LEVENDI

A SIMPLE APPROACH TO EVALUATE STRUCTURED PRODUCTS

INTRODUCTION

Choosing one investment over another inevitably involves weighing up various pros and cons. There may be unquantifiable factors, contingent risks and other elements that will always be a judgement call, but at the simplest level it is a judgement about risk and return. In this short note we illustrate the process we use to calculate the risk and return of structured products in a way that allows for a direct comparison with other investments. This type of analysis can then help identify products that expand the efficient frontier, and which do not.

A FRAMEWORK FOR ANALYISING STRUCTURED PRODUCTS (AND OTHER INVESTMENTS)

One of the benefits of structured products is that because the various possible outcomes are defined in advance, investors can relatively easily estimate how likely the various events are to happen. It's then a short step to calculate the risks investors face and the return a product may offer in a way that allows easy comparison with other investments.

AN EXAMPLE

To illustrate how this analysis can help identify attractive investments we can look at how we calculate the risk and return of a standard Autocall.

INDICATIVE TERMS

- The investment is a senior unsubordinated bond issued by an investment grade bank. The issuer offers daily liquidity.
- The issue price is 100%
- The payoff is linked to the levels of the FTSE 100 and S&P500
- The bond is denominated in GBP and has a maximum term of eight years.
- If at the end of any year up to the penultimate (seventh) anniversary, both indices are greater than the initial level, the bond matures at that point. The maturity value is 100% plus 8% for each year that has elapsed.
- If the bond has not matured early, at the maturity date three are three possible outcomes.
    - If both indices are above 65% of the initial level, the maturity value is 164%. This is calculated as 100% plus 8 x 8%
    - If one or both indices are less than 65% but both are above 50% of the initial levels the maturity value is 100%
    - If either index has dropped by more than 50%, the maturity value is reduced in line with the fall in the worst performing index.

The various events are summarized in the table

Event	Condition	Payoff
Maturity at the end of 1st year	Closing levels of both indices is greater than the initial index levels	108%
Maturity at the end of 2nd year	Closing levels of both indices is greater than the initial index levels	116%
Maturity at the end of 3rd year	Closing levels of both indices is greater than the initial index levels	124%
Maturity at the end of 4th year	Closing levels of both indices is greater than the initial index levels	132%
Maturity at the end of 5th year	Closing levels of both indices is greater than the initial index levels	140%
Maturity at the end of 6th year	Closing levels of both indices is greater than the initial index levels	148%
Maturity at the end of 7th year	Closing levels of both indices is greater than the initial index levels	156%
Maturity at more than 100%	Closing levels of both indices is greater than 65% of the initial index levels	164%
Maturity at less than 100%	Closing level of one or both indices is less than 50% of the initial index levels.	Variable
Maturity at 100%	Closing levels of both indices is greater than 50% of the initial index levels, but one or both are less than 65% of the initial index levels.	100%

PRODUCT ANALYSIS; STEP 1 - SCENARIOS

The first step of the analysis is to estimate how likely each event is. To do this we have to show how the product would have performed based on the performance of the underlying market. We could use a simple deterministic example; if at the end of year 1 the FTSE is up XX% and the S&P is down YY% then… Although this serves to illustrate what may happen it is of no use if we want to have an estimate how likely each event is. To create a schedule of probabilities we need to run the product through multiple investment cycles. There are several ways that this can be done:

- BACK TEST; We can use the historic price series for the FTSE and S&P500 and see how often each event would have happened if the product had been launched every day in the past over the last twenty years or so.
- PARAMATERISED STRESS TEST; We can estimate values for how markets may behave in the future and use this to see how often each event would occur. This means we must estimate value for the average change in the level of the indices, volatility and correlation.
- STRESS TEST; Our preferred process is to simulate index returns using the data we have of daily changes in the level of each index. We use a process where we pick data from this pool of information randomly and use this to drive our testing process.

The table below shows the results from the Back-Test and our Stress-Test. The Stress test uses data from the beginning of 1993. The Back Test goes back to 1984 where there is a long enough time series.

Event	Payoff	Stress Test	Back test
Maturity at the end of 1st year	108%	46%	72%
Maturity at the end of 2nd year	116%	16%	10%
Maturity at the end of 3rd year	124%	9%	2%
Maturity at the end of 4th year	132%	5%	4%
Maturity at the end of 5th year	140%	4%	3%
Maturity at the end of 6th year	148%	3%	3%
Maturity at the end of 7th year	156%	2%	3%
Maturity at more than 100%	164%	10%	3%
Maturity at less than 100%	Stress Test; 41.6% Back Test; n.a.	2%	0%
Maturity at 100%	100%	3%	0%

The value when the maturity is less than 100% is the average payoff in these cases. For the back-test the value is n.a. because in this scenario there are no instances where the maturity value is less than 100%.

This data gives us enough information to draw some initial conclusions

	Stress Test	Back Test
Chance of maturity > 100%	95%	100%
Average annual return if maturity is > 100%	7.5%	7.7%
Chance of loss	2%	0%
Payoff when there is a loss	42%	n.a.

In this case these results paint a very favourable picture. The Stress Test and the Back Test both indicate a high chance of a positive return. The back test shows that the product would always have generated a positive return. The stress test is marginally more conservative. In this scenario there is a 3% chance of maturity at 100% and a 2% chance of a loss. Where there is a loss, the average payoff is 42%.

CALCULATING RISK AND RETURN

The final step is to use this data to calculate the risk/return profile of this investment in a way that allows a direct comparison with other investments.

RETURN

The return calculation is relatively straightforward. Resisting the temptation to multiply the chance of each event by the associated annualised return, the average return can be calculated in one of three ways.

- Multiplying the probability by the payoff allows us to calculate a probability weighted payoff schedule. This can be used to calculate the IRR using Excel.
- We prefer an arithmetic average, this is the probability weighted average payoff discounted by the probability weighted average term to maturity.
- The CAGR is then a similar calculation but using a probability weighted average compound payoff

RISK

Risk is trickier. We think that it is helpful to calculate the chance of loss and the average payoff when there is a loss. This is how many investors will think about risk.

However, in order to comply with the broader metric of risk; "volatility", it's important to calculate the volatility of returns in a way that takes into account the asymmetry of return in most structured products. Using this product as an example, there is a high chance of a good return and a low probability of a large loss. Recognizing this, we calculate volatility based on the average of the worst 10% returns from a product and the Arithmetic Return. Using a "left tail" measure like this allows us to then use the volatility value we calculate to compare the downside risk of a structured product with the downside risk of other assets that is also expressed as a volatility of returns.

	Stress Test	**Back Test**
CAGR	5.4%	7.3%
Arithmetic Return	6.0%	7.7%
IRR	5.9%	7.3%
Volatility	6.0%	1.0%

CONCLUSIONS

In the case of the product we have used as an example the analysis is very positive, for other products the analysis can be much less flattering. The important part of this is not the analysis of this product itself, but the creation of a framework that allows the user to see what returns they may get and the risks that they face.

This framework we have developed provides a robust and transparent way to calculate the risk and return. The analysis can be used to evaluate the returns from structured products, conventional funds linked to equities, bonds and other assets. By being able to use the same process to calculate the risk / return profile of a broad range of assets, the analysis enables users to compare one product with another, to evaluate the benefits and disadvantages of various changes to product design and to identify the most attractive investments.

We favour the use of our stress test results over the back-test results because this scenario does not require us to haver to estimate values for return, volatility and correlation. The stress test scenario reflects the vagaries of actual market performance. Volatility and correlations are not stable. Market returns are unpredictable. But we recognised the limitations of any process that is largely a reflection of how markets have performed. Our standard Paramaterised testing process uses capital market assumptions that are an aggregation of publicly available data from large reputable organizations that publish their own forecasts.

Investment managers will want any analysis to be consistent with their capital market assumptions. By setting the parameters for the performance of each of the underlying assets users can calibrate the analysis of structured products with the risk and return of other funds with consistent underlying assumptions.

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