Scenario analysis: necessary in the managing of expectations!

A description of the methodology, quality and added value of scenario analysis in financial advice

Introduction

Current developments in the improving of advisory processes and the information supply that accompanies it are moving fast. The need for ever greater transparency, both instigated by the consumer as well as the supervising authorities, is at the heart of this movement. Transparency is often understood to be a clear insight in the costs involved, but in our vision transparency is above all defined by an acute awareness of risk and return. A few years ago an awareness of the investment risk involved was hardly ever considered in the financial advice or subsequent plan. But with the tumultuous economic events of recent times, insight in investment and product risk has suddenly become a very hot topic. In the day-to-day routine of financial advice the central focus still remains the expected return. But what now is the value of this expected return, of this arithmetic yardstick? After all, the expected scenario is just one potential development of the economy, so what if that economy is suddenly moving in a radical different direction from our original outlook? What will then be the impact on the financial plan, and what are the risks and results involved? Is the consumer willing and able to carry this risk? Is the goal of the financial plan still achievable? How do we, as the trusted advisor, make sure that the expectations of the clients are managed in the best possible way and that we give solid and well-founded advice?

An analysis using various economic scenarios is necessary to get a good insight in risk and return. Besides the information supply, scenario analysis also gives support in the grounding of the investment advice and in the determination of the optimal asset allocation. Simulation techniques are clearly favoured above analytical formulas here, because simulation can take into account a multitude of different variables, such as deposits, withdrawals, taxes, inflation, etc., and do so across a range of investment strategies and portfolios. In such complex situations analytical formulas are no longer possible or useful. In this article we will describe the nature of scenario analysis, its added value and which factors influence its quality. Finally, we will argue that the random drawing of numbers from historical data, as is done with most Monte Carlo simulations, is often inadequate.

What is scenario analysis?

Scenario analysis is a technique in which, by using a large number of scenarios, insight is provided in the development of the assets of an institutional or private investor. To do so a multitude of factors that can play a role, such as investment returns and inflation, are taken into account. The objective of scenario analysis is to create the most realistic possible view of the potential future developments based on simulations of the economy. To be sure, scenario analysis does not merely build upon historical data. Naturally, history is a very important basis, a starting point that provides insight in the potential developments of the economy, through learning from events that did actually occur, albeit in the past. But one must also take note of the current economic conditions.

Frequently an analysis is made of the development of specific assets in case history will repeat itself, a technique known as 'Back Testing'. Yet this is only one scenario of how the economy could evolve. The question we must ask ourselves is what this historic scenario can tell us about the future. This is why scenario analysis goes considerably further than a technique like 'Back Testing'. It takes a more in-depth look at the future, while taking into account historical data and economic knowledge.

If only past events are taken into account, one may understandably ask whether that is sufficient in itself. After all, the future always holds its share of new and entirely unique circumstances. By nature mankind – and, by implication, the investor as well – underestimates the impact of extreme events on the economy. Just look at the ongoing financial and credit crisis!

This explains why we often work with stress scenarios, also called 'Stress Testing'. This 'Stress Testing' generally limits itself to a primary focus on extremes. This in an attempt to answer the question: what if a certain extreme event or a combination of such events occur? By using stress scenarios the effects of these events on the economy, and indirectly on someone's financial planning, can be integrated into the scenario analysis.

By now Monte Carlo simulations have won a place in the financial world. The name is taken from the famous casino of Monte Carlo, and because of that a connection with gambling can be inferred. This is somewhat misleading. The resemblance between both is the principle of the entirely random, thus arbitrary, drawing of individual values from a representative pool of data. But to have a data pool that is representative is more important than the principle of

random selection. Even more, in order to reach a certain high or desired reliability level, it is truly necessary to simulate many thousand times, thereby taking into account the relations between the various data, so that ultimately a representative new set of data can be created. The number of drawings is not decisive for the creation of a real and realistic economic perspective, however the manner in which the data are processed is! Obviously, it should be tested whether the amount of data is sufficient to get a good insight in risk and return.

The quality of scenario analysis stands or falls – as is common with most other financial models – with the economic basis, the methodology and the starting points able to provide a most accurate insight in the potential future developments. It is essential to take into account the various (and therefore also extreme) events, both historically as in the future, but even more with the various relationships that play a crucial role in the economy. Think, for example, of the relationship between interest rates and inflation, or between the real interest rate and the risk premium on stocks. The incorporation of economic knowledge (the results of all events) is therefore essential. This also makes for the biggest difference with a standard Monte Carlo simulation.

Finally it should be noted that it is not the intention of scenario analysis to predict future economic development, but only to display scenarios that are as realistic as possible.

What is the added value of scenario analysis?

Based on scenarios it can be tested what the risks are, given a certain financial position of a private or institutional investor, for liquidity and the objectives desired. For a client to make a well-founded decision and receive an answer on the implementation of the investment problem, he or she needs to be provided with the proper information.

This not only applies for the advisory phase, but also – and especially – for the duration of one or more products that form part of this advice; in other words, a good information flow is crucial in the management phase as well. This information must provide insight in risk and return and accordingly fulfil the role of ‘manager of expectations’. The probability of realizing the set objectives must be maximized, thereby taking into account the dynamics of the economy, for example, in case of a dramatic stock market crash.

The advisor understandably has an important role to play in the advisory process. If the advisor is able to give his or her client the required insight in risk and return, then he or she is

definitely able to bring added value in realizing the personal objectives of the client. Scenario analysis is an instrument that helps demonstrate more clearly why a certain advice is given. In other words, it improves real client-centred advising!

According to various research studies and reports by the Dutch supervisor on financial markets AFM, often undertaken in light of the duty of care, it appears that clients make better judgements when they are informed by means of graphs, images, feasibility percentages and concrete numbers regarding the assets under a respective expected, bad or good scenario. This sort of visual communication proves to have a much better effect that page upon page filled with nothing but text. An example is given in Figure 1.

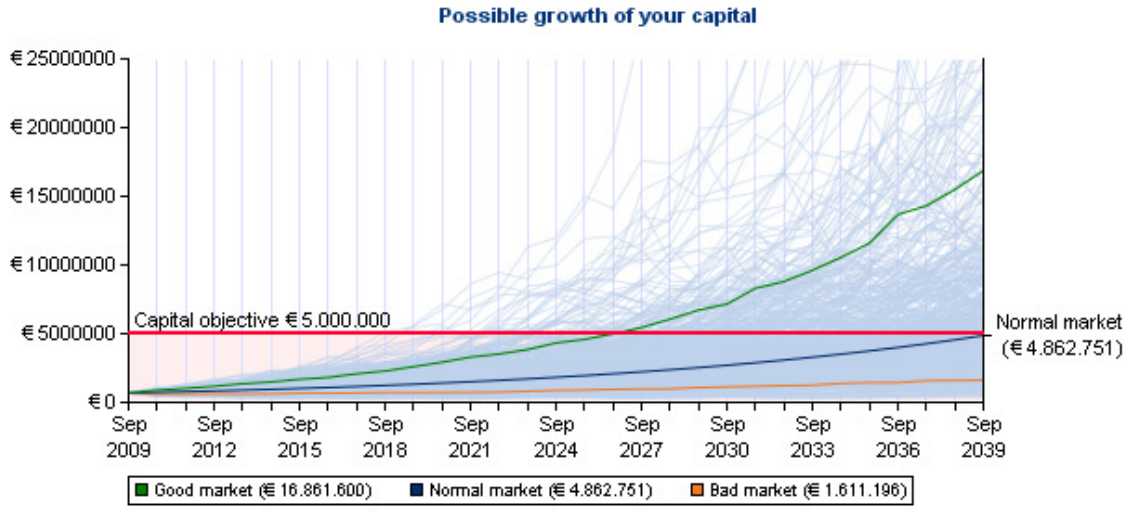

Figure 1

Only by giving true insight into risk and return, the concept of risk management can be honoured. Why would anyone be prepared to run more risk than necessary for aiming at a specific high return? But also, how much return does one minimally need in order to realize his or her objectives? And what degree of downward risk is accepted herewith? By taking such questions serious, the investment risk will be placed in the right context within the financial advice and plan.

With the aid of scenario analysis insight can be achieved into which Strategic Asset Allocation (SAA) comfortably suits the risk and return profile of the client. Global research has shown that the SAA remains one of the most important factors in the implementation of the investment profile.[1]

Scenario analysis therefore offers:

- *Improved information supply* by providing insight into risk and return with a client-centred focus. This translates into a better management of the client's expectations;
- *Added value in the advisory process* for both client and advisor. Each will understand how the specific advice, the product of the SAA, corresponds with the personal situation of the client;
- *Implementation of good risk management;* not only manage the risk of the product or the investment, and perform 'rebalancing' within the mandate (the agreed-upon profile), but also risk management at the level of the objectives of the client;
- *Product development;* with the aid of scenario analysis the effectiveness of products can be tested. By comparing and testing the practical application of various product characteristics, improved products can be developed that really fit the objective of the clients.

Starting points of scenario analysis

As mentioned earlier, the true power of scenario analysis, besides a solid methodology, is found in the correct starting points as they are used in the model. The starting points are being determined by historic data, for example the returns of the past 30-50 years, supplemented by economic knowledge. This is knowledge, based on research over the last century, in the area of macro-economic factors such as the relationship between inflation, real interest rates and the risk premiums of stocks. The historic data give direction to the risk characteristics of the economic scenarios, such as the standard deviation, the correlation between investment categories and the auto-correlation within an investment category.

Correlation shows the relationship between different data series, for example between bonds and inflation. Auto-correlation is established when there is a clear recognizable pattern between a series of returns within the same investment category, say, the relationship

[1] C.G.E.Boender (2009), "The practical implementation of the first lesson of portfolio theory", OCFR Working paper series.

between the interest rates of this year and those of the next year. If the interest rate this year stands at 5%, the probability of it being 6% next year is significantly higher than it being 10% next year. Such a relationship hardly applies to an investment category like stocks, which has a much higher volatility. It is important therefore to take into account the status of the economy in generating future scenarios. Expertise in the area of macro-economic models helps direct the expected return used for the various investment series. The objective of creating economic scenarios is to make the characteristics measured with the aid of historic data, and enhanced with economic knowledge, come back in the characteristics of the scenario set that is used to simulate future scenarios.

Methodology

Generating scenarios based only on historic data is often problematic because either the data history is too brief, or because the historic data give insufficient information about the characteristics of the future data.

An example of this is the return on bonds over the last 35 years. In this period the interest rate declined from an average of around 9% in the years 1973-1983 to an average around 3-4% since 2002. It therefore must be questioned if the characteristics of this period are representative for the future. Regarding the expected return the answer is in any case no. An extra return was actually made by a decline in the interest rate which caused market gains to materialize. The probability that a similar effect will occur in the coming years is very unlikely.

The question moreover remains if the correlation with other series is properly displayed if the numbers of the total return (coupon plus yield/return) is being used.

If use is made of the underlying 'drivers' – short-term interest, long-term interest and term structure of interest rates – a more realistic picture can be given of the valuation of a bond portfolio and the relationship between interest rates and inflation, for example, can be better taken into account. The development of a bond portfolio can be more optimally displayed by modelling the term structure of interest rates rather than by using the historic returns of a specific bond portfolio or index. One well-known technique to model the interest term structure has been developed by Nelson and Siegel.[2]

[2] H. Steehouwer, "Nelson and Siegel Yieldcurve modelling and bank asset and liability management", 1998.

Certain econometric techniques can be applied if the data history is too brief. One can, for example, create a longer data history by making use of explanatory series. The composition of these series provides insight into the development of the returns of a specific series with a brief data history. But this approach does not always belong to the possibilities.

Return: arithmetic versus geometric

In practice there exists a lot of confusion between the geometric return (the effective return over the measured horizon) and the arithmetic return (the average of the annual returns). The geometric return is lower than the arithmetic return when the annual returns fluctuate in time. The geometric return takes into account the fluctuation of the return over time, whereas the arithmetic return does not.[3] In regulation and legislation the geometric return is generally applied, whereas in the financial world the starting point is often still based on the arithmetic return. Therefore good communication between, for example, the financial planner and the asset manager regarding the type of return that is used is of the utmost importance. To give an example: the arithmetic return of the MSCI World over the last 40 years is around 9%, whereas the geometric return over the same period amounts to only 6.7%

In many models the expected future return must be entered. In most cases the geometric return is used for this. The theory assumes that there is a 50% probability to realize a return that is equal or higher than the expected return when the normal distribution is applied. But in practice this probability is not always equal to 50%, due to several reasons:

- correlation effects will alter the probability distributions;
- the probability for year 1 may be 50%, but in a multi-period model the probability starts to deviate because of the definition of the geometric return;
- returns are, by definition, not distributed normally. This depends on the frequency day/month/year data;

These observations should be kept in mind in order to be able to generate 'realistic' scenarios.

Calculation and methods

The added value of scenario analysis is particularly determined by the manner in which scenario analysis can be integrated in the financial advice.

[3] For more information: R.A.M. Janssen (2006), article (in Dutch) "Welk rendement past in een goed financieel plan", or M. Kritzman (2000), "Why the Expected Return is Not to Be Expected", Chapter 4 in *Puzzles of Finance*.

Optimal asset allocation

You can apply scenario analysis to investment funds (mutual fund), bank accounts and insurances. This is sufficient when the liabilities, or the desired deposits and withdrawals, which rest on the investement are taken into account. Based on these liabilities it can be determined which asset allocation optimally corresponds with the individual objectives of the client.

This is different from the optimization techniques that are currently being applied with great regularity. These techniques, e.g. Black-Litterman or Markowitz, optimize the expected return at a specific given risk (standard deviation), or minimize the risk at a specific given return. The disadvantage of such models is that they are one-period only, whereas simulation models based on scenario analysis are multi-period models. Moreover, these optimization techniques do not allow taking along the dynamics of the liabilities in detail and distinguishing, for example, between income and wealth or capital objectives.

To determine the optimal asset allocation, a questionnaire is still frequently being used. This questionnaire serves to establish certain matters such as knowledge, experience and willingness to take risk, but obviously can never be the foundation from which to determine a good investment profile or an optimal asset allocation. In order to do that, a much greater effort is needed. The questionnaire is wholly insufficient to honour the 'Know Your Customer' principle – as also defined in the legal (Dutch Wft and European MiFID) regulations – over the next few years. Making the objective both concrete and quantifiable is therefore an important focus point.

Investment strategy and life cycle

If an optimization is performed, it is important to keep the investment strategy in mind. Roughly speaking, we can distinguish between the following investment strategies:

- 'Buy and hold', no adjustment of the asset allocation;
- 'Rebalance to plan', rebalance the investment periodically to the (originally) determined fixed distribution between the various investment categories;
- 'Life cycle' / risk reduction, reducing the share of more risky investment categories over time as the remaining investment horizon grows shorter.

In working out an investment strategy the future must always be taken into account. The investment strategy can have a major impact on the average risk profile of the duration and

subsequently on the optimal investment portfolio and the expected return as well. The strategy therefore has a great influence on the ultimate advice regarding the periodic and/or one-time deposits and the feasibility of the client's objective(s).

Analysis per product / total assets

The added value of scenario analysis will be truly noticed when specific product characteristics are being calculated. Examples are the large influence of (administration, management, etc.) costs and risk premiums. Many insurance products have been calculated in the past based on a fixed return of, say, 8% or 4%.The costs of risk premiums were withdrawn based on that return. Both client and advisor receive insufficient insight in the true risk and return of the product. In a very bad scenario a higher risk premium will be deducted than was originally accounted for and, vice versa, when the return is better the risk premium taken out will be much lower. The first situation has occurred all around us in recent times, causing many insurance products to end up lower than what people had been predicting beforehand.

When the risks per product are made transparent and understandable, the next step can be taken, that is to make the risk concerning the total wealth transparent as well. By doing this, we can move toward integral balance management, or ALM for the individual. This is an important step forward to be able to facilitate the expectation management of an individual in the right way, both in the advisory phase and in managing for the duration, the after-care phase.

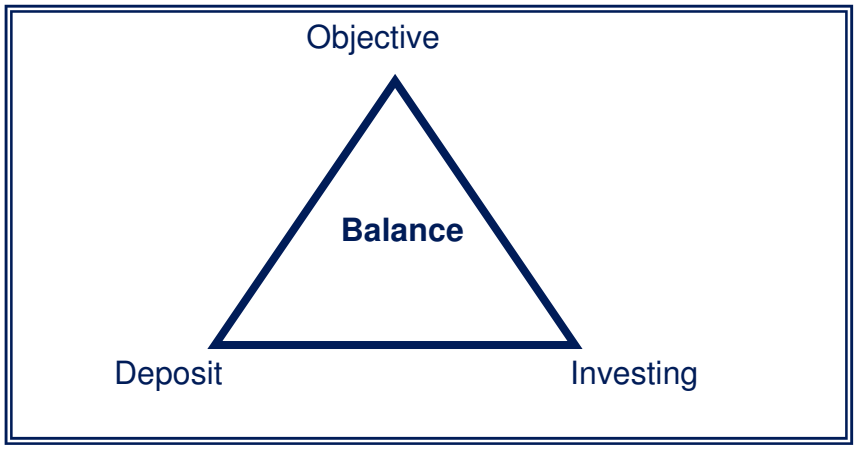

Figure 2: Asset Liability Management (ALM)

Asset Liability Management (ALM)

What is Asset Liability Management (ALM) for the individual? It seeks to optimize the assets or investments in relation to the liabilities, the personal objective(s) of an individual (see Figure 2).

To illustrate this, take the following example: A married couple, both 55 years of age, has €400.000 available (one-time deposit). Besides the wealth tax (Dutch tax rates are 1,2 %), they annually require an amount of € 14.000 to be added to their pensions in order to live comfortably (income objective). They furthermore want to maintain the real value of their capital (wealth objective). What is your advice?

At an inflation of 2%, they need a return of 6,7% (=3,5%+1,2%+2%). The logical conclusion would be to compose a portfolio with an expected return of 6,7% and minimal risk.

If ALM is applied, a portfolio will be composed in which it will be attempted first to minimize the risk of insufficient capital to add € 14.000 to the income, after a correction for inflation. The current tax rates are assumed to remain similar in the future and are entered as such in the scenario analysis.

Next it is time to look under what case the probability to maintain the current capital will be highest. While doing so, the correlation between investments, the assets, and requirements, the liabilities, will be kept in mind; in this case the size of the withdrawal and the correlation with the price inflation.

When there exist various investment funds on the total balance sheet, scenario analysis must take an approach of one analysis per fund, after which, with the aid of econometric techniques, a translation can be made to the total in order to gain insight in the feasibility of the objective. It simply cannot be that for all funds only one analysis suffices, as each fund or depot can have a different investment strategy. A good pension can be achieved with, for example, three or four different products with different asset allocations. The integration of these four products provides insight in the total feasibility of the pension.

Conclusion

Scenario analysis is an important instrument to gain insight in risk and return. The foundation of scenario analysis is Monte Carlo simulation, a technique that is increasingly being applied on a world-wide scale. The quality of the various simulation techniques is highly dependent on the data used, the methodology of the models and integration of economic knowledge. The random drawing of numbers from historic data, as is advocated by the original Monte Carlo simulations, is for that matter entirely inadequate.

The goal is that scenarios provide the most realistic possible image of the potential developments of the economy, so that the advisor can test to what extent the client's objectives are financially realistic and feasible.

Besides a better information supply by providing insight in risk and return, scenario analysis can also help in the grounding of a solid advice and as a result honour the duty of care that is so important these days. But, above all, scenario analysis is an instrument to manage the expectations of consumers much better and as a consequence it can restore and improve their trust in the financial advisor and the financial world itself.

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