EValue

Calculating the Risk Rating of Portfolios

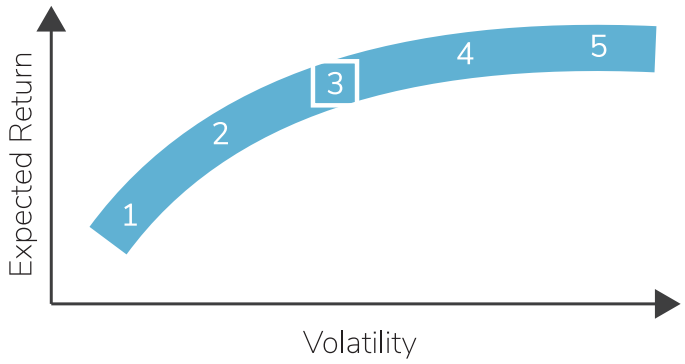
Introduction

This document sets out details of efficient portfolio construction against a risk rating scale together with the explanation of the risk measure used by EValue when assessing the risk rating of a portfolio.

Efficient Portfolios

Constructing a suitable portfolio can be a daunting and difficult process. One way of selecting investments is to use the investor's attitude to risk as a basis for their investment strategy. Efficient portfolios involve determining the mix of assets which will achieve the highest expected return for a given risk target over the relevant investment period.

An efficient frontier is the line of risk and return drawn by a set of efficient asset allocations, as shown in the graph below. If an investor's choice sits below the line, it should be possible to achieve a higher return for the same level of risk by changing the mix of assets to one that is more optimal.



Possible definitions of risk

An objectively measurable risk factor is required in order to assess whether funds should be included in an investment portfolio or not and to assess funds and portfolios of funds against the risk rating scale. There is no universal definition of customer risk. Customers are exposed to many different risks, the relative importance of which depends upon their own personal circumstances.

The following definitions for measuring risk can be considered:

- Standard deviation of annual return (volatility)

  Standard deviation is a statistic that measures how annual returns vary from the expected return. Very volatile investments have large standard deviations as their annual returns can vary significantly from their average annual return. Less volatile investments have a smaller standard deviation because their annual returns are closer to their average annual return.

- Standard deviation of the cumulative return over an assumed investor goal planning time horizon, assuming the funds are rebalanced annually

  In this case, the standard deviation of the cumulative return is measured. The cumulative return measures the total increase in the value of an investment, over a number of years, not just one year. For example: if an investment was bought for £10,000 and 10 years later is worth £15,000, then the cumulative return is 50%. The formula for calculating the cumulative return is as follows:

  (Current price of investment) - (Original price of investment)

  (Original price of investment)

  This measure of risk also assumes that the funds are rebalanced annually. Rebalancing is where the portfolio is adjusted periodically to restore the original level of mix of assets. For example, assume the original target asset mix was 50% equities and 50% bonds. If equities have performed well over the year then the weighting of equities may have increased to say 70%. Rebalancing the portfolio by selling some equities and buying more bonds will restore the original asset mix of 50% equities and 50% bonds. The primary objective of rebalancing is to manage risk by maintaining an effective diversification of assets.

- Value at risk (VaR)

  Value at risk answers the question “What is the worst case scenario?” This measurement of risk uses statistical analysis of historical market trends and volatilities to estimate the likelihood that the losses of a particular portfolio will exceed a certain amount. Value at risk is generally shown as a specific percentage chance that the portfolio will lose a certain monetary amount.

- Risk of capital loss, either over an assumed investor goal planning time horizon or between observations (for example annually)

  A capital loss occurs when an asset is sold for less than the original purchase price. The monetary loss experienced is referred to as capital loss. For example, if an investor bought a house for £250,000 and sold the house five years later for £200,000, the investor would realise a capital loss of £50,000.

- Probability of underperformance compared to minimum risk alternative investments

  This risk measurement looks at the likelihood that the current portfolio will produce lower returns compared to the returns available from alternative lower risk investments such as cash or fixed interest.

Choice of Risk Measurement

In the 1950s, Harry Markowitz put forward a theory for dealing with issues concerning investment choices. The Markowitz model is often described as dealing with portfolio risk and (expected) return or, more simply, risk and return.

The basic assumption is that risk is measured by variance and that the investor's goal should be to minimise variance given an expected return, or to maximise the expected return for a given variance. In other words, mean variance analysis assumes that if the expected return on two investments is the same, but the second investment has a higher variance (or standard deviation), then the investor will prefer the first investment. Also, if the variance on the two investments is the same but the second has a higher expected return then, in this case, the investor will prefer the second investment.

The choice of risk measurement should meet the following criteria:

- It should map to a risk to which the investor is exposed
- It should be objective and easily understood by users
- It should be a single measure so that the calculations are clear

Standard deviation is most commonly used to represent volatility risk. However, using standard deviation, no account is taken of other types of risk such as liquidity (the ability to convert an asset to cash quickly) or capital loss.

EValue's Definition of Risk Measure for Assessing the Risk of a Portfolio Relative to a Customer's Attitude to Risk

EValue uses three key elements for the portfolio risk comparison standard deviation of the natural logarithm of the cumulative prospective returns.

The reasons these are used are as follows:

Standard deviation

- Standard deviation is perhaps the most widely used and understood measure of investment risk. Assuming that return is normally distributed the volatility will capture all of the information about the variability.
- Other measures such as VaR or probability of loss place a higher emphasis on particular outcomes. This may be useful in a customer planning process but perhaps less suited to the assessment of the relative risks of funds.

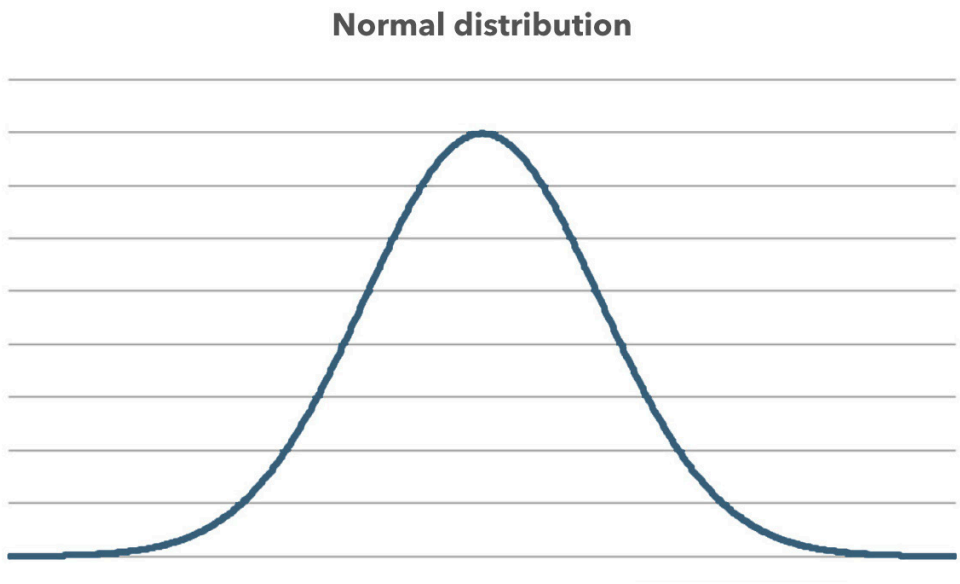
Cumulative value at an assumed goal planning time horizon

- The risk (typically) to which an investor is exposed is the change in the investment performance in the final fund value.

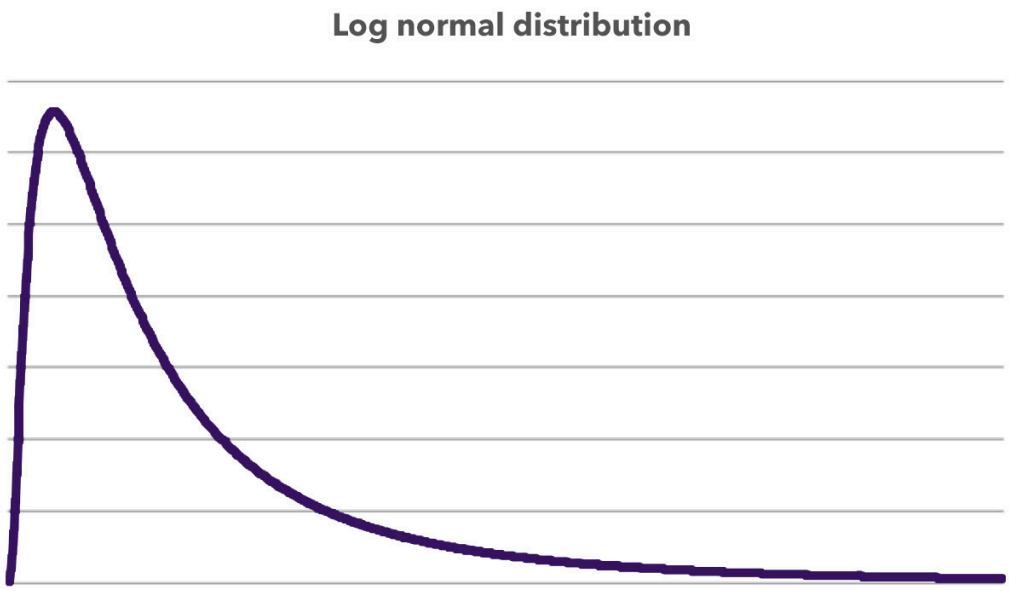
Natural logarithm

The natural logarithm gives the amount of time needed to reach a certain level of continuous growth.

- A good assessment of risk is given by the volatility of a normally distributed variable. An example normal distribution is shown below which has good properties to assess standard deviation to measure risk:



Annual returns, however, are usually assumed to be log normally distributed as per the diagram below.



To give a better volatility measure, we use the natural logarithm of the annual returns which gives a normal distribution of results, which in turn leads to a better risk measure.

- The risk return trade-off over time of the actual return is not linear. However, the natural logarithm is more linear allowing interpolation of targets between corner points.
- Use of the natural logarithm removes distortions between funds which have the same underlying asset allocation but different charges. Only the relative level of charges between different asset classes affects the result.
- Standard deviation is affected by the level of average returns – for the same % difference in cumulative returns an asset class with a higher average return will also give a higher standard deviation (this is similar to the effect of charges). The effect of this is significantly reduced by using the natural logarithm which means that the average return no longer affects the risk of the portfolio.

It should be noted that this definition of volatility risk does not necessarily give a good estimation of risk for all funds. No single value can compare every fund or distribution of outcomes for all investors. In particular it may not reflect the value that a guaranteed minimum value might have for investors or its changing value over time.

The risk measure can be compared to the customer's attitude to risk as may be determined by a suitably constructed psychometric risk questionnaire. No risk measure can capture all of the risks that may be important to a customer. In particular, a customer's capacity for risk needs to be addressed separately using a suitable stochastic forecast of possible outcomes against the customer's objectives, whatever risk measure or portfolio rating process is used.

Time Horizons to be Considered

The time horizon of an investment is important in assessing both the requirements of investors and the relative risk reward trade off of different asset classes.

When considering the time horizons the following need to be taken into account:

- Need to match the most common investment periods
- A range of terms is required as risk changes depending on the period of investment objective
- Specific terms are required for guarantee funds with spot guarantee
- A stochastic review is not suitable under 3 years

Using the asset model, EValue Index Solutions

The EValue asset model, Insight, is a full economic model which produces returns series from an internally consistent projection of economic conditions. Long term behaviour of assets can be quite different from short term behaviour and this is reflected in the EValue asset model. Therefore, long term effects can be taken into account in the construction of asset allocations for investors with different time horizons.

The EValue asset model:

- Is a comprehensive and sophisticated model
- On-going investment and dedicated support
- Quarterly updates of assumptions
- Regular recalibration
- On-going refinement
- Is extremely flexible and able to model a wide range of asset classes

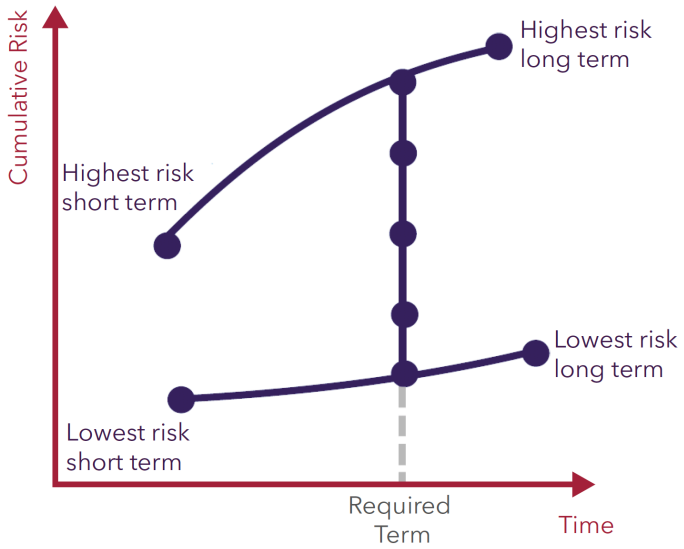
Setting Risk Benchmarks for each Risk Category

An investor's tolerance to risk must be properly explored. EValue uses psychometric testing which provides a robust and proven method to assess and test an individual's attitude to risk. Investors are assigned a portfolio based on their risk tolerance and potential investment timescale.

Targets for each term are set based on benchmark asset allocations for the highest and lowest risk categories. Targets for the remaining risk levels are spread appropriately between the high and low risks.

The risk benchmarks are expressed as the minimum and maximum standard deviation values (volatilities) for the natural logarithm cumulative return over the selected term.

Target portfolios are set at 4 "corner" points only. These are: Highest risk, short term; Highest risk, long term; Lowest risk, short term and Lowest risk, long term as shown in the example graph below:



Risk targets for other terms, and for any number of risk levels at each term, are set by interpolation. The detailed process is as follows:

1. Benchmark portfolios are identified and consist of asset allocations corresponding to the highest and lowest risk levels for the shortest and longest terms considered. These will correspond to descriptions of the relevant risk levels and be in line with market practice for corresponding investors.

2. The risk measurement is calculated for each of the 4 corner points. These risk targets remain fixed in terms of asset allocation, thus ensuring that as model assumptions are updated from quarter to quarter, risk targets do not move much in relative terms. This affords some protection against changes being made to the classification of a given risk category, say, just because the market has become less or more risky.

3. Once these corner points are established, the level of risk for each intermediate risk category is interpolated such that the gaps between the lower risk levels are smaller than those between the higher risk levels. This is because a low-risk investor is more sensitive to movements in risk than a high-risk investor.

Why use this method?

The reasons for adopting this approach are as follows:

- It avoids risk targets being based on arbitrary asset allocations for intermediate risks and terms;
- It ensures a smooth transition in 2 dimensions between both risk and time;
- It does not fluctuate unnecessarily with minor changes in asset volatility during the year;
- The lowest and highest risk asset allocations are justified by reference to risk descriptions and common market practice;
- It reflects the non-linear nature of risk / reward;
- It is independent of the choice of assets for the resulting portfolios.

Why use an Asset Model and not Simple Historic Volatility?

A model is always being used whether it is an explicit asset model or simple historic volatility. The reasons why an asset model should be used instead of simple historic volatility are:

1. Historic volatility is an estimator of standard deviation. In such a model, short term behaviour can be extrapolated directly to long term behaviour. Unfortunately, the record suggests that such extrapolations overestimate equity risk and underestimate the risk of property, cash and some fixed income investments over the long term.

2. Basing estimates over a short sample exaggerates the problem of giving overweight credibility to what has happened in the past. There may also be foreseeable risks which did not occur in the sample (that period of historical data) and are therefore not taken into account.

3. Historical averages, as indicators of objects that change over time, are necessarily slow moving and systematically behind. Any adjustment to investment policy prompted by such measures runs the risk of being systematically wrong. For example, equity volatility is typically low in the build up to a crash which might lead to a high allocation during a crash but declining allocations into any recovery and so drive a systematically losing strategy.

4. Historical volatility is not available for new products.

5. Under the stochastic asset model process, the diversification within a portfolio can be easily assessed. This is not the case with historic volatility where the weighting of the individual volatilities of the funds in the portfolio takes no account of the benefit of diversification which is likely to arise in the portfolio.

6. Finally, as a measure rather than a model, historic volatility falls short when applied to investments such as structured products that do not have return distributions that are roughly log normal.

Here are some examples to put this into context:

Case 1 – Property Funds. Until 2007 the historic volatility of property funds was very low and so such funds would have been rated as minimum risk on a historic volatility basis. This period of low volatility in property has given investors the expectation, based on historic volatility, that this will continue. However our forecasts have continually demonstrated more risk for the future with property than a historical model during this period. The stochastic asset model takes into account what might happen in many hundreds of scenarios from a worst to best case scenario and is not going to reflect the last 5 years as such and use that to predict the say, next five years.

Case 2 – Knockouts, covered calls and other market contingent events Using historic volatility to assess funds which have strategies which aim to add value by exposure to contingent events can materially incorrectly state the risk to which the fund is exposed. If the contingent event has not happened in the historic period under review the risk will not be captured. The EValue approach accurately reflects the likelihood of the event happening, whether it has happened in the recent past or not.

How can Historical Volatility be Calculated?

The Financial Express tool “FE Analytics”, which is a past performance tool with rich functionality, can be used to give the historical volatility of the benchmark asset allocations of the EValue portfolios. This can be done by setting these benchmark asset allocations as a portfolio within FE Analytics. However, as described above, this will not be comparable with the risk rating methodology used by EValue, for either a portfolio of assets or individual funds.

EValue

ev.uk