Sanlam Wealthsmiths™

Joining forces:
Portfolio construction with traditional and alternative assets

Investments

Introduction

It has long been understood that Alternatives can add uncorrelated sources of positive alpha to an investment portfolio; delivering higher returns at lower risk. But the inclusion of Alternative assets is not a trivial exercise and requires adjustments for both stale pricing[1] and illiquidity[2] in addition to asset allocation. It is therefore important to explore the impact of:

1. **Adjusting a traditional portfolio for actual experience and forward expectations.**
2. **Including Alternative assets into traditional portfolios and the effect on efficiency and diversification.**

Building a typical Multi-asset portfolio.

A traditional investment portfolio usually consists of cash, bonds, property, and equities with both local and international exposure. Consider these elements with the associated performance figures derived from the past 15 years of data - from end February 2004 until February 2019. Both real (performance in excess of CPI) and nominal figures are shown for this period in Table 1, where inflation averaged 5.55%.

Table 1

Asset class	Benchmark	Actual Return	Real Return	Stdev (Nominal)	Stdev (Real)
SA Cash	STEFI Composite	7.35%	1.71%	0.46%	1.50%
SA Inflation Linked Bonds	BSAGI	8.84%	3.12%	5.37%	5.39%
SA Fixed Income	ALBI	8.77%	3.06%	7.09%	7.32%
SA Property	SAPY (J253T)	17.26%	11.10%	16.28%	16.27%
SA Equity	Capped Swix (J433T)	15.13%	9.09%	13.81%	13.88%
Global Equity	MSCI ACWI	12.73%	6.81%	14.07%	14.23%
Global Bonds	Bloomberg Barclays Global Aggregate	9.19%	3.46%	16.23%	16.48%
Global Cash	3-Month Libor	6.93%	1.31%	16.74%	16.93%

1. Refer to our article at https://www.sanlamintelligence.co.za/institutional/evaluate-alternative-assets-from-a-fresh-perspective/ for more details.
2. Details (article and presentation delivered at 2017 Institutional Insights Conference) available upon request.

Joining forces: Portfolio construction with traditional and alternative assets

The strategies actually used by portfolio managers for many of these investments could be either passive or active – in this example passive strategies are used for growth assets (Equity and Property) and all International assets, whereas active manager returns are used for interest-bearing assets. The Actual Manager Adjustment indicates average actual performances achieved by managers using these strategies. Forward adjustments are made to asset distributions, indicative of our view on what assets are likely to achieve on a real basis over the next business cycle relative to the historical numbers shown above (Table 2).

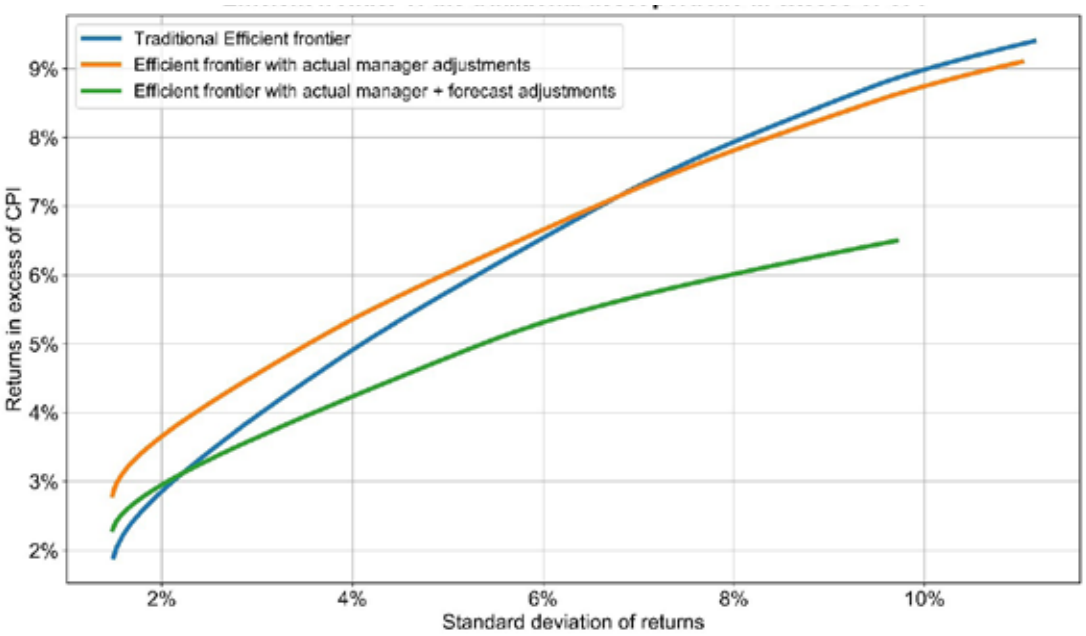
Table 2

Asset class	Benchmark	Actual Manager Adjustment	Forward Looking Adjustment	Total	Projected real return
SA Cash	STEFI Composite	+100bps	-50bps	+50bps	2.21%
SA Inflation Linked Bonds	BSAGI	+50bps	-25bps	+25bps	3.37%
SA Fixed Income	ALBI	+70bps	-10bps	+60bps	3.66%
SA Property	SAPY (J253T)	-25bps	-550bps	-575bps	5.35%
SA Equity	Capped Swix (J433T)	-30bps	-250bps	-280bps	6.29%
Global Equity	MSCI ACWI	-10bps	0bps	-10bps	6.71%
Global Bonds	Bloomberg Barclays Global Aggregate	-5bps	-50bps	-55bps	2.91%
Global Cash	3-Month Libor	-5bps	-30bps	-35bps	0.96%

It should be noted that we make no forward adjustments to how each of the asset forward return streams will correlate with each other; we assume historical consistency.

We can now build three separate efficient frontiers, constrained by Regulation 28. The analysis is undertaken in real return space and show in Graph 1 as:

- A traditional frontier using only historical returns and relationships.
- An actual experienced frontier utilising returns from actual manager results.
- An adjusted forward-looking frontier, combining implied actual results with forward adjustments.



Graph 1. Standard deviation and returns Efficient frontier of the traditional asset portfolio in excess of CPI

What is initially noticeable is that the experienced efficient frontier (orange line) is flatter than the historic frontier (blue line) effectively showing that we achieve greater efficiencies at the lower end of the risk spectrum than it suggested by traditional SAA models. This shows that an investor should actually carry higher levels of interest-bearing assets for medium to low risk funds than is typically suggested. The returns of the forward-looking efficient frontier (green line) are similarly flatter, and are also than the historic returns, particularly at the higher risk levels. For easy reference the asset allocation strategy of the efficient frontier (including actual manager and forecast adjustments) is presented at various real return targets, in Table 3.

Table 3

Return in excess of CPI	2.30%	3.00%	4.00%	5.00%	6.00%	6.50%
Standard deviation	1.49%	2.06%	3.60%	5.36%	7.96%	9.71%
SA Cash	94.72%	69.29%	36.19%	3.03%	0.00%	0.00%
SA ILB's	4.28%	13.55%	15.00%	15.00%	8.23%	0.00%
SA Fixed Income	0.00%	6.03%	22.67%	39.52%	19.96%	12.28%
SA Property	0.06%	2.18%	4.06%	6.01%	15.00%	15.00%
SA Equity	0.33%	0.99%	2.56%	6.44%	26.81%	42.72%
Global Equity	0.62%	7.97%	18.78%	27.29%	30.00%	30.00%
Global Bonds	0.00%	0.00%	0.74%	2.71%	0.00%	0.00%
Global Cash	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

We note the following from this forecast efficient frontier:

- Below the CPI+4% return target, there is a strong bias for domestic interest-bearing assets.
- At the higher end of the efficient frontier, for return targets above CPI+6%, more risk needs to be incurred (through an increased allocation to growth assets) in order to achieve the higher expected returns (often resulting in an increase in fees).
- The most diversified portfolios occur around the CPI+4.2% target as measured by the diversification ratio[3] .

3. See https://www.tobam.fr/wp-content/uploads/2014/12/TOBAM-JoPM-Maximum-Div-2008.pdf for the original formulation of this ratio.

Introduction of Alternative Assets

The exciting question is "Can we improve the efficient frontier by adding in Alternative assets"?
Table 4 shows a list of indices/proxies that are Alternative assets that satisfy the given criteria (all numbers representative of the period February 2004 to February 2019).

Table 4

Asset class	Benchmark	Actual Return	Real Return	Standard Deviation (Nominal)	Standard Deviation (Real)
Unlisted Credit	Sanlam Fund	10.83%	5.41%	1.21%	1.82%
Unlisted Property	Sanlam Fund	14.69%	8.66%	4.90%	5.04%
Private Equity	Sanlam Fund	15.51%	9.08%	9.71%	9.80%
Foreign Infrastructure	MSCI Index	13.98%	7.98%	14.10%	14.27%
Foreign Resources	MSCI Index	11.58%	5.71%	16.86%	16.90%
Foreign Real Asset Composite	MSCI Index	10.59%	4.77%	14.09%	14.31%

Technical adjustments to the assets' returns were made to reflect the presence of stale pricing and the embedded illiquidity premium where applicable, as shown in Table 5.

Table 5

Asset class	Implied Illiquidity Premium[4]	New Excess of CPI Return	Stale Pricing Adj. Factor	New Standard Deviation (Real)
Unlisted Credit	7bps	5.34%	1.23	2.24%
Unlisted Property	45bps	8.21%	1.03	5.20%
Private Equity	76bps	8.32%	1.16	11.45%
Foreign Infrastructure	None	7.98%	None	14.10%
Foreign Resources	None	5.71%	None	16.86%
Foreign Real Asset Composite	None	4.77%	None	14.09%

As with traditional assets, strategy adjustments and forecast adjustments are made as well, see Table 6.

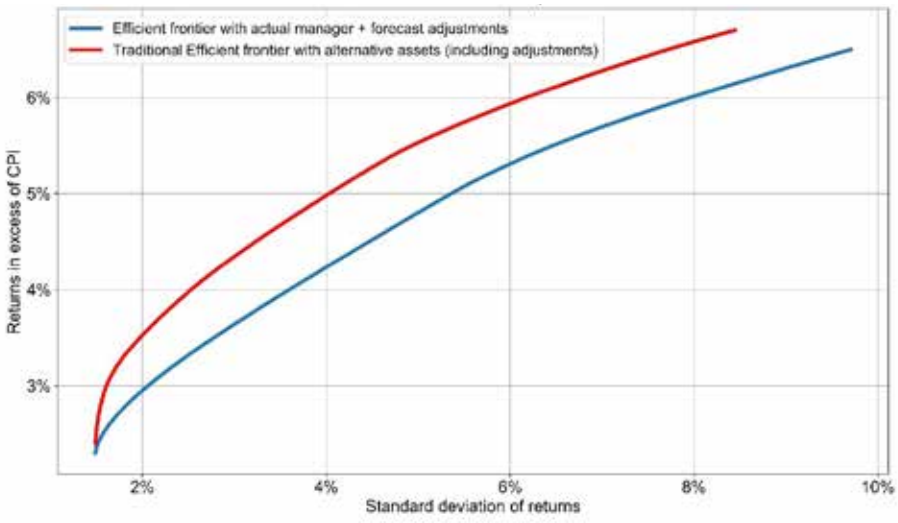
Table 6

Asset class	Benchmark	Actual Manager Adjustment	Forward Looking Adjustment	Total (After all adjustments)
Unlisted Credit	Sanlam Fund	0bps	-100bps	4.34%
Unlisted Property	Sanlam Fund	0bps	-150bps	6.71%
Private Equity	Sanlam Fund	0bps	-200bps	6.32%
Foreign Infrastructure	MSCI Index	-30bps	-150bps	6.18%
Foreign Resources	MSCI Index	-30bps	-150bps	3.91%
Foreign Real Asset Composite	MSCI Index	-30bps	-150bps	2.97%

4. The implied illiquidity premium is calculated assuming an investment horizon of 10 years, a 1-year initial lock-up of funds and an average redemption of funds of 6-months for Unlisted Property, 3-months for Private Equity and 1-month for Unlisted Credit. These figures are for illustrative purposes only and may vary depending on trading conditions.

Joining forces: Portfolio construction with traditional and alternative assets

The expanded efficient frontier including alternatives is shown in Graph 2.

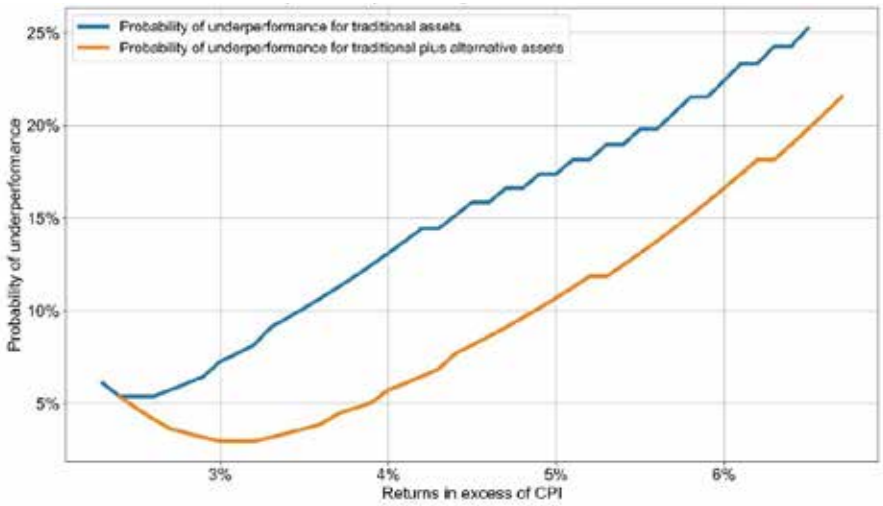


Graph 2
Efficient frontier of the traditional asset portoflio in excess of CPI

Table 7

Return in excess of CPI	2.40%	3.00%	4.00%	5.00%	6.00%	6.70%
Standard deviation	1.49%	1.72%	2.53%	4.03%	6.18%	8.45%
SA Cash	92.27%	68.64%	41.46%	9.27%	0.00%	0.00%
SA ILB's	3.29%	9.00%	15.00%	15.00%	9.25%	0.00%
SA Fixed Income	0.00%	0.00%	8.08%	25.34%	12.95%	0.00%
SA Property	0.00%	0.00%	0.17%	2.03%	12.87%	15.00%
SA Equity	0.00%	0.44%	1.34%	2.80%	9.93%	30.78%
Global Equity	0.42%	3.33%	8.94%	20.10%	30.00%	30.00%
Global Bonds	0.00%	0.00%	0.00%	0.46%	0.00%	0.00%
Global Cash	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Unlisted Credit	1.79%	5.00%	5.00%	5.00%	5.00%	4.22%
Unlisted Property	2.24%	10.00%	10.00%	10.00%	10.00%	10.00%
Private Equity	0.00%	3.59%	10.00%	10.00%	10.00%	10.00%
Foreign Infrastructure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Foreign Resources	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Foreign Real Asset Composite	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

By plotting the diversification ratio across the efficient frontier, per level of excess return over CPI, and by considering the probabilities of underperforming the CPI target across the efficient frontier, the difference in the outcomes becomes significant for traditional portfolios that include or exclude alternative assets.



Graph 3
Probability of underperforming CPI across the efficient frontier

The results show that after adjustments, Alternatives can enhance the portfolio of Traditional assets by providing higher expected returns over CPI at a reduced volatility. It is clear that the diversification benefits that Alternative assets provide are most pronounced in the CPI+4 to CPI+5.5% area. At lower returns the combination of Cash and Unlisted Credit make up the largest part of the portfolio. This combination gives better return per unit risk taken although the portfolio tends to be more concentrated as a result. Here the diversification ratio takes this into account and gives lower values for such a concentrated portfolio. Finally, the probability of underperforming the CPI over any year is reduced with the inclusion of the suggested Alternative assets classes by a significant margin as the diversification benefits of including Alternatives helps reduce overall portfolio volatility and hence the probability of underperforming.

Broadening the universe of Alternative Assets

Previously a set of only six alternative assets was considered, but other assets can also be considered provided appropriate adjustments are made for liquidity constraints and stale pricing. Sufficient information (track record data) is needed to understand the relationship of the new Alternative asset with other assets, and as a result we have used the data of three possible examples of other alternative assets including hedge funds, listed real assets and African investments from Sanlam Investments.

Hedge Funds

In South Africa there have been over 400 hedge funds that existed between 2000 and 2019[5] . Only 16 of these hedge funds have a full history of 15 years or more, and are listed in the appendix. When the data for the 16 hedge funds is combined into a single composite (assumed to be equally-weighted) then this portfolio would have had an annualised return of 12.11% and a standard deviation of 5.7% over that period (2004 – 2019).

To assess the effects of including a hedge fund of this nature in a portfolio, a Mean-Variance spanning test[6] was used - a procedure that determines whether the inclusion of such an asset would add value (and where it would add value) to a portfolio (portfolio of traditional assets).

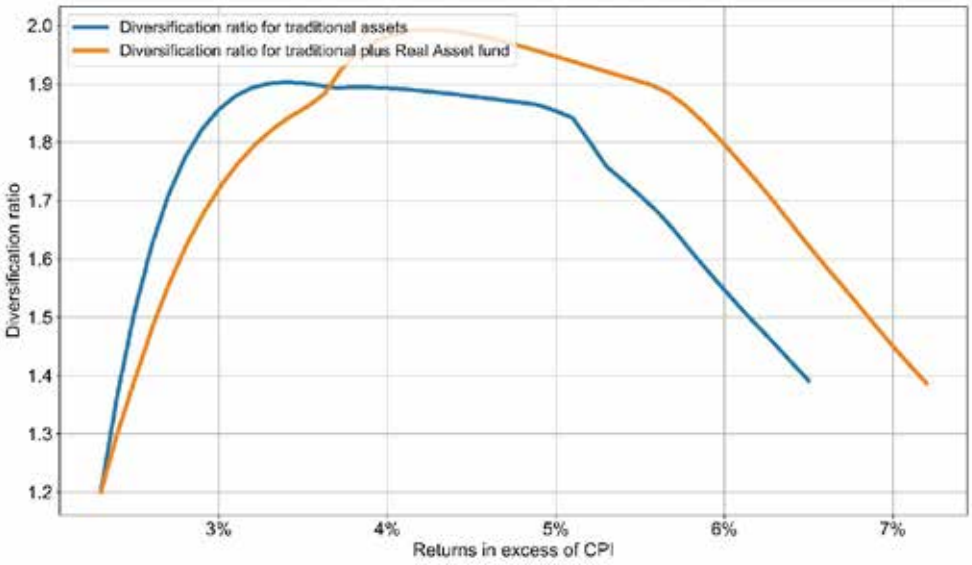
These results indicate that this Hedge fund composite would add value in terms of additional (alpha) real returns to the portfolio and would provide diversification benefits by lowering the overall portfolio volatility.

Listed Real Assets

Sanlam Investments recently launched the Sanlam Four Real Asset Fund (August 2018) in the United Kingdom[7] . As this is a new standalone fund with limited history, we used the actual carve-out performance of the instruments comprising this fund for analysis. This equates to 14.36% annualised return and 16.01% annualised volatility in Rand terms. Repeating the Mean-Variance spanning test on this fund (as part of the test for efficient inclusion into a traditional portfolio) it was found that the Real Asset Fund would add value to a traditional portfolio in terms of additional returns to the portfolio, but would not lower the overall portfolio volatility - largely as a consequence of the Rand effect shown in Table 8. However, the diversification benefits from the Real Asset Fund showed significantly at the higher end of the expected return axis of the efficient frontier.

5. From the Hedge Fund News Africa database.
6. For details please consult Kan, Zhou (2008), Tests of Mean-Variance Spanning for details. An overview is provided in the appendix.
7. See http://institutionalimpact.co.za/content/uploads/Sanlam-Real-Assets-Fund.pdf

Graph 4
Diversification ratio across the efficient frontier



Africa Credit

Sanlam Investments has several funds that invest in Africa and we consider one of them here: the Africa Credit Fund. The historical availability of data is more sparse than with listed markets and as such we had to backfill the data using appropriate statistical measures. Data for the Africa Credit Fund is given in Table 8.

Table 8

Africa Funds	Mean Implied Performance (Nominal Rand Terms)	Mean Implied Standard Deviation
Africa Credit	**14.57%**	**16.83%**

Repeating the Mean-Variance spanning test shows that there is sufficient evidence to conclude that Africa Credit will provide additional performance benefits to a portfolio in real terms and mitigate portfolio volatility on the high-risk spectrum due to lower correlations (after exchange rate adjustments) with the other international assets. As a result, its inclusion across the risk spectrum is beneficial.

Conclusion:

Traditional assets can be complemented by introducing Alternative assets that help diversify the portfolio and reduce the investment risk of underperforming the CPI target return levels. For very growth-focused portfolio the benefits of including Alternatives only make sense over a long investment horizon period of more than 10 years. For more income-focused portfolios, there is significant benefit in including Alternative assets that are focused on delivering yield, such as unlisted credit. For most other complementary portfolios that contain a mix of growth, income and protection assets, Alternative assets could provide good additions to enhance returns, reduce portfolio volatility and bring greater diversification to the portfolio.

Appendix

List of hedge funds used:

- Alpha Prime Cautious Qualified Investor FOHF (QIF)
- Absolute Alpha Fund
- Coronation Granite Hedge Fund (QIF)
- Coronation Multi-Strategy Arbitrage Hedge Fund (QIF)
- Edge RCIS Absolute Return Retail Hedge Fund (RIF)
- Novare Mayibentsha Moderate Qualified Fund of Hedge Funds (QIF)
- Nautilus Fairtree Proton Retail Hedge Fund (RIF)
- Craton Capital Precious Metals Fund
- Peregrine Capital Pure Hedge H4 QI Hedge Fund
- Visio SNN Golden Hind QI Hedge Fund
- SA-Alpha Peregrine Capital High Growth Offshore Portfolio (Class Q)
- Peregrine Capital High Growth H4 QI Hedge Fund
- Allan Gray Africa Equity Fund
- Citadel Multi-Strategy H4 QI Hedge Fund
- Abax Long/Short Equity Prescient RI Hedge Fund (RIF)
- Capricorn SCI Stable Retail Hedge Fund

Overview of the Mean-Variance spanning test:

The Mean-Variance spanning test effectively tests whether the current K assets in a portfolio can span (or replicate) the returns of a set new set of N assets that we wish to introduce into the portfolio. The test shows whether the current universe of assets can be expanded by introducing new assets, i.e. is it worth adding a new asset(s)? The model assumes the following structure: $R_N = \alpha + \beta * R_K + \epsilon$

Here R_N is the returns of the set of N assets with T observations (i.e. a $T \times N$ *matrix*) that we wish to introduce, R_K is the set of current assets in the portfolio ($T \times K$ matrix), α is a set of constant values (intercept terms), β is a set of sensitivities of the returns of all the K assets to every one of the N assets and ϵ is an error terms assumed to be independent and identically distributed as a multivariate normal with mean zero and variance Σ.

Using this model we can construct two matrices that contain all the model information we need to perform the Mean-Variance spanning test. We call the matrices G *and* H and intuitively we describe G as containing all the information about the mean return per unit of risk about the set of K assets and H as containing all the statistical information about the excess return (α) per unit of excess risk taken Σ, adjusted for the sensitivity ratios β.

The matrices are multiplied together as HG^{-1} (which gives a 2×2 matrix) and we compute the resulting eigenvalues of this matrix. The eigenvalues are labelled as λ_1 & λ_2 and they are used to do a hypothesis test.

The hypothesis test associated with the above model is whether $\alpha = 0_N$ (a N length vector of zeros) and whether $\delta = 1_N - \beta 1_K = 0_N$ under the null hypothesis. The null hypothesis is rejected with a confidence level $\phi = 0.05$ if the test-statistic has a p -value less than 0.05 (or equivalently if the test-statistic is greater than the value of the 95th percentile of the null distribution). If we have sufficient information to reject this hypothesis then the set of N assets may be added to the set of K assets and this will add value when to the portfolio otherwise we conclude that the new set of assets will not add value when included in the portfolio.

The test statistic for this test is and when , which is the case we consider in this report , the following -test can be applied under the null hypothesis

The test statistic for this test is $U = \frac{1}{(1+\lambda_1)*(1+\lambda_2)}$ and when $N = 1$, which is the case we consider in this report[8] , the following F -test can be applied under the null hypothesis:

$$\left(\frac{1}{U} - 1\right)\left(\frac{T-K-1}{2}\right) \sim F_{2,T-K-1}$$

The above test may be too broad in the sense that it does not give us sufficient information about exactly what is causing (if any) rejection or acceptance of the null hypothesis. From an economic viewpoint testing whether $\alpha = 0_N$ is the same as testing whether tangency portfolios to each frontier (the one with K assets and the one with $K + N$ assets) are statistically different and testing whether $\delta = 0_N$ tests is equivalent to testing whether the global minimum variance portfolios between the two frontiers are different. For our purposes it is more important to test whether $\alpha = 0_N$ as we are unlikely to hold the minimum variance portfolio.

In order to obtain further clarity on our results we use a two-step test to test whether $\alpha = 0_N$ and then whether $\delta_N = 0$ conditional on $\alpha = 0_N$. The test statistic for the first test is given by:

$$F_{test_1} = \left(\frac{T-K-N}{N}\right)\left(\frac{\bar{\Sigma}}{\hat{\Sigma}} - 1\right) \sim F_{N,T-K-N}$$

8. The statistic differs for when $N > 1$ and in this case we prefer to employ three different tests, i.e. the Wald, Likelihood Ratio and Lagrange Multiplier tests, for comparability. Incidentally, when $N = 1$ all three of these tests are equivalent

Here $\hat{\Sigma}$ is the estimate of Σ and $\bar{\Sigma}$ is the estimate of Σ but constrained on setting $\alpha = 0_N$.
In order to perform the second test where conditional on we use the following test statistic:

Here $\tilde{\Sigma}$ is the estimate of Σ assuming both $\delta = 0_N$ and $\alpha = 0_N$.

It can be shown that both F_{test_1} and F_{test_2} are independent of each other. To use the two-step test we need to set two significance levels, ϕ_1 and ϕ_2 with the overall significance level of both tests being given by $1-(1-\phi_1)(1-\phi_2) = \phi_1 + \phi_2 - \phi_1\phi_2$. We will prefer to have an overall level of significance of 0.05 and we place more economic importance on the first test with an assigned significance level of $\phi_1 = 0.04$ (and hence $\phi_2 = 0.0104$).

Sanlam Investments