Multi-asset macro and decision-based performance attribution

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24 June 2025

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Frankfurt

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Agenda

- Review of Valuation & Risk analysis for multi-asset portfolios
- Critiques of typical multi-factor attribution approaches:
  - Methodology inconsistencies & incompatibilities
  - Quest for complicated & complex approaches
- Presentation of simple approach to explain decision-based performance attribution

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How do we analyze various investment return drivers?

Fixed Income: closed-form / algorithmic valuation functions with just a few drivers (i-rate, c-rate, time, etc.)

Derivatives: like fixed income with closed-form or algorithmic valuation functions

Equities: fundamental factors that are *statistically* reliable

- Factors are established on average over long periods of time (e.g., Growth is not yet a factor!)
- Factor definitions involve a lot of judgement (is 'Value' based on price-to-book or free-cash-flow?)
- Factor relationships to stocks and to each other can change rapidly
- Some 'factors' like volatility and momentum have nothing to do with fundamentals.

Private Assets: estimates of valuations, use of proxies and managers' own guidance. Money-Weighted-Return measures. Can be up to 70% of the portfolio weight!

Crypto: No valuation functions, no fundamentals, highly lepto-kurtotic. Volatility doesn't capture the picture.

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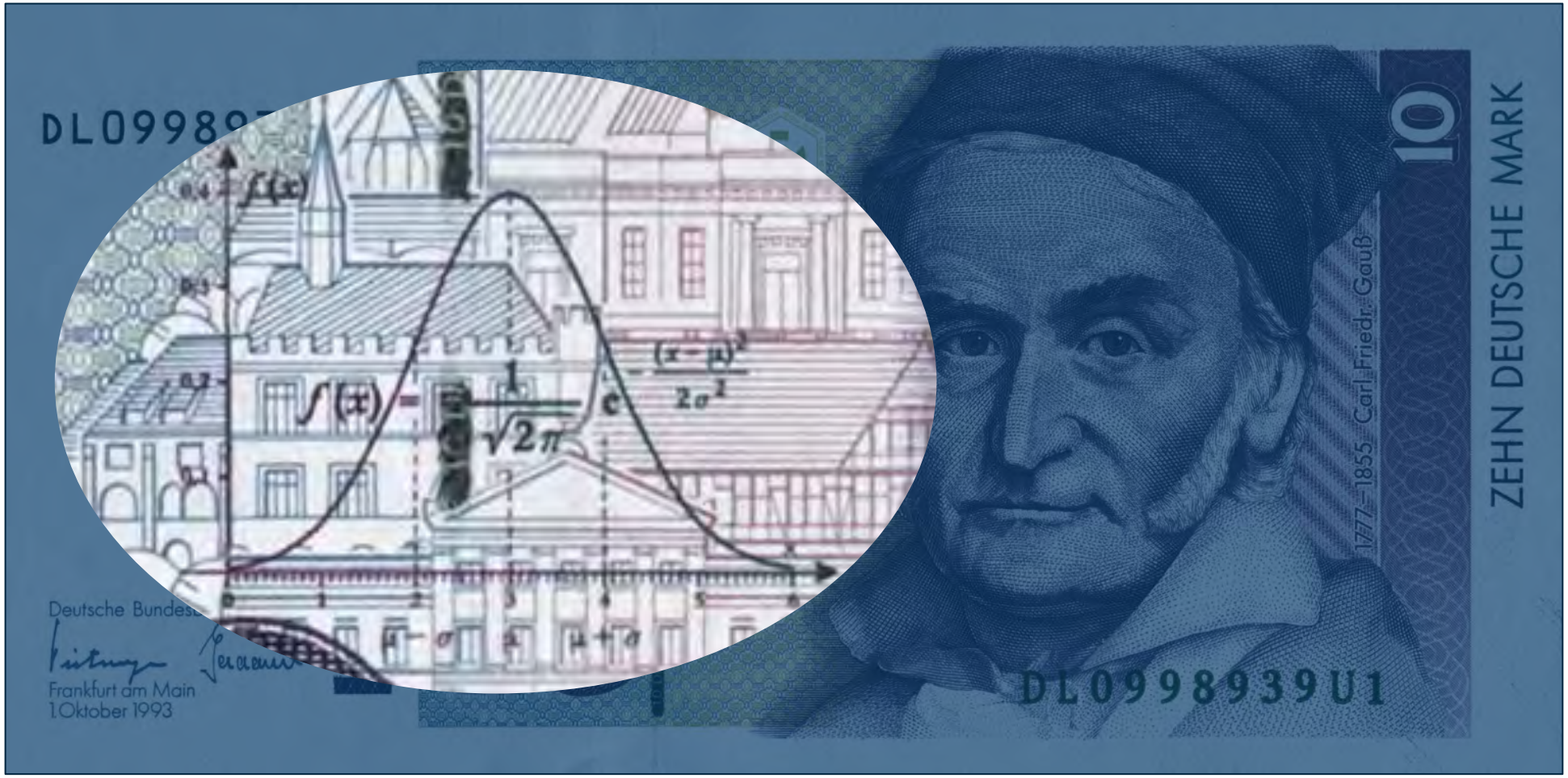
An equation like no other: Gauß's Normal Distribution



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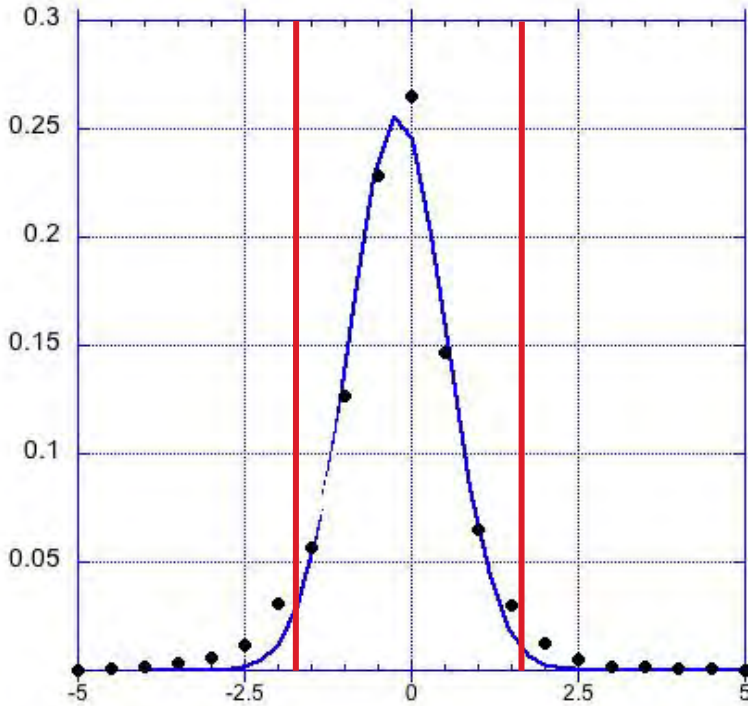
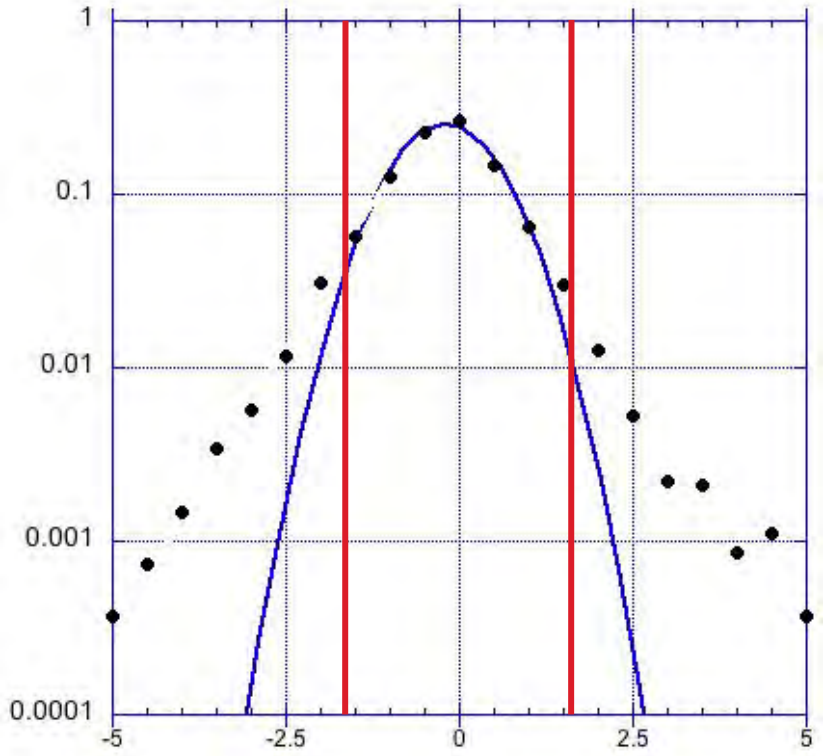
How Non-Normal are Financial Markets?

S&P Distribution

95%



95%



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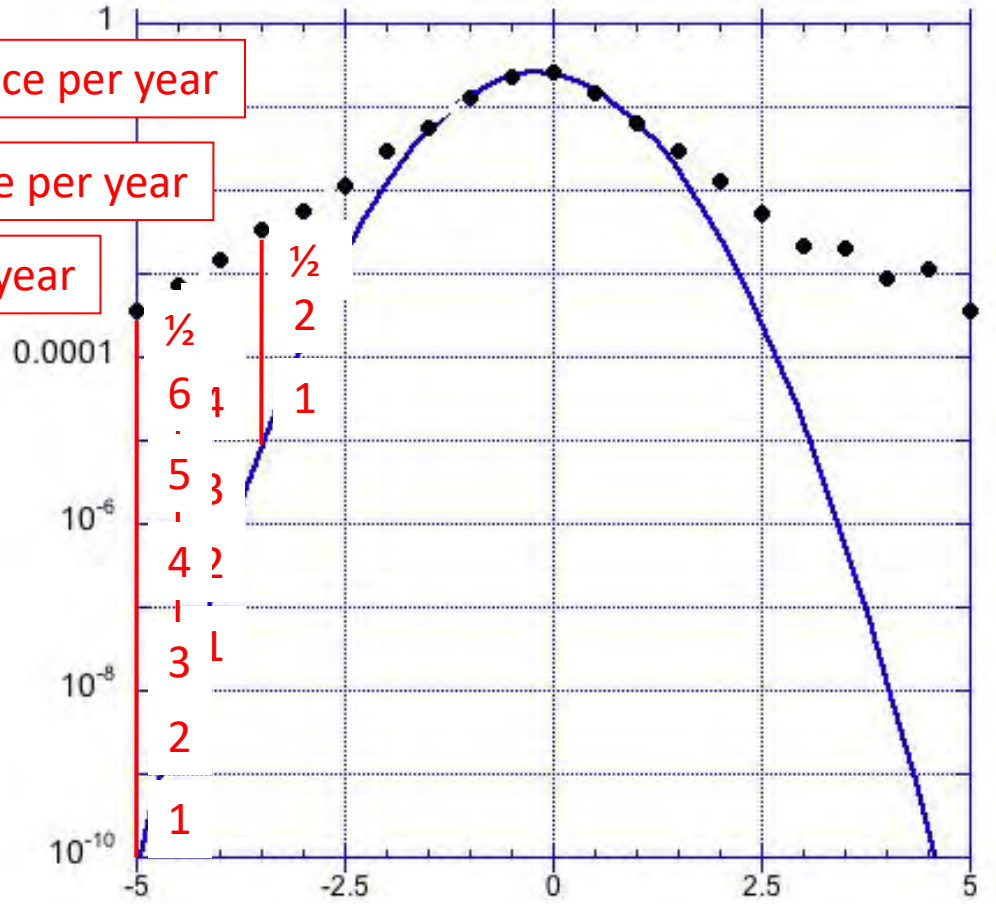
How Non-Normal are Financial Markets?

3,200,000 year flood once per year

320 year flood once per year

100,000 year flood once per year



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The Normal / Gaussian Distribution is ubiquitous

Markets do not follow the Gaußian / Normal distribution. But the Gaußian is:

- embedded in equity factor analysis
- embedded in formulas for volatility, correlation
- embedded in options valuations, monte carlos, copulas, VaR, stress tests, scenario analysis
- embedded in mean-variance optimization
- embedded in many random-number generators to generate correlated returns

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Multi-Asset Performance Attribution usually means ‘factor-based’

- Factors rely on regressions: time-series or cross-sectional
- R^2 measures how well the regression matches (not always well).
- Practitioners often twist themselves into knots looking for a better R^2 :
  - More frequent regressions: daily? hourly? 30 mins? Etc.
  - Frequently changing factor mix for inconsistent fit
  - Non-linear and non-interpretable factors

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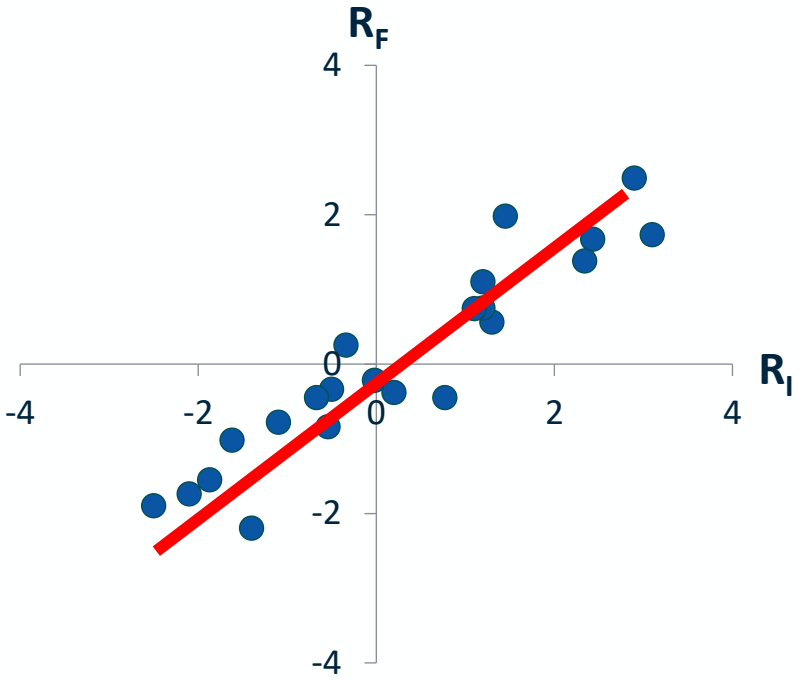
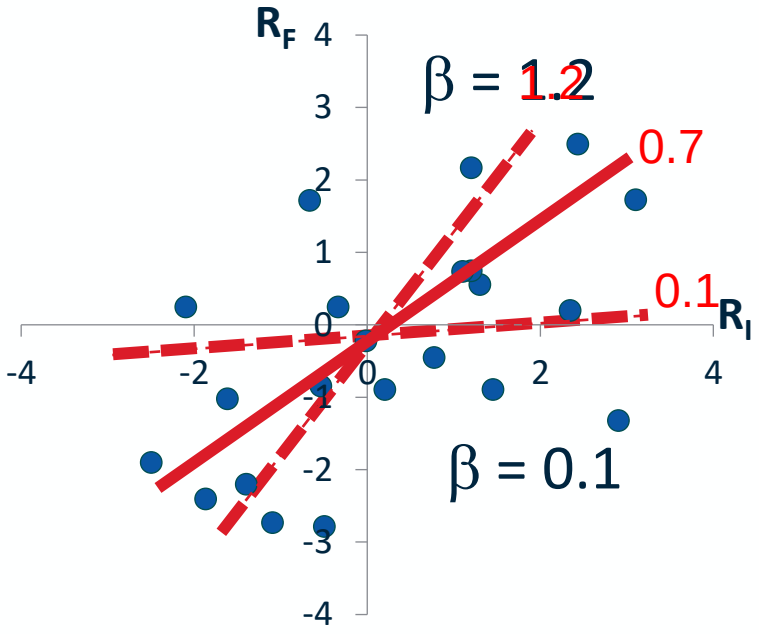
Models vs. Reality

$$R_F = \alpha + \beta R_I$$



$\beta = 0.7$



$\beta = 0.7$

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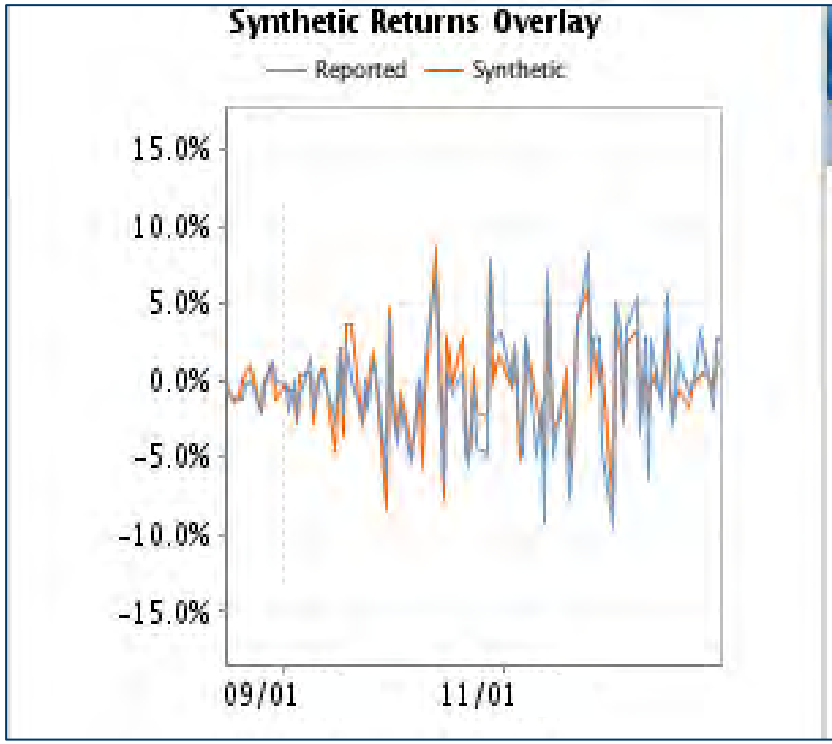
Multi-factor Modeling

$$R_{level} = \alpha + \beta_1 R_{index1} + \beta_2 R_{index2} + \square + \beta_n R_{indexn}$$

Description	L G Agg	L US Agg	MSCI FE	MSCI Eur USD	S&P 500 Index
⊟ Pension Mixed Portfolios	0.3762	-1.0924	-0.0620	0.0744	0.7548
⊟ Assets	1.9315	-1.0447	-0.2892	0.2591	3.0625
⊟ Traditional	0.3636	0.2378	0.0570	0.2565	0.1759
				0.4273	0.3081
				0.1083	0.0611
				0.0136	0.0326
				6.8489	-2.3788
				0.0129	0.0305
				-0.0151	0.0038
				-0.0385	0.9704
				-0.2801	2.2537
				0.0157	0.0202



Description	Alpha	R^2	Adj. R^2
Multiple Factors	-0.1407%	0.7777	0.7658

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Private Asset Valuation and Risk

Credit for concept: Dan DiBartolomeo, CEO Northfield

Valuations:

- Usually a Money-weighted-return approach (capital calls, inflows, outflows): IRR and MOIC
- Public Market Equivalent is a useful way of gauging performance but not helpful for attribution.
- Published indices for illiquid assets are based on *estimates of the value of the assets*, not on observations of actual transactions.

Risk

- The 'standard' formula for volatility requires the returns to be independent of one another. But illiquid asset returns are notoriously self-dependent with auto-correlations as high as 0.7 or 0.9.
- Geltner's correction formula for correlated volatility estimates (*Journal of Real Estate Finance and Economics*, 1991):

$$\sigma_{true} = \sigma_{estimate} \cdot \sqrt{\frac{1+\rho}{1-\rho}}$$

$$\text{If } \rho = 0.7, \text{correction effect} = 2.4$$

$$\text{If } \rho = 0.9, \text{correction effect} = 4.4$$

Simple, Easy-to-Understand Approach to DBA

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Sample Multi-Asset Fund Structure:

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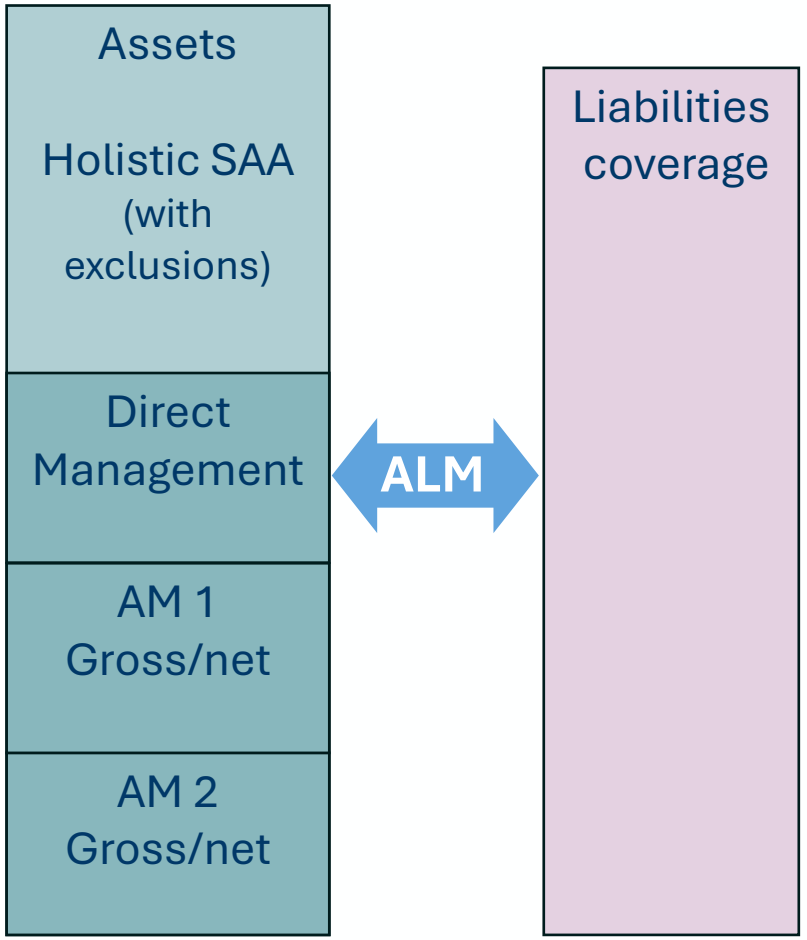
Decision-Based Attribution

- Traditional ‘Macro attribution’: Modelling the impact of the fund sponsor’s (asset owner’s) decision-making process.
- Examples of decision types to be attributed:
  - Strategic Asset allocation
  - Tactical Asset allocation
  - Policy Exclusions or Concentrations
  - Style selection
  - Manager selection
  - Fee effects

Client calls it “Investment Value Chain Analysis”



Decision-Based Attribution needs to be simple enough for AO board consumption

			Value Added	
Mandate	Market Value Start	1,200,000,000	%	$
	Risk Free		0.2065	2,478,000
	SAA		4.34567	52,148,040
	SAA exclusions		0.621	7,452,000
	Active Management		-2.174	-26,088,000
	Expenses		-0.005	-60,000
Mandate	Market Value End	1,235,930,040		
		Total return	2.99417	35,930,040

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CFA Definition of Macro / Decision-Based Attribution

- Each decision-making level is treated as an investment strategy, represented by a benchmark or a return series.
- The absolute performance of each strategy (decision level) is compared to the cumulative performance of the previous strategy (decision level)
- The strategies (decision levels) are hierarchically ordered in terms of increasing volatility / risk and complexity.

What is Decision-Based Attribution trying to capture?

- DBA calculates the incremental contribution that the choice to move to that strategy produces
- How much did each of the decision-making levels contribute to the Fund's change in value over a the period?

Confluence Insurance / Pension Scheme Performance

					Avg AuM Base	Total Performance (mEUR)	Total Performance (%)
Asset	Investment Management	ALM	Full Company	Base: BEL + Risk free (with perfect IR hedge)	2,000	86.0	4.30%
		SAA		Holistic SAA	2,000	143.0	7.15%
				Holistic SAA including ESG exclusion factors	2,000	137.0	6.85%
	Asset Management		Asset Manager 1	Gross performance	1,000	103.2	10.32%
				Net performance	1,000	81.2	8.12%
			Asset Manager 2	Gross performance	800	83.2	10.40%
				Net performance	800	57.2	7.15%
			Direct Management	Gross performance	200	14.3	7.15%
				Net performance	200	13.7	6.85%
Liabilities				Liability Replicating portoflio	2,000	106.0	5.30%

		Investment Value Chain Contribution			
Assets	Investment Management (AO)	Base	2,000	86.0	4.30%
		SAA	2,000	57.0	2.85%
		ESG	2,000	-6.0	-0.30%
	Asset Management (AMs)*	AM Gross	2,000	63.7	3.18%
		Expenses	2,000	-48.6	-2.43%
Liability		Liability Replicating portoflio	2,000	106.0	5.30%
Total A-L			2,000	46.1	2.31%

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Our Client's Requirements:

To report contributions of different decisions in the investment value chain:

1. Return from liability replicating portfolio
2. Return from target SAA (market benchmarks at target weights)
3. Return from target SAA with ESG exclusions (market benchmarks at target weights)
4. Return from active management split into gross and expenses

***** The return contributions should be simply additive for ease of interpretation**

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Comparison

CFA Approach	
Net Cashflows	Assume net cash inflows earns 0% return
Risk Free Asset	Added benefit of investing in risk free asset
Asset Categories	Added benefit of passive investment in market benchmarks at policy weights
Benchmarks	Added benefit of passive investment in mandate benchmarks at policy weights
Investment Management	Added benefit of active investment at policy weights
Allocation Effects	Added benefit of allocating funds at weights different to policy weights

Our Client's Approach	
Immunization Portfolio	Assume return of immunization portfolio
SAA	Added benefit of passive investment in market benchmarks at policy weights
ESG	Added benefit of passive investment in ESG exclusion benchmarks at policy weights
Gross Asset Management	Added benefit of active investment
Expenses	Added loss due to cost of active management

Planned Output

Investment Value Add Summary	Fund Value	Return		Value Add	
	$m	%	$m	%	$m
Start Value	2,252				
Cashflows	2,321		69		
Decision 1: Risk Free	2,329	0.32	7	0.32	7
Decision 2: Asset Categories	2,340	0.79	18	0.48	11
Decision 3: Benchmarks	2,342	0.92	21	0.13	3
Decision 4: Active Management	2,352	1.37	31	0.45	10
Decision 5: Allocation Effects	2,353			0.04	1
End Value	2,353	1.41	32	1.41	32

Table:

- Decision Name
- Decision Return %
- Decision Return Monetary
- Value Add %
- Value Add Monetary

Chart:

- Waterfall

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