Don’t optimise, satisfice!

satisfice

[ˈsatɪsfʌɪs]
VERB
Formal
Decide on and pursue a course of action that will satisfy the minimum requirements necessary to achieve a particular goal.

To navigate the uncertainty in a complex world safely, we should not seek to maximise the investment return; instead we should maximise the chance of reaching the goal in a wide range of potential outcomes. In this article we will illustrate how a satisficing approach can be applied to managing the balance sheet of a Defined Benefit (DB) pension scheme. This includes de-risking the contract design and re-risking the investment portfolio. By applying scenario thinking and seeking ‘true’ diversification, our decisions will become more robust against our own ignorance. The price to be paid is the introduction of complicated, but manageable, operational risks.

Living in a complex world

Among practitioners in particular, a fundamental discussion exists in the finance sector. The conventional wisdom is that markets are mean-reverting towards a long-term equilibrium. A long-term investor should select a static ‘optimal’ asset mix on the efficient frontier and adjust the level of risk by allocating some part of their portfolio to cash (or borrow money). A growing camp of challengers argue that this is an oversimplification of reality and that these ‘conclusions’ are leading investors astray. The difference in opinions boils down to whether the economy and financial markets are best modelled as a complex or a complicated process.

The difference between complex and complicated systems is well-illustrated by cars and traffic flows at busy highways. A car is a *complicated system* with many interacting subsystems designed to create a smooth and safe journey. The components of the car, and how they interact, do not change over time, which makes it is easy for a good mechanic to diagnose and repair a broken car. Traffic flow on a busy highway is an example of a *complex system*. From a helicopter’s perspective, traffic flow appears orchestrated, but it just emerges from continuous interactions between drivers changing lanes, matching speeds and distance to avoid bumping into each other. Drivers’ responses are not constant over time and create dynamic patterns including so-called ‘ghost jams’. When observing a complex system, we can recognise reoccurring patterns, but it is impossible to predict how these patterns will evolve.

It is in our human nature to simplify the complex world using a complicated model, but we often tend to oversimplify reality and become wilfully blind to the shortcomings of our own complicated model. Faced with a complex world, the guidance we get from complicated financial theories leaves us short. This was illustrated by Her Majesty the Queen, when, in 2008, she asked the professors at LSE why they had not foreseen the financial crisis. After six months of discussions, the academics replied to her in a letter that said, a bit simplified, that they could not have foreseen the financial crisis because their [complicated] models did not include a financial crisis.

In the complex world, which we live in, we must accept that there are no long-term equilibriums to which the financial markets mean-revert. We cannot find a long-term optimal portfolio since the world is continuously evolving. This means that the long-term is a path dependent on a combination of shorter-term periods. In a complex world, the alternative is to look for an investment portfolio that delivers satisficing outcomes while being resilient to what we do not know. The term satisfice was coined by the economist Herbert Simon describing the consequences of his theory of bounded rationality. Translated into an investment decision process, and developing the short description at the top of this article, satisficing means that, instead of searching for the optimal investment portfolio, we should maximise the chance of reaching the goal under a wide range of potential market outcomes.

Decomposing a complex problem

Let's take a closer look at the complex balance sheet problem of a DB scheme. Members of a DB scheme expect to receive a life-long retirement income that roughly grows in line with inflation. To fund this benefit, the employer and employees have paid pension contributions to the scheme. The scheme sits at arm's length from the company and the assets in the scheme are invested by the trustees with the goal of paying pension benefits until the last member dies. If the assets are not sufficient for the scheme to fulfil its obligations, the corporate sponsor is liable for covering the funding gap.

Most corporate DB pension schemes in the UK have been closed over the last two decades so their actual investment horizons have shortened dramatically. This additional complexity has been recognised by the Pensions Regulator (tPR) which is asking schemes to reflect on how to deal with the shortening investment horizon in their most recent funding statement.

The balance sheet of a DB pension scheme is exposed to three areas of risk:

1. Unexpected changes to the members' life expectancy
2. The credit risk of the sponsor (covenant risk)
3. Investment risks arising from the financial markets

For retired members, the scheme can re-insure macro longevity risk in the market, but that is difficult for active or deferred members. Covenant risk and investment risk are both affected by similar underlying factors – the real economy and financial markets.

Where there is an underfunded DB scheme, the covenant can be regarded as a typically illiquid, complex, non-linear financial instrument that is "in the money". This particular financial 'instrument' provides long-term flexible financial support typically without collateral – unlike other financial derivatives – and, given it is provided by the scheme's sponsors, it is fully exposed to the sponsors' credit risk. The covenant can improve or worsen through trustee and sponsor actions and its financial sensitives need to be understood, monitored and managed fully. In practice, the covenant acts as a boundary condition when managing the financial risks in the balance sheet.

Turning to the financial risks, it is useful to separate *unintended financial risk*s that arise due to the DB contract design from *intended financial risks* that are taken in order to earn a positive risk premium. To improve the resilience of the portfolio without changing the overall level of risk, it is a good idea to de-risk the DB contract design and re-risk the intended investment risks. In practice, this approach is known as 'LDI' and is widely accepted among DB pension schemes.

To neutralise the interest and inflation sensitives that are inherent in the DB contract, a customised 'liability bond' is constructed using a combination of Gilts, cash and derivatives. This reduces the uncertainty by reducing the exposure to complex risks. But working with derivatives introduces complicated risks such as counterparty risks, operational risk in collateral management, rolling risks and changes in the spread between Gilts and swaps.

The benefit of de-risking the DB contract design is that we can transform the problem from a complex balance sheet problem into a more comprehensive, but still complex, asset-only problem. We are able to do this by removing one layer of complexity and exchanging it for complicated operational risks that we can manage better. The final step is to re-risk by investing part of the cash component from the LDI portfolio in return seeking assets. This is just re-risking the scheme back up to the level of risk that trustees previously were comfortable with.

In short, we have simplified the balance sheet problem to a complex asset-only problem by introducing complicated operational risks, but we are still exposed to macro longevity risk and regulatory risks. To avoid mental compartmentalisation, a common human bias, the financial result of the LDI portfolio should be evaluated net of the liabilities. The result of the return-seeking portfolio should be evaluated net of cash. Evaluating the individual components that constitute each of these two portfolios on a standalone basis could unintendedly lead to concerns. While the overall result remains stable, the individual components might show dramatic movements.

Risk is in the eye of the beholder

An underfunded scheme needs to take investment risk to be able to meet its obligations. Investment risk is not directly observable and traditionally it is often defined as random deviations from a complicated model of reality. These derived risk measures only make sense when the model itself is a good depiction of reality. Many years ago, my PhD supervisor in econometrics captured this challenge brilliantly by saying "first moment first". In other words, if the model of the mean is mis-specified, then it is pointless calculating the volatility or any other higher order moments. Accepting that our world is complex and continuously evolving over time means that that risk cannot be uniquely defined. Investment risk is a construct in the eye of the beholder.

So how should we approach diversification in a complex world? A naïve approach to diversification is to follow the 1/n allocation rule. An equal amount is invested in different asset classes or buckets. The degree of diversification achieved by this strategy depends on to what extent the buckets are interconnected. In a complex world, we do know that the interconnectivity changes over time. It is especially important to gain a better understanding of how interconnectivity evolves in times of financial stress or geopolitical crises.

In nature, the tool for diversification is bio-diversity. The equivalent for investors is to apply diversity in thinking. Knowing that no model will be a perfect description of reality, we should use different models to see how the complex world could work. This results in a higher order diversification compared with diversifying between strategies within a single class of complicated models. In other words, we should not put all our eggs in a basket defined by one theoretical model, even if that particular basket has different compartments. Diversifying only within one complicated model results in second order diversification.

As an illustration, we will take a look at a traditional investment portfolio through three different lenses: capital, risk factors and scenarios.

Capital The traditional lens is to use capital (asset allocation) as the measure when determining diversification between asset classes. The advantage is that capital is an observable, uniquely defined measure. The downside is that traditional asset classes are clearly interconnected. For example, in the corporate capital structure, debt and equity are ultimately exposed to the same underlying business risks.

Risk An alternative lens is to use investment risk as the framework and diversify between different risk factors. Risk is a derived measure conditional on model assumptions and the sampling window and frequency of historical data. Diversifying between different risk factors requires the investor to make several subjective choices.

Scenarios The scenario lens requires a set of sketches outlining how potential futures could unfold. This set can be based on the two fundamental drivers of the business cycle: inflation and economic growth. A scenario is derived through deductive thinking and is a partial description of reality. The quality of the scenarios is highly dependent on the skill of the scenario builder.

Applying these three lenses to a traditional asset-only investment portfolio shows how the perception of diversification is highly driven by which lens we use to study the portfolio.

Through the capital allocation lens, the portfolio looks fairly diversified between the different asset classes as illustrated in the stylised pie-charts above. In this example we have taken DGFs to be a diversified fund built with the intention of delivering equity-like returns with less risk. In many portfolios, government bonds have been replaced by higher yielding corporate bonds. Through the risk factor lens it is clear that most of the 'investment risk' can be explained by the allocation to equity risk, interest rate risk, credit risk and other risk, but the dominant risk driver is equity risk. Applying the scenario lens reveals that this portfolio will only do well in two phases of the business cycle and will perform poorly in a recession or an inflationary environment.

The findings from applying the scenario lens is somewhat surprising. Many experts and commentators currently argue that we are at the end of the business cycle and that we should expect a recession, but many investors basically hold assets that will perform well in a growth environment. Does this mean that these investors have a strong view that central banks and politicians have found a way to avoid recessions? Or is it just an implicit investment view that has been determined by framing – looking at the portfolio through the capital allocation lens instead of the scenario lens?

Constructing a satisficing portfolio

The long-term is a path dependent on a combination of shorter-term periods. In a complex world, the alternative is to look for an investment portfolio that delivers satisficing outcomes while being resilient to what we do not know. This translates to constructing a resilient portfolio that can deliver

a sufficient annualised investment return even when our assumptions do not hold. In practice it means that we need to construct an investment portfolio that can deliver satisficing outcomes under different potential scenarios, instead of an 'optimal' portfolio based on second order diversification.

One way to achieve this is to aim for diversification along the dimensions of the economic drivers behind the business cycle – inflation and growth. This particular approach of scenario thinking is often referred to as 'all-weather' (a term coined by Bridgewater). For each of the business cycle phases, a scenario is developed outlining how the short- or mid-term future might look. Based on that, scenario-specific investment portfolios can be constructed.

Not knowing how the future will develop, the naïve approach would to allocate 1/n to each of the scenario portfolios. For this allocation to be diversifying, we need to rescale the 'punching power' of each scenario portfolio so that they have roughly the same parity in terms of investment risk. The desired sizing can be achieved by applying leverage. This improves the diversity of complex unpredictable risks but introduces the need for counter party management – an example of a manageable complicated operational risk.

For example, government bonds will be a key portfolio component that will do well in a recession. Given current interest rates, a substantial allocation to government bonds would cause a significant drag on overall performance if the recession does not materialise. To avoid this, the 'punching power' of government bonds could be increased by applying leverage so that, as well as offering protection in a recession, this allocation will also provide some return in the other scenarios.

In addition to the different business cycle scenario portfolios, other components can be added to the investment portfolio. Examples include strategies that are driven by specific manager skill, illiquid assets and trend-following strategies. The latter tends to perform well in markets with high volatility, typically at times of financial stress. Although financial markets are not predictable and it is nearly impossible to time the markets, there are some patterns emerging that we should be aware of that could result in the need to tweak the allocation between the scenario portfolios or to add portfolio protection if market instability increases.

The robustness of the investment portfolio needs to be evaluated as a whole; individual components in the investment portfolio can show significant variability. Implementing an integrated approach for dealing with complexity provides first order diversification but it also introduces complicated operational risks and requires more expertise and skill than merely pursuing the traditional approach. Compared with the traditional approach, which typically starts with an overly optimistic view of future asset performance 'optimised' based on a complicated theoretical model, constructing a satisficing portfolio based on economic scenarios leads to a significantly more robust investment portfolio.

Satisficing requires expertise

In this paper we have discussed a way for pension schemes, and other long-term investors, to navigate uncertainty in a complex world. For a DB scheme, transforming the balance sheet problem to an asset-only investment problem means that we remove *unintended* investment risks so that we can focus on the *intended* investment risk. To achieve 'true' diversification, we apply scenario thinking; a dynamic approach as the potential scenarios are path-dependent. The final step is to construct a satisficing investment portfolio, which can reach the goal under a wide range of potential

market outcomes. In addition to managing financial risk and operational risks, other risks such as macro longevity risk and regulatory risks remain.

Constructing a satisficing portfolio that is robust against our own ignorance requires both implementation and investment expertise. Complicated operational risks are introduced, which are manageable but require operational excellence. We need to construct high quality scenarios which requires diversity in thinking leading to a better understanding of how markets may evolve over time. Finally, we need to be aware that even if we do everything as well as we can, success is not guaranteed since the world is complex and, therefore, largely uncertain. But at least we will be less vulnerable to one-dimensional thinking and be more adaptive to changes in the environment.