ALM Analysis for a Pensionskasse

Asset Liability Management Study

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New Thinking in Finance
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PIONEER Investments®

Fiduciary Solutions for Pensionkasse

Agenda

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Asset Liability Management Study

Asset and Liability Simulation

Problem Set Up and Results

An Overview of Asset Liability Management Study

Asset Liability Management Study

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The ALM study analyzes assets in respect to the liabilities, verifying the actual and perspective funding ratio on the basis of some assumption shared with the company and finalizes an strategic asset allocation proposal able to improve the funding ratios as a results of a dynamic asset liability analysis.

Step 1

Identifying Client Requirements

We identify the client's ALM Problem starting from:

- client's inputs
- and the status quo analysis

Step 2

Analysing Client Needs

We carry out a detailed asset and liability analysis:

- To define the actual and perspective funding ratio
- Simulation of alternative scenarios across different investment options.

Step 3

Proposed ALM Solution

The Advantages of a Dynamic Approach
Asset Liability Management Study

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Pioneer approach to ALM is multistage and simulation based,

the main advantages are:

- *Flexibility* – we can account for multiple different future scenarios
- *Dynamism* – multistage approach is able to proxy 'real-life' portfolio management
- *In/outflows management*
- *Forward-looking* – strategic visibility on potential upside/downside
- *Scalar Factor Based Structure* – merging macroeconomic and financial theory with empirical evidence

Pioneer Integrated Platform
Asset Liability Management Study

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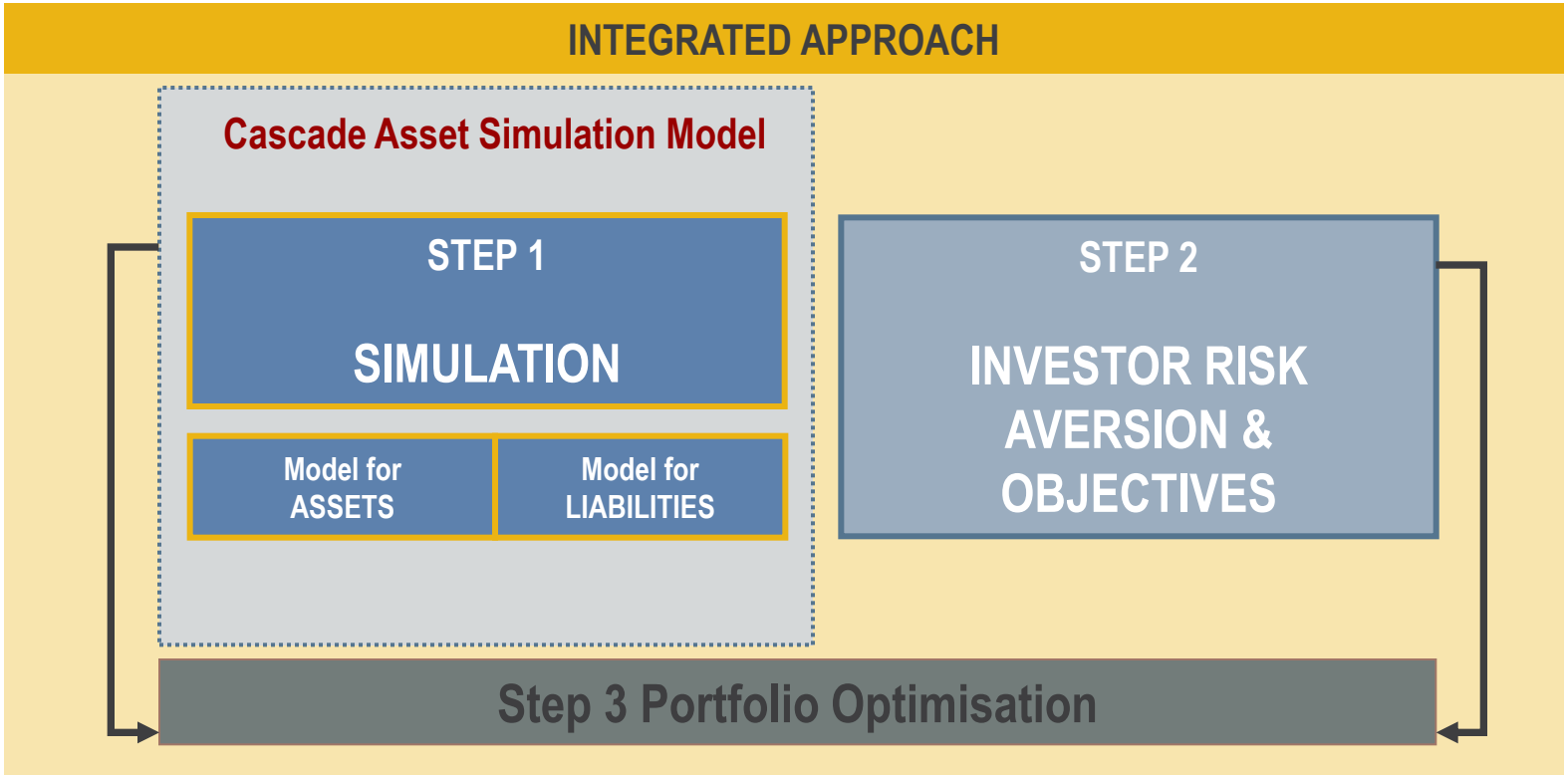
- Risk-return profile definition through simulation
- Multi-Stage Optimizer to replicate portfolio environment decision



A Dynamic Approach to ALM
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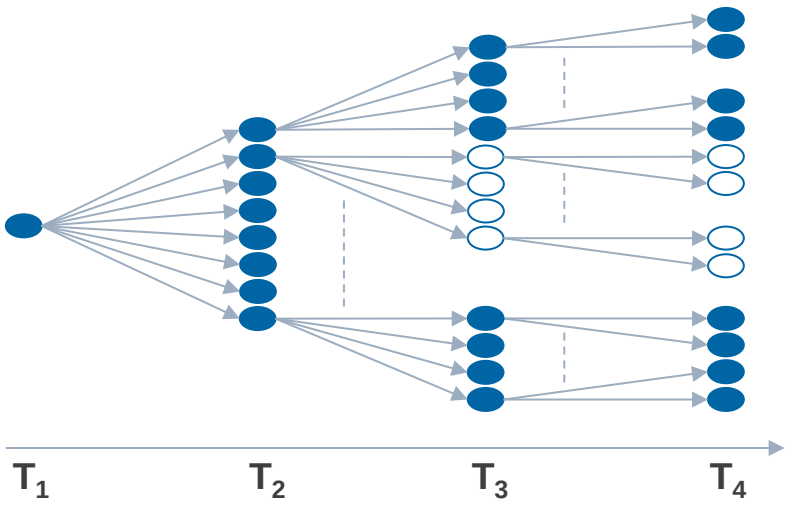
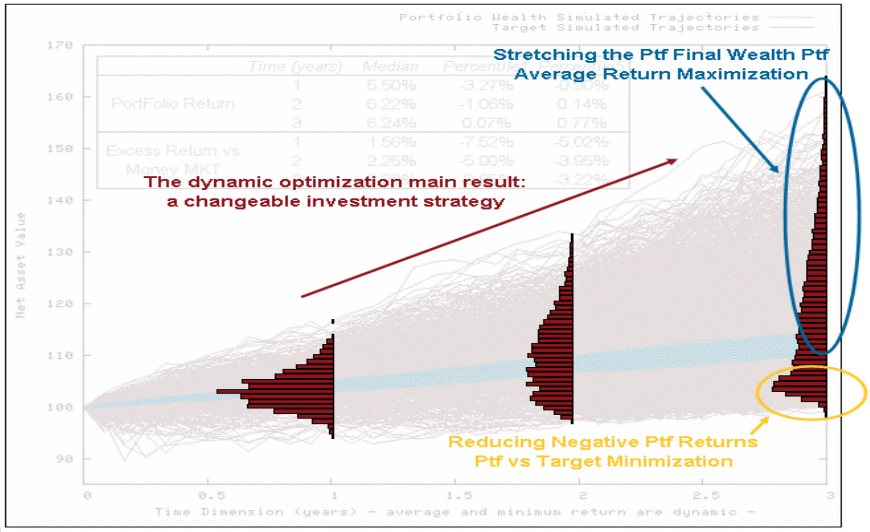


Multi-Stage optimization:

- A dynamic and stochastic environment
- Designed to emulate
  - Real portfolio investment decisions
  - Flow management

Cascade Asset Simulation Model

- We work with distributions rather than averages
- Macro economic and financial modeling in a proprietary engine
- Joint scenarios for assets and liabilities
- Risk factor model embedded
- Multiple time horizons simulated



Source: Pioneer Investments for illustrative purposes only

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Cascade Model for Simulating Assets and Liabilities

Asset and Liability Simulation

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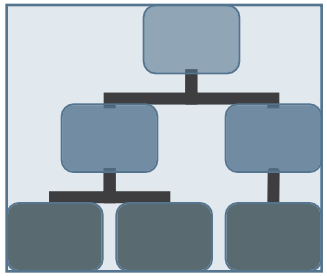

VERTICAL DIMENSION

Simulation Engine (CASM):

- **Modularity of the vertical dimension**

Macro Economic Forecasts

- Forecasting GDP and Inflation
- Analysing trend and cycle components – and structural breaks
- Extrapolating long-term steady state equilibrium growth

Cyclical Dynamics & Monetary Policy

- Generation of scenarios for business-cycle sensitive variables (e.g. slope of yield curve, monetary policy)
- Additional variables may be added e.g oil price forecasts etc.

Asset & Liabilities Simulation

- Generation of trajectories for equity, credit spreads, currency and all liabilities

Consistency over time

Asset and Liability Simulation

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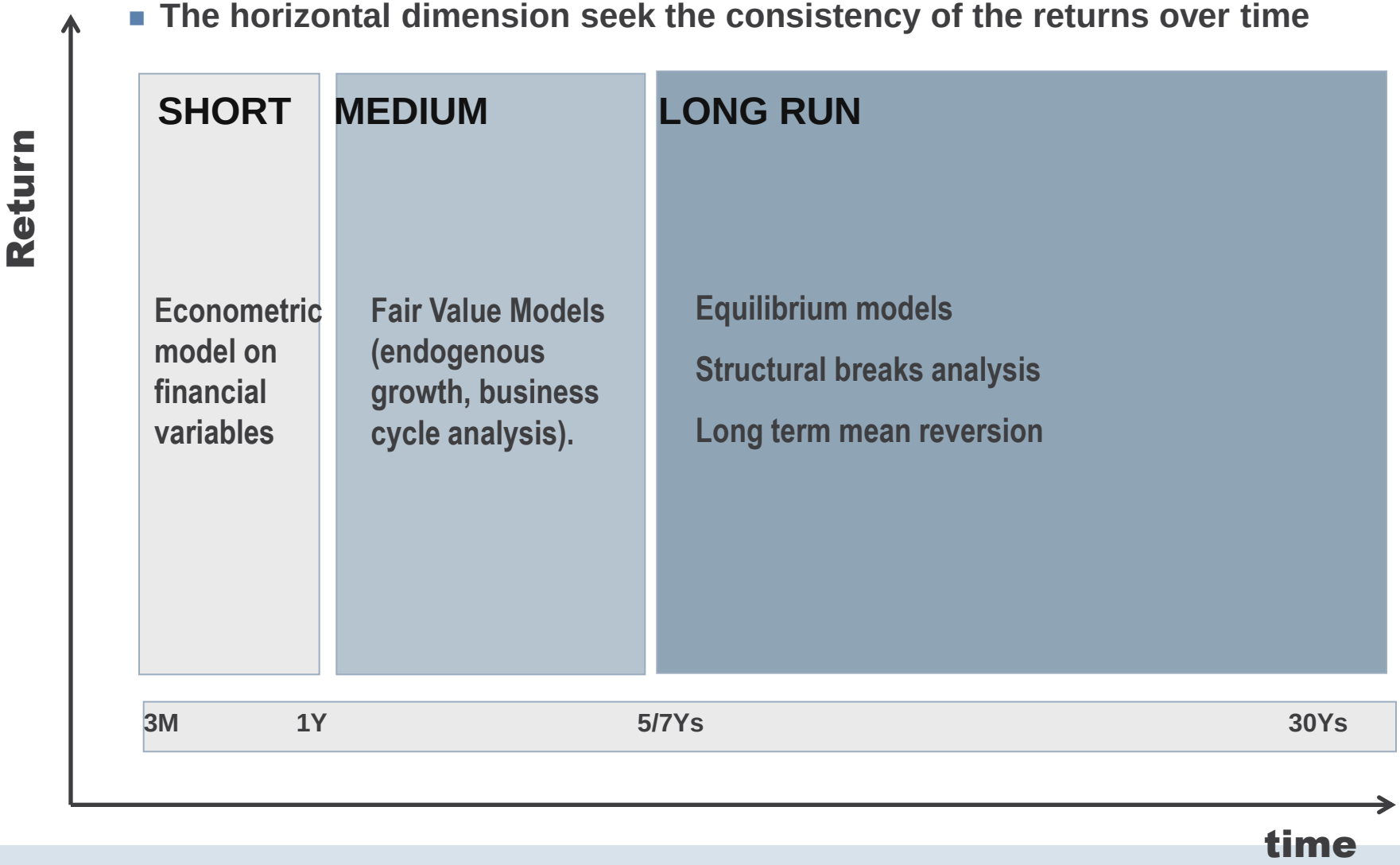
- The horizontal dimension seek the consistency of the returns over time



Transition Dynamics from Short Term to Long Run

Asset and Liability Simulation

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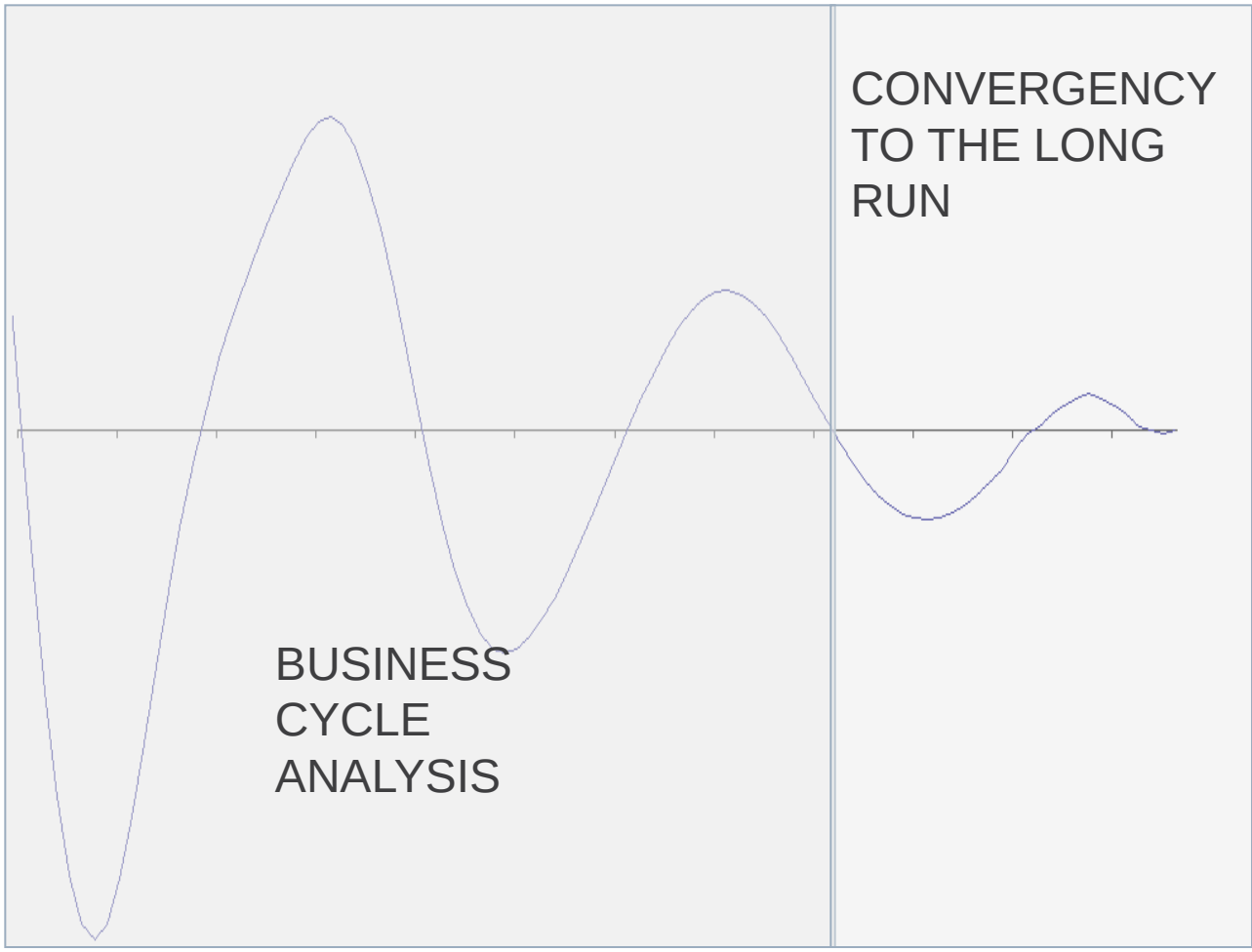
SHORT TERM

- **BVAR** models for Developed countries
- High frequency indicator analysis and continuous flow data provide timely assessment of the level of activity (volatility of the economic cycle around the main trend and turning points in the economic cycle)
  - forecasts of GDP breakdown,
  - inflation and economic trend variables



(3M) 1Y 3Ys 7 Ys

Modelling Inflation
Asset and Liability Simulation

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Short	Medium	Long Term
Econometric Forecast	Mean Reverting component Business Cycle Commodity Cycle	Long Run Inflation

Modelling Bond Yields
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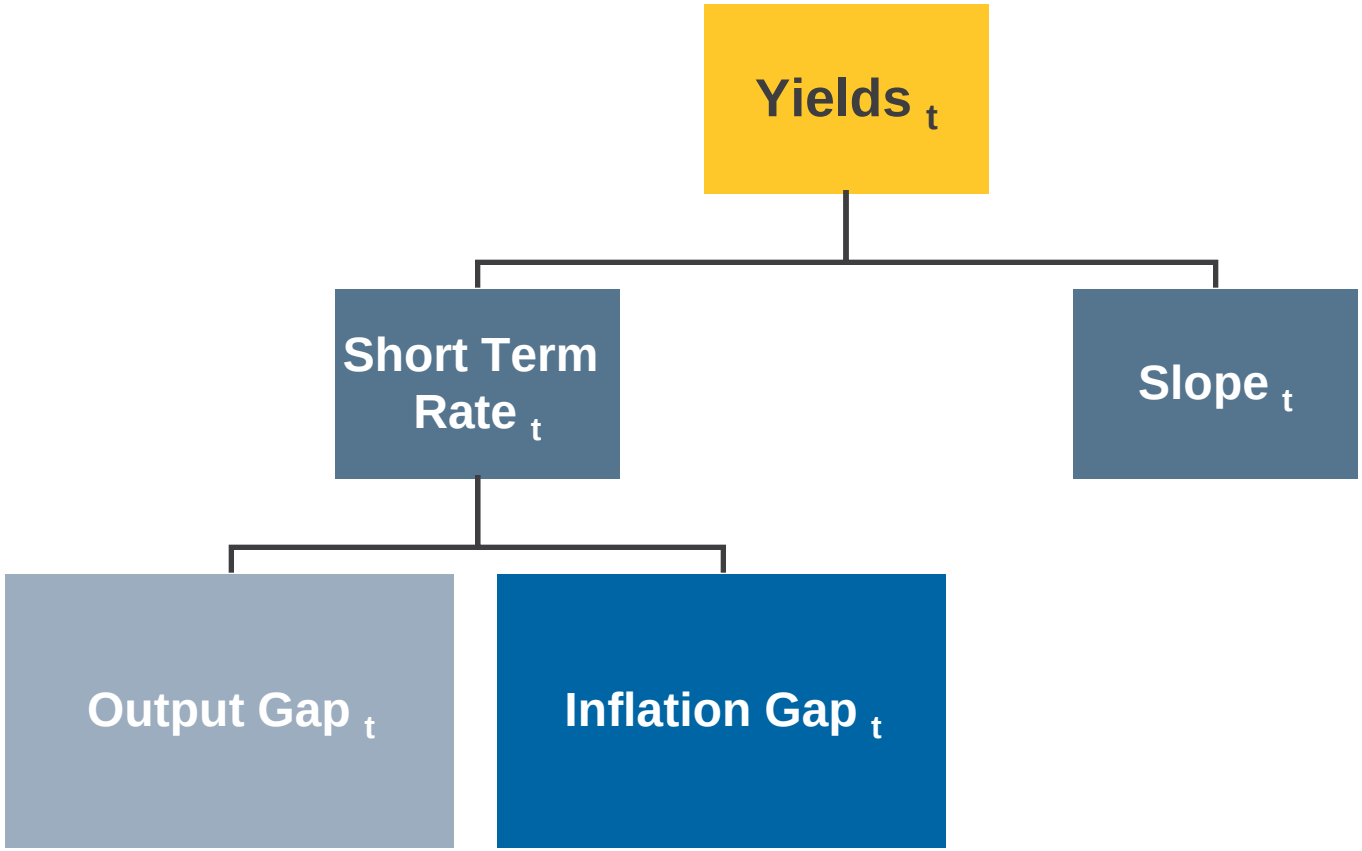

Calibrated Scenarios

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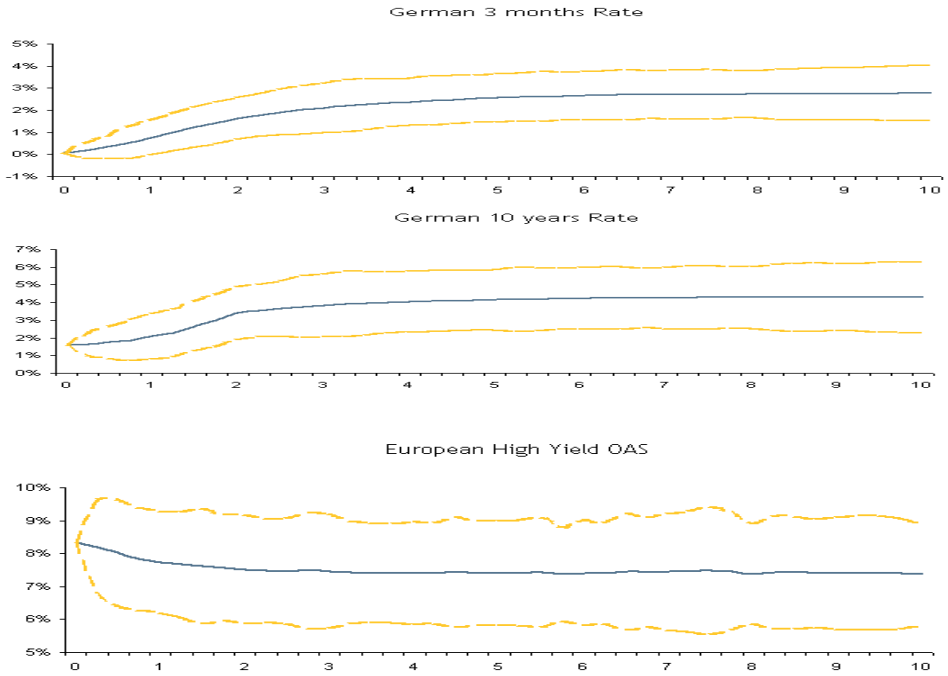
EU Term Structure

+

EU High Yield Spread

=

Scenarios on European High Yield



	1 Year Standard Deviation	Expected Returns (annualized) 1 year	10 Years	30 years
EUROPEAN HIGH YILED	10.8%	5.0%	7.6%	8.6%

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Q1 2014 Forward Looking Scenarios

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As of 4th Quarter 2013	Reference Index	Reference Duration	Simulated Volatility	Average Expected Returns at Horizon** 1 year	3 years	5 years	10 years	20 years
EU Money Market	JPCAEU3M index	0.25	0.2%	0.1%	0.8%	1.4%	1.9%	2.3%
EMU Bond 1-3 Years *	JNEUI1R3 Index	1.91	0.5%	0.8%	0.9%	1.5%	2.3%	2.8%
EMU Bond 1-5 Years *	JNEUI1R5 Index	2.69	0.8%	1.0%	0.9%	1.4%	2.3%	2.9%
EMU Bond AM *	JPMGEMUI Index	6.41	2.8%	0.9%	0.9%	1.1%	2.4%	3.3%
German Bond	JPMTWG index	6.60	3.5%	0.6%	-1.4%	0.0%	1.8%	2.9%
Italian Bond	JPMTIT index	6.15	4.0%	1.3%	4.4%	2.7%	3.2%	3.7%
Euro Corporate	ER00 index	4.44	2.1%	2.1%	0.6%	1.8%	3.2%	4.0%
Euro High Yield	HE00 index	3.02	5.3%	1.4%	-0.5%	1.8%	4.6%	6.4%
US Bond	JPMTUS Index	5.56	3.8%	0.6%	0.5%	1.5%	2.7%	3.4%
US Corporate	C0A0 index	6.55	4.8%	3.3%	1.1%	2.4%	3.9%	4.9%
US High Yield	H0A0 index	4.17	5.8%	4.6%	1.5%	3.5%	5.8%	7.2%
EM Bond Index	JPEMCOMP index	7.27	6.1%	3.4%	2.8%	4.1%	5.6%	6.4%
European Equity	NDDLEU15 index		17.1%	10.9%	9.4%	9.0%	8.4%	8.0%
US Equity	NDDLUS Index		14.0%	9.8%	8.3%	7.8%	7.2%	6.8%
AC World Equity	NDLEACWF Index		14.9%	9.6%	8.5%	8.2%	7.9%	7.6%

* Emu index are obtained weighting 60% Core (German) Index and 40% Peripheral (Italian) index

** Local Currency

Assumptions

CASM

	Ticker	Details	LAST UPDATE	12 M***	LONG RUN
Fed Funds	Fed Funds	yield (%)	0.25%	0.25%	2.9%
US Treasury 2 ys	UST2 ys	yield (%)		0.90%	
US Treasury10 ys	UST10 ys	yield (%)	2.83%	3.25%	4.6%
REFI rate	REFI	yield (%)	0.25%	0.25%	2.7%
German Bund 2 ys	Bund 2 ys	yield (%)	0.21%	0.40%	
German Bund 10 ys	Bund 10 ys	yield (%)	1.93%	2.20%	4.6%
Italian BTP 2 ys	BTP 2 ys	yield (%)	1.02%	1.20%	
Italian BTP 10 ys	BTP 10 ys	yield (%)	3.93%	4.30%	4.7%
EMU Corporate IG spread	ER00 spread	spread vs govies (bps)	115	Flat/ Slight Tightening	112
European High Yield spread	HE00 spread	spread vs govies (bps)	350	Flat/ Slight Widening	711
US Corporate IG spread	C0A0 spread	spread vs govies (bps)	123	Tightening	164
US High Yield spread	H0A0 spread	spread vs govies (bps)	388	Tightening	592
Emerging Markets GVT spread	EMBI spread	spread vs govies (bps)	340	Flat	340
European Equity	European Equity	total return perf. (%)		10.9%	7.6%
US Equity	US Equity	total return perf. (%)		9.8%	6.3%

*** 1 year forward views delivered by GAAR and PMs (govt and spread)

CASM
Cascade Asset Simulation Model

Target and main assumptions
Problem Set Up and Results

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ALM analysis target:

- **nominal funding ratio, to be higher than 100% on yearly basis**
- **liabilities are assumed to growth at a fixed rate equal to 3.5%.**

Client assumption:

- **the real estate and private equity exposure are considered fixed (and evaluated at book value**
- **the fixed income direct investments are maintained till the expiring date (no callable option possible) and fixed exposure evaluated at book value**
- **the fixed income direct investments are summarized as a breakdown by maturity, average coupon and rating (average rating is A) , the cash flow streams that are discounted using the European A corporate structure**
- **some par coupon bond instruments (as a proxy of the direct fixed investments) potentially accessed for reinvesting the cashflows coming from the direct fixed income investments.**
- **the liability should be discounted using the European AA corporate term structure**

Scenarios tree
Problem Set Up and Results

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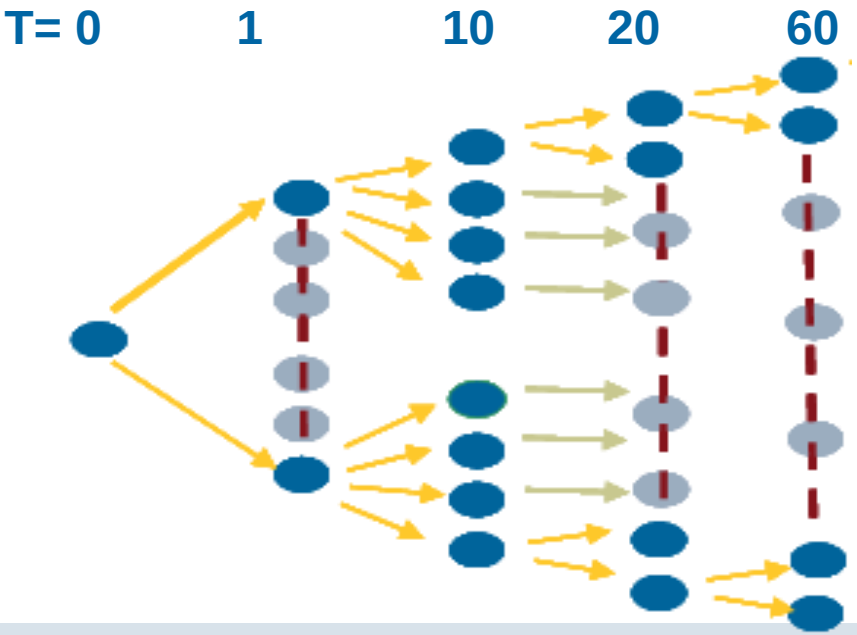
- Horizon: 60 years
- Intermediate steps (and rebalancing times): 1 year, 10 and 20
- Yearly turnover equal to 2% for risky assets (equity, high yield and emerging market bonds) or for not liquid assets (real estate and private equity in the alternative solution where they are considered variable assets)



Allocation Statistics
Problem Set Up and Results

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Time	Actual Allocation	0	1 year	10 years	20 years
Direct Fixed Income Investments	78.0%	78.0%	72.1%	23.8%	3.5%
Bond AA 15ys	0.0%	0.0%	0.1%	6.5%	8.8%
Bond AA 20ys	0.0%	0.0%	0.1%	14.0%	20.5%
Bond A 10 ys	0.0%	0.0%	0.9%	20.8%	30.9%
Bond A 5 ys	0.0%	0.0%	0.4%	4.4%	3.6%
Money Market	0.0%	0.0%	0.0%	0.1%	0.0%
Euro Bond Index	8.3%	0.5%	0.0%	1.9%	0.5%
Euro Corporate Bond Index	4.4%	1.0%	1.0%	4.0%	6.8%
Euro High Yield Index	0.9%	2.7%	4.6%	1.8%	0.1%
Emerging Debt Index	0.9%	0.0%	0.1%	3.2%	5.0%
European Equity Index	2.2%	14.3%	18.4%	17.5%	18.3%
Private Equity Investment	1.5%	1.5%	1.4%	1.2%	1.4%
Real Estate Investment	2.0%	2.0%	0.9%	0.7%	0.7%

The proposed allocation at time 0 suggests:

- **to increase the exposure on equity**
- **to reduce the allocation on euro bond funds and euro corporate funds**
- **to increase the allocation on emerging market debt, reducing to zero the exposure on high yield.**

All the suggestions except the one on emerging market debt (that is mainly driven by tactical considerations) are confirmed in the strategic allocations at 10 and 20 years horizon.

Portfolio Statistics
Problem Set Up and Results

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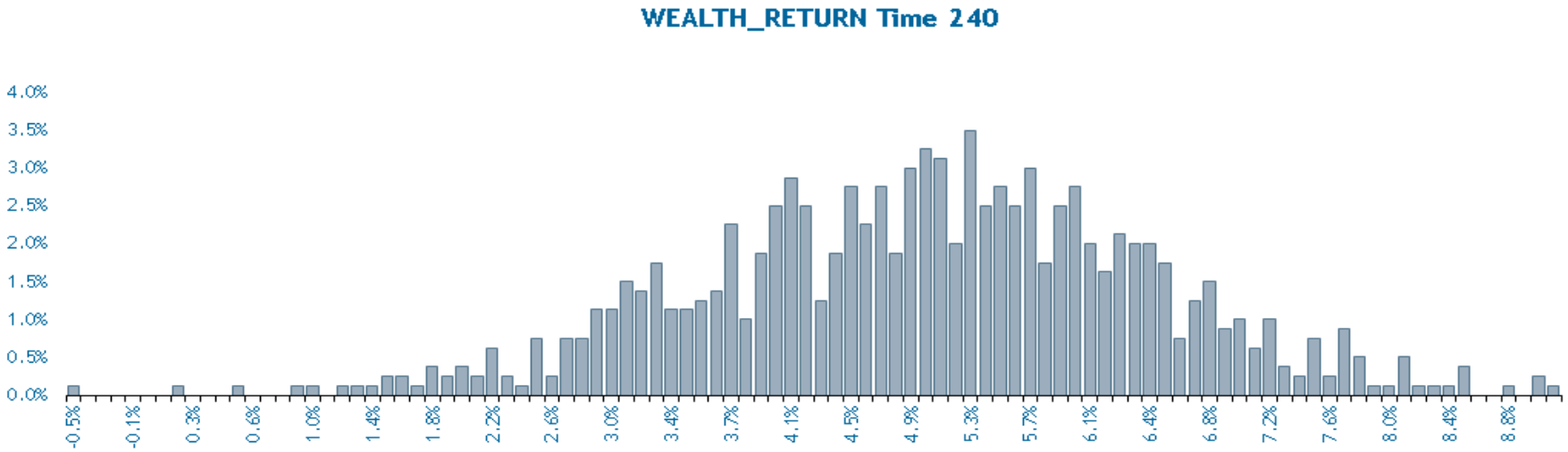
TYPE	TIME	YEAR	percentile(50)	percentile(5)	percentile(1)
WEALTH	0	0	5,868,620,000	5,868,620,000	5,868,620,000
	4	1	5,632,580,000	5,272,150,000	5,212,150,000
	40	10	5,726,330,000	3,549,270,000	2,864,480,000
	80	20	7,552,330,000	2,491,280,000	2,020,990,000
	240	60	105,928,000,000	23,208,800,000	10,157,700,000
WEALTH_RETURN	0	0	0.0%	0.0%	0.0%
	4	1	-7.5%	-13.6%	-14.6%
	40	10	-1.6%	-6.3%	-8.3%
	80	20	1.5%	-3.0%	-3.8%
	240	60	5.0%	2.7%	1.5%

The portfolio average return at horizon could be equal to 5% with 50% probability,

The minimum return (define as the 1st percentile is 1.5%)



Portfolio Statistics
Problem Set Up and Results

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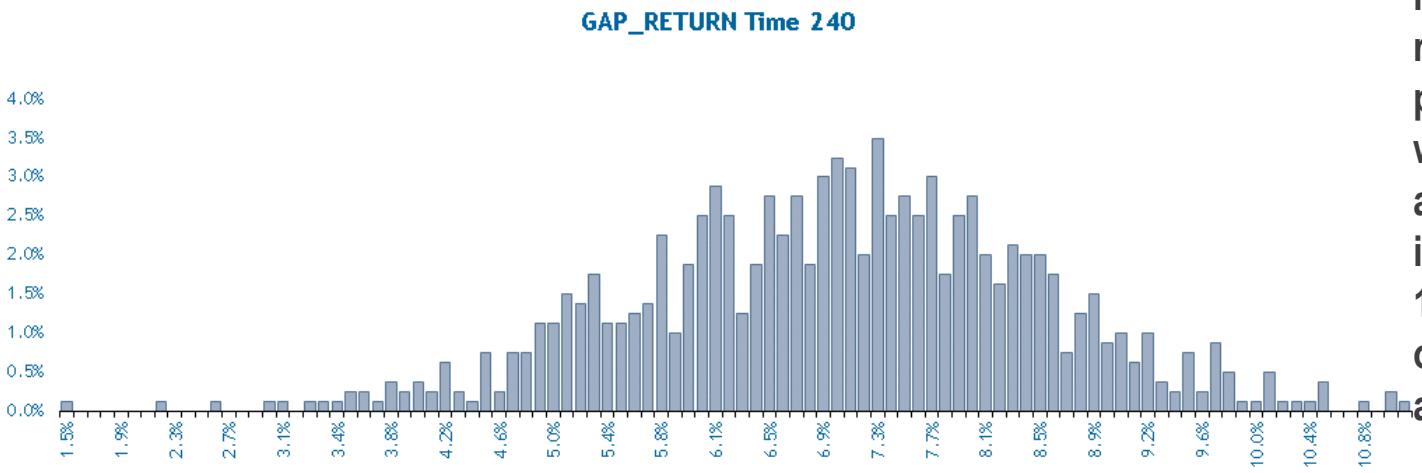
TYPE	TIME	YEAR	percentile(50)	percentile(5)	percentile(1)	P(GAP>=0)
GAP	0	0	419,454,000	419,454,000	419,454,000	
	4	1	686,264,000	163,035,000	-56,330,200	
	40	10	2,587,810,000	349,294,000	-108,919,000	
	80	20	6,042,160,000	997,890,000	558,566,000	
	240	60	105,928,000,000	23,208,800,000	10,157,700,000	
GAP_RETURN	0	0	0.0%	0.0%	0.0%	100.0%
	4	1	11.7%	2.8%	-1.0%	98.0%
	40	10	5.8%	1.0%	-0.3%	98.0%
	80	20	6.2%	1.7%	0.9%	99.8%
	240	60	7.1%	4.7%	3.5%	100.0%



The probability to have positive gap return positive at 1 year horizon stays at 98%, this is due to the portfolio wealth which decreases because of a combined effect of lower cashflows from the fixed income direct investments and the return of the asset portfolio that is very weak and for some asset negative. The gap is positive with around 100% probability on the other intermediate and at final horizon