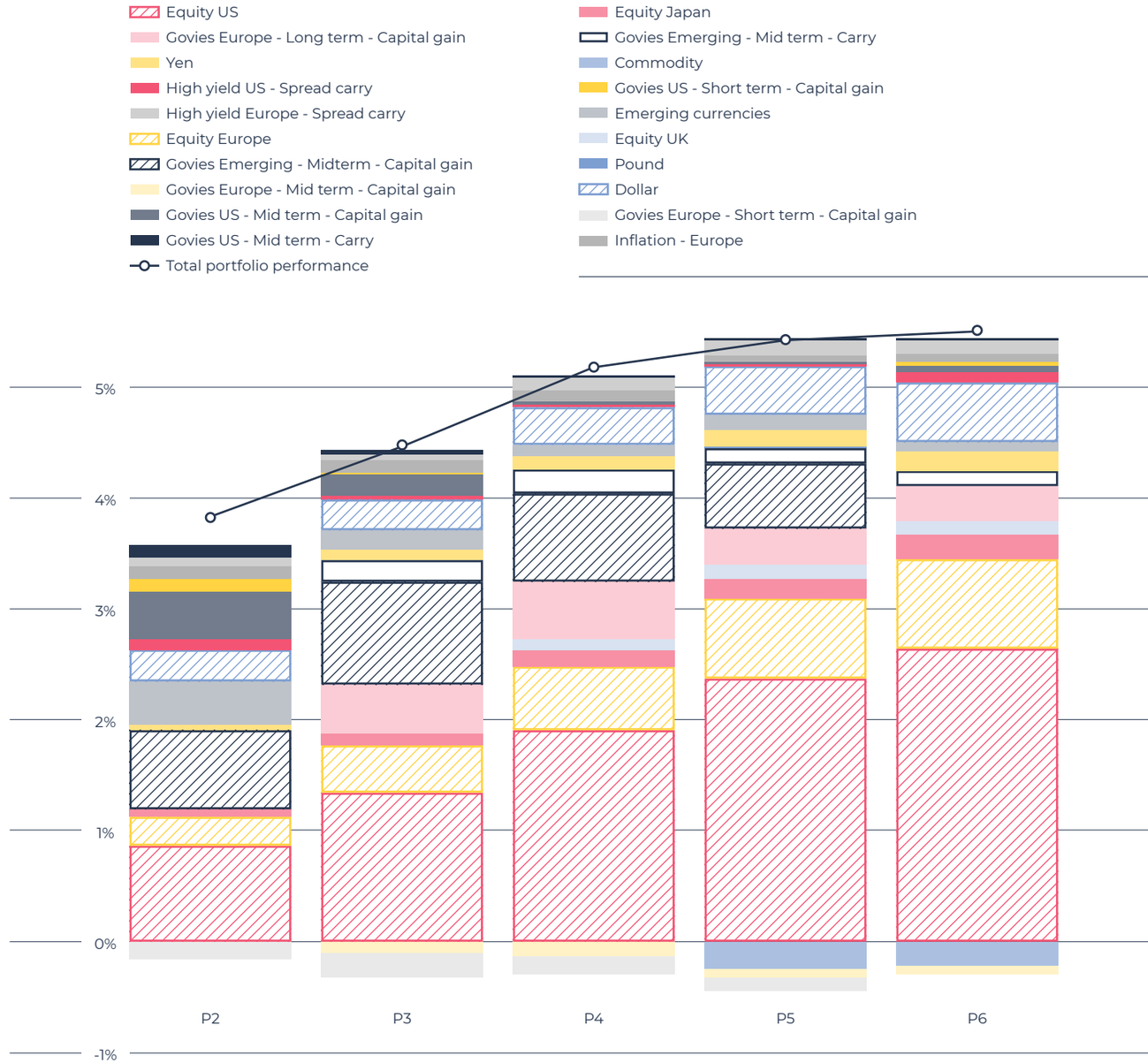
- We monitor the performance of our model portfolio on a daily basis - considering risk metrics as well as returns;
- We review the performance of clients' portfolios at our monthly Investment Committee meetings[15];
- We analyse ex-post the contribution of each asset class and ETF to the returns of our portfolio, to understand what exposure impacted performance either positively or negatively;

— Monitor
— Review
— Analyse

[15] Performance of the client's portfolio can differ from the model portfolio due to additional flows, cost and operating expenses.

Return decomposition

In the example, the biggest contributor of the return was equity, while commodity was negative.



Portfolio returns versus peers

- **Internal Peer Groups**:
  We have built internal peer groups of mutual funds (using Bloomberg data), against which we compare ourselves in both the UK and Italy. There are a couple of advantages here: Firstly, we have greater clarity on the performance of individual funds. Secondly, with daily data we have a better sense of peer portfolio volatility, compared to seeing only monthly returns. The one caveat here is that our performance is slightly penalised. We compare Moneyfarm portfolios after all fees. The mutual fund performance is after management fees, but excludes any platform or adviser fees that the client might be charged. The Asset Allocation Team has its compensation tied partly to the performance of our model portfolios relative to these internal peer groups.

- **ARC Private Client Indices (PCI)**:
  Our clients have a wide choice of managers and we want to understand how we perform in comparison. We subscribe to ARC PCI – a peer group comparison tool that tracks the performance of discretionary private client portfolio managers. ARC has four different risk levels: Cautious, Balanced, Steady Growth and Equity Risk. We match these four to each of our risk levels and track their performance on a monthly basis. We focus not just on absolute return, but also on risk metrics like volatility and drawdown.

Portfolio returns versus benchmark

When we construct portfolios, we think about long-term absolute returns – helping clients to grow their wealth over time in real terms. So, we think it makes sense to have benchmarks that reflect that underlying philosophy, as illustrated in the table below. There is a challenge with this approach – these portfolios cannot 'go short', so it's tough to generate positive returns from falling markets, especially in the very short term. Historically, this issue has been addressed by focusing on long term returns.

We compare the performance with Xibor (interbank deposit interest rate) plus spread. The spread is aimed to repay the risk underlying the portfolios.

ITA PORTFOLIOS	BENCHMARK	UK PORTFOLIOS	BENCHMARK
P1	1M Euribor + 0.5%	P1	1M Libor + 0.5%
P2	1M Euribor + 1.0%	P2	1M Libor + 1.0%
P3	1M Euribor + 1.5%	P3	1M Libor + 1.5%
P4	1M Euribor + 2.0%	P4	1M Libor + 2.0%
P5	1M Euribor + 2.5%	P5	1M Libor + 2.5%
P6	1M Euribor + 3.0%	P6	1M Libor + 3.0%
P7	1M Euribor + 3.5%	P7	1M Libor + 3.5%

Measuring tactical choices

How do we know if the Tactical Asset Allocation process is effective? We have several ways of evaluating this. Some of the measures are strictly related to the objective of the tactical choice, i.e. improving risk adjusted expected returns. Others are absolute measures to understand the quality of the portfolio relative to peers. The primary evaluations we perform are:

- We track the impact of individual rebalances or a group of rebalances relative to a baseline date.
- We evaluate the performance of the Investment Committee – was the decision-making process valuable? Did we miss signals that we should have followed?
- We compare the performance of our portfolios versus the Strategic Asset Allocation, with a particular focus on risk-adjusted returns.

— Track
— Evaluate
— Compare

Benchmarking and active managers

Most active managers have a benchmark that they're trying to beat. If you're a US portfolio manager, frequently you're trying to beat the S&P 500. It's quite well-known that beating the S&P 500 has proven challenging for most managers in recent years, particularly after fees.

But it's also interesting to think about what a benchmark means for most fund managers. They've been told, by clients and managers, to focus on a narrow goal - not to think about their clients' goals or about how their US equity exposure fits into a broader portfolio context, for example. When they think about risk, it's typically measured in terms of risk versus a benchmark, rather than in terms of volatility or actual loss. That might impact the decisions they make.

We don't think that those fund managers are necessarily doing anything wrong. Their goals are usually well-defined and well-disclosed. And, by design, they don't see the complete picture. We would argue, however, that from a client perspective, it is incomplete. Someone should be thinking about the clients' overall needs throughout the investment process.

Ex-post risk *analysis*

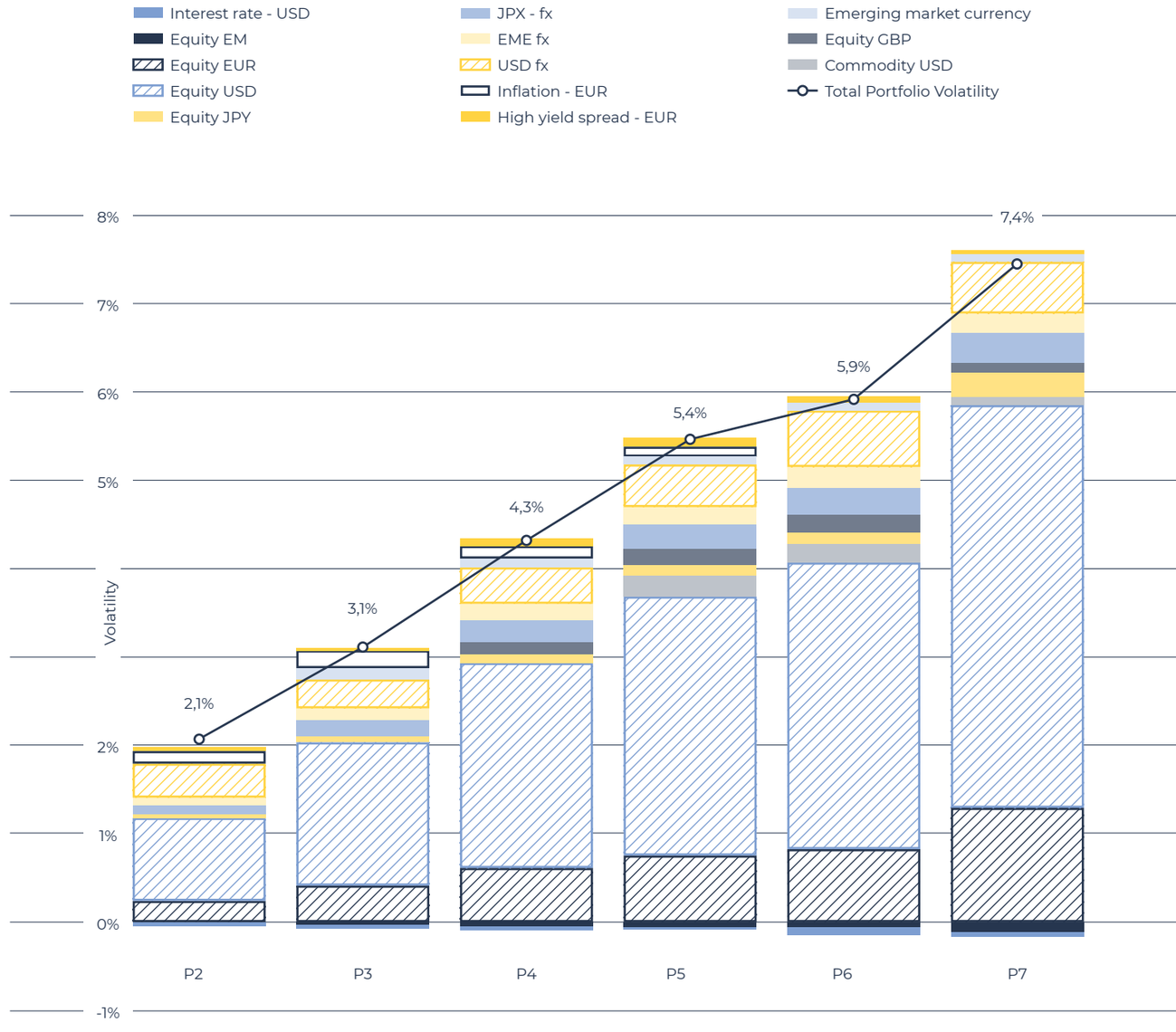
As for the ex-post return, we monitor the risk measure of our portfolios in the following ways:

- Volatility: We check that the ex-post volatility remains within the target range.
- Drawdown: Maximum drawdown is an indicator of downside risk over a specified time period. A maximum drawdown is the maximum observed loss from the peak of the portfolio to the minimum reached.
- Volatility contribution: Decomposition of the volatility among risk factors or ETFs. It considers both the overall risk and the diversification effect of the asset class inside the portfolio. The volatility contribution is a useful tool in understanding what the greatest risk contributor is and to understand if the market risk is too concentrated on a single risk factor.

The ex-post analysis is an important part of analysing the effectiveness of our tactical choices. It establishes whether or not we are able to track our target risk or to contain the drawdown of the portfolio. We can, also, understand if the volatility of the risk factor has started changing and what is driving the movement of the portfolios.
We also want to analyse any losses, comparing them with our ex-ante expectations in order to understand if our estimates correctly accounted for the risk in the portfolios.

Volatility contribution

The chart below shows an example of volatility contribution. Clearly, the biggest contributor to risk is US Equity, so in our Tactical Asset Allocation, one of the first questions to answer will be how to manage US Equity effectively.



CHAPTER

06.

SUBTITLE

THE FOUNDATIONS OF OUR INVESTMENT PROCESS

TITLE

To conclude

The Moneyfarm investment process is all about striking a balance. Any good process needs to be rigorous enough to enforce discipline and structure on a vast amount of data – much of it noise. At the same time, financial markets represent complex, adaptive systems – constantly changing in response to both new information and participants' reaction to that information. That requires a process that adapts and develops over time. We need to be clear, in our own minds and with our clients, about what assumptions we make and how that thinking translates into our client portfolios. At Moneyfarm, that means a few things that are worth repeating:

- **A focus on asset allocation**: asset classes and macroeconomic data, rather than individual companies or securities.
- **An emphasis on risk management**: making sure that we're not just searching for returns, but looking to manage the risks in our client portfolios.
- **A long-term focus**: there's a lot of noise in financial markets and it's important to avoid getting distracted. It can distract people from their goals and encourage actions that may do more harm than good.
- **Low-cost**: in a world where future returns may be lower than in the past, controlling your costs can have a significant impact on your long-term wealth.
- **Client goals**: this process isn't really about building client portfolios, it's about helping customers to achieve their goals. That starts with an assessment of risk - tolerance and capacity - to ensure that a client gets the most suitable portfolio but also enables customers to turn to an advisor for guidance.

Technical deep dives

Delineating risk levels

One of the challenges we face is matching a potentially infinite number of preferences with a finite number of solutions; the model portfolios. When selecting the model portfolios, we want to have a good degree of confidence that the portfolios we exclude are similar to those we select. In this annex, we demonstrate how we achieve a high level of confidence that two portfolios are not too differentiated in terms of risk.

We view the differences of the portfolios in terms of their risk, i.e. we consider two portfolios similar if their risk is similar. We define the risk in terms of Value at Risk[16] ("$VaR_{95\%,1M}$").

Assume that we have one portfolio with risky-asset exposure w_0 and a second portfolio with exposure $w_1 = w_0 + x$. We exclude w_1 from the model portfolios, only if the probability P that the difference between the VaR of the two portfolios is greater than a small value ξ[17], is higher than 95%. In simple terms, we drop only those portfolios that are similar to each other with at least 95% probability. In mathematical terms:

$$P\left(|VaR_{95\%,1M}(w_0) - VaR_{95\%,1M}(w_0 + x)| < \right) \xi > 95\%$$

For the most risk averse clients, we build the model portfolio with no exposure to risky-assets, the P1. If P1 is compared with portfolios with risky-asset weight lower than 22%, the probability that the two allocations have similar losses is extremely high, so we exclude these portfolios from the investment solutions. Once the exposure is 22%, we cannot say with 95% confidence that the losses of the portfolio are similar, so the 22% risky-asset allocation is selected as P2. We iterate this process until the risky-asset weight is 100%.

The future monthly return of a 5-year investment can be represented by a simulation of 60 random variables, with a certain expected return and volatility. Each random sample has a different VaR. There will be the sample that has only positive returns, without any losses, and the sample that has only losses.

[16] The VaR is defined as the minimum loss, within a certain time horizon, that the portfolio can incur with a probability equal to alpha. Since our contractual limits are defined for a VaR with 1 month time horizon and a probability of 95%, in the computation of the Annex II we will parametrize the VaR in this way.

[17] This threshold was defined as 1%. The choice is subjective and can vary for each investor.

Via a Monte Carlo simulation method, we found that portfolios are different with a 95% probability.

Hypothesis[18]

- Our starting model portfolio has a weight of risky assets equal to 0;
- We can invest in a risky asset with weight w and in a low risk asset with weight *1-w*;
- Short selling and leverage are not allowed; the weight of the risky asset is between 0% and 100%;
- The monthly returns of the assets are distributed as a multivariate normal;
- The annual volatility 'σ' of the risky asset is 15% and 4% for the low-risk one;
- The correlation between the two assets is 0%;
- For the sake of simplicity and without loss of generality, we assume 0 expected returns for both the assets;
- The time horizon of the investment is 5 years;
- The threshold ξ that discriminates the risk of two portfolio is 1%.

Methodology

1. We select 50 equally spaced portfolios in terms of equity exposure;
2. We extract 60 random samples "i", for risky asset and low-risk portfolios;
3. We compute the return of each of the 50 portfolios "*p*" as:

$$r_{p,i} = w_p\, r_e + (1\text{-}w_p)\, r_e$$

4. We calcualte the *VaR* of the 50 portfolios;
5. We calculate the difference between the *VaR* of the portfolios;
6. We repeat the process 10,000 times,"*s*";
7. We calculate the absolute delta between δ_s the *VaR* of two consecutive portfolios:

$$\delta_s = |VaR_{95\%,1M}(w_p) - VaR_{95\%,1M}(w_p + x)|$$

8. We count the percentage of times the scenario is greater than ξ

$$X(w_p) = \sum_{s}^{10.000} I_{\delta_s > \xi} \text{ where } \sum_{s}^{10.000} I_{\delta_s > \xi} = 1 \text{ if } \delta_s > \xi$$

and 0 otherwise;

9. If $X(w_p)$ > 95% the *VaR* of the delta, the *VaR* between the two portfolios can be considered significant.

It's important to note that the **final aim** of this work is to estimate the distance between the exposure to risky assets and not to provide definitive numbers.

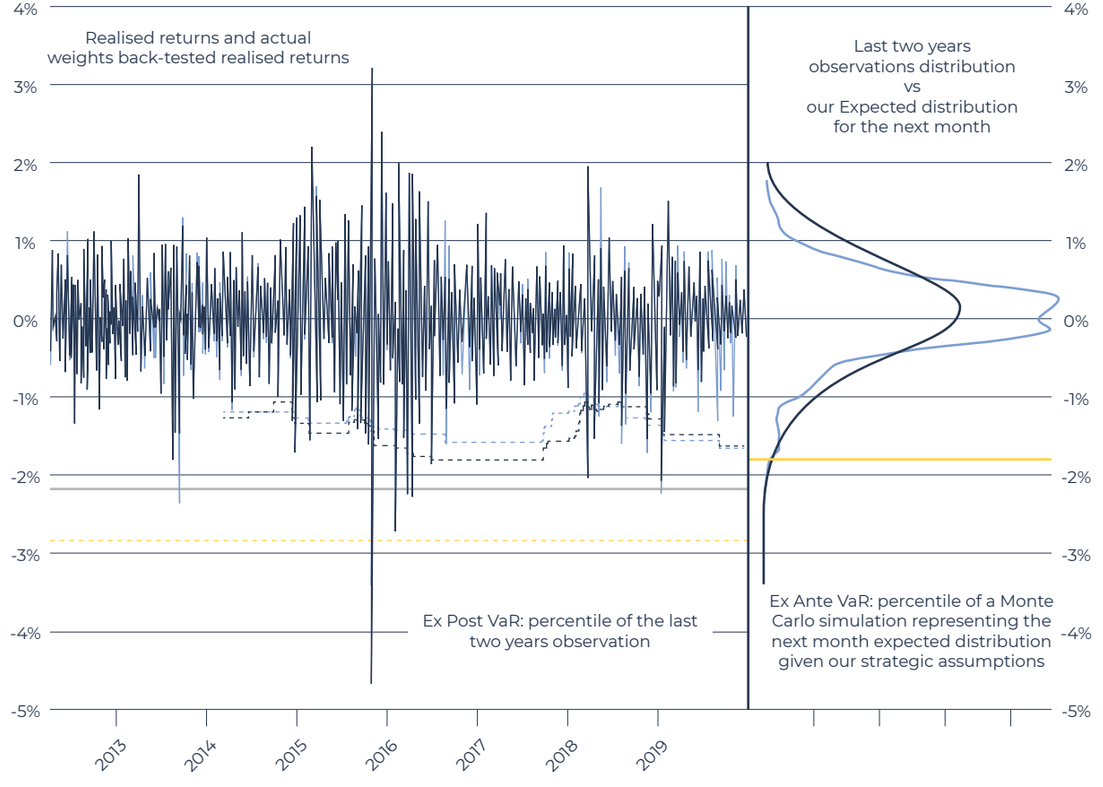
[18] These assumptions are in line with the historical parameters of MSCI World Developed Equity and Bloomberg Barclays Global Aggregate

The VaR monitoring

We have a clearly defined objective in terms of the maximum risk we take on when managing clients' portfolios. As stated in the opening section, this is of course related to the specific client's profile and objectives.

It forces us to have a structured risk management process, which defines the frequency of the measurement and the actions to perform to properly manage it.

We undertake a weekly assessment of the current state of the portfolios and their short term perspective, in order to detect the expected VaR and make sure it is in line with the expected risk level for the clients' positioning.



SAA expected return forecasting

Equity

There are two key things to consider when we assess the predictability of equity: fundamentals and how those fundamentals are priced (valuation). To assess fundamentals from a strategic perspective, we prefer to start from a Cyclical Adjusted Price to Earnings (hereafter CAPE) approach. We then retrieve 10 years' history of corporate earnings and CPI indexes for the main geographical areas (United States, United Kingdom, Japan, Eurozone and Emerging Markets) and adjust the earnings to take into account inflation. This way, we get the current value of past earnings and divide prices for the adjusted earnings, in order to compute the historical series for CAPE.

Once you have assessed valuation, it is time to look at fundamentals. Equity growth is, in our opinion, driven by two main components: dividends and earnings growth. We use the actual estimates of the Dividend Yield as a proxy for the long term dividend yield, which will grow along with earnings (in other words, payout remains constant) at the GDP growth rate.

The final underlying assumption is that, in the long run, the price to earnings of a given equity market will converge to its long-term median. Therefore, by comparing the current price/earnings level versus the long-term average, we can estimate the mean reversion path to the median.

Once all the pieces of the puzzle are put together, the long term expected return is computed as the internal rate of return of an equity investment which pays a dividend every year and which the price earnings declines to historical average.

Fixed income

1. Sovereign

The most reasonable starting point in estimating expected returns for debt securities is to focus on yield to maturity (YTM). Yield to maturity is flexible enough to capture the ups and downs of interest rate movements, while avoiding the problem of depending on historical data.

However, to assess the profitability of bonds, we need to also forecast the level of yields in the long run. We estimate a long term 'fair' level for yields by summing the real expected GDP growth based, the long term inflation and the term premium (assuming it will go back to the 10-year median level).

This relies on the assumptions that a long term sovereign bond should remunerate for the cost of money (represented by the real GDP growth; when the economy is strong, the demand for money is higher and higher demand, in turn, drives up costs – in this case, interest rates), the inflation and the time horizon (the slope).

To model the current low interest rate environment, we introduced a financial repression factor. This represents a qualitative judgement that is debated and approved by the Investment Committee.

Given the current YTM and by assuming it will get to the expected YTM in 10 years, we can compute the long term expected returns for sovereign bonds. We do this by accounting for the capital gain or loss you'll get from the movement of yields towards their 'fair' value and the coupon you'll earn in the meantime.

2. Corporate

So far we've discussed sovereign bonds, i.e risk-free bonds. When it comes to corporate bonds and emerging markets bonds, in order to forecast some fair levels, we need to add the remuneration of another risk embedded in these asset classes: the default premium.

This is done by adjusting the carry and capital gains for the additional remuneration (called the spread) and conditioning the coupons and capital gains or losses with the probability of not defaulting.

3. Inflation-linked product

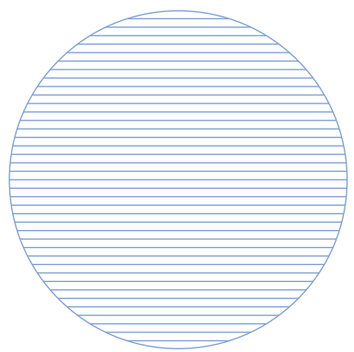
In addition to sovereign, corporate and Emerging Markets Bonds, our asset allocation can also include other types of bonds. The previously mentioned asset class all pay nominal coupons, which are not adjusted for inflation (if you buy a 2% nominal bond now, it will pay 2% per year for the rest of its life, even if the price of the houses may, in the meantime, double). In our portfolios, we think it's beneficial to include inflation linked bonds, for which the coupon is adjusted for inflation.

Estimating expected returns for inflation-linked bonds is similar to the previously discussed process, but our focus of attention needs to shift a little: from nominal yields to real yields. From the current level of real (net of inflation) yields and the estimate of a long term fair value of real yields, we can compute the total return by looking at the real carry and capital gain or loss and then adding back the inflation premium these bonds pay.

4. Commodities

For the commodity index, we use a regression model to estimate the long term historical relationship between the deviation from the median US CPI and the performance of the commodity index (Thomson Reuters Commodity Index) on an annual basis. We use US inflation because most of the commodities are listed in the USD.

Given the deviation of the 10 years' CPI expectation (based on Philly Fed forecast) from the historical median, we can use the relationship to compute a 'fair return' for the commodity index.



SAA optimisation

The idea of building a portfolio through an optimisation process was pioneered in the 50s by Harry Markowitz. He demonstrated how to find a set of efficient portfolios (the so called “Efficient Frontier”) by solving an optimisation process (maximise returns given a target risk or minimise risk given a target return).

We use all the assumptions made previously to produce a set of scenarios for each target risk profile. In each scenario there will be a given asset allocation which will be ideal for that given realisation of the world.

Then, for each of the target levels of volatility, we analyse each scenario generated by bootstrapping the covariance matrix, and maximise the return for every level of risk.

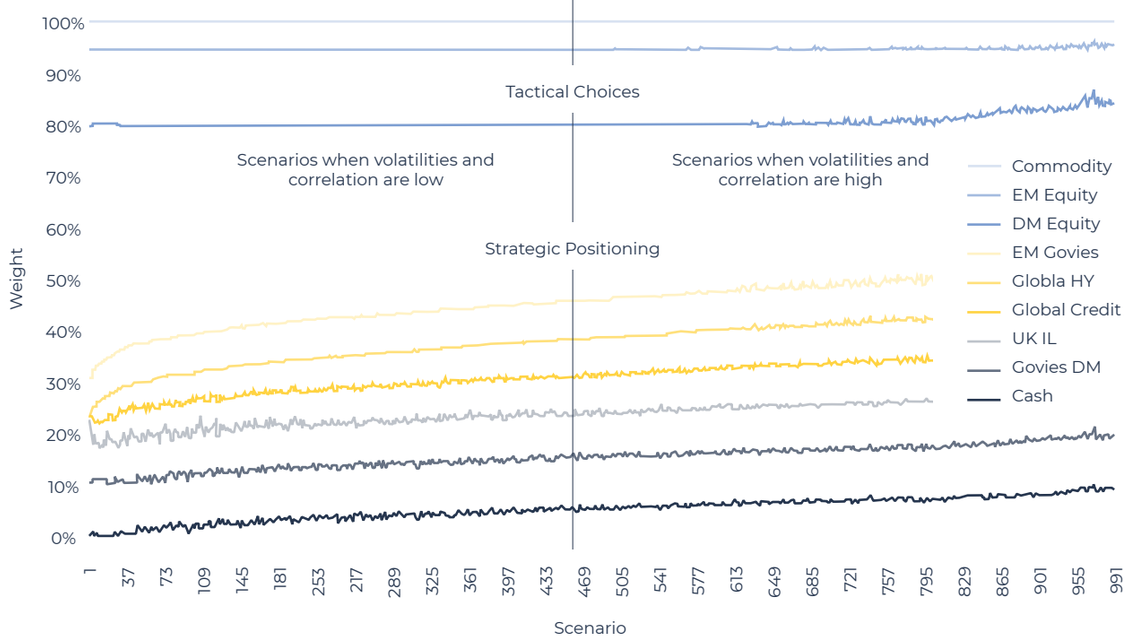
The SAA mechanically extracts the average allocation for each asset class. As we will see later, the TAA looks to tilt the portfolios according to the scenario that better resembles the current market environment.

Quantitative analysis in the Tactical Asset Allocation

We prefer to decompose the expected return for the major asset class in three main components: carry, expected cash flow growth and expected valuation change. The time horizon when it comes to the tactical model is 12 months.

Each column represents an asset allocation. On the right we have a portfolio which satisfies the risk target of P4 in an environment of extreme volatility and high correlation. On the left we see allocations suitable under a benign market environment.

Range of portfolios generated to target the volatility of P4 for each of the 1000 scenarios



Equity

- **Carry**:
  Expected pay-out yields.
- **Cash flow growth/other source of returns**:
  Expected change in the fundamentals (earnings and revenues).
- **Capital gain/loss**:
  Expected price/earnings and price/sales variation.

There is no single, definitive model for forecasting each of these sections. We’re constantly on the lookout for improvements.

The current state of our internal modelling relies on a more traditional econometric approach for dealing with expected earnings and revenues (assuming autoregression of corporate fundamentals and cointegration with economic fundamentals). It is a little more flexible on the expected valuation change, where it relies on clustering algorithms typical of machine learning to detect the possible group (or regime) for valuation changes over the next 12 months.

Since we want to enhance the focus on probability of loss, we need to receive as an output not a single value, but a range of outcomes. Only with a set of different forecasts, we can tell which is the probability of a negative performance of equity.

By looking at the usual breakdown:

$$E\,[Equity\ Total\ Return] = E\,[\Delta\ ] + E\,[\Delta E] + E\,[Dividend]$$

We can look at the probability of loss as:

$$Probability\ of\ loss = Prob\,\{E\,[Equity\ Total\ Return] \leq 0\%\}$$

$$= Prob\,\{\Delta\ \leq -(\Delta E + E[Dividend])\}$$

This is simply the probability that valuation will decline more than the returns provided by earnings growth and cash payout (dividend yield).

It makes sense to express the probability of loss as a function of the valuation changes, since historically this has been the main driver of short-term volatility. If fundamentals shifting set the overall trend, the swinging of valuation is the component which explains the majority of the return.

We like the idea of dealing with distribution and probability of loss, since they complete the picture outlined by the expected return, by allowing us to also see the spectrum of possibilities that the model is suggesting to us.

Bond

One of the challenges in portfolio management is conjugating the qualitative view of the Investment Committee, with the market valuations, interest rate levels and fx hedging costs. Also, in any given multi-asset portfolio, the view of a particular asset class can vary on the basis of its correlation with the other risk factors.

The expected return of a bond can be expressed as the sum of:

- **Coupon**
- **Theta**
- **Capital gain**

The long-term driver of the return and of diversification is the coupon, while the duration risk provides opportunities mainly across the short term. While, in the short term, capital gain losses can represent a risk, in the long term they are followed by higher coupons that offset the losses of the portfolios.

Usually, the Sharpe Ratio is maximised for short maturity bonds. However, since we cannot leverage our positions, to get higher returns we need to look to the long term.

When we take a tactical view on fixed income, we consider the impact of all the components on the return and all the risk that come with them. Our portfolio positioning involves mixing:

- **The geographical area**
- **The tenor of the curve**

In our selection process, on the basis of the portfolio risk target, we find the combination of geo-duration that maximises the expected return of the portfolio. In this process, we consider the different diversification properties driven by the different behaviours of the interest rates across the world and across the tenor of the curve. Since, in some ways, the estimation tends to give a lot of weight to the diversification benefit, we set a maximum level of diversification benefit. This is to avoid a situation where, in an adverse correlation environment, the VaR of the portfolio will be affected.

The sensitivity model

Knowing the risk exposure of the portfolio is necessary to avoid any adverse scenarios that haven't been taken into account. Working with funds instead of single stocks comes with a lot of advantages, but requires some additional computation when we need to understand the risk exposure.

When we think in terms of exposure, we are not interested in knowing the quote of the ETF in the portfolio. We are interested in the risk factors.

"The risk factors of a financial instrument are the market parameters (interest rates, foreign currency exchange rates, commodity and stock prices), which, through their fluctuation, produce a change in the price of the financial instrument."

For instance, if we say we are exposed to the fluctuations of the ETF replicating the Bloomberg Barclays Global Aggregate, this isn't enough for us. The main securities underlying this index are indeed US Corporate bonds, European Corporate bonds, US Governative bonds and many others. These securities are exposed to different types of risks, such as US interest rate risk, European Corporate credit spreads, US Dollar and Yen. Exchange rates, government bonds and credit spreads have levels of risk that differ from country to country.

	P1	P2	P3	P4	P5	P6	P7
FX - Emerging Market Debt	-	-	0.06	0.05	0.04	0.04	0.04
FX - Emerging Market Equity	-	0.03	0.04	0.06	0.07	0.08	0.08
FX - Pound	-	0.01	0.01	0.02	0.03	0.03	0.04
FX - Yen	-	0.01	0.02	0.03	0.04	0.04	0.07
FX - Dollar	0.06	0.18	0.18	0.23	0.29	0.35	0.32
Commodity	-	-	-	-	0.05	0.05	0.03
Equity - Emerging	-	0.03	0.04	0.05	0.06	0.06	0.07
Equity - Euro	-	0.03	0.05	0.07	0.08	0.09	0.12
Equity - UK	-	-	-	0.02	0.03	0.03	0.04
Equity - Japan	-	0.01	0.02	0.03	0.04	0.04	0.07
Equity - US	-	0.10	0.16	0.23	0.29	0.32	0.45
Govies - Emerging - Mid term	-	-	0.39	0.34	0.28	0.27	0.26
Govies - Euro - Mid term	0.77	0.83	0.48	0.57	0.50	0.81	0.45
Govies - UK - Mid term	0.14	0.17	0.10	0.10	0.08	0.15	0.09
Govies - Japan - Mid term	0.18	0.32	0.14	0.10	0.05	0.21	0.18
Govies - US - Mid term	0.37	0.56	0.29	0.24	0.16	0.43	0.29
Govies - Euro - Short term	1.02	0.48	0.42	0.27	0.13	0.00	-
Govies - US - Short term	0.11	0.14	0.02	-	-	0.05	-
High yield spread - Euro - Mid Term	0.27	0.14	0.09	0.21	0.27	0.22	0.13
High yield spread - UK - Mid Term	0.03	0.01	0.01	0.02	0.03	0.02	0.01
High yield spread - US - Mid Term	0.06	0.08	0.03	0.02	0.03	0.07	0.01
Investment Grade spread - Euro - Mid Term	0.18	0.12	0.14	0.18	0.14	0.21	-
Investment Grade spread - UK - Mid Term	0.04	0.02	0.03	0.04	0.03	0.04	-
Investment Grade spread - US - Mid Term	0.07	0.04	0.05	0.07	0.05	0.08	-
Inflation Europe	1.21	1.37	1.73	1.40	1.04	-	-

When we build a portfolio, we want to be sure that we understand the real risk we are undertaking. Saying that we are exposed to Bloomberg Barclays Global Aggregate does not tell us enough information about the portfolio's risk. The definition of the risk factors depends on the level of detail the portfolio manager wants to get into.

Suppose that we now add a global equity ETF replicating the MSCI All Country World. The MSCI world securities are stocks from different countries with different currencies: US Equity, Emerging Market Equity, Dollar, Yen and Emerging Market currencies. As we've seen, some of the risk factors like Yen and US Dollar are common to the two ETFs. So, when we compute the total exposure, we need to aggregate the common exposure across the ETF to understand our total positioning.

An additional level of complexity comes when you consider exposures that are not "delta one". "Delta one" means that, if the return of the risk factor is 1%, the security will move 1%. This is the case with Equity, for instance: if the underlying stocks move 1%, the portfolio exposure to equity will move 1% too. This is not the case for bonds. If interest rates move by 1%, the return of the bond can be approximated to the product of its duration and the interest rate delta. This means that the sensitivity of the risk factor is different from 1.

One of the tools we use to measure risk is the risk exposure matrix. The risk exposure matrix is a table where we have for each portfolio its sensitivity to its underlying risk factors. The risk exposure matrix answers to the question:

"What is the return of the portfolio if we shift only the specific risk factor move of 1% ?"

The table below is an example of risk factor matrix. The value of 0.32 for FX -Dollar for P7 tells us that if the US Dollar appreciate 1%, the portfolio will have a return of 0.32% (0.32 * 1%). The value of 1.02 for Government Bonds - Euro - Short term in P1 indicates that if short term rates in Europe increase of 1%, the portfolio loses 1.02%. With the risk factor matrix, it is possible to perform sensitivity stress testing. We can say that, if there is a drop of US equity in P2 of 10% and the other risk factors do not move, the portfolio will lose 1%.

Securities lending

Securities lending is a well-established practice whereby ETFs make loans of stocks or bonds to seek an incremental increase in returns for fund shareholders. Securities lending is a fairly simple process that can generate extra returns for ETF investors, but it also introduces extra risk, however minimal. The process could be summarised as follows:

A large financial institution asks to borrow a stock or bond from an ETF. The ETF asks for collateral to secure the loan. The value of the collateral is required to be at least equal to the market value of the loaned stock or bond.

Once collateral is received, the ETF lends the stock or bond to the financial institution and invests the collateral in a money market fund to seek incremental return.

At the end of the loan term, the borrower must return the security back to the ETF, the ETF then releases the collateral back to the borrower to close out the process.

The logic behind this is that the ETF can generate additional income through the rate charged to the borrower for lending securities (if applicable) and/or the income on the reinvestment of cash collateral in the money market fund. Generally speaking, securities-lending activities are positives for shareholders and contribute to tighter index tracking and better overall returns. However, they are not without some risks.

The profitability of the security lending depends on the lending premiums. In general, securities that are in high demand in the loan market command higher premiums. Premiums tend to fluctuate as certain sectors, markets or countries fall in and out of favour with short-sellers.

Risks of securities lending

The primary risks of securities lending are :

1. **Borrower default risk**:
   Securities lending involves the risk that the borrower may fail to return the securities. However, industry practice is for borrowers to provide collateral exceeding the value of the loaned securities by a set margin. So, while a busted counterparty is a pain, it's not immediately costly. The costs could come in if the borrower is a short-seller and the security they shorted rallies strongly in a single day, the borrower defaults and the provided collateral is insufficient to cover the cost of reacquiring the security.
2. **Collateral reinvestment risk**:
   When an ETF receives cash as collateral, it can be reinvested in a money market fund with the objective of preserving principal and liquidity while generating income.

This reinvestment of cash collateral exposes the fund to various investment risks and the potential loss of principal. The principal ones are:

- **Market risk**:
  losses due to changing prices.
- **Liquidity risk**:
  the possibility that securities in which the cash is invested become difficult to sell.
- **Credit risk**:
  the potential that securities in which the cash is invested default.

Our approach to securities lending

As previously explained, securities lending is a well-established practice and a fairly simple process that can generate extra returns for ETF investors, even if it also introduces risks.

The Moneyfarm approach is to include ETFs which perform security lendings. We recognise the potential benefits associated with the practice and we think, on balance, that the corresponding risks are minimal.

However, we score all ETFs in the instrument selection process in order to avoid hidden costs and minimise liquidity risk. The process for screening and evaluating ETFs relies on a quantitative score that aggregates the variables we consider to be significant to evaluate an ETF, one of these variables is the ETF security lending policy.

To summarise, the instrument selection process includes ETFs which allow securities lending but slightly penalises them with respect to the others (everything else equal), in order to maximise our clients' best interests and to comply with a prudent risk management policy.

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