# Alpha portfolios

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Keeping on top of portfolio performance

Having benchmarked our Moderate Risk strategic asset allocation (SAA), we take a look at key performance measures and how they can inform tactical investment decisions.

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- The fourth stage of our Twelve Steps of Portfolio Management is about using a selection of portfolio management techniques to monitor the success of our static strategic asset allocation (SAA) Moderate Risk benchmark. We can use these to inform tactical deviations from the SAA.

- Metrics include the Sharpe ratio, Sortino Ratio, Treynor Ratio, M², Jensen's Alpha and STARR, Omega and Calmar Ratios..

- The basic SAA consists of four main assets that can be invested in with ETFs. We use modified value at risk (MVaR) to budget risk based in line with our SAA. We can be 99 per cent confident that daily losses will not exceed -3.11 per cent and we estimate the average loss on the worse 1 per cent of days (our MVaR) will be -4.52 per cent.

Moderate Risk Strategic Asset Allocation

US Gov. bonds $
30.0%

UK Shares
46.0%

Global large cap sha…
19.0%
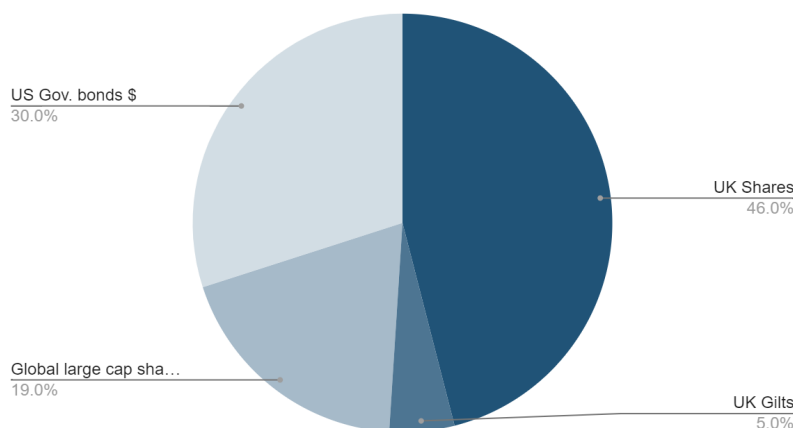
UK Gilts
5.0%

Source: Investors' Chronicle, Refinitiv, NEDL

ETF	% Allocation
SPDR FTSE UK All Share (FTAL)	45.96
iShares Core UK Gilts (IGLT)	5
iShares Core MSCI World GBP Hedged (IWDG)	19
iShares $ Treasury Bond (GOVT)	29.94

Source: Investors' Chronicle, Refinitiv, NEDL

Many opportunities arise to improve the performance of a passive strategic asset allocation. There are times when the equity weightings can be focused on particular sectors, on other geographies, on different 'styles' or 'factors'. Fixed income investments can shift between funds focusing on bonds from different issuers and with varying credit quality or time to maturity.

It also may be worth switching some of the higher-risk allocations into other assets such as real estate or commodities. Sometimes it makes sense to de-risk and hold more cash than usual. Such portfolio decisions shouldn't be made on the fly: they ought to be sense-checked against risk/reward and performance ratios.

Risk-adjusted performance ratios

Sharpe Ratio:

Probably the most widely used for risk-adjusted performance, this ratio bears the name of William F Sharpe, who made substantial contributions to development of the capital asset pricing model (CAPM) in the 1960s. One of Sharpe's innovations was the notion that investors could improve their risk-adjusted performance by holding a portion of their portfolio in an asset that offered a risk-free rate of return, which he posited was the yield on US Treasury bonds (because if held until maturity, the cash flows are certain and free of default risk) but any high-quality government bond is appropriate.

$$Sharpe\ Ratio = \frac{(Return\ from\ portfolio - Rf\ rate)}{Standard\ deviation\ of\ portfolio}$$

The use of a risk-free rate expanded the possibilities of achieving target rates of return while controlling overall portfolio risk. Logically, it follows that the portfolio should be judged on returns exceeding the risk-free rate and per unit of risk (measured as the

volatility or standard deviation of returns), which is the premise of the Sharpe Ratio. The higher the figure, the better.

Our Moderate Risk SAA is built with indices going back decades. Looking at real returns after adjusting for inflation, the SAA has a Sharpe ratio of 0.52, which compares to 0.49 for a passive portfolio split 60:40 between UK shares and UK government bonds (gilts). Investing just in UK shares would have delivered a Sharpe Ratio of 0.45 and the superior risk-adjusted performance of the mixed-asset portfolios demonstrates the benefit of diversification to investors.

Long-run SAA risk-adjusted performance

	Moderate Risk SAA	60:40 (UK shares:gilts)	UK shares
Annualised real rate of return	7.64	7.43	9.39
Annualised risk-free rate (Bills)	2.50	2.50	2.50
Annualised volatility	9.82	10.12	15.39
Sharpe Ratio	**0.52**	**0.49**	**0.45**

Source: Investors' Chronicle, Refinitiv, NEDL, Credit Suisse Global Returns Yearbook (Dimson, Marsh and Staunton)

Having brought our Moderate Risk SAA to life with exchange traded funds (ETFs), we don't have such a far-reaching track record. That said, having experienced the Covid-19 sell-off and the portfolio drawdowns of 2022 – when inflation's return sparked a savage rise in positive equity/bond correlations – the past three years have provided the most testing of times.

Real returns of ETF Moderate Risk SAA (from 30.08.2019)

Moderate Risk SAA	3.23
Risk-free gilt yield	1.60
Annualised CPI	4.60
SAA Real rate of return	-1.37
Risk-free real rate of return	-3.00
Annualised volatility	11.72
Sharpe Ratio	**0.14**

Source: Investors' Chronicle, Refinitiv, NEDL

Over the short timeframe (from 30.08.2019) we can look at the ETF track record, the overall consumer price index (CPI) inflation rate can be annualised to about 4.6 per cent, so the real return from gilt yields and our Moderate Risk SAA is negative. It's worth commenting that, with just equities and bonds, our SAA has no *hedge* against spikes in inflation, but we can say the equities component gives the SAA a good chance of *beating* inflation over time.

To hedge against inflation you need to make tactical asset allocation decisions that may deviate from the SAA. We will discuss this at a later stage in the portfolio construction series, but as our long-run analysis has shown, holding assets such as industrial commodities and gold in all conditions hasn't delivered optimal utility for investors: these are tactical rather than strategic assets.

Return performance should always be thought of in real terms, but when it comes to making portfolio adjustments we focus on drawdown risks in nominal terms. Therefore, the rest of our assessments are made without adjusting for inflation.

It happens we're in a bad time now, but actually that's good for our purposes of assessing how much we're at risk of losing in nominal terms by following this strategic framework. This also helps us understand the baseline risk we shouldn't exceed when changing things up to cope with tough macro conditions such as persistent inflation.

Shifting the focus onto the risk of peak-to-trough portfolio falls, we can take the traditional Sharpe Ratio a step further. Integrating Value at Risk (VaR) analyses and quantifies risk-adjusted returns in terms of the upside compensation for the likelihood of severe losses.

Modified Sharpe Ratio

The first such metric, the Modified Sharpe Ratio, uses statistics closely related to Modified Value at Risk (MVaR) analysis we conducted to understand our portfolio risk budget.

$$Modified\ Sharpe\ Ratio = \frac{(Return\ from\ portfolio - Rf\ rate)}{(Rf\ rate - MVaR\ confidence\ loss\ limit)}$$

Modified Sharpe Ratios equal the rate of return for the portfolio minus the risk-free rate divided by the risk-free rate minus the modified value at risk.

We calculated the MVaR for the ETF portfolio of our Moderate Risk SAA as being -4.52 per cent. This is our estimate for the average amount the portfolio value will fall on the worst 1 per cent of days.

Closely related to this figure is the magnitude of negative return that we are 99 per cent confident our daily returns won't be worse than. We calculate this as being -3.11 per cent.

So, to summarise, we are 99 per cent confident the portfolio won't have a day worse than -3.11 per cent, but if it does, we estimate the return on such a day will be -4.52 per cent on average. In reality, we can't accurately predict how far fearful markets would drag us down on a truly horrific day (think Black Monday 1987), but we're at least being cognisant

of the risk with these models.

We use the -3.11 per cent figure to compute our Modified Sharpe Ratio, along with a risk-free rate of 1.6 per cent, which was the gross redemption yield one could have got from a gilt over the three-and-a-half years ETF portfolio track record.

Our Modified Sharpe Ratio for our ETF SAA comes out at 0.35, meaning that for every percentage point of downside risk we take 99 per cent of the time, the portfolio returns 0.35 per cent positive return. What that means is that although we have got a positive rate of return, it has been low compared with the inherent riskiness of the Moderate Risk SAA ETF portfolio.

Given the tumult of the past three years, that isn't a terrible performance – especially as we know these are pretty much the worst type of conditions for our long-term strategy. Things may have been bad, but we can say with confidence that they are likely to be better most of the time and in the meantime we have still made money in nominal terms.

Using the Modified Sharpe Ratio for optimisation

We can also look at what an optimal portfolio, made up only of our strategic asset ETFs would have looked like over the survey period. We must maintain discipline to our strategic asset class weights, but we can be flexible on the geographical allocations. When we are talking about UK-listed or global equities (the MSCI World has been almost 70 per cent US stocks at times in the past few years), there isn't any need to constrain the mix between UK and Global shares beyond having a 5 per cent minimum allocation to either.

We do, however, require that the equity to bonds split in our SAA is maintained: the sum of US treasuries and gilts must be maintained at above 35 per cent, with a minimum of 5 per cent in each.

UK Shares 5.0%
UK Gilts 5.0%
US Gov. bonds $ 34.0%
Global large cap… 56.0%
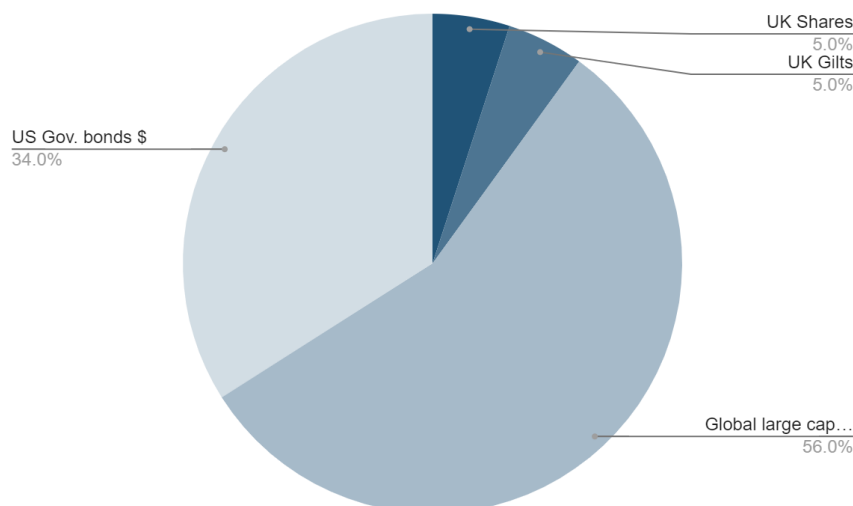
Source: Investors' Chronicle, Refinitiv, NEDL

Using the Solver function in Microsoft Excel, we can specify these constraints and set it to change the portfolio weights to maximise the Modified Sharpe Ratio while maintaining the maximum loss at the 99 per cent confidence level to -3.11 per cent.

The results show that, given our risk budget, the highest Modified Sharpe ratio that could have been achieved over the life of our Moderate Risk ETF portfolio is 0.52 – a significant improvement.

This asset allocation is actually slightly more conservative in terms of the equity to bond split (59:41) than our Moderate Risk SAA, but the key difference is the equity weighting for an optimal portfolio in the past three-and-a-half years would have heavily favoured global large cap stocks over the overall size weighted UK market.

The purpose of this backward-looking exercise is to provide an example of how we can keep our strategic risk budgeting when adjusting a portfolio. Clearly, we wouldn't have known the outcome of holding what turned out to be an optimal asset allocation from our strategic assets in 2019, but the same principles of applying constraints and sense-checking risk can be applied to any proposed tactical asset allocation (TAA).

When we begin discussing the tactical steps in our Twelve Steps of Portfolio Management, we can plug the proposed assets (including tactical assets that don't make our SAA) into our models to ensure our strategic risk budget isn't breached.

ETF	% Allocation
SPDR FTSE UK All Share (FTAL)	5
iShares Core UK Gilts (IGLT)	5
iShares Core MSCI World GBP Hedged (IWDG)	56
iShares $ Treasury Bond (GOVT)	34

Source: Investors' Chronicle, Refinitiv, NEDL

STARR Ratio

$$STARR\ Ratio\ = \frac{(Annulised\ expected\ return - Rf\ rate)}{CVaR}$$

This also looks at estimates of the average value for bad days and presents the ratio of excess returns to the Conditional Value at Risk (CVaR), which is the expected shortfall

based on a weighted average of bad outcomes.

2019-2023 Moderate Risk SAA versus optimal

	Moderate Risk SAA	Optimal 2019-2023
Annualised % rate of return	3.23	3.83
Annualised % vol	11.72	11.70
99 per cent loss limit %	-3.11	-3.11
Sharpe	0.14	0.19
Modified Sharpe	0.35	0.52
STARR	0.96	1.44

Source: Investors' Chronicle, Refinitiv, NEDL

Using the STARR Ratio to optimise for CVaR, we get exactly the same asset allocation as for our Modified Sharpe Ratio optimisation. This is a good sign as we will need both ratios going forward making tactical asset allocation adjustments.

This is because CVaR is a slightly more flexible tool for working with probabilistic models for risk-optimised TAAs, but we still need to use the more rigorous MVaR-based risk budget checks before we commit to any portfolio changes.

To target risk-adjusted performance ratios

Annualised target	10.94
Moderate Risk SAA annualised return	3.23
Risk-free gilt yield	1.60
Volatility on miss target days	12.67
Sortino Ratio	**0.13**
Daily relative performance	-0.03
Average downside to target	0.26
Omega Ratio	**0.88**

Source: Investors' Chronicle, Refinitiv, NEDL

Sortino Ratio

It makes sense to focus on rewards for downside risk: volatility cuts both ways, but no investor is worried when their portfolio value breaks to the upside. The Sortino ratio is a tool that's useful for personalising the risk management of portfolios because its premise is assessing risk in the context of how regularly investors achieve returns commensurate with a target rate versus the negative volatility they suffer when that target is missed.

Targets vary between investors but, for our purposes, we can take the long-run annualised rate of return from the indices used to build the Moderate Risk Strategic Asset Allocation model. From 1978 that was 10.94 per cent annually in nominal terms (7.64 per cent after inflation but we work with the nominal figure). On a daily basis that works out at roughly 0.04 per cent.

$$Sortino\ Ratio = \frac{(Return\ from\ portfolio - Rf\ rate)}{deviation\ of\ downside\ (below\ target)\ returns}$$

We can look at downsides from that daily target figure and the standard deviation of those 'misses' is the denominator in our Sortino Ratio calculation.

Once again, the numerator is the excess of portfolio returns over the risk-free rate. Thus the Sortino Ratio gives a measure of the efficacy of risk taken in order to meet a given objective rate of return.

Our Moderate Risk SAA ETF portfolio has a weak Sortino Ratio of 0.13, thanks to the strategy undershooting the long-term rate of return in recent years.

Omega Ratio

$$Omega\ Ratio = 1 + \frac{(Rate\ of\ return - Target\ rate\ of\ return)}{Average\ below\ target\ return}$$

Similar to the Sortino Ratio, the Omega Ratio is simply one plus the ratio of performance relative to target versus average underperformance on bad days. Our SAA ETFs portfolio has an Omega ratio of 0.88.

Drawdown Ratios

Investors are rightly most worried by the nastiest portfolio falls, so it is useful to examine a number of metrics that take account of this especially worrisome manifestation of risk.

Calmar Ratio

$$Calmar\ Ratio = \frac{(Return\ from\ portfolio - Rf\ rate)}{Maximum\ drawdown}$$

This concentrates on the compensation investors are getting for riding out the most uncomfortable times. It is calculated as the excess return divided by the maximum peak-to-trough drawdown in portfolio value.

Sterling Ratio

$$Sterling\ Ratio = \frac{(Return\ from\ portfolio - Rf\ rate)}{Average\ drawdown}$$

Similar to the Calmar Ratio, but instead it takes the average drawdown value as the denominator.

Ulcer index and Martin Ratio

The Ulcer index tracks the levels of drawdowns and retracements from high points to give an indicator of the magnitude and persistence of downside risk for a portfolio. It is named after stomach ulcers (because at the time the tool was formulated by Peter Martin, stomach ulcers were highly associated with stress).

$$Martin\ Ratio = \frac{(Return\ from\ portfolio - Rf\ rate)}{Ulcer\ index}$$

Expressed as a percentage, the Ulcer index score is used as the denominator in the Martin Ratio. Again, the numerator is excess return over the risk-free rate, with higher ratios indicating the investment strategy is maximising returns for the level of stress.

Moderate Risk SAA annualised return	3.23
Risk-free gilt yield	1.6
Maximum drawdown	22.28
Calmar Ratio	**0.07**
Average drawdown	4.73
Sterling Ratio	**0.34**
Ulcer index	6.13
Martin Ratio	**0.27**

Source: Investors' Chronicle, Refinitiv, NEDL

Benchmarking Ratios

As well as measuring performance against the absolute levels of risk taken, investors want to assess the opportunity costs of their strategy and compare it against peers. We have already set out how we intend to benchmark our Moderate Risk asset allocation against the dynamic ARC Steady Growth index and the PIMFA Balanced Private Investor Index.

Furthermore, our strategic weightings are a benchmark in their own right against which to measure the success of tactical asset allocation decisions and security selection. For active investors, it is essential to quantify and maintain risk in line with the SAA and understand the extent to which changes impact portfolio performance.

In the case of the PIMFA Balanced Index, which publishes its daily performance data calculated by MSCI, it is possible for us to demonstrate how we can use benchmark indices to make risk-based evaluations.

Treynor Ratio

$$Treynor\ Ratio = \frac{(Return\ from\ portfolio - Rf\ rate)}{Portfolio\ Beta}$$

Named after Jack Treynor, another luminary whose work helped evolve the capital asset pricing model (CAPM), this measures the performance of the portfolio relative to the 'beta' or market risk. It can also be used to track a portfolio against a benchmark.

For our ETF SAA portfolio it is useful to see how the funds are delivering against the indices they track.

For now, though, we treat the PIMFA Balanced as a comparator. Calculating the SAA's 'beta' against this benchmark isn't quite the same as calculating a share's beta against an equity market index (which shows the extent to which systematic market risk that can't be diversified dictates share price moves) is, but it does give some approximation of how much the factors affecting volatility of the PIMFA Balanced Index are equally present in the Moderate Risk SAA.

The Treynor Ratio simply divides excess returns by this 'beta'. In practice, the measure will be most useful when assessing the performance of stock portfolios versus a relevant equity index Using our SAA and the short-term optimised portfolio we created using our Modified Sharpe ratios, however, the ratio demonstrates that portfolio tilts can improve performance.

Jensen's Alpha

$$Jensen's\ Alpha\ = Portfolio\ excess\ return - Beta * Benchmark\ excess\ return$$

More useful for our purposes is the closely related Jensen's Alpha measure, which takes the portion of a portfolio's excess return over the risk-free rate that is explained by a portfolio's benchmark beta from the total excess return.

Effectively, this measures the average return on a portfolio above or below that which would be predicted by the CAPM, given the extent to which the portfolio mirrors its benchmark risks and the average market return.

M² (Modigliani and Modigliani) Risk-Adjusted Performance

$$M^2 = Portfolio\ excess\ return * \frac{st\ dev\ of\ benchmark}{st\ dev\ portfolio - (benchmark\ excess\ return)}$$

Developed by Franco and Leah Modigliani, this is the excess return adjusted for the risk of the portfolio relative to the market. Really, it's another variation on the Sharpe Ratio and usefully gives a figure in units of percentage return that is easily interpreted.

When looked at alongside the other ratios, it backs up the Sharpe Ratio and is more intuitive when assessing the underperforming SAA and the outperforming optimised portfolio (by Modified Sharpe) versus the PIMFA Balanced.

	Sharpe	Treynor	Jensen's Alpha	M squared
SAA	0.14	1.90%	0.14%	-0.15%
Optimised (Mod Sharpe)	0.19	2.85%	0.87%	0.43%
PIMFA	0.15	1.74%	0.00%	0.00%

Source: Investors' Chronicle, Refinitiv, NEDL

Next steps

These are a powerful set of optimisation and performance monitoring tools to help control risk in managing either a passive strategy or if we choose to be more active and make tactical asset allocations.

We've now undertaken the first four of our **Twelve Steps of Portfolio Management** for a

Moderate Risk investment strategy:

Step One - Create a strategic asset allocation (SAA) based on long-run indices

Step Two - Match the SAA to exchange traded funds (ETFs), undertake risk analysis of the investable portfolio. This analysis forms the basis of a risk budget for the portfolios.

Step Three - Find suitable external benchmarks for the portfolio.

Step Four - Ratios for monitoring the performance versus benchmarks.

Step Five - Create a framework for the maximum amount the portfolio can be permitted to deviate from the target strategic weightings. This will include assessing optimal rebalancing frequency for passive investors who just invest in the SAA.

The next steps are tactical: they are where we begin to look at the signals for an investor to dilute the strategic asset allocation with cash (and thus duck out of the long drawdowns). For more active investors, it is also when we look at signals to tilt asset weights and use the risk budget to make investments in assets such as gold and commodities that have great value as short-term diversifiers.

Acknowledgements

The Excel spreadsheets used to build our models are the work of Northumbria University academic Dr Savva Shanaev, who has an excellent Youtube channel called NEDL to help investors with mathematical coding in MS Excel and the Python language. We source data from Refinitiv.

Data for our benchmark is taken from PIMFA and MSCI websites.