LEVENDI

WHY AUTOCALLS BECOME MORE ATTRACTIVE IN A LOW RATE ENVIRONMENT

INTRODUCTION

As the Fed joins in with other central banks, cutting rates, investors need to adjust to the new norm. Lower for longer has been a theme since the financial crisis, and there seems to be no prospect of rates increasing back to pre-crisis levels. Investors need to consider current investment opportunities in the present state. The past is no longer a reference point. Referring to coupons and returns that were possible is futile.

If investors accept that lower rates are here to stay, and that central banks are likely to continue to adopt an accommodative stance, Autocalls look increasingly attractive. The effect of lower rates is to reduce the headline rate that investors may receive, but on balance our analysis shows that the risk/return profile of Autocalls improves versus other assets. This is because Autocalls reward investors for absorbing equity market risk. They are a form of covered put strategy. In a lower rate world, the risk neutral premium investors receive for accepting equity market risk increases. This partially offsets the present-value effect of lower yields that drives up bond prices.

There are other important dynamics and relationships that investors must consider. The relationship between lower rates and volatility is important as is the long-term prospect for equities to increase in value when real returns are very low.

When it comes to the pricing of the long dated puts that are embedded in Autocalls we agree with Warren Buffet when he wrote in 2010: *Both Charlie and I believe that Black-Scholes produces wildly inappropriate values when applied to long-dated [put] options…. More tangibly, we put our money where our mouth was by entering into our equity put contracts. By doing so, we implicitly asserted that the Black-Scholes calculations used by our counterparties or their customers were faulty.*

Buffett identified an opportunity that is still available to investors in Autocalls and similar products today. The difference between the “price” and “value” of put options is an factor that is driven by regulatory, economic and behavioural factors. It is this gap that drives the returns that investors in Autocalls enjoy and which makes Autocalls particularly attractive in the current low rate environment.

In this note we first look at the effect of lower rates on Autocall pricing before looking at the risk/return that they offer investors.

THE EFFECT OF LOWER RATES ON AUTOCALL PRICING IN A RISK NEUTRAL WORLD

Lower rates have a both a negative and positive effect on the headline return offered by Autocalls. To appreciate how lower rates effect the terms of an Autocall, we need to understand how Autocalls are priced.

When issuers calculate the payoff of an Autocalls, they calculate the probabilities of each event happening and the associated payoff. The price of a product is then the probability weighted present value of all the possible future outcomes. A Bank will issue a product that has a payoff that means that based on their calculations, the expected return is equal to their funding rate less the profit that they factor in and any other costs associated with the issue.

To illustrate this, we can look at the published probabilities of a product promoted by Dura and issued by Credit Suisse[1] in April 2018. The product is a simple FTSE Autocall. The maximum term is 6-years. The payoff is 7.2% each year, the Autocall triggers are that the FTSE needs to be above 100/100/95/90/85/80 at the end of each year. At maturity there is a 60% barrier knock-in put.

The Dura fact sheet for advisers publishes the "model implied probability" of each event. In the table below we have copied these probabilities and filled in the payoff (estimating the payoff if the barrier has breached which is the only uncertain value)

Term	Trigger	Probability	Payoff
1	100%	43.04%	107%
2	100%	13.09%	114%
3	95%	9.38%	122%
4	90%	6.18%	129%
5	85%	3.93%	136%
6	80%	2.88%	143%
6	Maturity at 100%	5.56%	100%
6	Maturity at less than 100%	15.85%	45%

Source; Dura

We can use these numbers to calculate the expected return. It's relatively simple to calculate the IRR using the probability weighted cash flow each year:

Year	Probability weighted cash flow
0	-100.000%
1	46.139%
2	14.975%

[1] https://duracapital.co.uk/wp-content/uploads/sites/13/2018/08/1521206620-Dura-Capital_Credit-Suisse-FTSE-100-Defensive-Autocall-Plan-1_Adviser.pdf

3	11.406%
4	7.960%
5	5.345%
6	16.817%
IRR	**1.004%**

Source; Levendi Investment Management

Alternatively, we can calculate the Arithmetic Return. The Arithmetic Return is the probability weighted payoff (102.64%) discounted by the probability weighted term (2.87 years). This is similar; 0.91%.

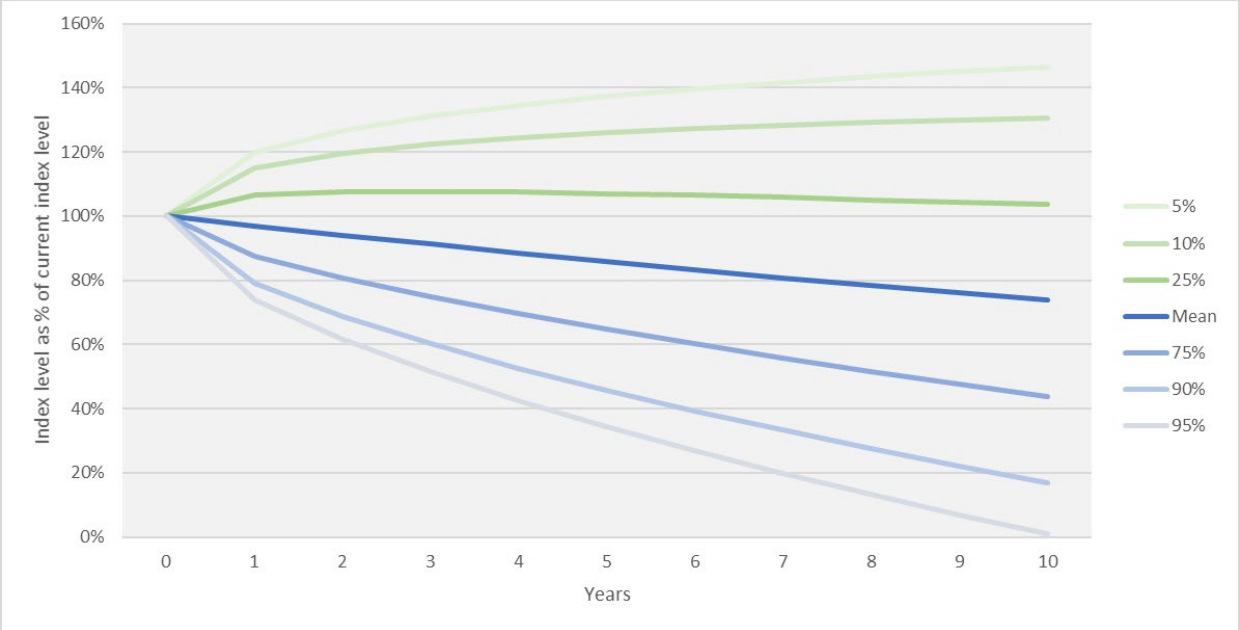
So, we can see from this example that based on the probabilities published by the issuer that the return is about 1%. If we take the average payoff when there is a loss to 35%, the IRR falls to 0.4%. This is what we would expect and would have been reasonable when the product was issued.

ESTIMATING PROBABILITY

When issuers estimate the probabilities of each outcome, the estimate is based on a "risk neutral" model and their estimate of volatility. Broadly, risk neutral pricing is an arbitrage free environment where assets can be bought and sold now and in the future without the buyer or seller being able to lock in a profit. There are two parts to estimating the probability of an event; the forward price and the level of uncertainty or volatility around the forward price.

The chart below illustrates the risk-neutral percentile return for an underlying with 1% rates, 4% dividends and 14% volatility. The bands represent the minimum level of the index with a set probability.

IMPLIED DISTRIBUTION; 4% DIVIDENDS, 1% RATES, 14% VOLATILITY



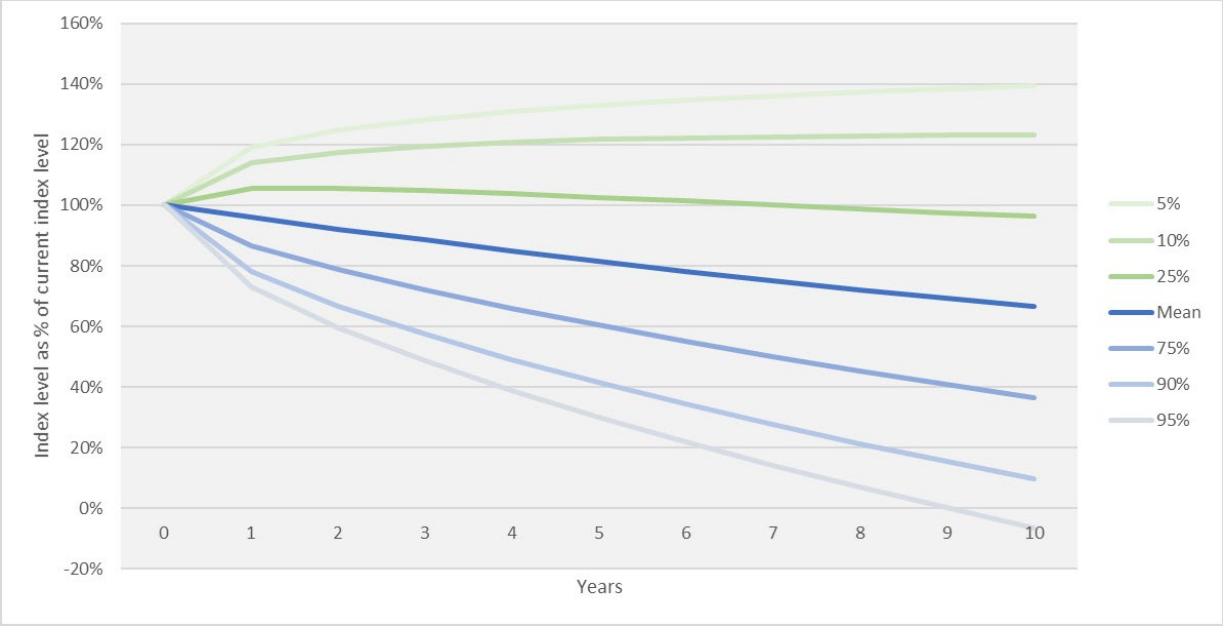
Source; Levendi Investment Management

The chart shows that with these assumptions that

- The 10-year forward price is 74% of the current level
- There is only slightly more than a 25% chance that the index will be above 100% in 10 years' time
- There is almost a 25% chance that the index will have fallen by 60%

If we now reduce the rate to zero – to illustrate the effect of lower rates, the effects are shown in the chart below

IMPLIED DISTRIBUTION; 4% DIVIDENDS, 0% RATES, 14% VOLATILITY



Source; Levendi Investment Management

In this lower rate environment

- The 10-year forward price is 33% of the current level
- There is less than a 25% chance that the index will be above 100% in 10 years' time
- There is more than a 25% chance that the index will have fallen by 60%

Risk neutral forward values for FTSE and Eurostoxx are already negative. As rates fall further, the forward price falls even lower. As a result, lower interest rates increase the risk neutral premium investors receive for selling long dated low strike puts.

As far as Autocall pricing is concerned, lower rates mean that there is a lower chance of the Autocall conditions being met and a greater chance that the index will fall below the level at which the maturity value would be 100%. As a result, the premium investors for accepting the same level of risk increases.

The balancing factor here is the present value effect. As illustrated in the Credit Suisse example above, the price of an Autocall is equal to the present value of the payoffs. So, although lower rates will reduce the risk neutral probabilities of a positive return and increase the chance of a loss, the PV effect works in the other direction.

The net effect is that for most products the annual return is lower in a low rate environment. The PV effect is typically more dominant. To illustrate this, we can use our pricing tool to show the terms for the same product in GBP and EUR. (6 years, annual Autocall at 100%, worst of FTSE and Eurostoxx, 60% down and in put. A rates issuer

- GBP Annual Return; 13.5%
- EUR Annual Return; 11.1%

The lower EUR rate reduces the annual return by 2.4%. By comparison, when we priced up these two assets the 10-year Bunds offer a return of -0.4% while 10-year Gilts yield 0.64%, a spread of 1.4%. Rates have subsequently reduced even more.

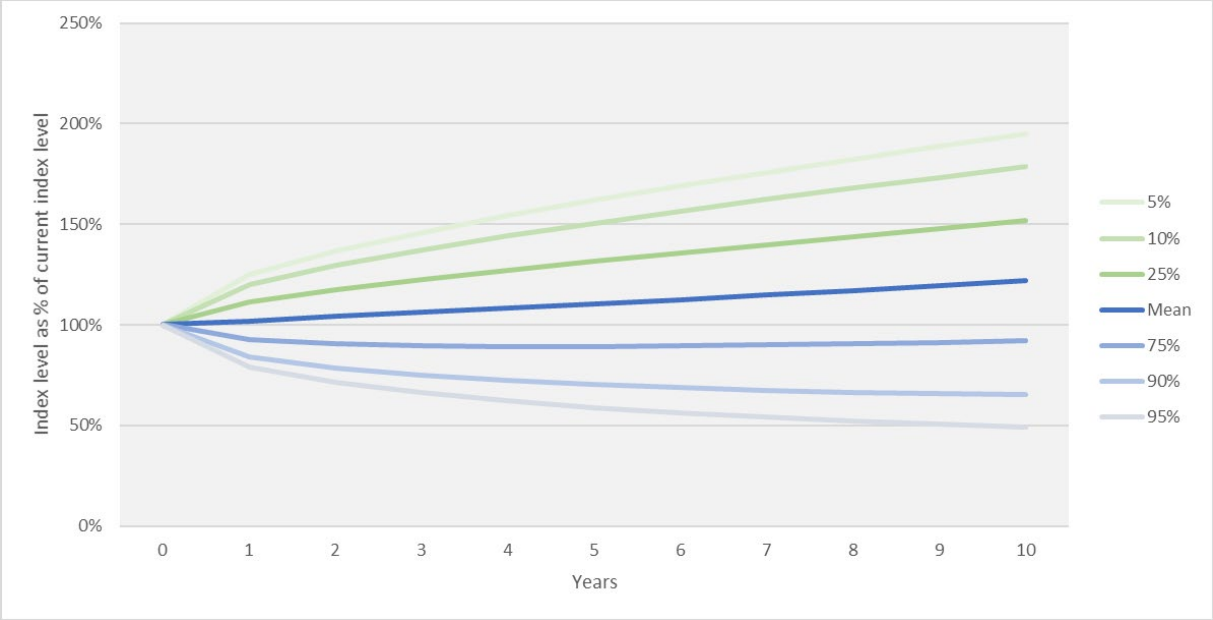
THE ISSUER AND THE INVESTOR

Investors don't live or work in a risk neutral world, but the real world. Risk neutral pricing is not a forecast of where markets will be, and banks would never say that it is. As a result, risk neutral implied probabilities are of little use to an investor. No investor is going to base their investment decisions on the forward values. This is the point that Warren Buffet was making in his letters when he told investors why he started to sell puts.

If instead we start from the perspective of an investor and estimate the total return that we expect from a market, then we can calculate a forecast index level / growth for the underlying index based on the dividends that we expect will be paid.

The chart below retains the 4% dividend assumption but now calculates a forecast value based on an assumption of 6% total return – so 2% capital appreciation each year.

IMPLIED DISTRIBUTION; 4% DIVIDENDS, 6% TOTAL RETURN, 14% VOLATILITY



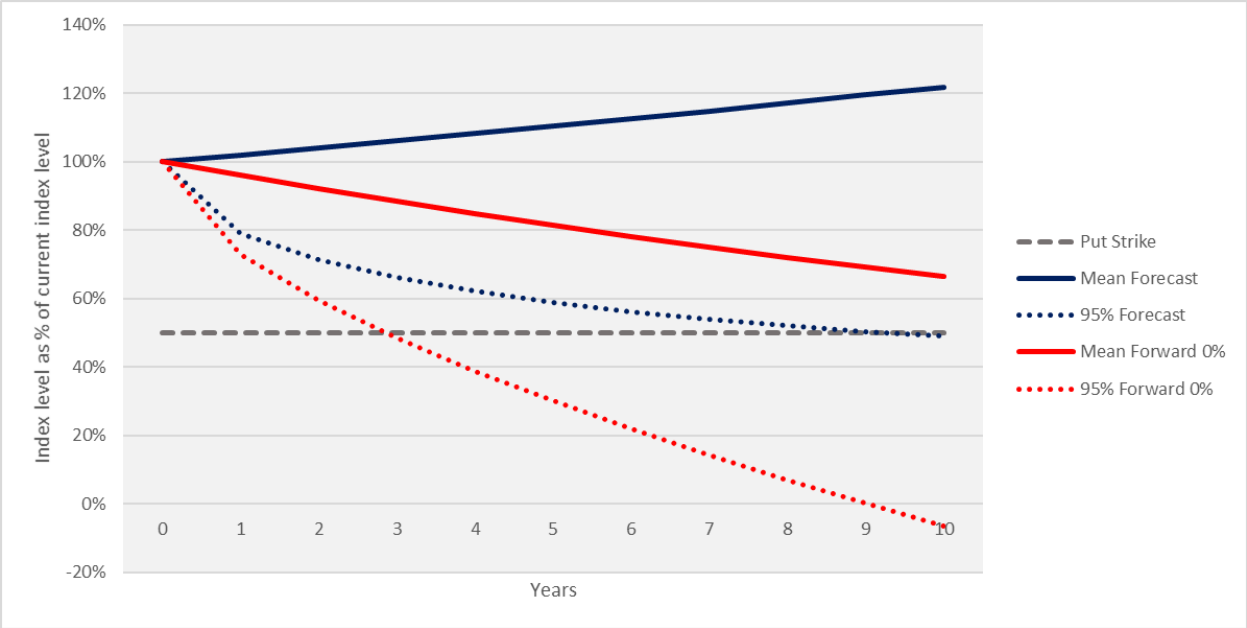
Source; Levendi Investment Management

The distribution is now very different. In 10-years:

- There is almost an 80% chance that the index will be higher
- There is only a 5% chance that the index will be below 50%

This is a more typical projection of projected values used by investors. The direct comparison of the two distributions highlights the differences; the forecast and forward values. The chart below illustrates the forecast Mean and 95th percentile levels for the investor – based on the forecast returns. It also shows the risk-neutral "forward" values based in rates and dividends.

MEAN AND 95TH PERCENTILE LEVELS ASSUMING FOR FORECAST AND FORWARD LEVELS



Source; Levendi Investment Management

The chart illustrates the increasing spread between the investors "forecast" value and the risk neutral "forward" value. In 10-years the investor has a strong conviction that the level of the index will be higher than today. The risk neutral model implies that level of the index is more likely to be lower. The effect is amplified when trying to estimate the scale of left tail events.

WHY AUTOCALLS ARE MORE ATTRACTIVE IN A LOW RATE ENVIRONEMT

The gross redemption yield of corporate bonds and gilts will immediately reflect lower rates. To see how the return from Autocalls compares, we need to estimate the risk and return profile of an investment using an estimate that is consistent with the investors forecast.

If we go back to the earlier Credit Suisse Product, we can compare the risk neutral probabilities with a schedule of the possibility of each event based on our stress testing process; this simulates how markets may perform based on the distribution of daily returns over the last 30 years. The stress test allows us to calculate the probabilities of each event using a real-world model.

Term	Trigger	Market Neutral Probability	Real World Probability	Payoff
1	100%	43.04%	58.5%	107%
2	100%	13.09%	13.8%	114%
3	95%	9.38%	9.0%	122%
4	90%	6.18%	5.6%	129%

5	85%	3.93%	3.6%	136%
6	80%	2.88%	2.6%	143%
6	Maturity at 100%	5.56%	4.0%	100%
6	Maturity at less than 100%	15.85%	3.0%	45%

Source; Levendi Investment Management / Dura

Using these assumptions the overall Arithmetic Return is 4.9%, the IRR is 5.02%. These values reflect the chance of no return and of a loss. At first glance they would appear to be attractive. We can see other numbers from our analysis to flesh out the evaluation of this investment

- There is a 93% chance of a gain and in these cases the average annual return is 7.0%
- There is a 3% chance of loss, and in these cases the average payoff is 50.0%
- The volatility of returns is 6.2%

These sort of risk and return numbers are typical of defensive Autocalls. Once investors apply a real-world framework to calculate risk and return, the attractive nature of these products become apparent.

Autocalls allow investors to monetise their views and take advantage of risk neutral pricing of long dated derivatives

Here is Warren Buffett again; *Academics' current practice of teaching Black-Scholes as revealed truth needs re-examination. For that matter, so does the academic's inclination to dwell on the valuation of options. You can be highly successful as an investor without having the slightest ability to value an option. What students should be learning is how to value a business. That's what investing is all about*.

The structure of Autocall products magnifies the return that investors can receive from selling puts. Autocalls require the index to be above a set level for the payment of the return, and the final index level must be above a set level for the product to mature at 100%. This double condition boosts the return by exploiting the difference between forward and forecast values. This is a gap that gets wider as rates fall. This is the gap that Warren Buffet identified. In the current environment Autocalls look to us to be a very attractive investment.

LEVENDI STRUCTURED PRODUCT TESTING

The stress testing and risk/return calculations we use to evaluate structured products have been developed over the last seven years. The inputs to the system are designed to eliminate the requirements to calculate parameters for return / volatility / correlation. The calculate of return and risk have been developed to facilitate a direct comparison of the risk/return profile of a product with other assets. The risk calculations have been designed to reflect the asymmetric return profile of most products. For more information about the stress-testing process and the way that we calculate risk and return please contact us at info@levendi-im.com or call on +44 203 150 2847

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