



Quantifying Risk, Enabling Opportunity.

Optimal Asset Allocation Strategies

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Date: 28/09/2020

Version: v.1.0

THE PRESENTERS



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THE RECENT CRISIS AND ASSET ALLOCATION

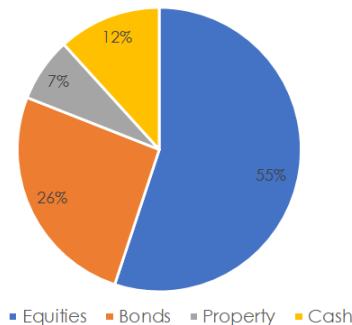
- Asset allocation – has a hole, we all know it!
- When extreme negative tail events materialise, portfolios often lose significant value.
- The recent crisis caused significant damage – financial portfolios were hit due to exposure to underperforming asset classes.
- Diversification imparts benefits during normal times, but disappears during times of market stress!



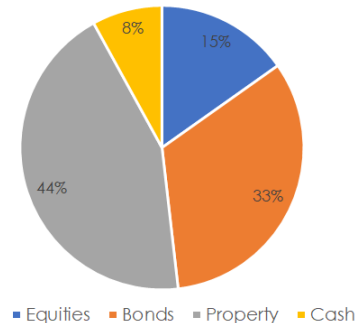
DE-RISKING THE BALANCE SHEET HAS BEEN THE NORM

Actual asset allocation, for assets backing regulatory capital, of a long-term insurance company in South Africa. Source: Company Annual Reports.

Domestic asset allocation - 1999



Domestic asset allocation - 2019



- After the 2008 global financial crisis, riskier assets have become un-desirable due to the penal regulatory charges.
- De-risking portfolios may come at the expense of the portfolio's potential return, but also does not address the diversification and forecasting conundrums.

CONSIDER THE FACTOR BASED APPROACH

- If it is broken, why do we insist on building portfolios using traditional asset allocation methods?
- Inertia -
 - We stick to traditional methods because we have ingrained it into our policy documents.
 - We stuck to these methods it because there were no viable alternatives – until now!
- In this presentation, we propose the use of a factor-based asset allocation approach that is designed to maximise risk-adjusted returns, while mitigating the tail risk.
- For short-term insurers, we show that factor-based asset allocation portfolios are less capital intensive when compared to portfolios built using traditional methods.

STRATEGIC ASSET ALLOCATION



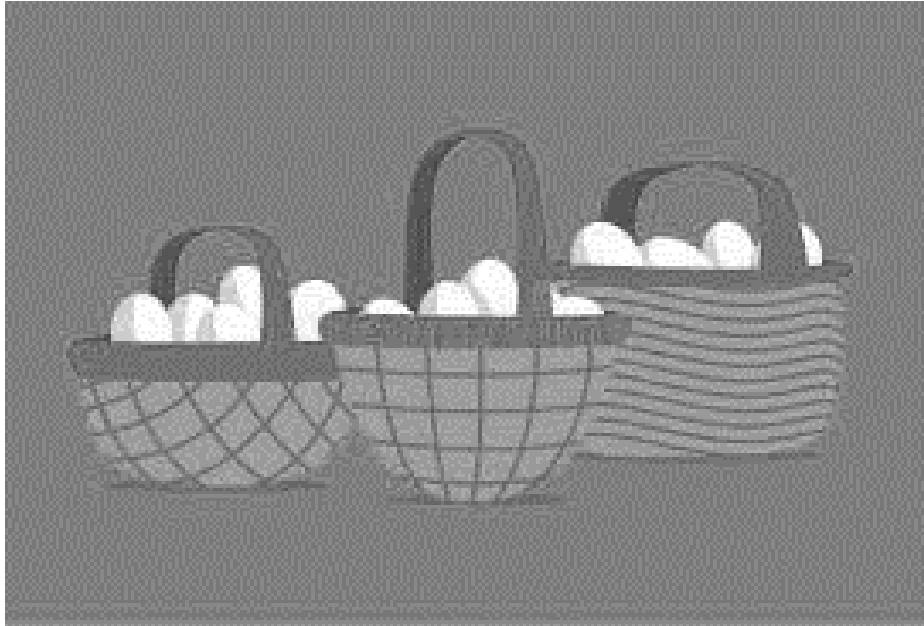
STRATEGIC ASSET ALLOCATION (SAA) - DEFINITION

- By diversifying investments across a broad range of assets investors can limit losses and reduce volatility of returns without sacrificing too great a return potential.
- Most practitioners follow a 3-step asset allocation process:
 - Strategic asset allocation - construct a strategic portfolio based on long-term asset class risk and return forecasts.
 - Tactical asset allocation - use an active investment approach to adjust to the economic environment by tilting strategic asset class exposures.
 - Security selection - managers providing stock/bond specific active management.

STRATEGIC ASSET ALLOCATION (SAA) - DEFICIENCIES

- At the heart of the strategic asset allocation process, is the derivation of expected returns and covariances. The concern here is that:
 - Portfolios are anchored on allocations based on forecasts of long-term averages.
 - Forecasting returns is incredibly difficult because volatility is not the same as investment risk, and correlation estimates are highly unreliable due to their time-varying nature.
 - The popular optimisation method, mean-variance, is highly susceptible to these assumptions.
- Various approaches for forecasting long-run asset returns incl. historical or economic models. The biggest drawback of the popular historical approach is that it does not consider structural economic changes.

FACTOR BASED ASSET ALLOCATION



FACTOR BASED ASSET ALLOCATION - DEFINITION

- Factors are specific drivers of investment return across asset classes. There are two main types of factors:
 - Macroeconomic: economic growth, inflation, real rates, currency etc
 - Style: value, growth, quality, volatility, momentum etc
- Benefits of using factors in asset allocation:
 - Diversifying across systematic factors with low correlation (rather than asset classes) results in portfolios with better risk characteristics.
 - Diversification benefits are more pronounced because of low correlation between macro factors and industry style factors.
- Asset portfolios are constructed to capture factor risk premia, over and above standard risk premia.

FACTOR BASED ASSET ALLOCATION - PROCESS

1. Formulate objectives and risks
2. Determine the investable universe subject to investor restrictions
3. Select macroeconomic and style factors.
4. Estimate asset class factor exposures to these factors.
5. Construct factor-mimicking portfolios.
6. Forecast factor-mimicking portfolio returns.
7. Create an optimal factor portfolio.
8. Infer asset expected returns.
9. Construct investable strategy portfolios.

FACTOR BASED ASSET ALLOCATION – PROCESS (1)

1 Formulate the objective

Asset only investor who wants to maximise risk-adjusted returns

2 Determine investable universe

Domestic assets only

Equities - Resources - Financials - Industrials - Bonds - Property - Cash

3 Select the factors as well as their listed proxies

Factor	Proxy	Factor Type
Economic growth	MSCI All Country World Index	Macro
Real rates	3-month treasury bill-inflation	Macro
Inflation	Nominal bond returns – inflation-linked bond returns	Macro
Currency	R/\$ exchange rate	Macro
Momentum	12-month asset class momentum	Style
Volatility	12-month historical asset class volatility	Style

FACTOR BASED ASSET ALLOCATION – PROCESS (2)

4 Estimate asset class exposures to each factor

	SA Equities	Resources	Financials	Industrials	SA Cash	SA Bonds	SA Property
Growth	0.7	0.8	0.8	0.6	-1.6	-1.1	-0.3
Real Rates	-0.1	-0.6	-0.9	0.5	-1.2	0.7	1.6
Inflation	-0.1	-1.2	1.3	0.4	-1.4	0.9	0.1
USDZAR	0.3	1.0	-1.4	0.2	1.3	-0.2	-1.1
Momentum	0.3	1.4	-1.1	0.3	0.4	0.3	-1.6
Volatility	0.0	0.7	0.8	-0.5	-1.6	-0.7	1.3

Table of asset class factor exposures as at 31 August 2020

Estimate asset class factor exposures using the formula (Bender, Le Sun and Thomas [2019]):

$R_t = B_t * F_t + \epsilon_t$ where R_t is the asset class returns, and F_t is the factor return using proxies

The factor exposures are standardized z-scores, following Clarke et al [2005] and Bender et al. [2019].

FACTOR BASED ASSET ALLOCATION – PROCESS (3)

5 Construct factor mimicking portfolios using a factor model (move into the factor space)

Factors are not directly observable or investable - use **listed proxies** to construct portfolios that mimic factors

6 Forecast the returns of the factor-mimicking portfolios

Factor mimicking portfolios are the new building blocks - we can use **historical average returns** as forecasts

7 Construct the optimal factor portfolio

This portfolio expresses the optimal mix of factors with the objective of **maximising risk-adjusted returns**

8 Infer expected returns for asset classes (transition back to the asset class space)

Infer **asset class expected returns** using the formula: $\alpha = \Sigma P' * \lambda$

where α is the asset class return, Σ the asset covariance matrix, P' the weight matrix of the factor portfolios and λ represents the optimal factor portfolio weights from step 7

FACTOR BASED ASSET ALLOCATION – PROCESS (4)

9 Construct the investable asset portfolio

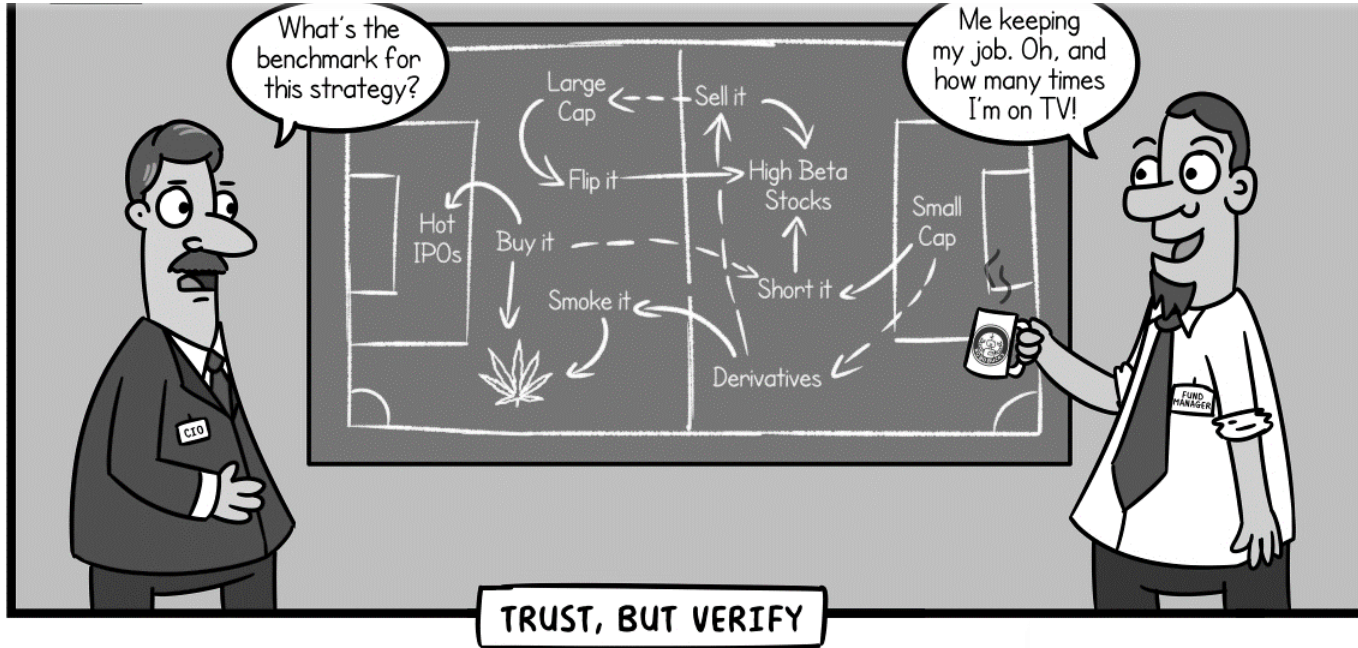
Factor risk premia		Expected return %		Allocation %	
Growth	-3,4	Equities	11,11	Equities	15
Real Rates	1,1	Cash	-0,11	Cash	25
Inflation	-5,5	Bonds	2,13	Bonds	60
USDZAR	-7,1	Property	13,28	Property	0
Momentum	5,2				
Volatility	-0,7				100

Using the optimal factor exposures to infer asset class returns and to construct the optimal investable portfolio

In the final step, we use the inferred asset class expected returns to construct the final portfolio.

Our objective is find a portfolio of asset classes that gives the best exposure to the desired factor risk premia

BACKTEST RESULTS



DESCRIPTION OF THE STUDY

Period of study: February 1993 to August 2020

Asset allocation strategies:

- 1) Defensive Static Strategic Asset Allocation - typical asset allocation for a short-term insurer and remains constant
- 2) Mean-variance based SAA - traditional asset allocation using mean-variance optimisation and historic averages
- 3) Factor-based SAA - factor asset allocation using the method proposed in this presentation

Constraints: asset allocation weights are constrained tightly around the static SAA to limit transaction costs

Asset Class	Proxy	Allocation %
Equities	3-month Treasury Bill	20
Cash	All Bond Index (ALBI)	50
Bonds	JSE All Share (ALSI)	25
Property	SA Listed Property (SAPY)	5

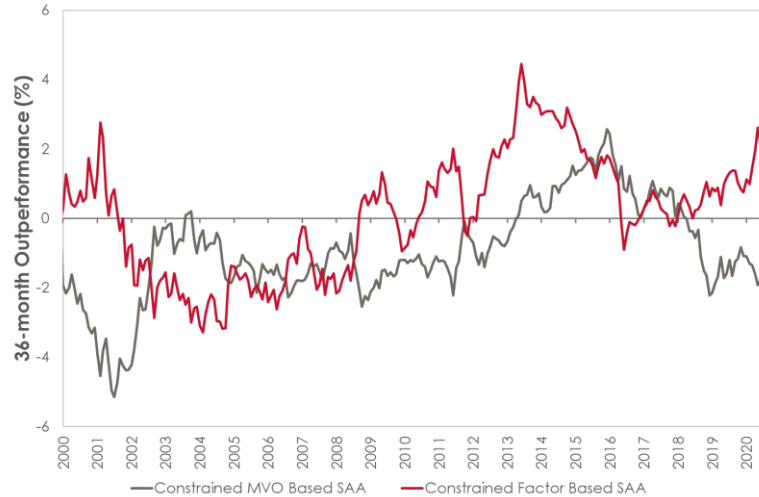
Typical asset allocation profile for the shareholders' portfolio at a South African short-term insurer

RESULTS

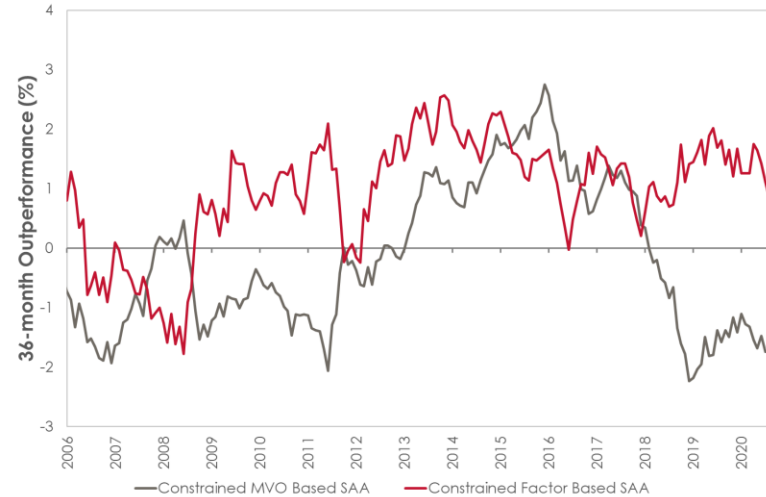
	No restrictions on bonds			Cannot buy long duration bonds		
Performance Measure	Defensive Static SAA	Constrained MVO Based SAA	Constrained Factor Based SAA	Defensive Static SAA	Constrained MVO Based SAA	Constrained Factor Based SAA
Average 36-month alpha (%)	0.0	-1.0	0.1	0.0	-0.2	1.0
Return (%)	11.8	10.9	12.2	10.4	10.1	11.3
Volatility (%)	7.8	7.8	7.9	6.4	6.6	6.3
VaR (95%)	-2.1	-2.1	-2.5	-2.0	-2.0	-2.0
CVaR	-4.3	-4.3	-4.3	-3.4	-3.7	-3.6
Probability of Outperforming Defensive Static SAA						
Rolling 12 Months	0%	36%	56%	0%	46%	68%
Rolling 36 Months	0%	25%	58%	0%	40%	82%
Rolling 60 Months	0%	25%	53%	0%	39%	91%

TIME SERIES CHARTS

No restrictions on bonds



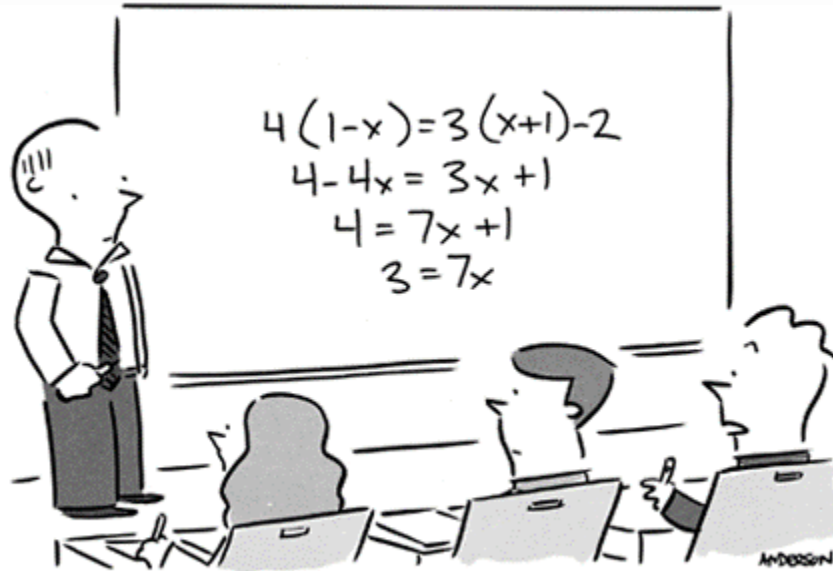
Cannot buy long-duration bonds



WHY THE FACTOR BASED APPROACH OUTPERFORMS

- Shortcomings of MVO are evident, underperforming the static SAA, with very low probability of outperforming over 12, 36 and 60 months.
- Factor approach outperforms at similar risk with high probability of outperforming over 12, 36 and 60 months.
- The factor approach considers factor risk premia over and above the normal asset class risk premia, in the construction of portfolios. The low correlation between these factors and the improved risk premia they deliver should lead to better portfolio outcomes

SHORT TERM INSURANCE – MARKET RISK IMPACT



"Wouldn't it be more efficient to just find who's complicating equations and ask them to stop?"

SHORT TERM INSURANCE: ASSET ALLOCATION

- Insurance companies tend to manage and monitor its asset allocation from an asset/liability perspective.
- This ensures that there are sufficient liquid funds available to meet the organisation's insurance liabilities, and that the shareholders' funds are not unduly exposed to investment risk.
- In defining the investment strategy, the capital risk associated to the portfolio is also taken into consideration.

REGULATORY CAPITAL: MARKET RISK (1)

- Market risk is the risk of loss arising from movements in market prices on the value of an insurer's assets and liabilities or of loss arising from the default of the insurer's counterparties.
- Exposure to market risk is measured by the impact of movements in financial variables such as:
 - Equity prices;
 - Interest rates,
 - Real estate prices,
 - Exchange rates; and
 - Widening of credit spreads.

REGULATORY CAPITAL: MARKET RISK (2)

- The formula below sets out the calculation of the regulatory market risk capital requirement:

$$SCR_{market} = \sqrt{\sum_{i*j} CorrMkt_{i,j} * SCR_{mkt}^i * SCR_{mkt}^j}$$

- SCR_{mkt}^i is the capital requirement for each of the individual market risks.

	Interest	Equity	Property	Currency	Spread	Concentration
Interest	100%	50%	50%	25%	50%	0%
Equity	50%	100%	75%	0%	75%	0%
Property	50%	75%	100%	25%	50%	0%
Currency	25%	0%	25%	100%	25%	0%
Spread	50%	75%	50%	25%	100%	0%
Concentration	0%	0%	0%	0%	0%	100%

- Note:** Currency and equity risk correlation is 0 in the case that the capital requirement for currency risk is derived from the risk of the Rand appreciating against other currencies, and 0.5 in the case that it is derived from the risk of the Rand depreciating against other currencies

RESULTS: IMPACT ON REGULATORY CAPITAL

- The table below sets out the average composition of the three portfolios:

	Equities	Cash	Bonds	Property	Total
Static Defensive SAA	25%	20%	50%	5%	100%
Constrained MVO	28%	23%	43%	6%	100%
Constrained Factor Based	21%	24%	51%	4%	100%

Bond portfolio consists of short dated bonds (modified duration 3 years)

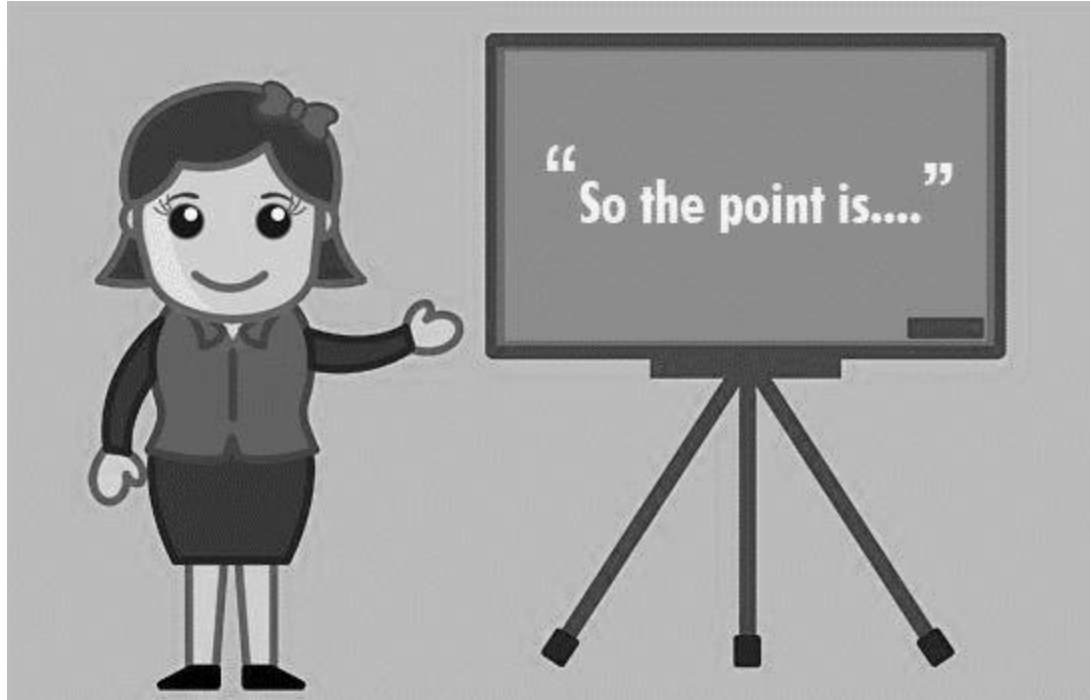
Cash portfolio consists of floating rate notes

- The table below demonstrates the 10 year average market risk capital % per portfolio:

	Market Risk SCR %
Static Defensive SAA	14.6%
Constrained MVO	14.3%
Constrained Factor Based	13.4%

- The constrained factor based portfolio is the least capital intensive

CONCLUSION



CONSIDER THE FACTOR BASED APPROACH

- Problems with traditional strategic asset allocation approaches.
- A factor-based approach improved the return potential of a portfolio while reducing the tail risks.
- The factor-based portfolio had a lower Solvency Capital Requirement.