



CYTA PENSION FUND | 13 September, 2013

Asset-Liability Modeling Results

AON Hewitt

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1. Introduction

2. Actuarial Valuation as at 31 December 2012 and other Statistics

3. Asset-Liability Modeling: Results & Recommendations

4. Next Steps

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Executive Summary: Introduction

- An Asset Liability Modelling (ALM) study for the CYTA Pension Fund was last conducted based on 2011 Actuarial Valuation
- As per Law 208 (I), 2012 and the Fund's approved Statement of Investment Principles (SIP), the Trustees must conduct a new ALM study every 3 years unless there is a significant event that effects the assets and liabilities of the Fund
- Given the recent developments that affected both the liabilities (freezing of salaries) and the assets (haircut and impairment of other assets), the Trustees commissioned Aon Hewitt to update the results of the ALM study using the 2012 Actuarial Valuation but allowing for the impact of events following the valuation date (mainly the March 2013 haircut).
- Dynamic ALM study will assist CYTA in their decision-making relative to the Strategic Asset Allocation of the Pension Fund by:
 - Observing current risk exposure and current return expectations
 - Updating the risk and return targets
 - Setting the new Strategic Asset Allocation in the SIP

Executive Summary: Objectives

▣ Fund's Objective:

- To ensure that the Strategic Asset Allocation of the Pension Fund reflects the financial objectives of CYTA while maintaining security of benefits, taking into consideration the overall risks inherent in the operation of the Fund

▣ Investment Targets (over a 3 year time horizon):

- Primary Objective: maintain the Funding Level at approx. 100% at all times subject to acceptable level of risk (Funding level as at 31/12/12 allowing for March 2013 events is estimated at 96%).
 - > Relating Objective: Target return at least equal the discount rate used in the Actuarial Valuation in order to meet the primary objective

Executive Summary: Observed risk and return

- ▶ We have projected the Funding Level of the Fund in 3 years time using 5000 different economic scenarios and set out below the summary of results:
 - the expected Funding Level of the Fund assuming it maintains the current investment strategy.
 - The Funding Level of the Fund based on what we consider as the worst case scenario (5% level) which looks at what is the minimum Funding Level that is achieved by 4750 out of the 5000 scenarios. We note that in 250 scenarios the funding level can be below the worst case scenario.

Current Portfolio (Horizon 3year):	Expected	5% Level
Funding Level	97%	73%
Return of the portfolio *	2.4%	-3.1%

* Annualised 3-year return

- ▶ ***The Aim of ALM exercise is to improve the metrics above (if possible) by either increasing the expected return, decreasing the assumed risk or a combination of the two.***

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Adjusted Assets as at 31/12/12

We have taken the asset position as at 31/12/12 and made reasonable assumptions in order to derive a more realistic valuation of the Fund's assets by assuming the following (note that these figures are not audited and are used only for the purposes of this report):

Initial assets before haircut/impairment: €745m

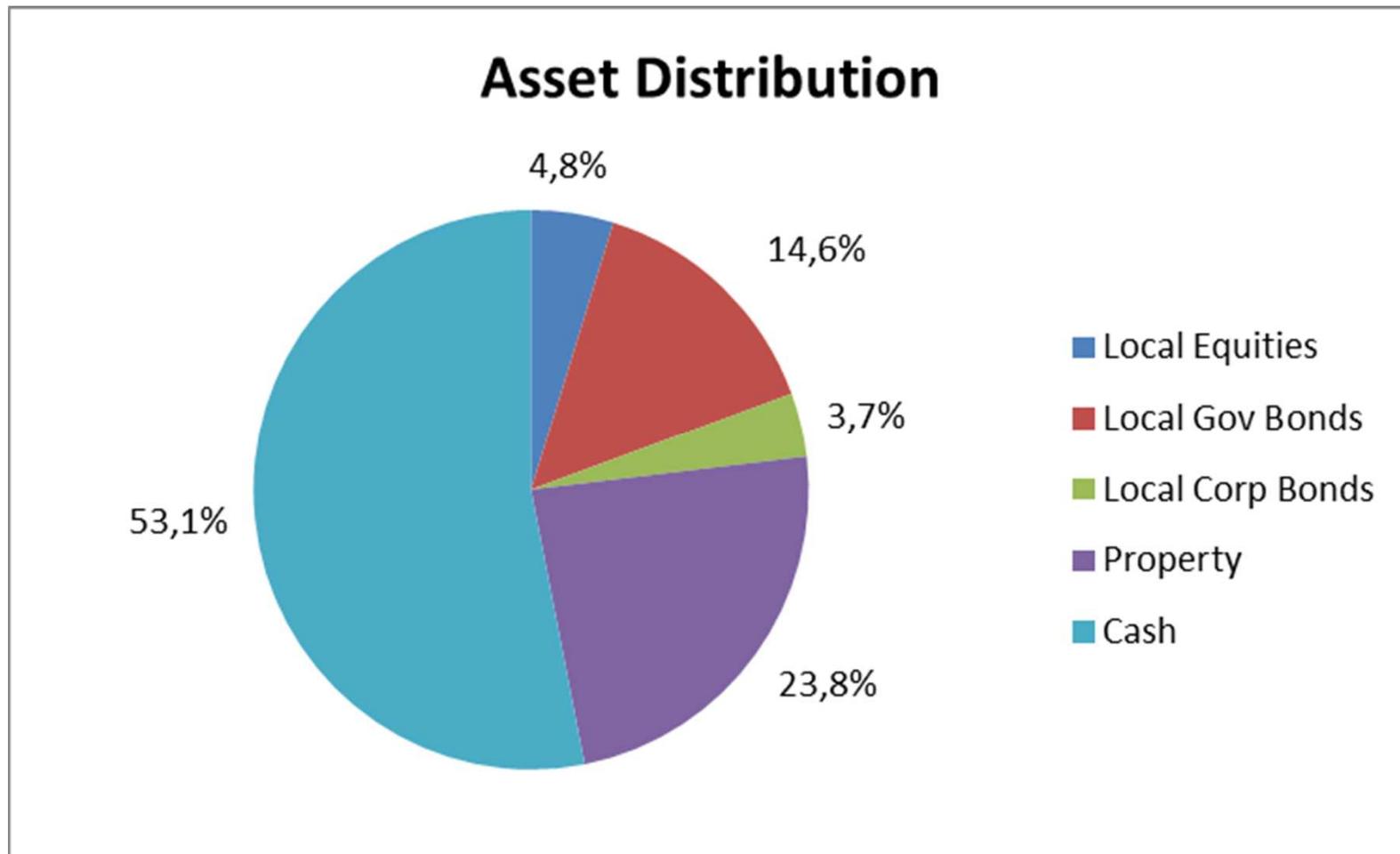
- ▶ Equity loss BOC and Laiki shares (100% reduction): **€1,7m**
- ▶ Reduction in market valuation of Government Bonds (not accounted for at market value – approximately 25% reduction): **€47,1**
- ▶ Reduction of value in bonds guaranteed by Laiki (100% reduction – amount is small so not significant): **€0,5m**
- ▶ Reduction in perpetual bonds from BOC and Laiki that have been bailed in (100% reduction): **€9,2m**
- ▶ Cash haircut from BOC and Laiki at 47,5% that have been bailed in: **€74,5m**

Resulting assets: €612m

- ▶ **We note that we have not assumed any impairment on property as we understand these have been provided at market value by independent valuers.**

Assets as at 31 December 2012

- Value as at 31 December 2012: €612m (allows for **haircut** in cash and **impairment** of bonds)



Amended Actuarial Results as at 31 December 2012

We outline below the actuarial position of the Fund taking into account the adjusted assets as these were described in the previous slides

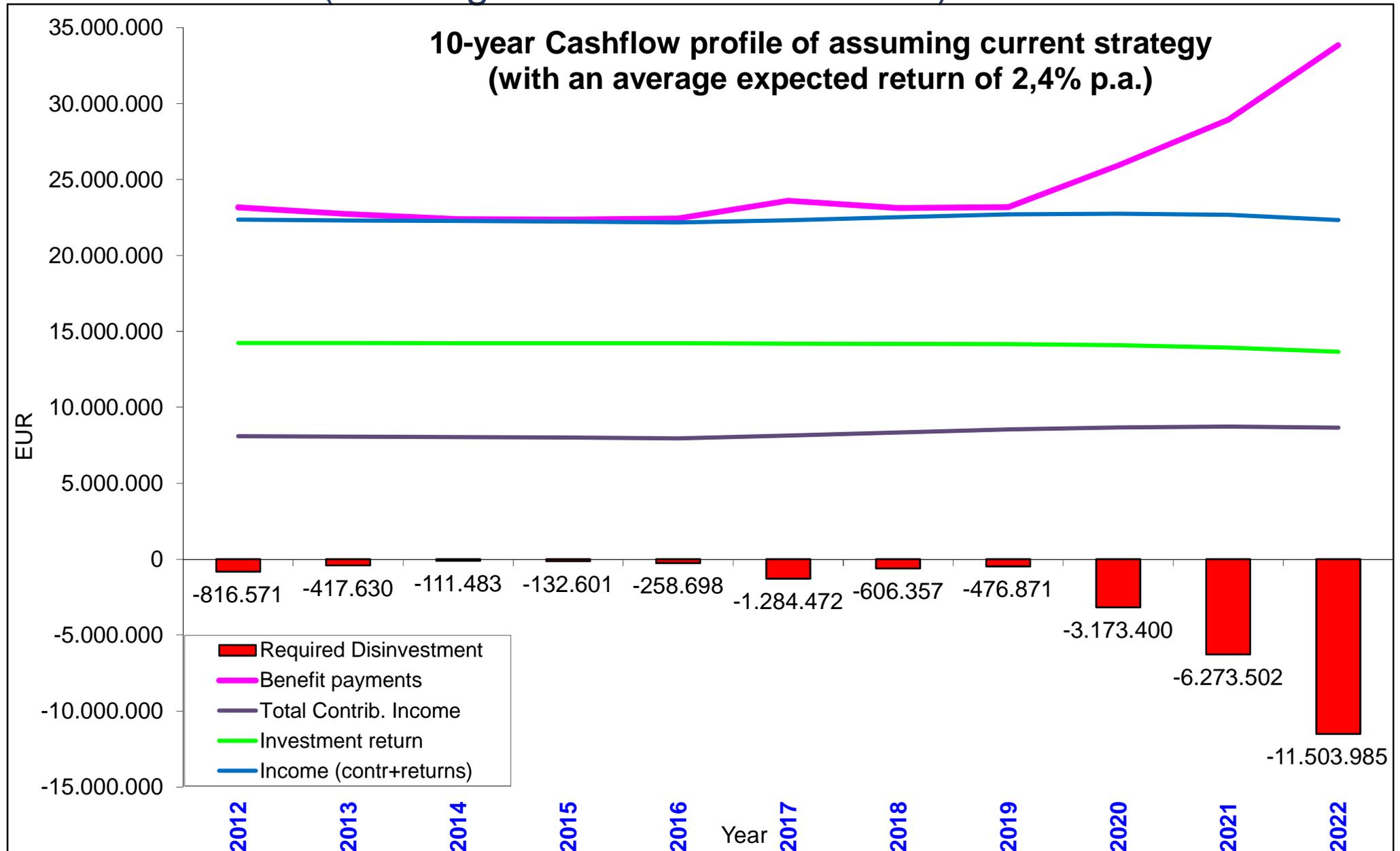
- ▶ Important Assumption: **Discount Rate = 3.58%** (based on AA Corporate bond rates)
- ▶ Liabilities as at 31 December 2012: **€640m**
- ▶ Assets as at 31 December 2012: **€612m**
- ▶ Funding Level (FL%) as at 31 December 2012: **96%**

Cashflow analysis

The graph on the next page projects forward the cashflow position of the Fund with the following parameters:

- ▶ The starting point of the projection is the **impaired** Assets of the Fund and the Liabilities as at 31/12/12
- ▶ Investment return is assumed to be 2.4% which is the annual returned expected from the current strategy allowing for Aon Hewitt's forward looking assumptions over the 10 years.
- ▶ Contribution is set at 9,7% of pay which is equal to the cost of accrual.
- ▶ ***We note from the graph that the Fund is cashflow negative from year 1 and would rely on contributions in excess of the above accrual contributions or liquidation of Fund assets in order to pay benefits.***

Cashflow Profile (allowing for Investment Returns)



Previous Strategic Asset Allocation

- ▣ The Trustees established their investment strategy in Dec 2011 following the ALM study:

Asset class	Target allocation, %	Permitted range, %
Domestic Equity	5	0 – 10
Global Equity	10	5 – 15
Property	15	10 – 20
Alternative Assets	15	10 – 20
Total Growth Assets	45	25 – 65
Bonds	35	30 – 40
Cash	20	15 – 25
Total Income Assets	55	45 – 65
TOTAL	100	100
Expected Return	5,8% per annum	
Value at Risk (5% level, 1 year)	€77 million	

Implementation of Asset Allocation Update

- ▣ Implementation of the strategic asset allocation:
 - Local equity managers:
 - > Argus Stockbrokers Ltd
 - > CISCO
 - > Ethniki Asset Management
 - > Eurobank Asset Management
 - > Laiki Financial Services
 - Custodian: Hellenic Bank Ltd
 - Purchases of direct bonds and direct property
 - The implementation of managers for global investments (global equity, global bonds and property) has not been completed since the last ALM.

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Risk Metrics Observed

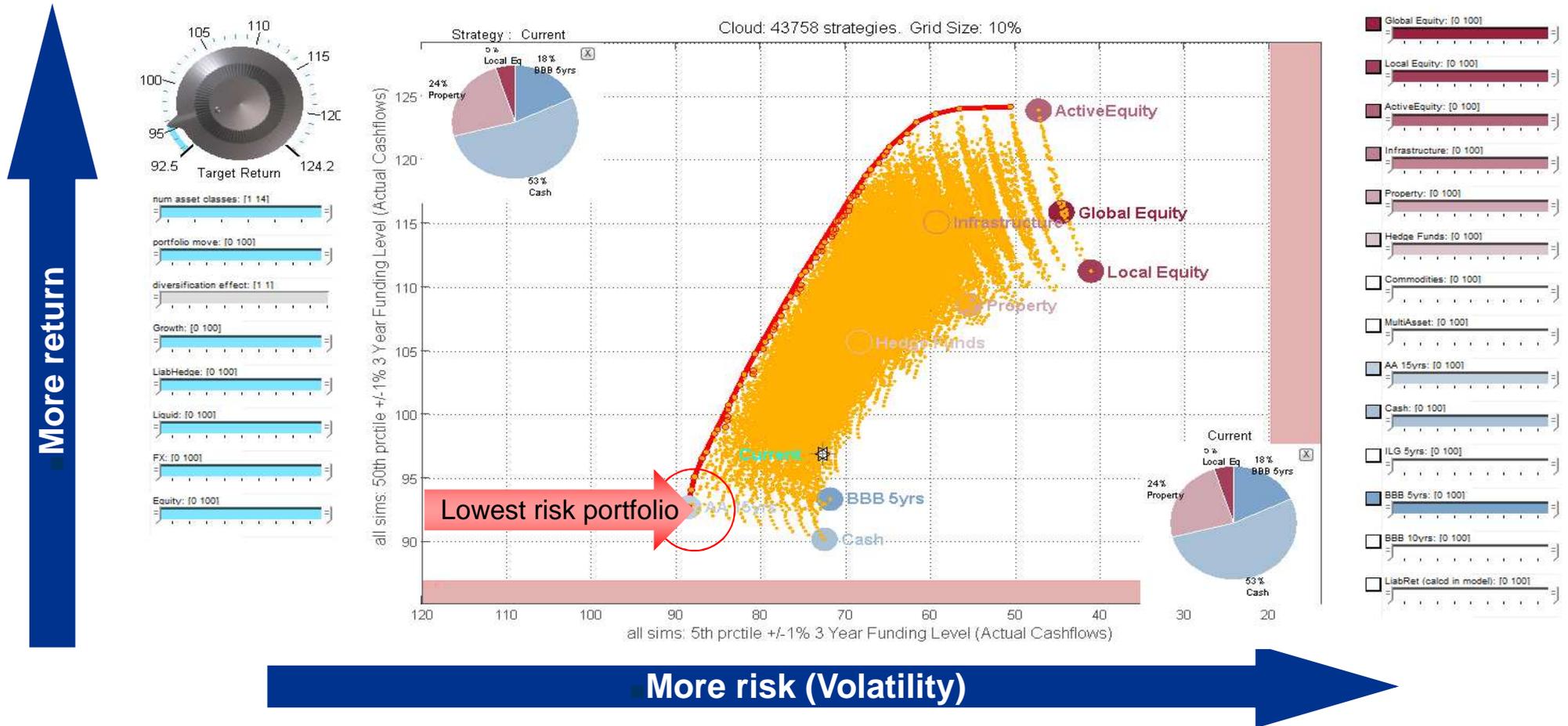
- ▣ We have assessed the results based on the following key risk metrics:
 - Pension Fund's Funding Level (FL) in 3 years
 - Expected Return of Assets

Our Assumptions

Our assumptions are long term assumptions, based on a 10 year projection period

Asset Class	Product	ExpGrsRet	VolGrsRet	ImpMgrRsk	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					
Equities	1 Passive Home	7,2%	20,3%	0,0%	1,00																																			
	2 Passive Global	7,2%	20,5%	0,0%	0,93	1,00																																		
	3 Traditional Active Home	7,6%	20,7%	3,3%	0,98	0,91	1,00																																	
	4 Traditional Active Global	7,9%	21,0%	4,5%	0,91	0,98	0,89	1,00																																
	5 High Performance Home	8,9%	21,8%	13,4%	0,93	0,86	0,92	0,84	1,00																															
	6 High Performance Global	9,3%	22,3%	15,3%	0,85	0,92	0,84	0,90	0,79	1,00																														
	7 Unconstrained Home	9,3%	22,3%	16,9%	0,91	0,84	0,90	0,83	0,85	0,78	1,00																													
	8 Unconstrained Global	9,7%	22,5%	17,0%	0,84	0,91	0,83	0,89	0,79	0,84	0,77	1,00																												
Bonds	9 Passive nominal government bonds	2,6%	10,6%	0,0%	-0,20	-0,20	-0,20	-0,19	-0,19	-0,18	-0,18	1,00																												
	10 Passive Index-Linked gov bonds	1,8%	8,8%	0,0%	-0,10	-0,09	-0,10	-0,09	-0,09	-0,08	-0,09	0,50	1,00																											
	11 Passive Investment Grade Bonds	2,6%	8,7%	0,0%	0,10	0,09	0,10	0,09	0,09	0,08	0,09	0,08	0,80	1,00																										
	12 Traditional Active Nominal gov bonds	3,0%	10,9%	5,3%	-0,19	-0,19	-0,19	-0,19	-0,18	-0,18	-0,18	0,97	0,49	1,00																										
	13 Traditional Active IL gov bonds	1,7%	8,8%	0,0%	-0,10	-0,09	-0,10	-0,09	-0,09	-0,08	-0,09	0,50	1,00	0,40	0,49	1,00																								
	14 Traditional Active Inv. Grade Bonds	3,4%	9,4%	14,8%	0,09	0,08	0,09	0,08	0,09	0,08	0,08	0,08	0,74	0,37	0,92	0,72	0,37	1,00																						
	15 Unconstrained Global	3,3%	6,5%	21,9%	0,07	0,06	0,07	0,06	0,06	0,06	0,06	0,06	0,55	0,28	0,69	0,53	0,28	0,64	1,00																					
Property	16 Passive Property	6,2%	14,8%	0,0%	0,40	0,41	0,39	0,41	0,37	0,38	0,36	0,38	0,10	0,10	0,10	0,10	0,10	0,09	0,07	1,00																				
	17 Active Commercial Property	6,9%	15,3%	5,7%	0,39	0,40	0,38	0,39	0,36	0,37	0,35	0,37	0,10	0,10	0,10	0,09	0,10	0,09	0,07	0,97	1,00																			
Private Equity	18 Global Fund of Funds	8,5%	27,6%	30,8%	0,69	0,74	0,68	0,73	0,64	0,68	0,63	0,68	-0,15	-0,07	0,07	-0,14	-0,07	0,06	0,05	0,31	0,30	1,00																		
Absolute Return	19 Global Fund of Hedge Funds	6,6%	7,1%	40,9%	0,47	0,51	0,47	0,50	0,44	0,47	0,43	0,46	0,04	0,03	0,23	0,04	0,03	0,21	0,17	0,22	0,21	0,38	1,00																	
	20 Equity LS	8,6%	10,8%	8,0%	0,88	0,95	0,87	0,93	0,82	0,88	0,81	0,87	-0,18	-0,08	0,10	-0,18	-0,08	0,09	0,07	0,40	0,38	0,71	0,50	1,00																
	21 Equity MN	4,9%	5,1%	46,6%	0,22	0,24	0,22	0,23	0,21	0,22	0,20	0,22	0,02	0,02	0,15	0,01	0,02	0,14	0,13	0,09	0,09	0,18	0,17	0,35	1,00															
	22 Fixed Income Arbitrage	8,4%	8,7%	47,1%	0,20	0,20	0,19	0,20	0,18	0,18	0,18	0,18	-0,08	-0,03	0,10	-0,08	-0,03	0,09	0,09	0,04	0,04	0,15	0,14	0,28	0,28	1,00														
	23 Absolute Return Bond Funds	3,0%	3,0%	0,0%	0,20	0,20	0,20	0,20	0,20	0,20	0,20	0,20	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,20	0,20	0,35	0,20	0,20	0,20	1,00														
	24 Global Macro	10,7%	10,9%	48,5%	0,18	0,20	0,18	0,19	0,17	0,18	0,17	0,18	0,04	0,02	0,12	0,03	0,02	0,11	0,09	0,09	0,08	0,15	0,13	0,31	0,26	0,25	0,20	1,00												
	25 CTA	11,1%	13,7%	48,1%	0,21	0,24	0,21	0,23	0,20	0,22	0,19	0,22	0,03	0,02	0,04	0,03	0,02	0,03	0,03	0,13	0,12	0,18	0,13	0,29	0,15	-0,06	0,28	0,43	1,00											
	26 Event Driven	9,0%	9,4%	41,4%	0,49	0,52	0,48	0,51	0,45	0,48	0,44	0,47	-0,07	-0,02	0,14	-0,06	-0,02	0,13	0,11	0,21	0,20	0,39	0,29	0,60	0,24	0,62	0,52	0,45	0,12	1,00										
	27 Cash	1,7%	1,3%	0,0%	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,10	0,10	0,20	0,10	0,10	0,18	0,23	0,00	0,00	0,00	0,16	0,06	0,25	0,17	0,12	0,11	0,06	0,12	1,00									
	28 Currency Overlay	7,9%	25,0%	74,0%	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,01	0,00	0,01	0,01	0,01	0,00	0,00	0,00	0,01	0,00	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,05	1,00					
	29 Infrastrucure	7,7%	16,8%	19,9%	0,51	0,51	0,50	0,50	0,47	0,47	0,47	0,46	-0,02	0,00	0,10	-0,02	0,00	0,09	0,07	0,44	0,43	0,38	0,27	0,49	0,13	0,10	0,36	0,11	0,13	0,27	0,03	0,00	1,00							
	30 Commodities	3,9%	19,4%	88,3%	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,01	0,01	0,00	0,00	0,00	0,01	0,00	0,01	0,01	0,00	0,00	0,00	0,00	0,00	0,03	0,00	0,00	1,00					
N/A	31 Under The Mattress	0,0%	0,0%	0,0%	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,00		

Building the Cloud



- We project tens of thousands of portfolios and present them in the “cloud”. Every dot on the cloud represents one strategy. We show the expected FL of each strategy in 3 years time (y-axis) as well as the worst case for the FL in 3 years time (x-axis)
 - Optimal portfolios have the highest expected FL and the lowest worst case FL ie top left hand strategies which lie on the efficient frontier (red line)

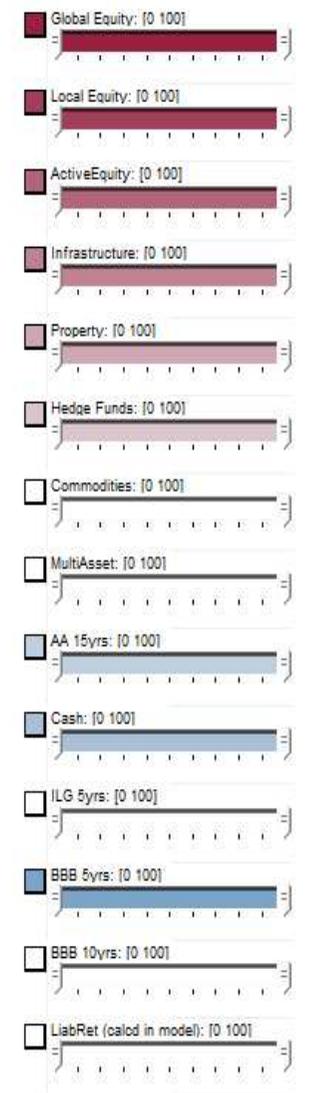
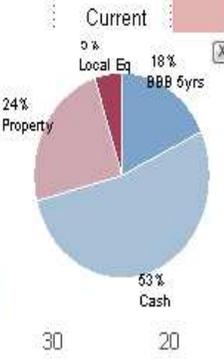
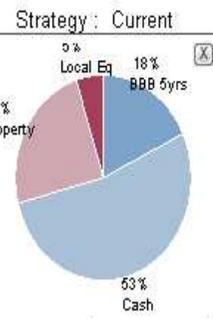
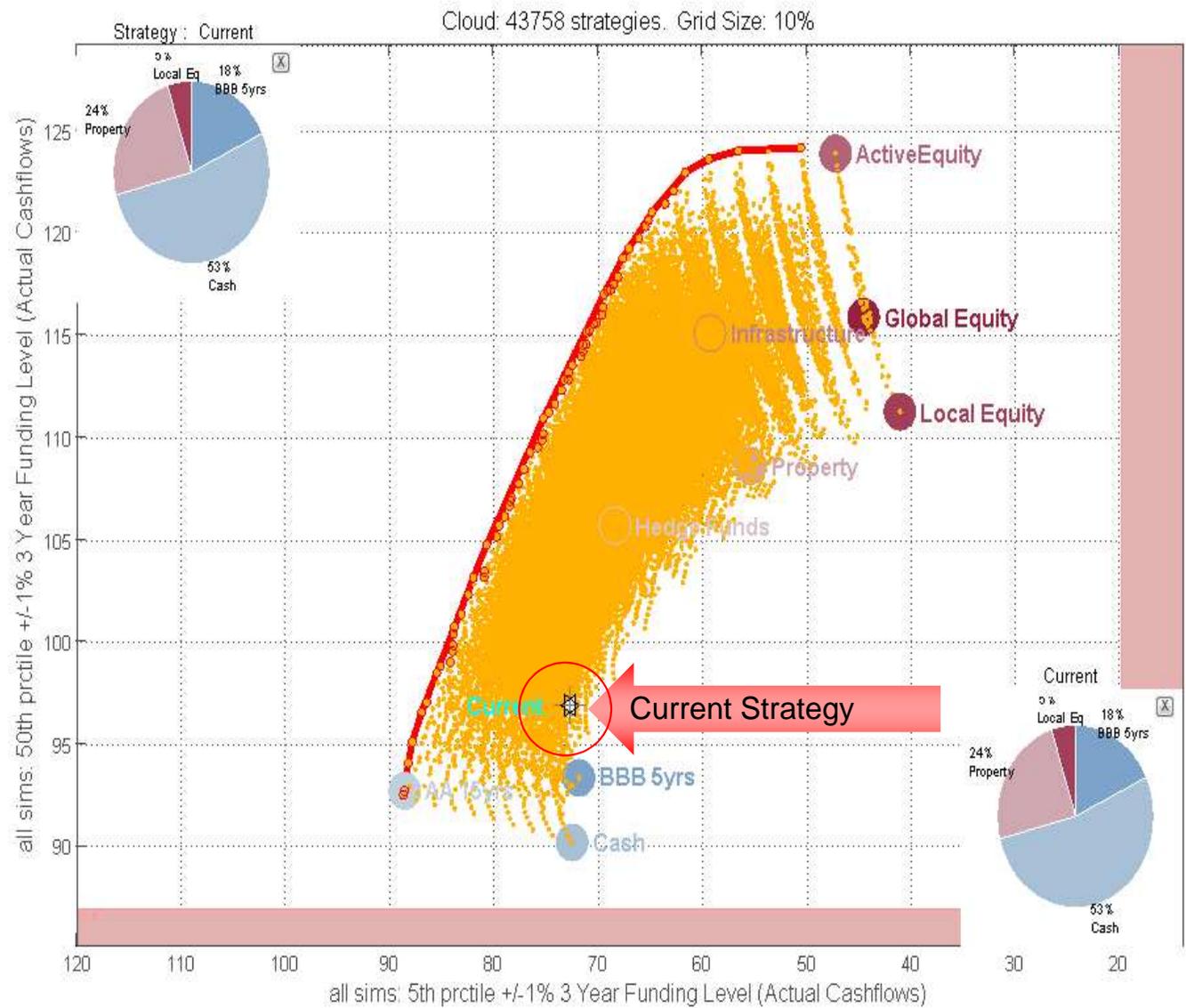
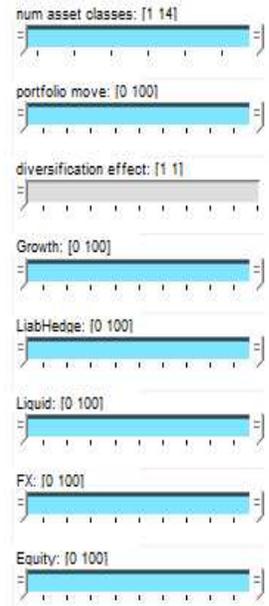
Definition of the Lowest Risk Portfolio

- ▣ Liabilities are valued using the yield on the >15 year AA corporate bond index as per the requirements of International Accounting Standards
- ▣ We thus deduce, that the portfolio of assets that resembles the liabilities the most is a portfolio invested fully in >15 year AA corporate bonds
- ▣ This can be used as a point of reference for appraising the relative risk-return characteristics of other portfolios

→ *Conclusion: Portfolio 100% corporate bonds provides the best / closest match to the liabilities*

- This is represented by the light blue dot at the far left point on the graph (i.e. the point with the highest FL in the worst case scenario.
- ▣ But where is the current strategy?

Current Strategy position in the “cloud”



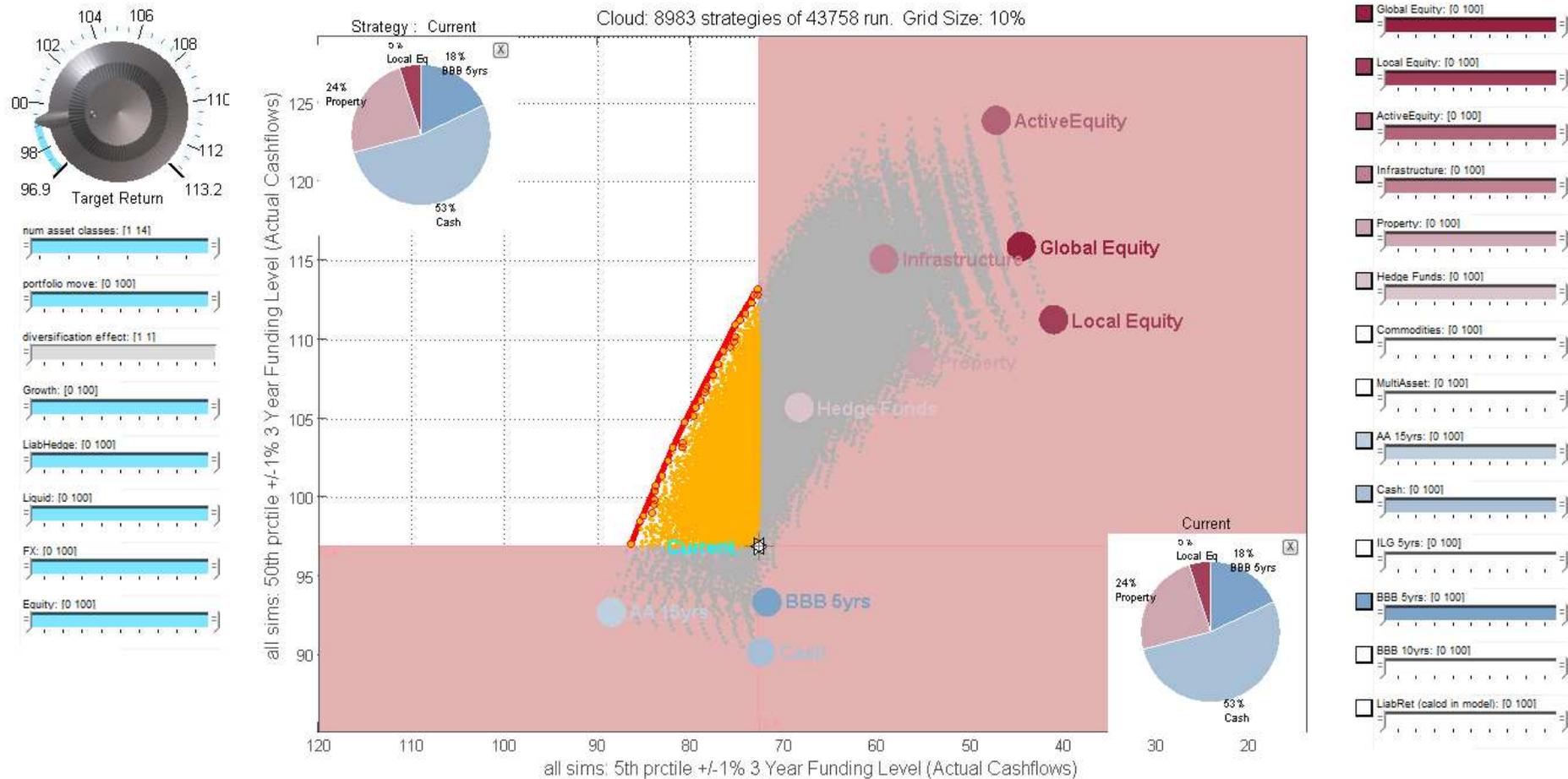
Characteristics of the Lowest Risk Portfolio vs. Current Portfolio

Characteristics of Low Risk Portfolio and Current Portfolio

	Current Allocation	Lowest Risk Portfolio
Asset Allocation:		
Local Equities	4,8%	0,0%
Local Bonds	18,3%	0,0%
Eurozone Corp Bonds AA 15+	0,0%	100,0%
Property	23,8%	0,0%
Cash	53,1%	0,0%
Expected FL in 3 years	97%	93%
Expected FL at 5% level in 3 years (worst)	73%	89%

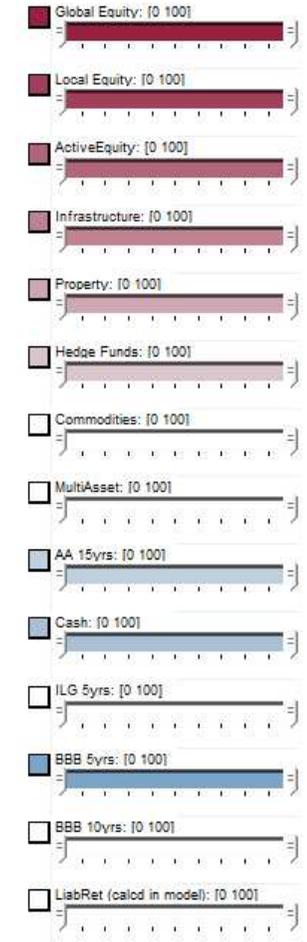
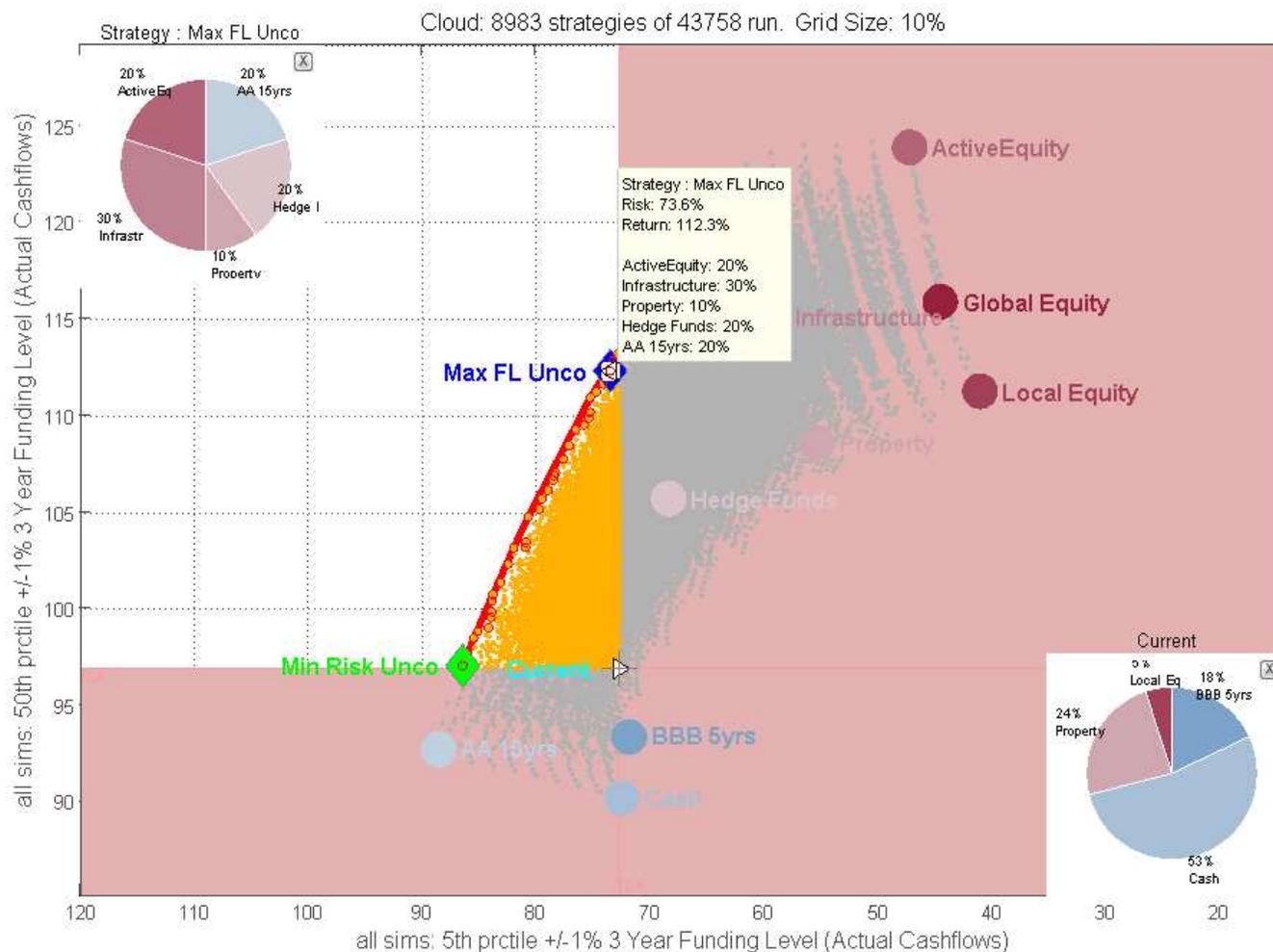
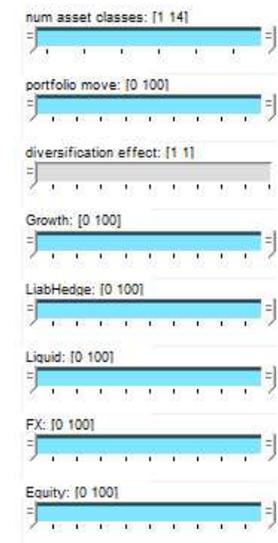
- ▶ ***Can we improve the statistics of the lowest risk portfolio bearing in mind the current risk implicitly accepted in the current strategy?***

Adding Risk and Return Objectives



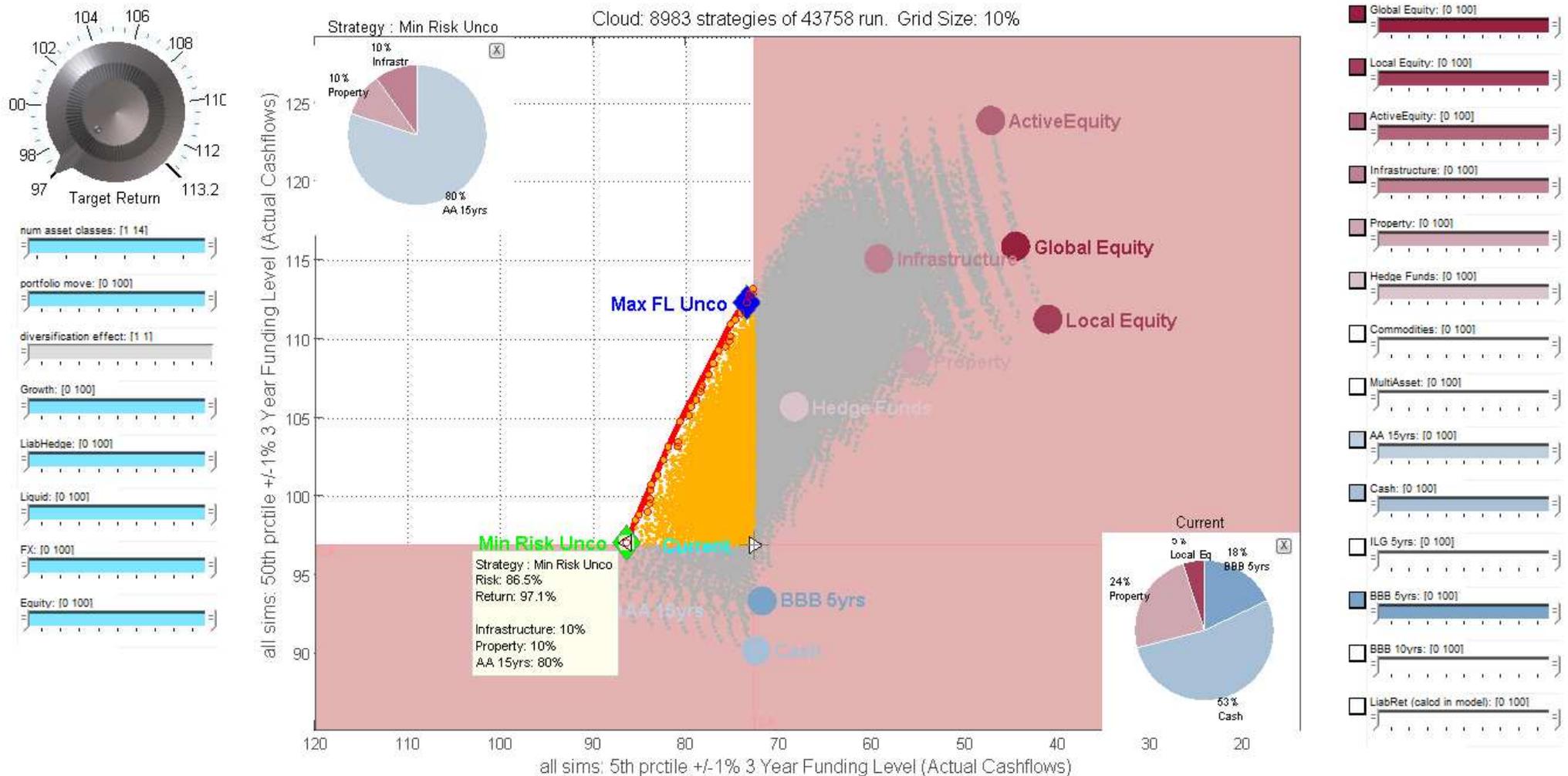
- Portfolios that do not satisfy the return objective (i.e. 97% FL) and risk objective of volatility $\leq 5\%$ (i.e. 73% FL) are eliminated (orange area are the scenarios that meet our objectives)
- No asset allocation constraints have been introduced so far.

Optimal strategy before constraints – Maximise return



- Can we achieve higher FL for the same level of risk as the current portfolio?
- The Max FL Strategy (in blue above) achieves an FL of 112% with the same risk as the current strategy

Optimal strategy before constraints – Minimise risk



- Can we achieve the same FL as the current strategy but with less risk?
- The Min Risk strategy (in green above) maintains the FL at 97% FL (the same as the FL of the current strategy) but reduces the risk.

Summary of results before constraints

Asset Class	Current Strategy	Unconstrained Max Return Strategy	Unconstrained Min Risk Strategy
Local Equities	5%	0%	0%
Local Bonds	18%	0%	0%
Active Global Equities	0%	20%	0%
Infrastructure	0%	30%	10%
Property	24%	10%	10%
Hedge Funds	0%	20%	0%
Eurozone Corp Bonds AA 15+	0%	20%	80%
Cash	53%	0%	0%
TOTAL	100%	100%	100%
Expected FL in 3 years	97%	112%	97%
Expected FL at 5% level in 3 years (worst)	73%	74%	87%

Introduce asset allocation constraints

▣ Pragmatic asset allocation constraints are introduced:

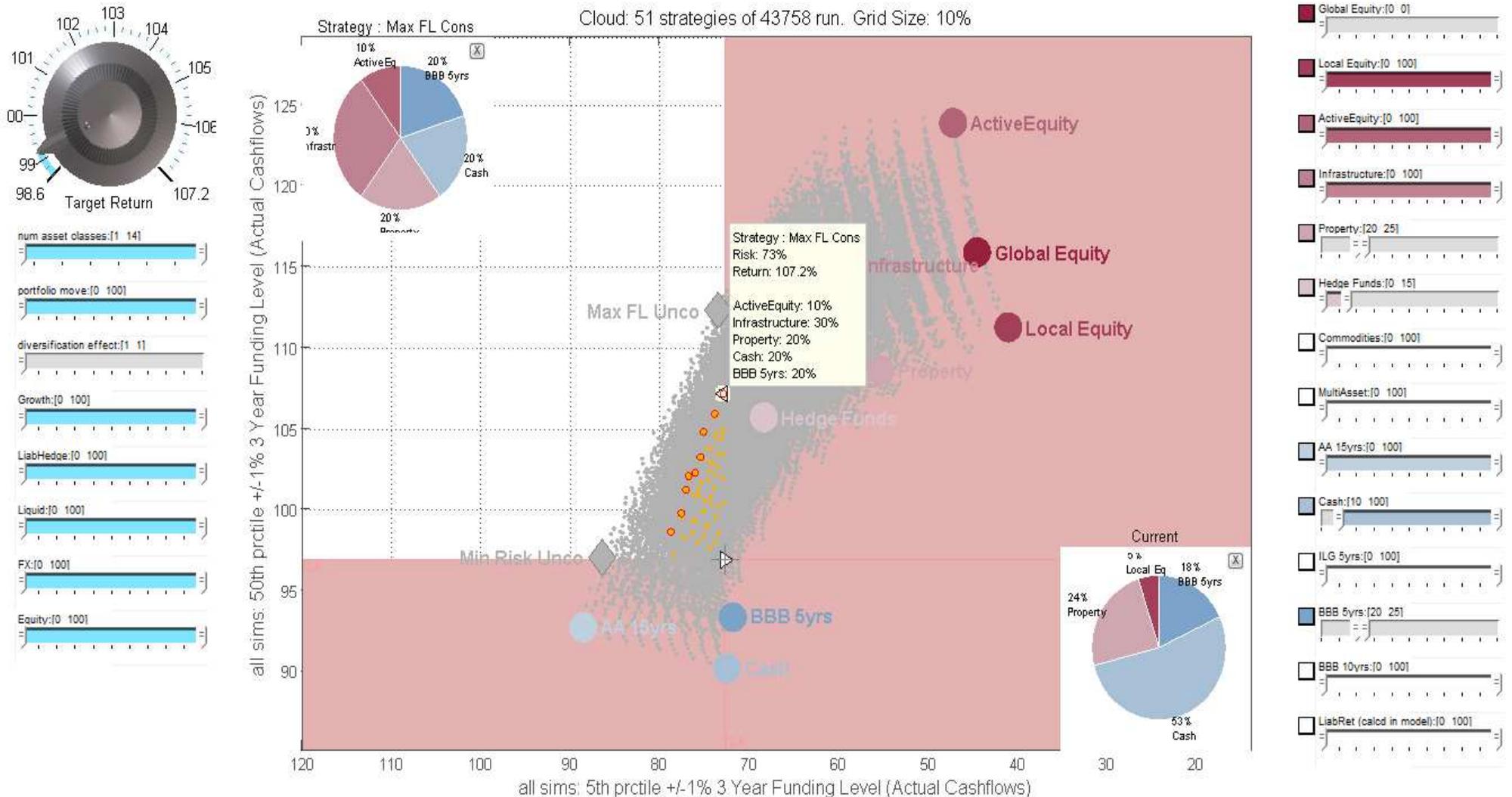
- Property: 20% - 25%
 - > We assume that current holding is maintained as limited marketability
- Cash: min 10% to allow for required cashflow
 - > We introduce a minimum liquidity required for the next 3 years
 - > $(\text{benefits} - \text{contributions}) \times 3 \div \text{assets}$ {i.e. $(23\text{m} - 8\text{m}) \times 3 \div 612\text{m} = 7\%$ }
- Local Bonds: 20% - 25%
 - > We assume that current holding is maintained as limited marketability

▣ Asset allocation constraints set by regulation:

- Hedge Funds: max 15%
 - > Maximum allocation to alternative investments, excluding property = 15%

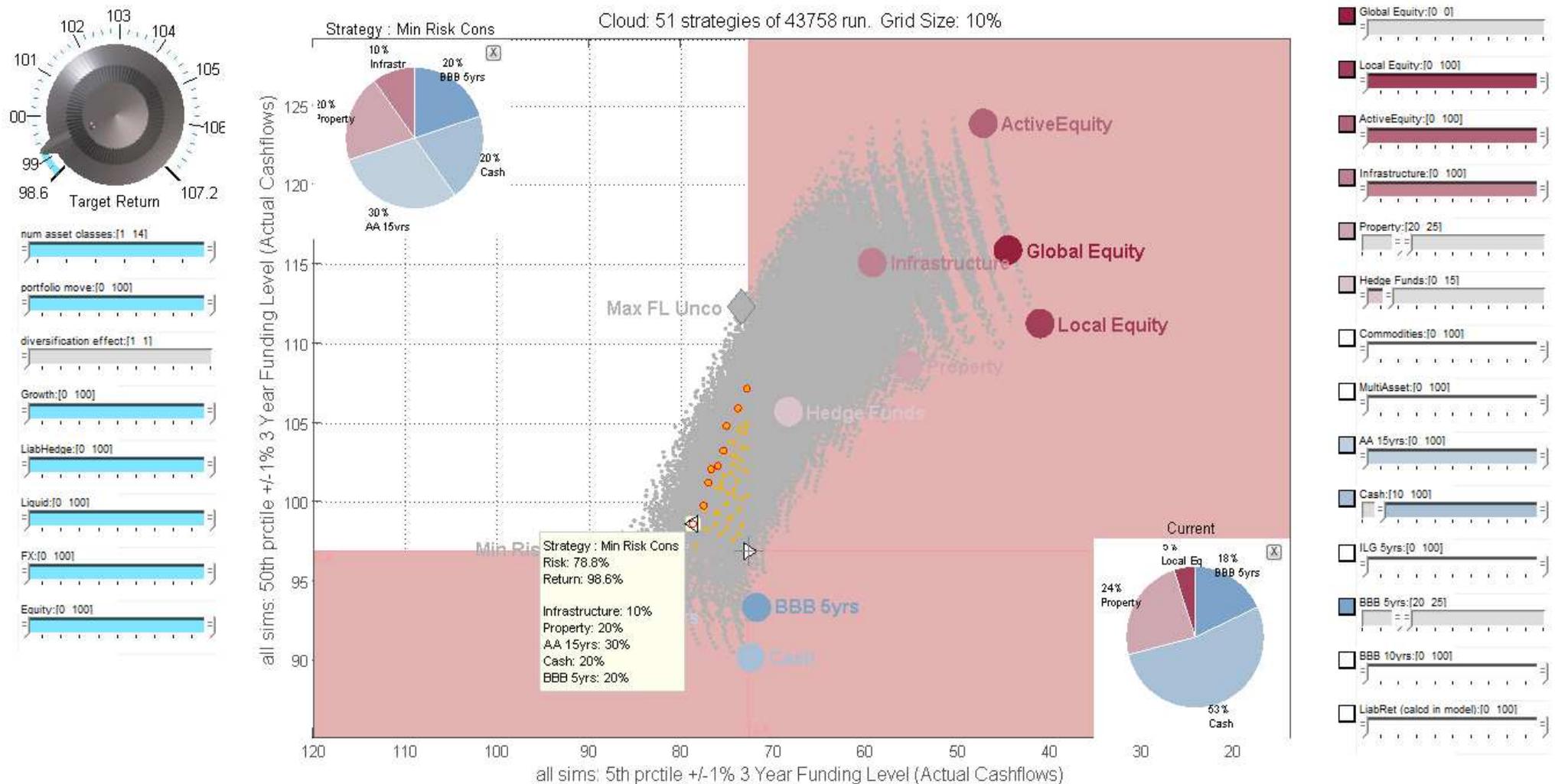
▣ The graph in the next page introduces the above constraints and re-calculates the available strategies (which are now more limited)

Optimal strategy after constraints – Maximise return



- Can we achieve higher FL for the same level of risk as the current portfolio within the constraints?
- The Max FL Strategy (in white above) achieves an FL of 107% with the same risk as the current strategy

Optimal strategy after constraints – Minimise risk

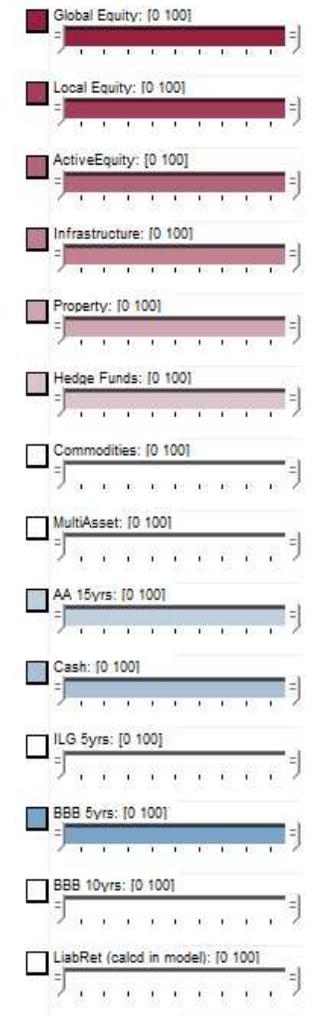
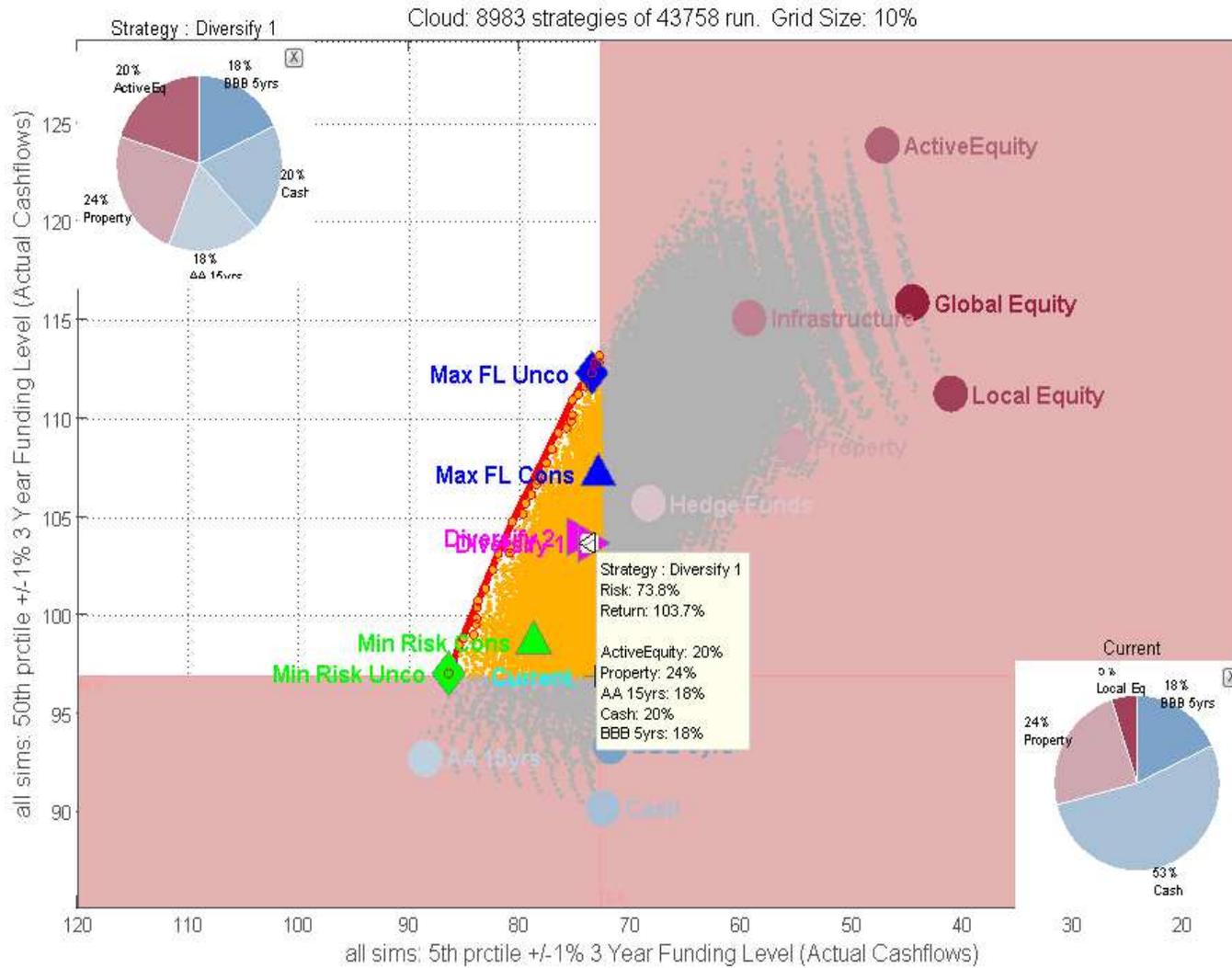
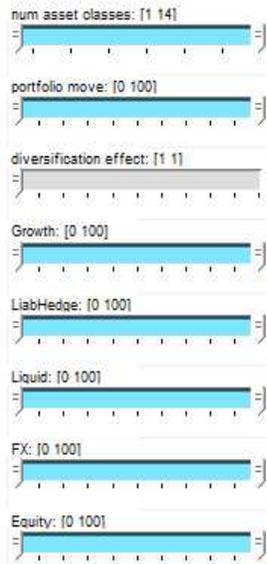


- Can we achieve the same FL as the current strategy but with less risk within the constraints?
- The Min Risk strategy (in green above) maintains the FL at 97% FL (the same as the FL of the current strategy) but reduces the risk.

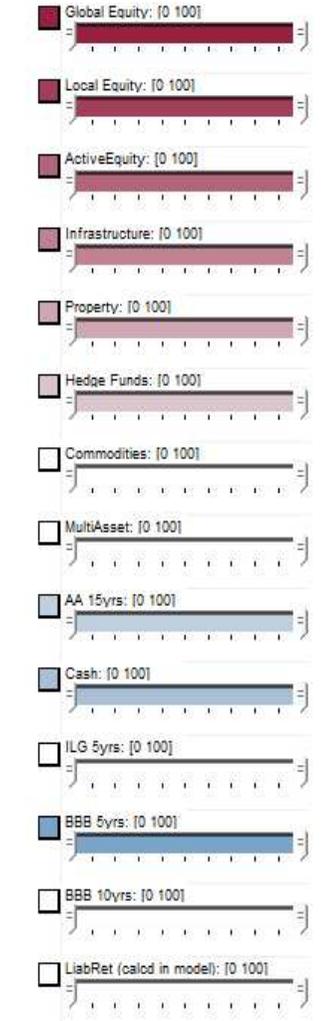
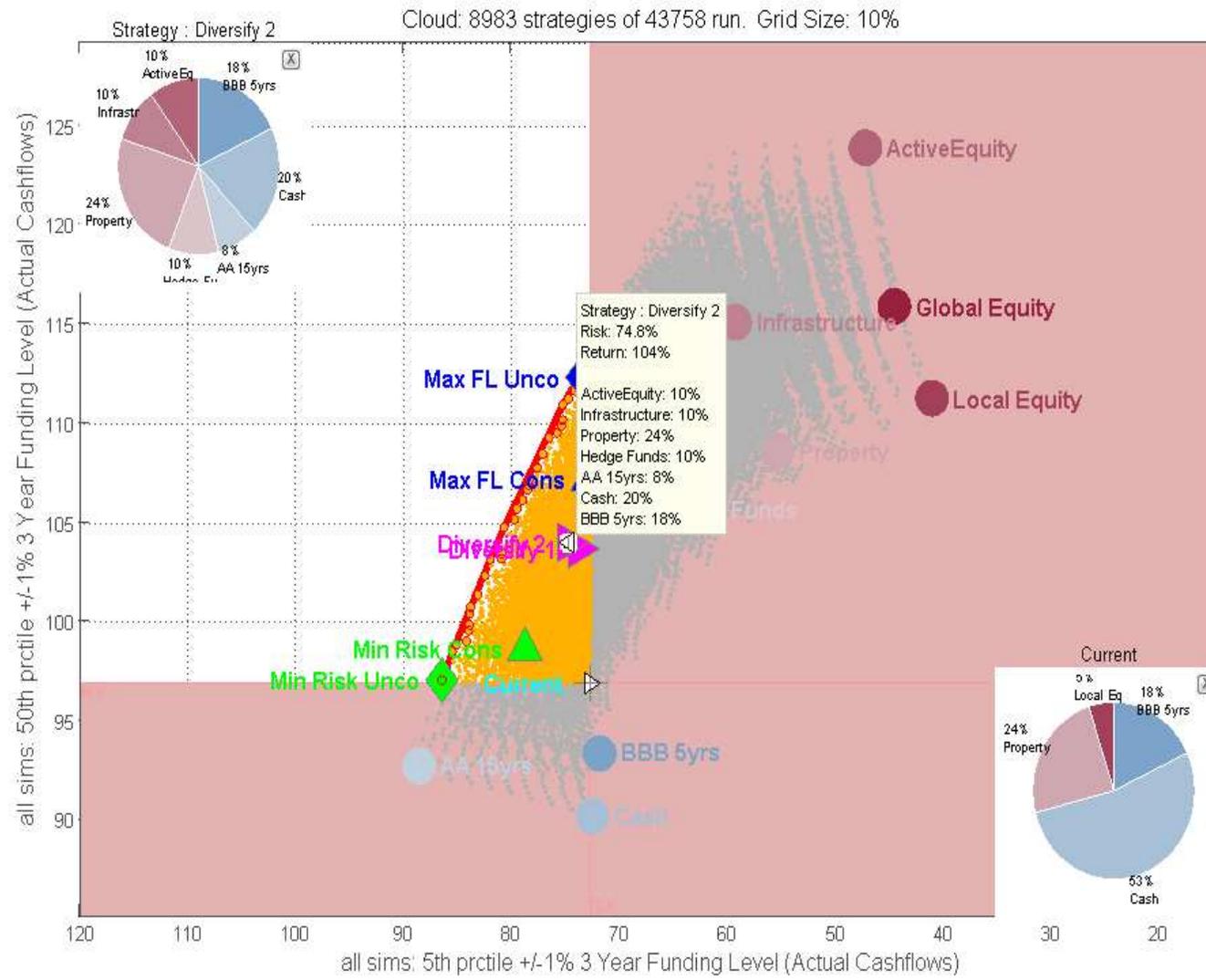
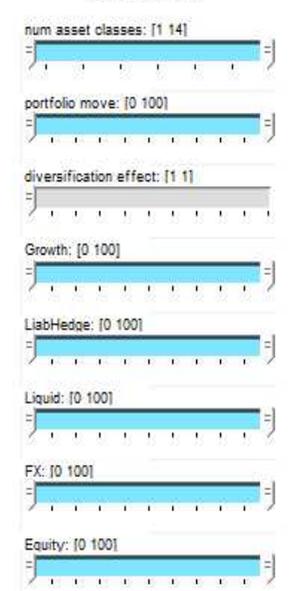
Summary of results after constraints

Asset Class	Current Strategy	Constrained Max Return Strategy	Constrained Min Risk Strategy
Local Equities	5%	0%	0%
Local Bonds	18%	20%	20%
Active Global Equities	0%	10%	0%
Infrastructure	0%	30%	10%
Property	24%	20%	20%
Hedge Funds	0%	0%	0%
Eurozone Corp Bonds AA 15+	0%	0%	30%
Cash	53%	20%	20%
TOTAL	100%	100%	100%
Expected FL in 3 years	97%	107%	99%
Expected FL at 5% level in 3 years (worst)	73%	73%	79%

Exploring other optimal strategies



Exploring other optimal strategies cont...

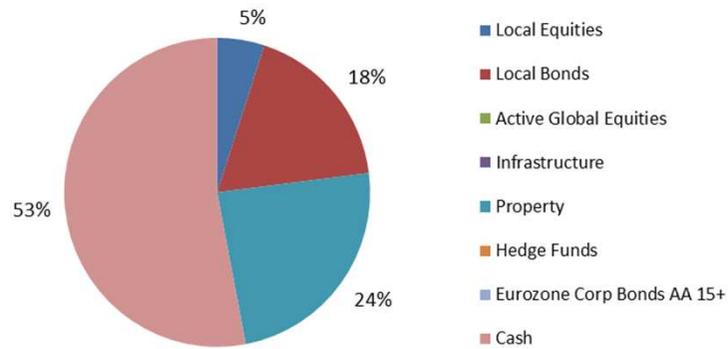


Final results

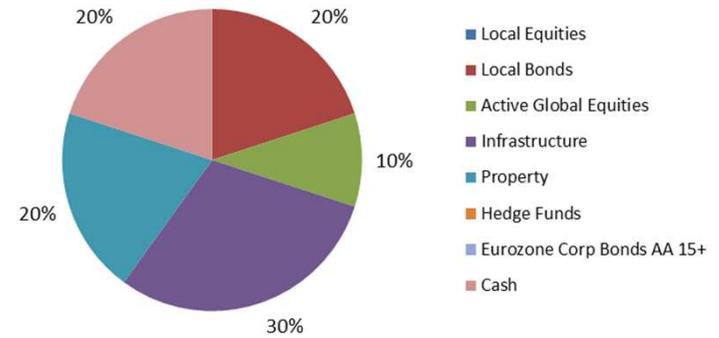
Asset Class	Current Strategy	Constrained Max Return Strategy	Constrained Alternative 1	Constrained Alternative 2	Constrained Min Risk Strategy
Local Equities	5%	0%	0%	0%	0%
Local Bonds	18%	20%	18%	18%	20%
Active Global Equities	0%	10%	20%	10%	0%
Infrastructure	0%	30%	0%	10%	10%
Property	24%	20%	24%	24%	20%
Hedge Funds	0%	0%	0%	10%	0%
Eurozone Corp Bonds AA 15+	0%	0%	18%	8%	30%
Cash	53%	20%	20%	20%	20%
TOTAL	100%	100%	100%	100%	100%
Expected FL in 3 years	97%	107%	104%	104%	99%
Expected FL at 5% level in 3 years (worst)	73%	73%	74%	75%	79%
Expected Annualised return over 3 years	2,4%	5,5%	4,3%	4,7%	2,8%
Expected Ann Return at 5% level in 3 years (worst)	-3,1%	-4,0%	-4,5%	-3,5%	-3,3%

Final results cont...

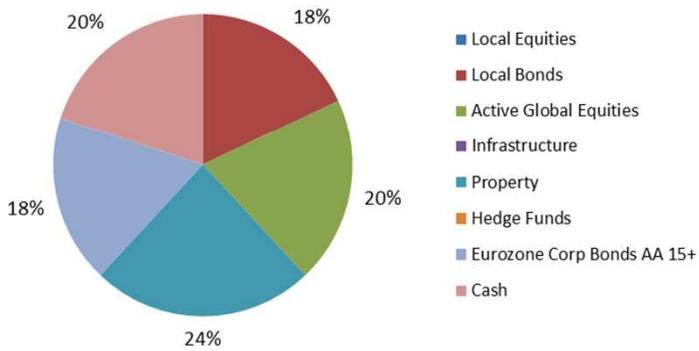
Current Strategy



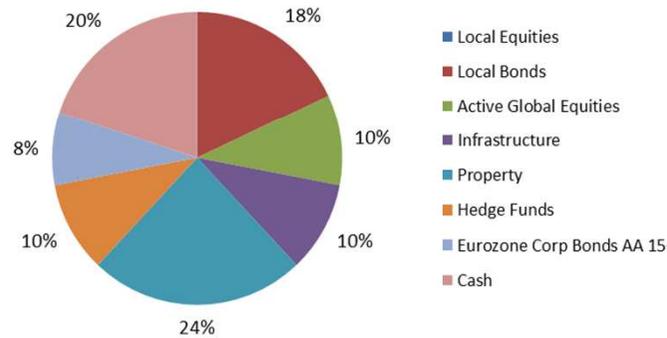
Constrained Max Return Strategy



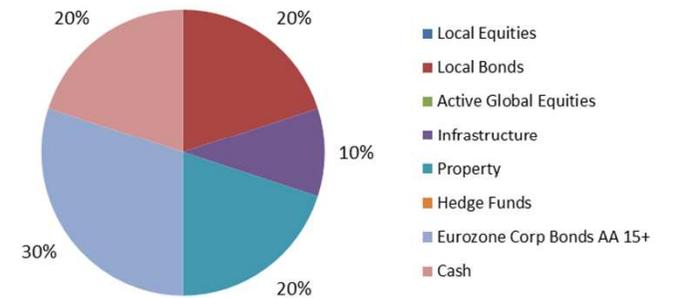
Constrained Alternative 1



Constrained Alternative 2



Constrained Min Risk Strategy



A word on Diversification... Three of the Largest Funds in the World - Overview

Stitching Pensioenfonds ABP

- > Pension fund for employers and employees in service of the Dutch government and the educational sector
- > 2,8 million customers have the assurance of income security against disability, death and pension
- > Largest pension fund in Europe - invested capital of €286 billion as at 30 June 2013

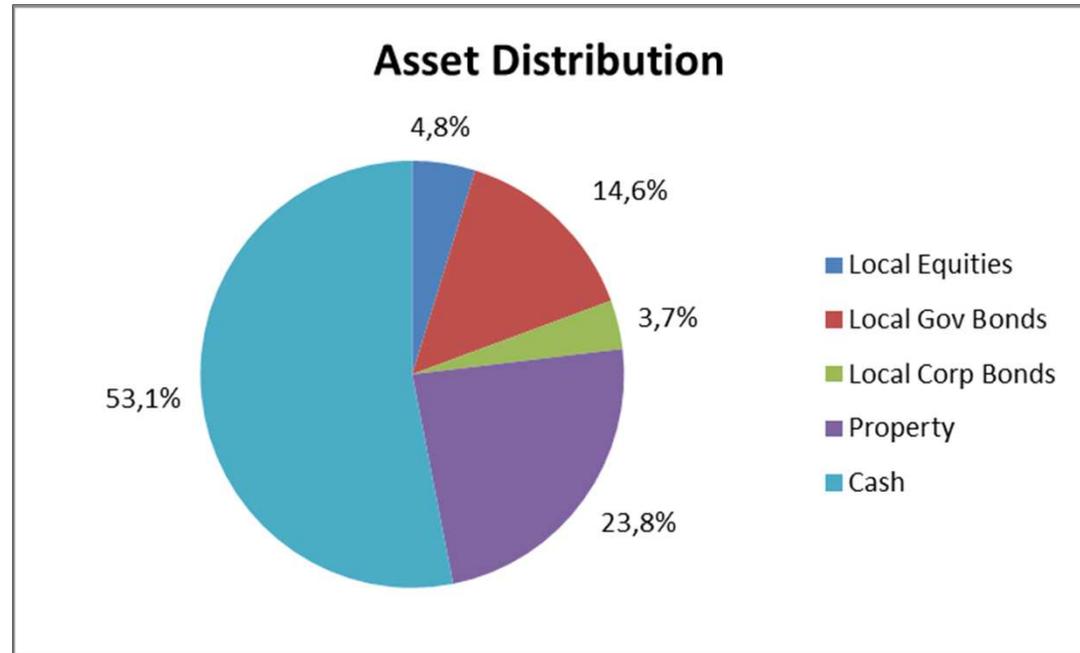
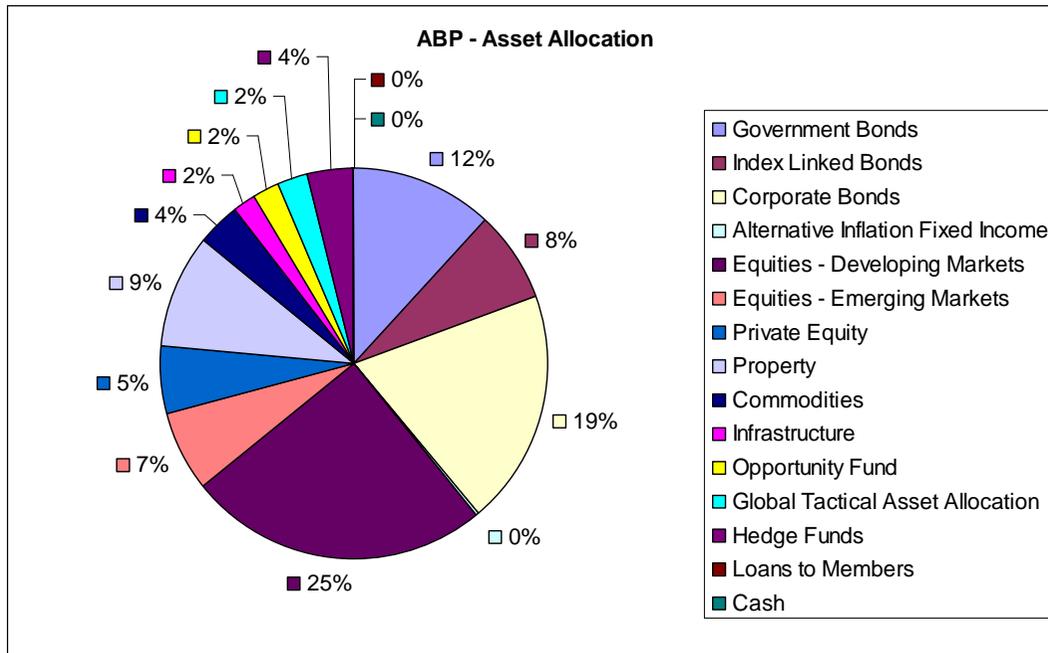
CalPERS - California Public Employees' Retirement System

- > Manages pension and health benefits for more than 1,6 million California public employees, retirees, and their families
- > As of 31 March 2011 - the largest public pension fund in the United States with \$262,7 billion in assets as at 25 July 2013

ADIA - Abu Dhabi Investment Authority

- > Globally diversified investment institution that is wholly owned by the Government of Abu Dhabi
- > World's largest Sovereign Wealth Fund with \$627 billion of assets

A word on Diversification... Three of the Largest Funds in the World - Overview



- The portfolio of ABP is clearly much more diversified than that of CYTA
- CYTA invests in 4 asset classes / ABP invests in 13 asset classes / styles
- CYTA has no exposure to: Global Equity, Global Bonds, Global Property, Private Equity, Commodities, Infrastructure, Hedge Funds
- **VISION STATEMENT: Develop the CYTA Pension Fund into a world-class global investor through the implementation of best-practice investment management processes**
- **=> Diversify by moving to gradual Implementation**

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1. Introduction & Executive Summary
2. Actuarial Valuation as at 31 December 2010 and other Statistics
3. Asset-Liability Modelling: Results & Recommendations
4. Next Steps
5. Appendix

Next Steps

- ▣ Decide Strategic Asset Allocation
- ▣ Prepare Statement of Investment Principles
- ▣ Asset Class Strategies
- ▣ Consider implementation plan:
 - Selection of fund managers
 - Implementation of selected fund managers
 - Continuous monitoring of performance

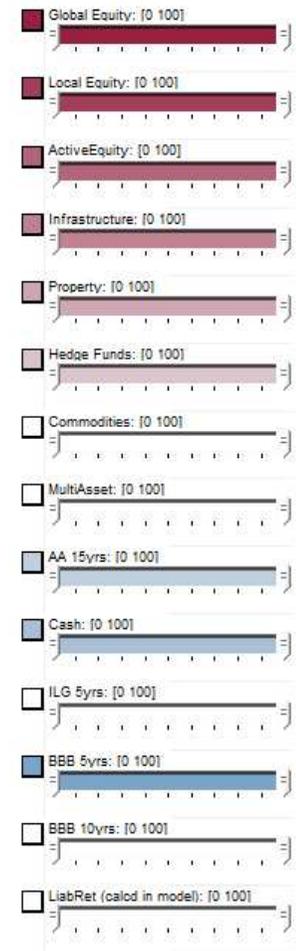
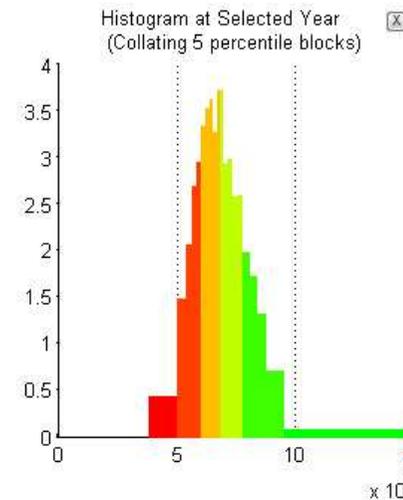
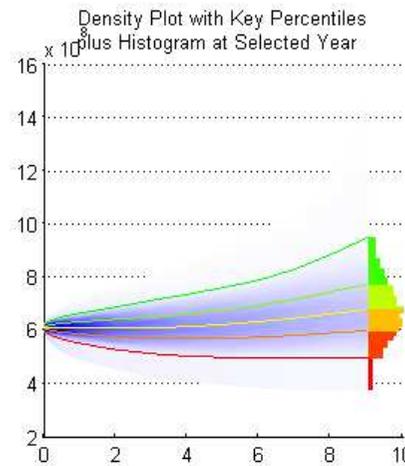
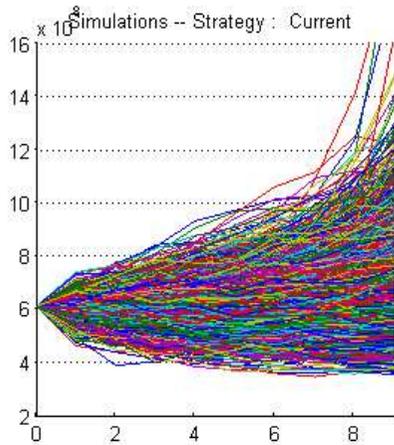
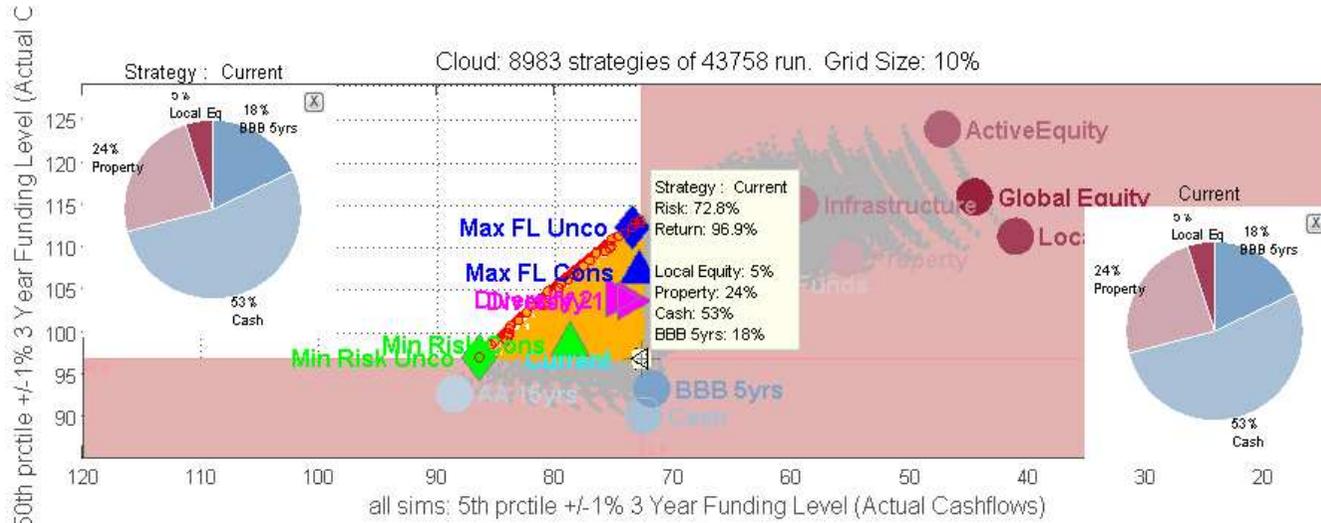
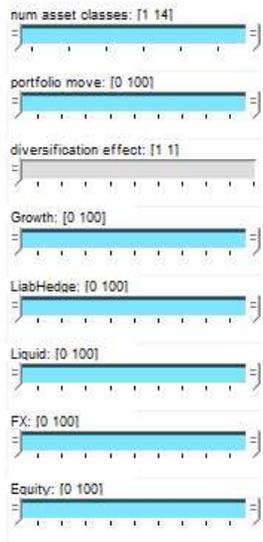
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Risk Statistics

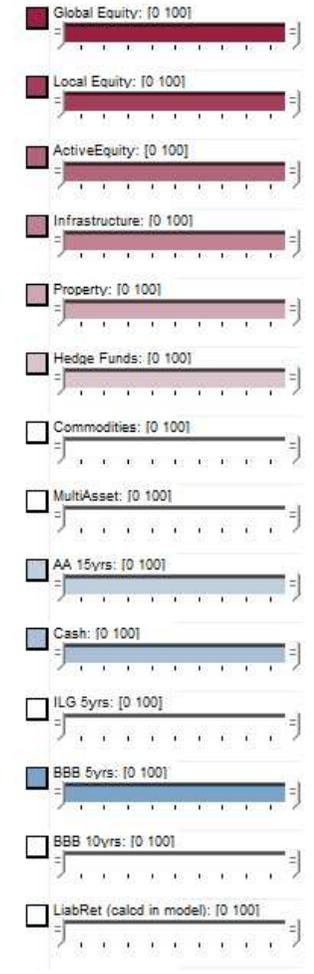
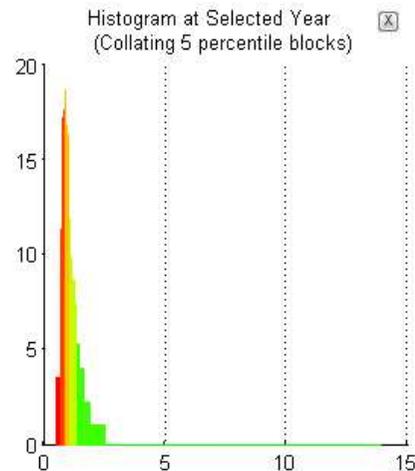
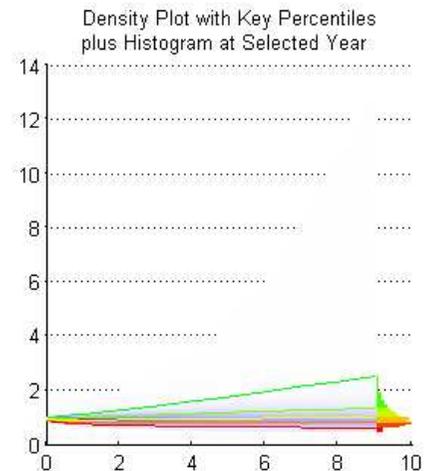
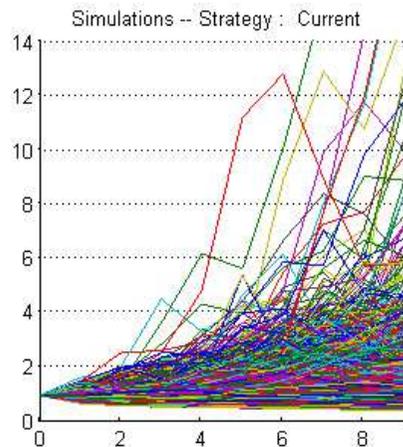
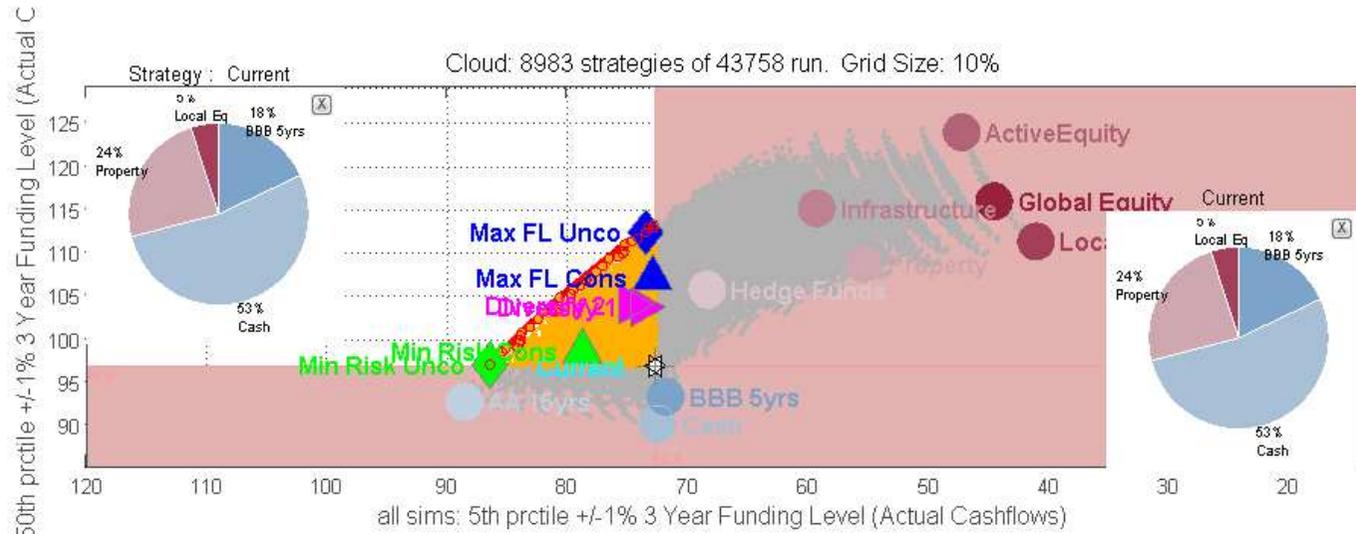
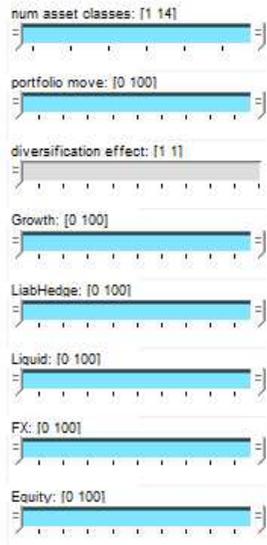
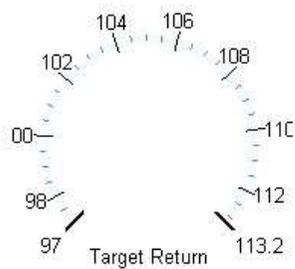
Distribution of results: Current Strategy

➤ Assets simulation



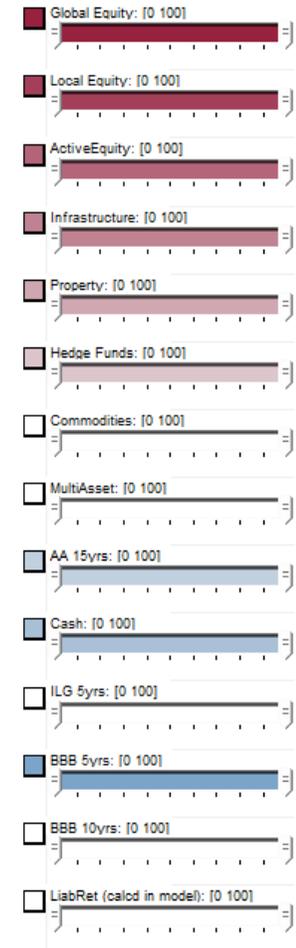
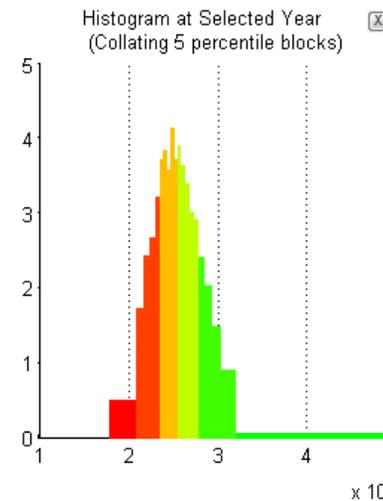
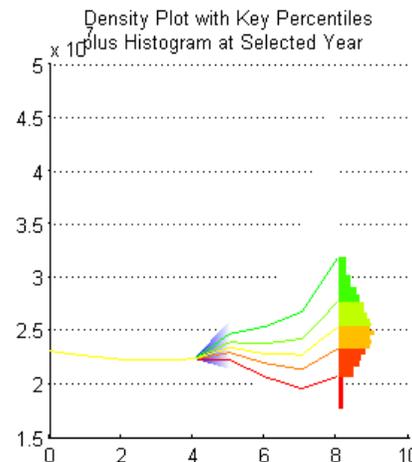
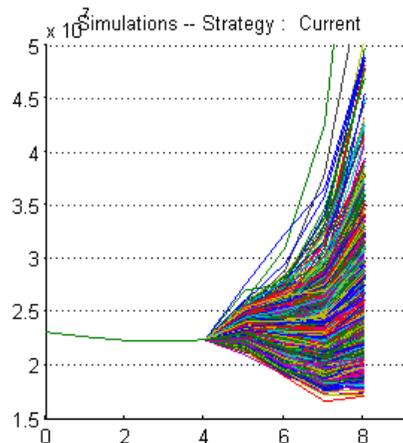
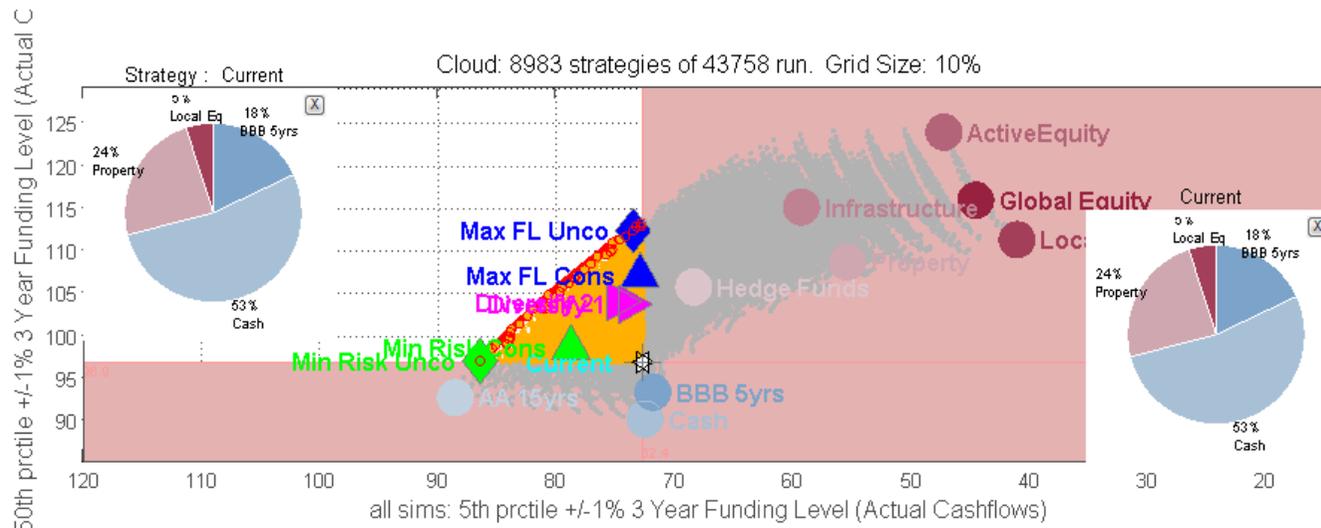
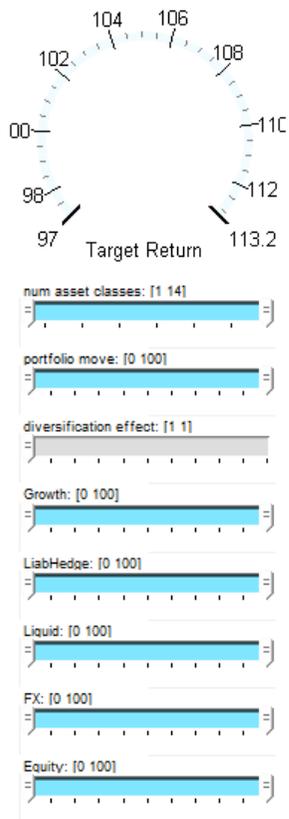
Distribution of results: Current Strategy

➤ Funding Level simulation



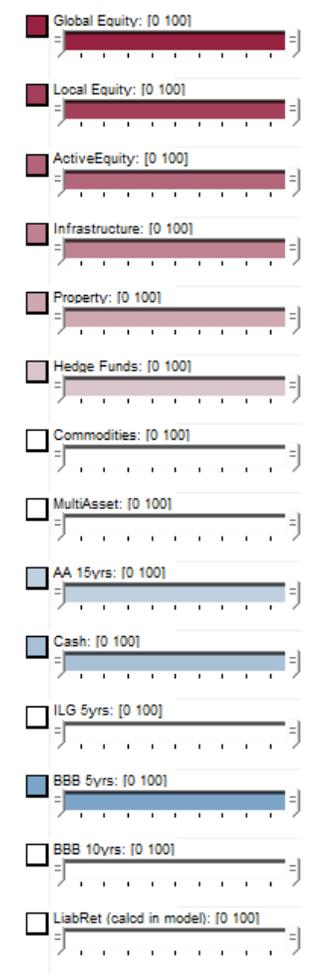
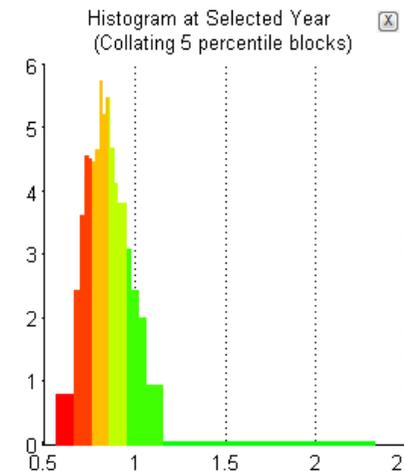
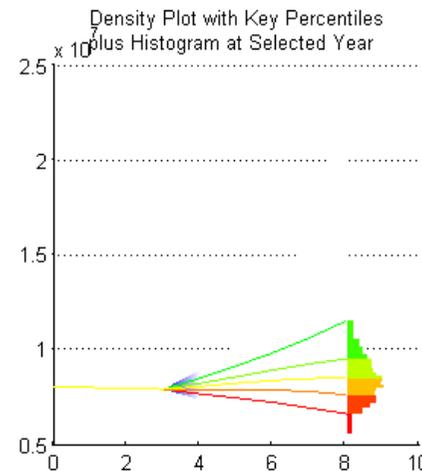
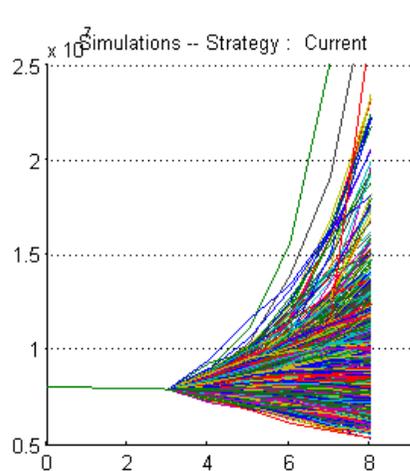
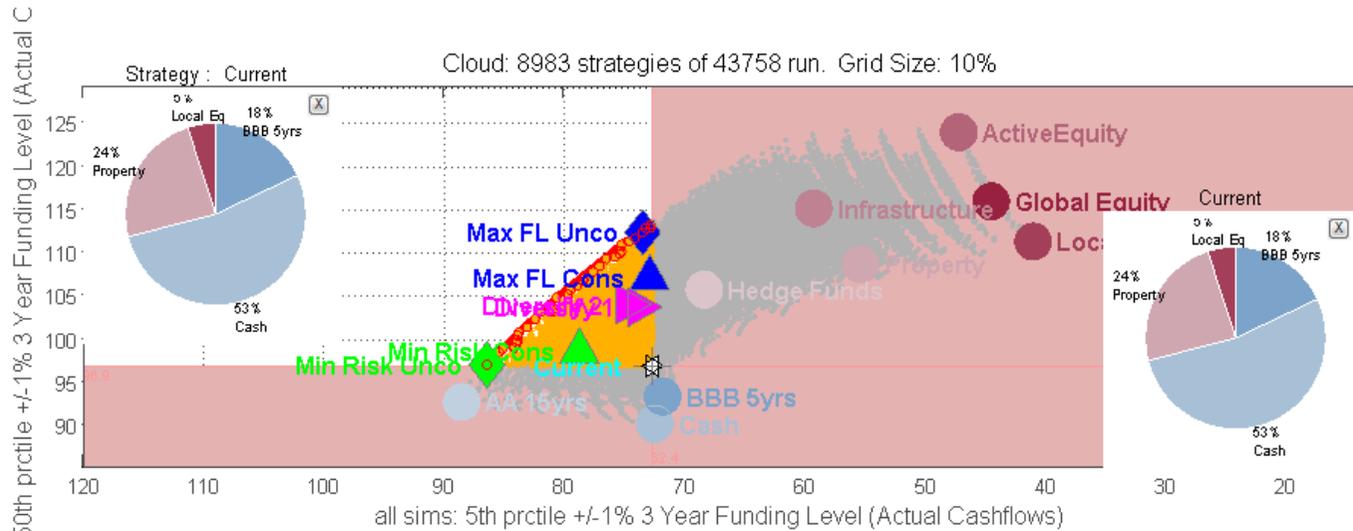
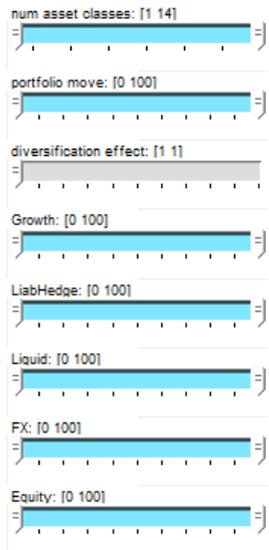
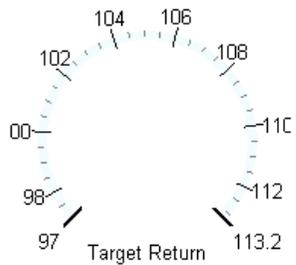
Distribution of results: Current Strategy

➤ Benefits simulation



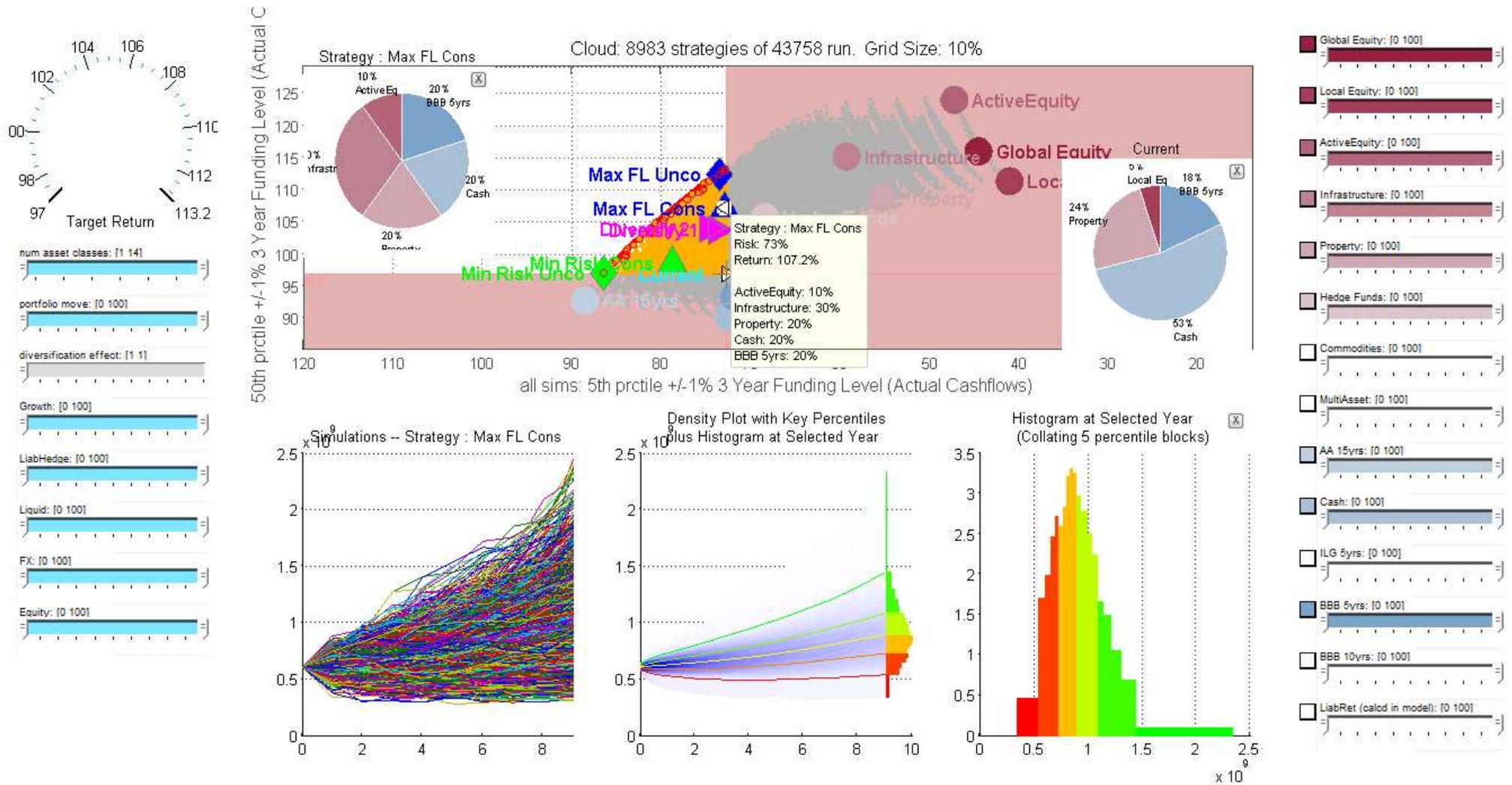
Distribution of results: Current Strategy

➤ Contributions simulation



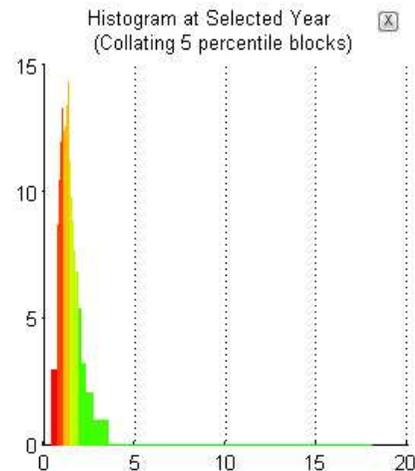
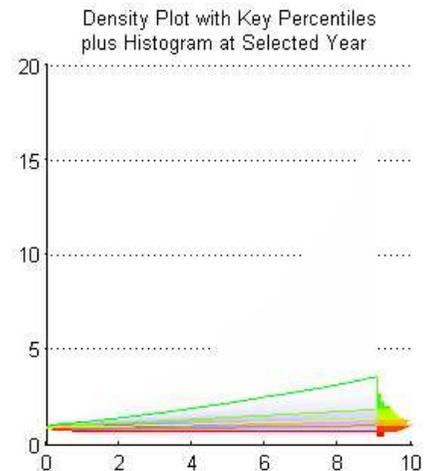
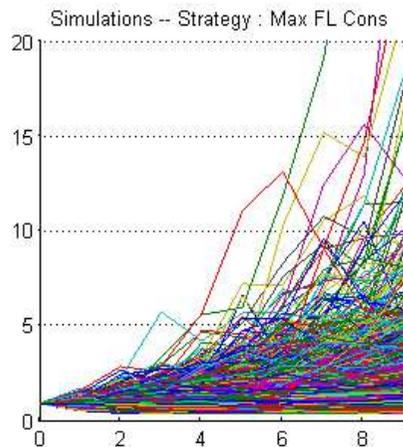
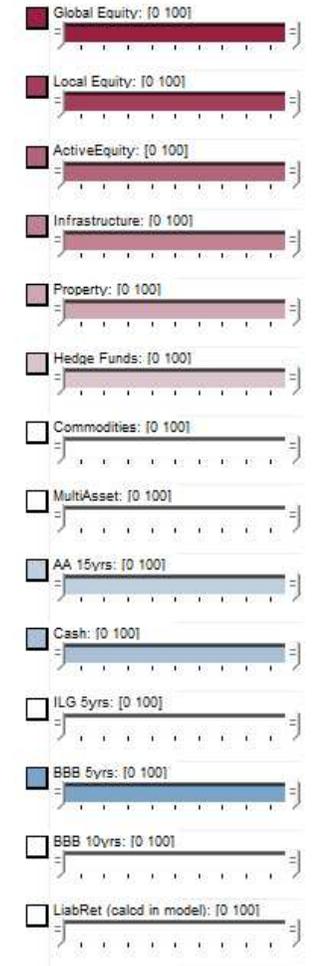
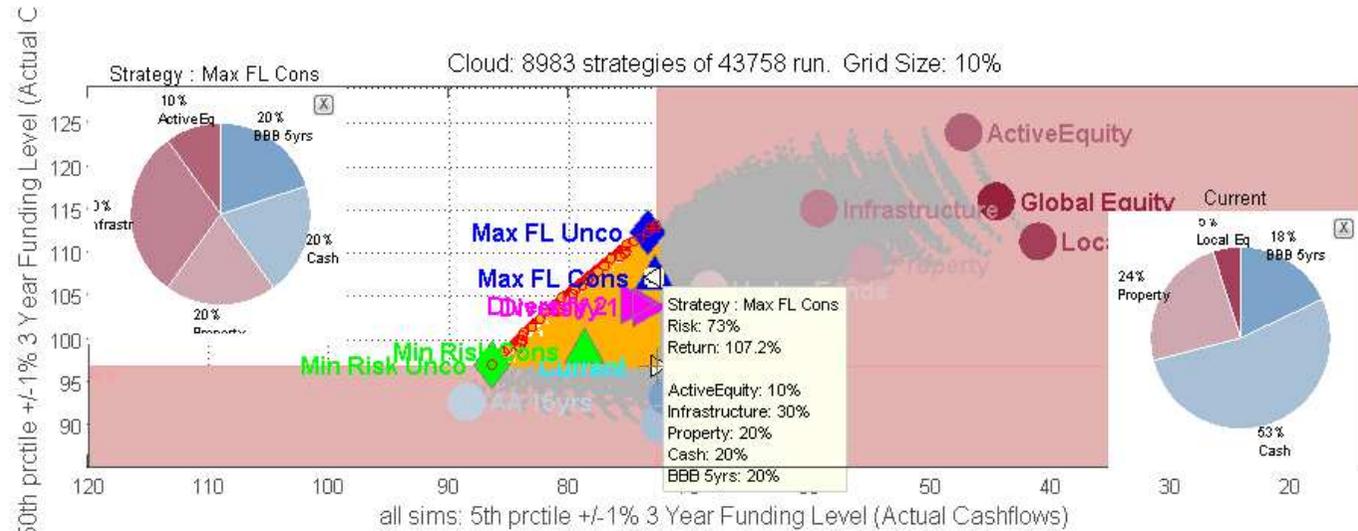
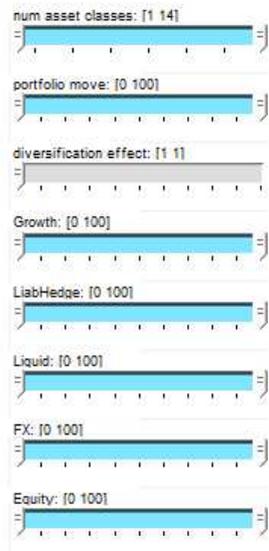
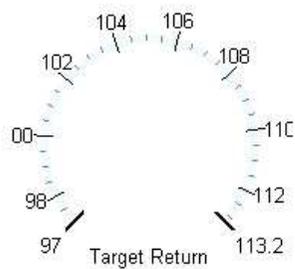
Distribution of results: Maximum Funding Level Constrained Strategy

➤ Assets simulation



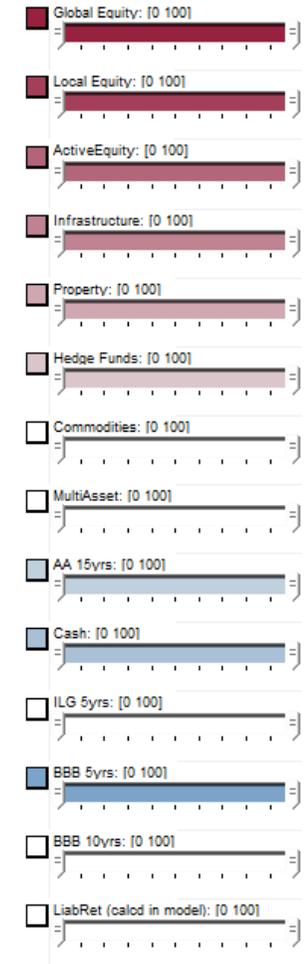
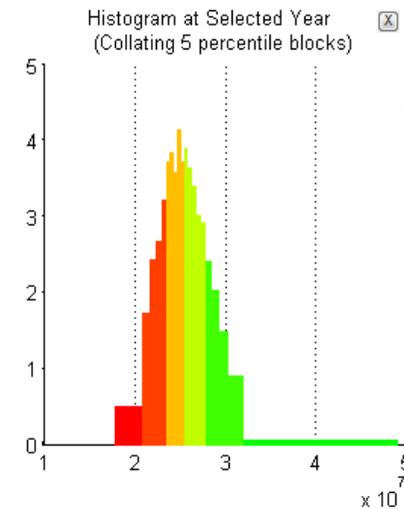
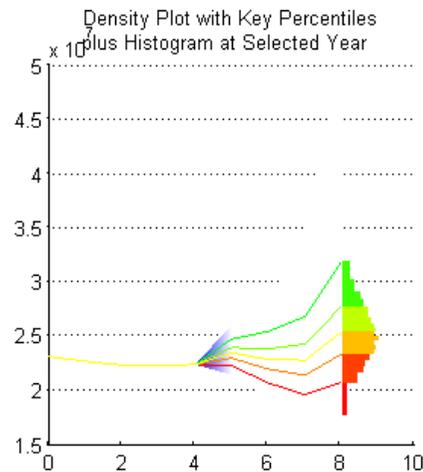
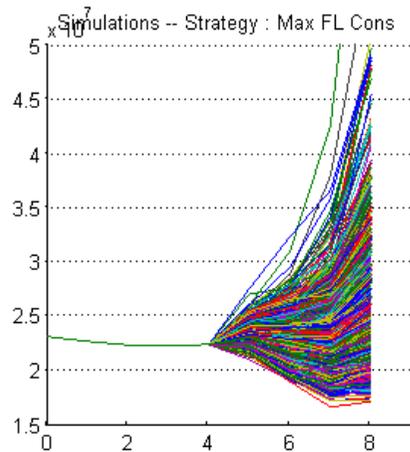
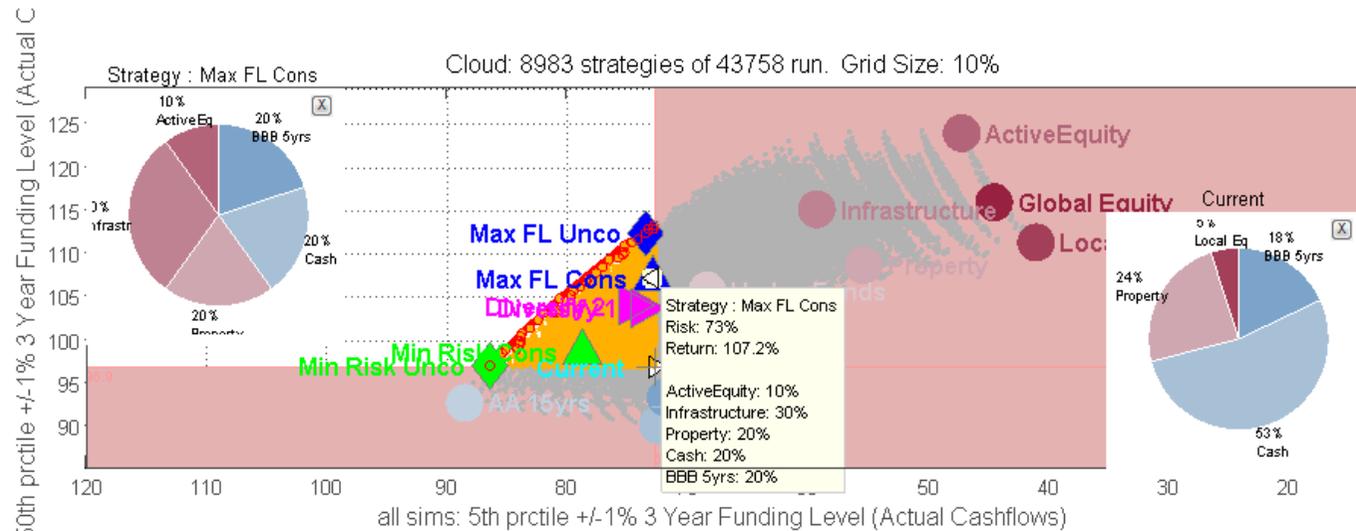
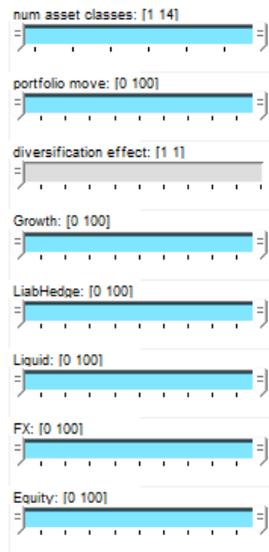
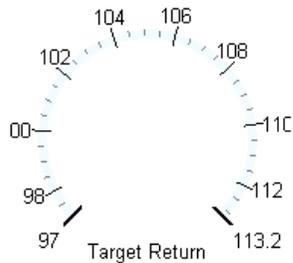
Distribution of results: Maximum Funding Level Constrained Strategy

➤ Funding Level simulation



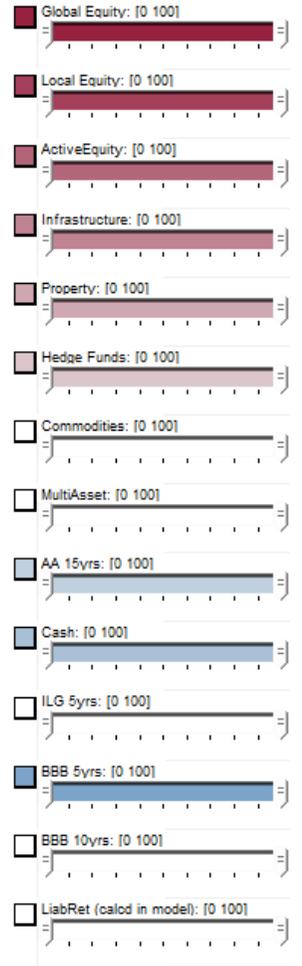
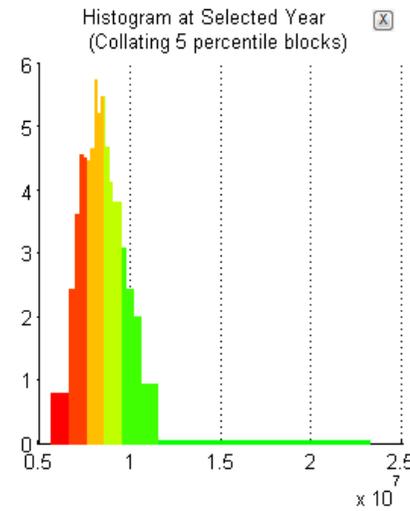
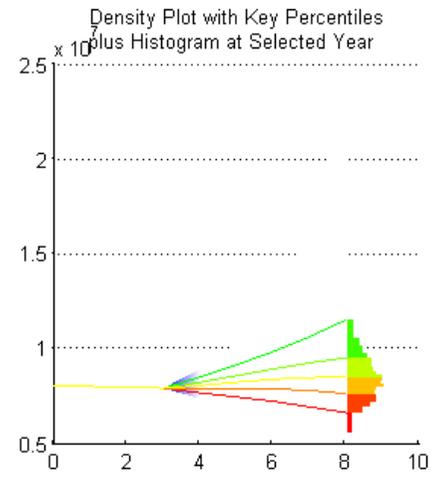
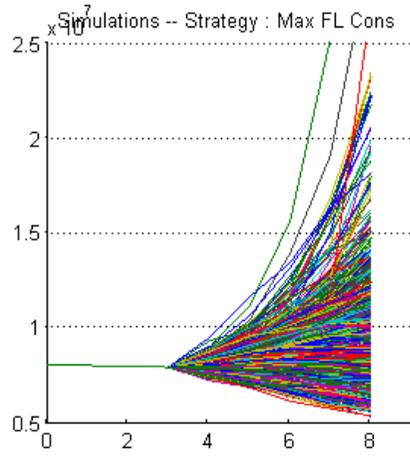
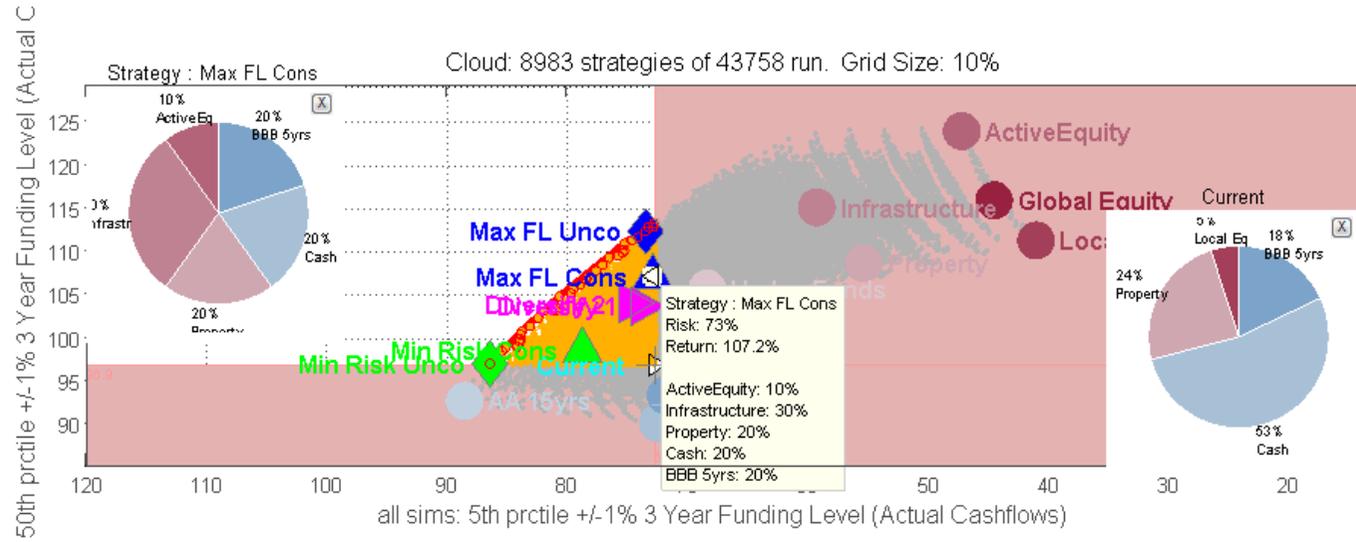
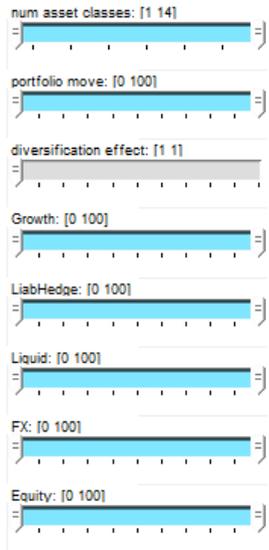
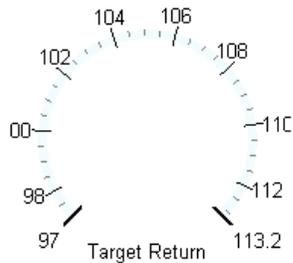
Distribution of results: Maximum Funding Level Constrained Strategy

➤ Benefits simulation



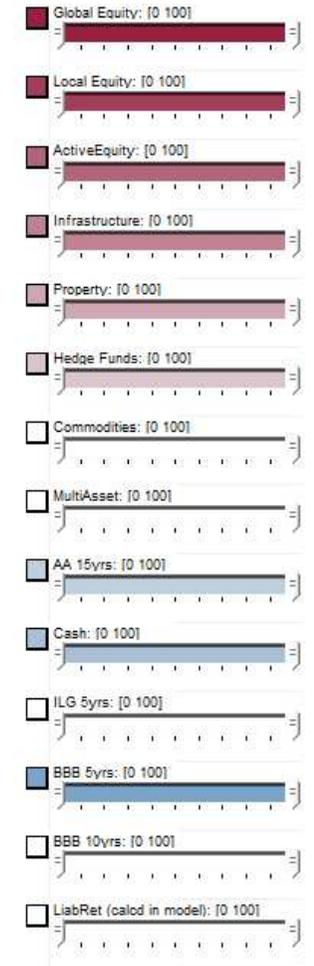
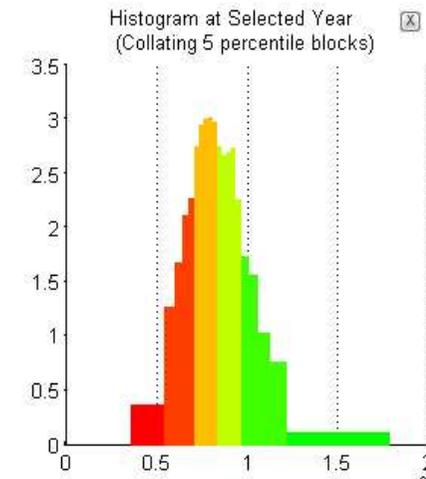
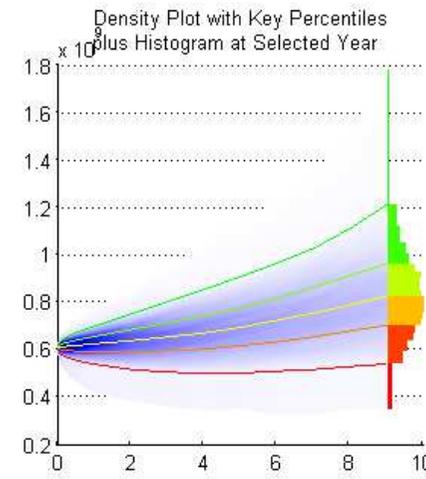
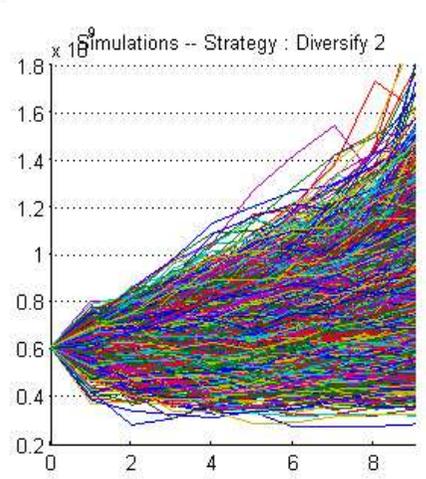
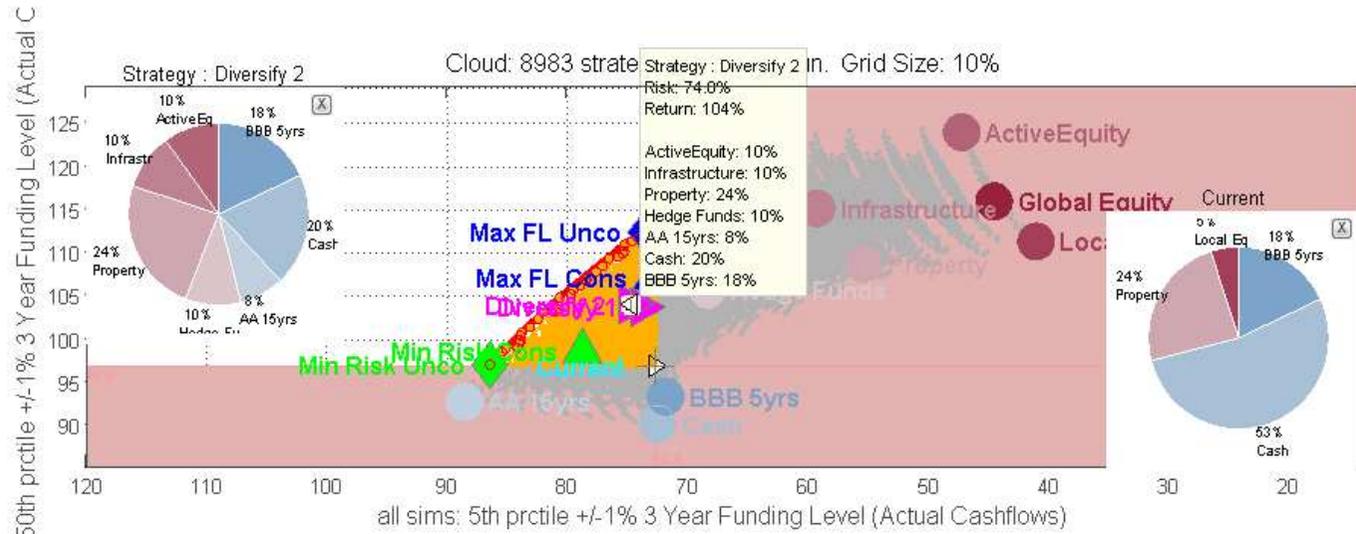
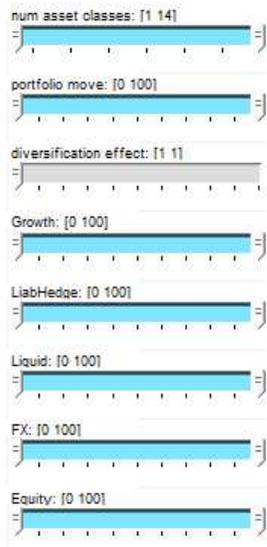
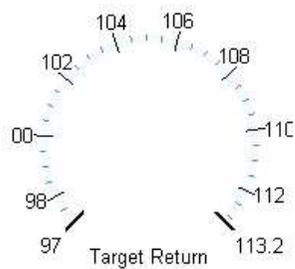
Distribution of results: Maximum Funding Level Constrained Strategy

Contributions simulation



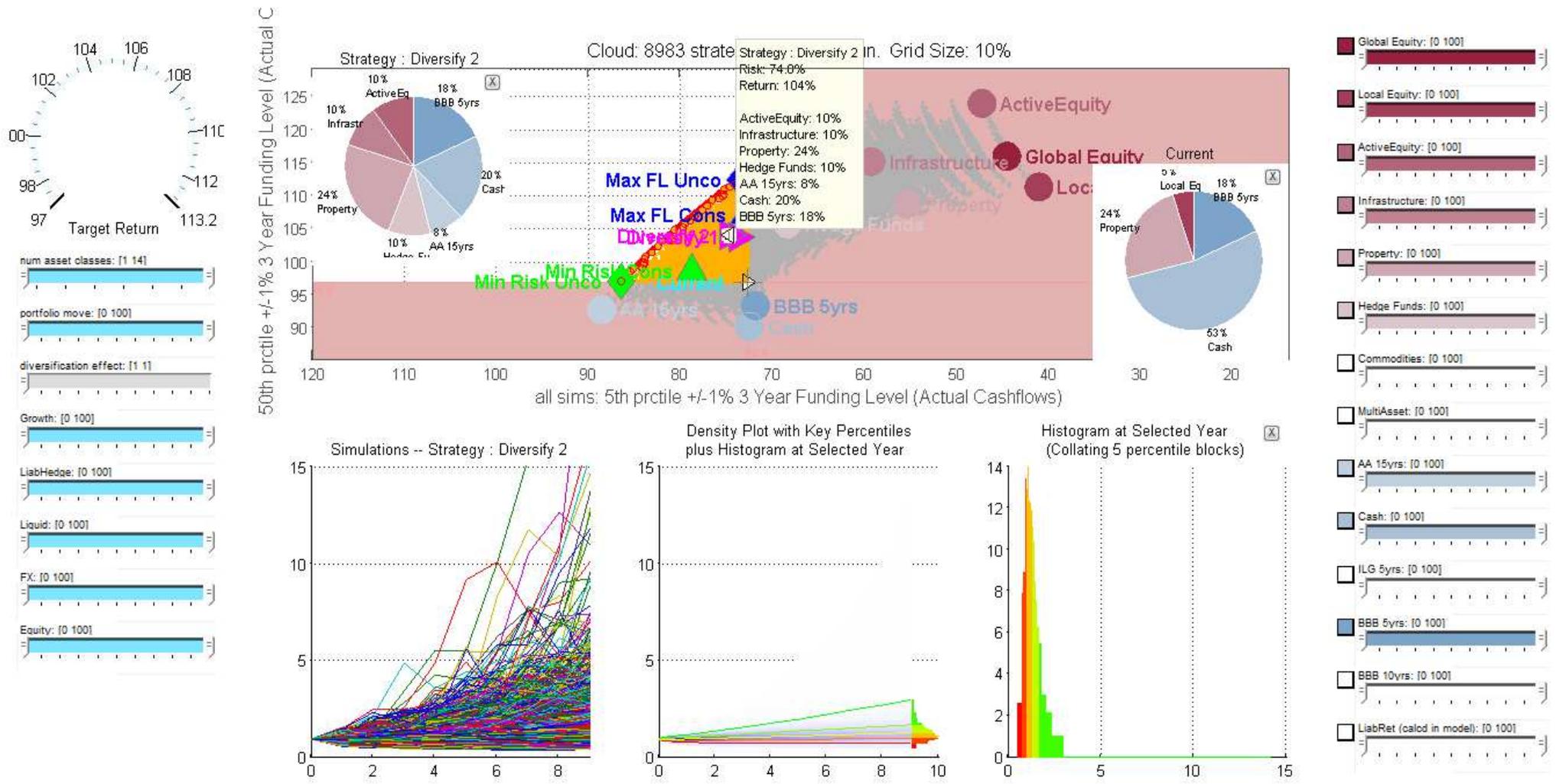
Distribution of results: Constrained Alternative 2 Strategy

➤ Assets simulation



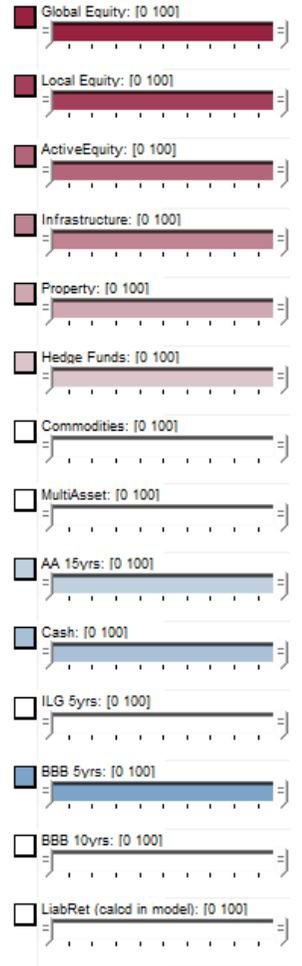
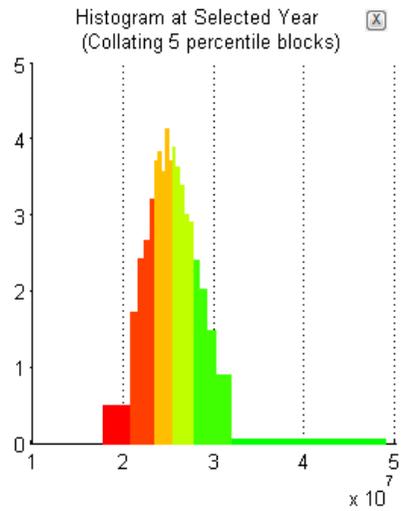
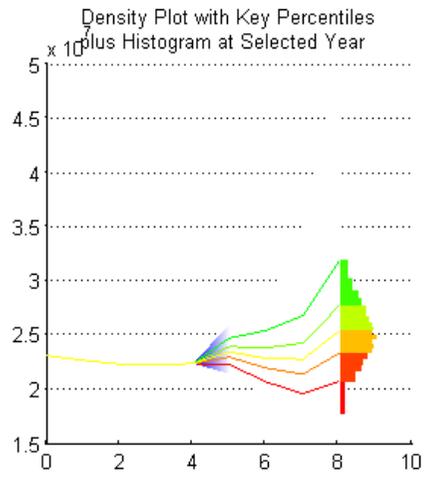
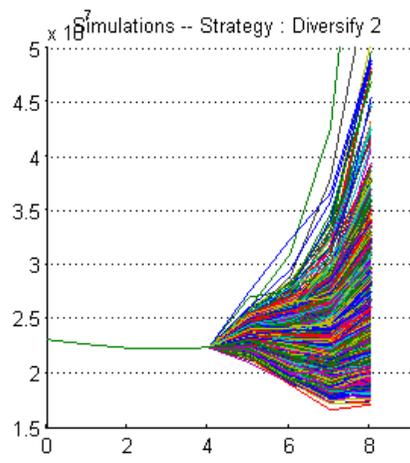
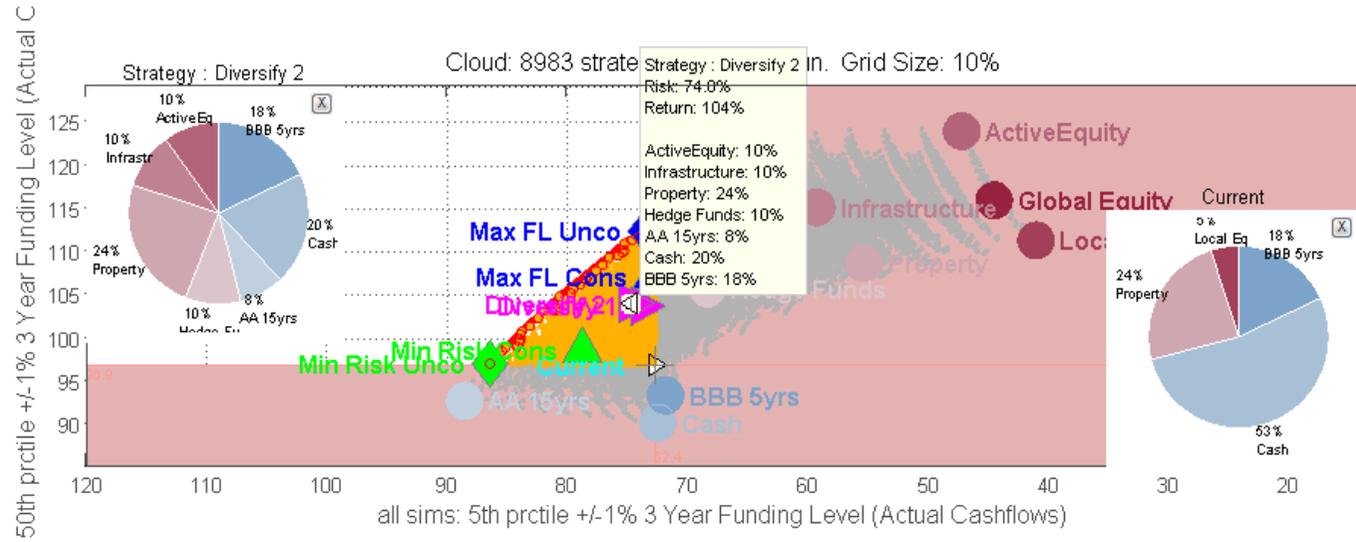
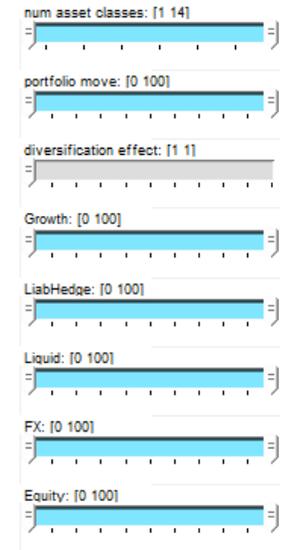
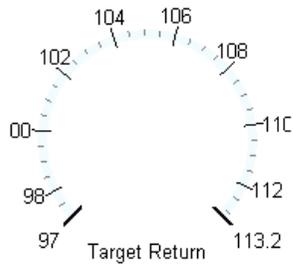
Distribution of results: Constrained Alternative 2 Strategy

➤ Funding Level simulation



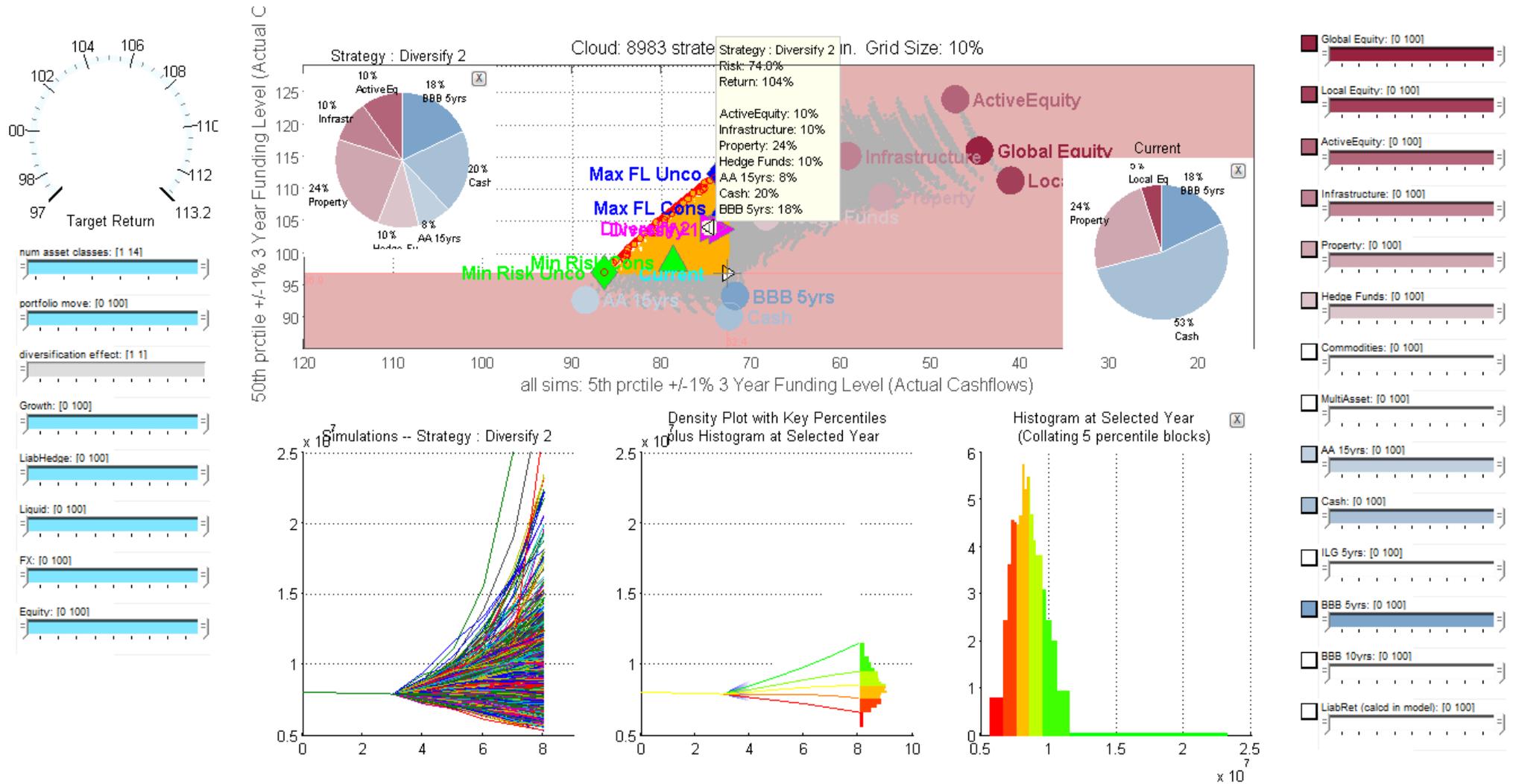
Distribution of results: Constrained Alternative 2 Strategy

➤ Benefits simulation



Distribution of results: Constrained Alternative 2 Strategy

Contributions simulation



Asset Liability Modelling: Introduction

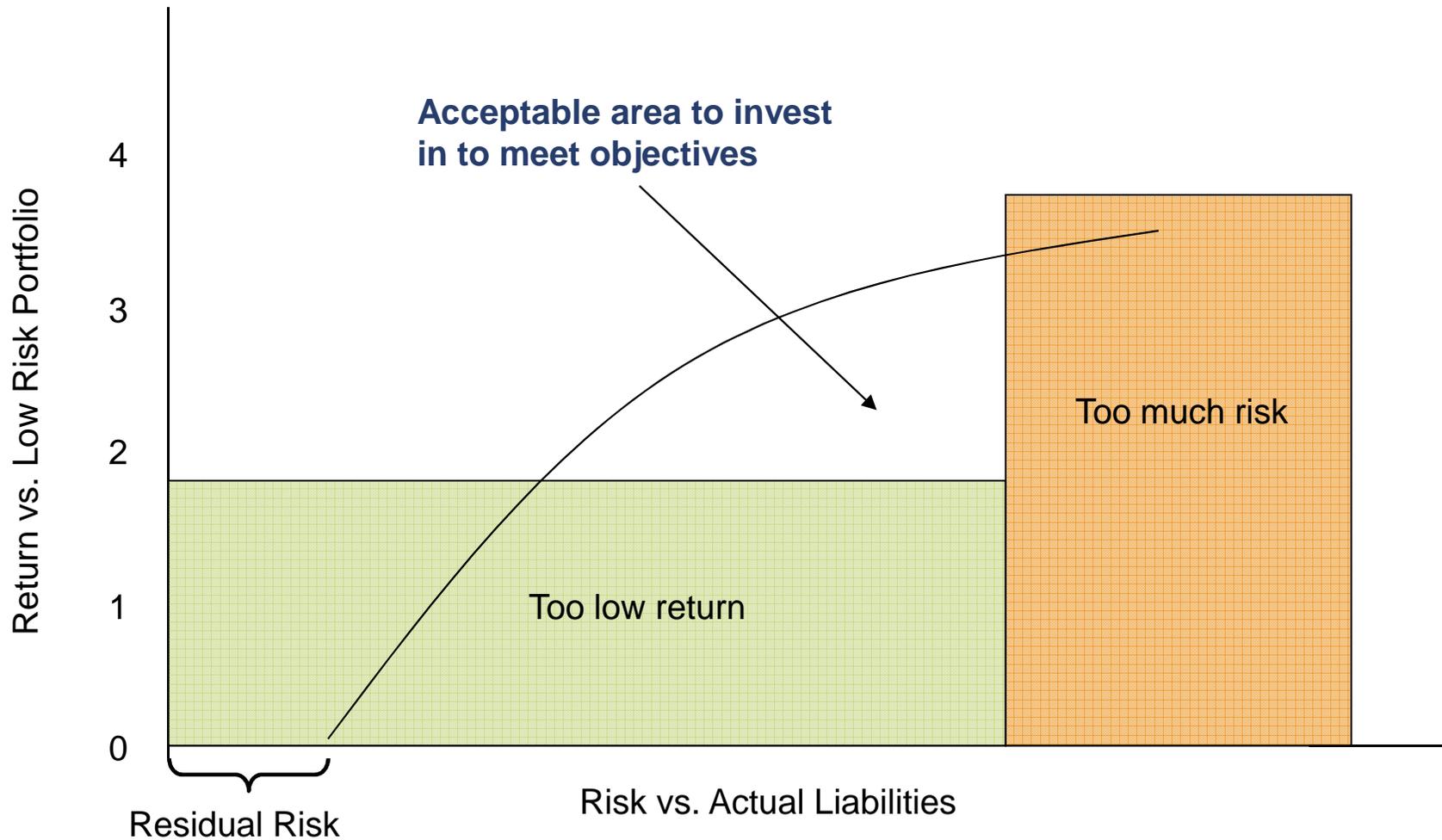
Asset-Liability Modelling

Asset liability modelling is a tool to help Trustees assess:

- ▣ What is the lowest risk portfolio
- ▣ The impact of including several asset classes (such as equities, bonds, cash etc.)
- ▣ The interplay between risk and return
- ▣ Analysing risk metrics such as the funding level impact on expected rate of returns
- ▣ The financial efficiency of possible investment strategies

Asset-Liability Modelling

- ALM helps set tolerances



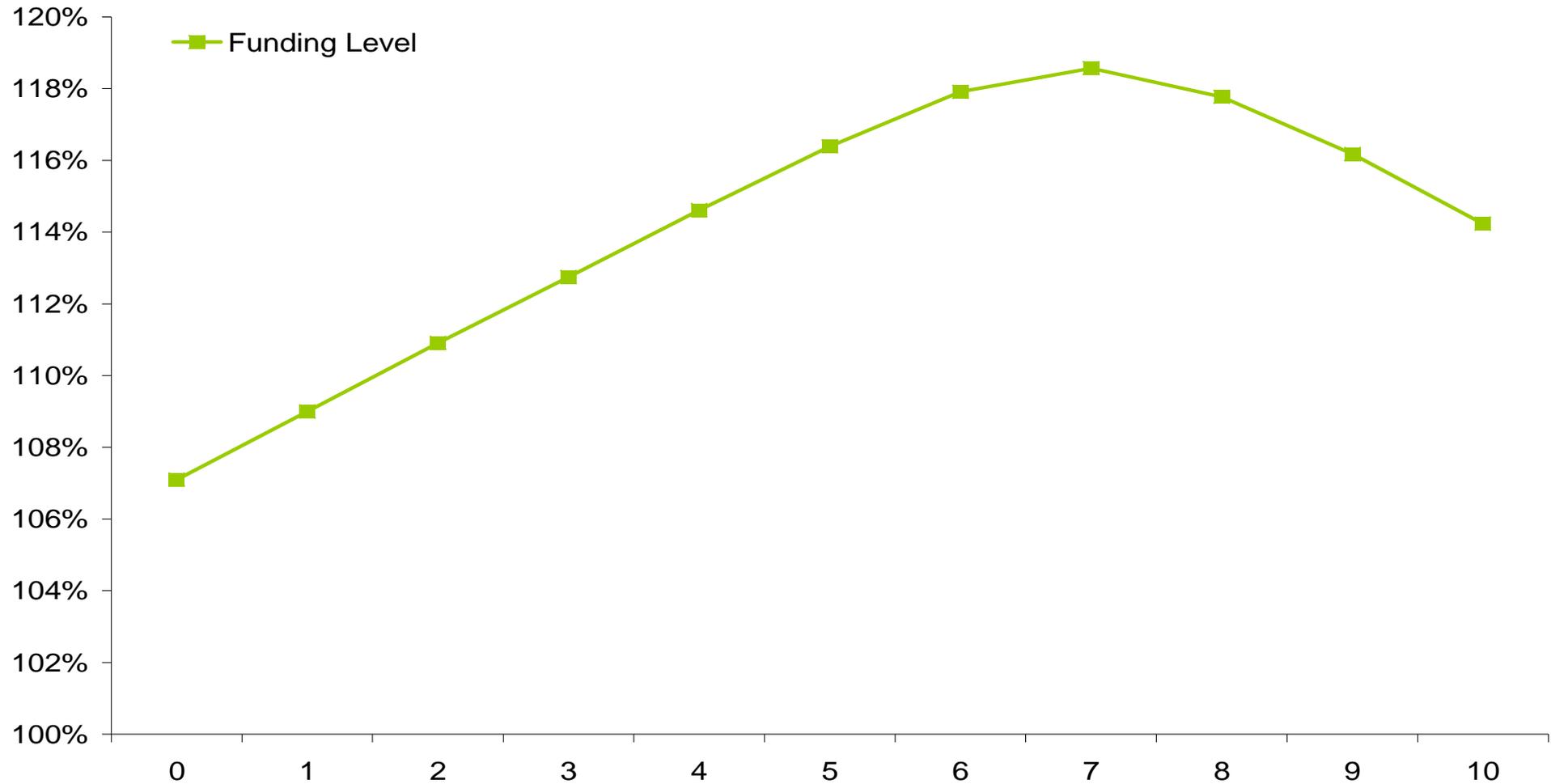
Asset-Liability Modelling

The Process

- ▶ Make a series of financial and demographic assumptions
- ▶ Project Pension Fund's assets and liabilities on a consistent basis
- ▶ Projection over the next 3 – 10 years
- ▶ Perform over 5,000 simulations
- ▶ Repeat for different scenarios
- ▶ Allow for specifics of the Pension Fund based on the last actuarial valuation
- ▶ Assume contributions paid in accordance with the agreement

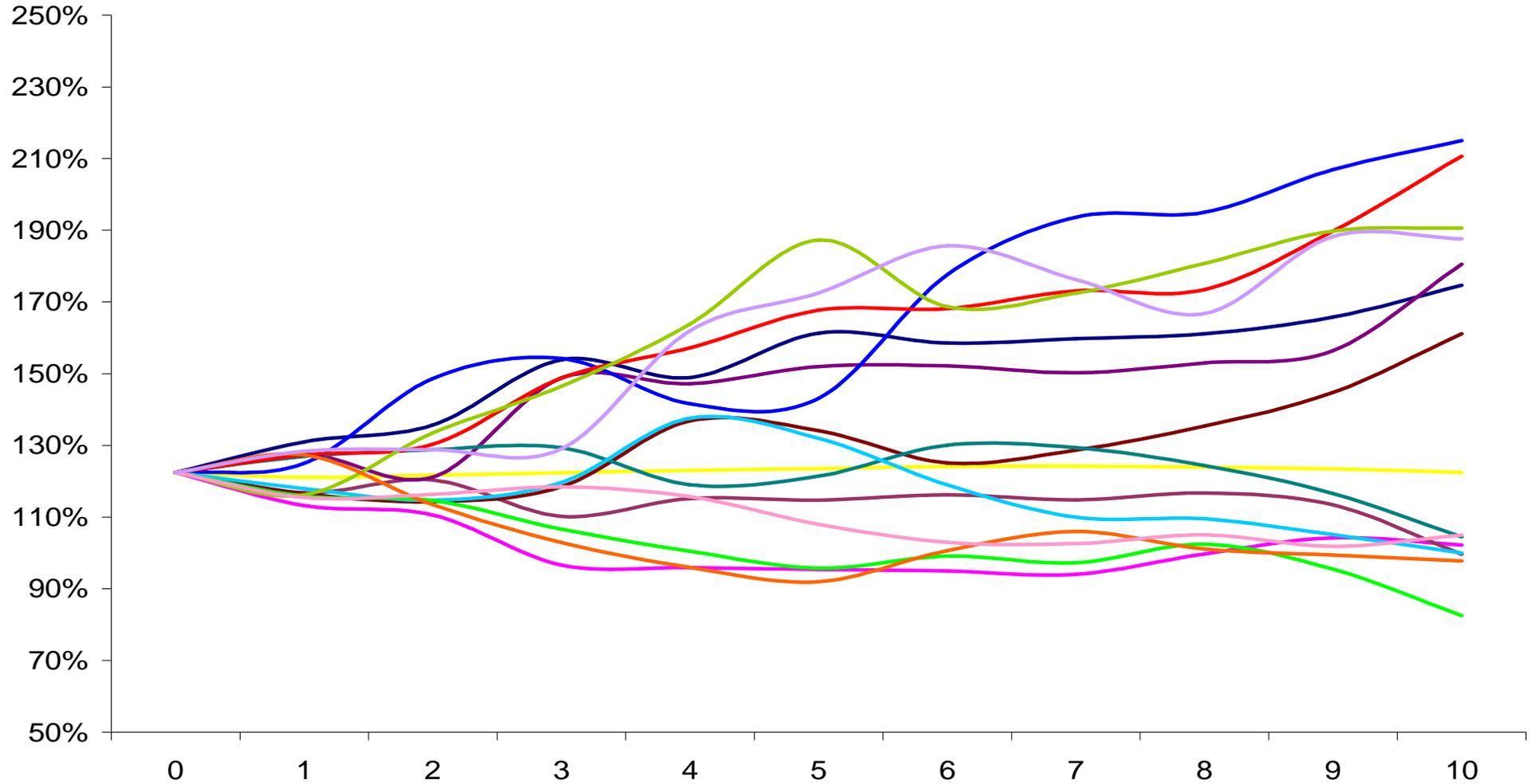
Asset-Liability Modelling

▣ Example of a deterministic 'run'



Asset-Liability Modelling

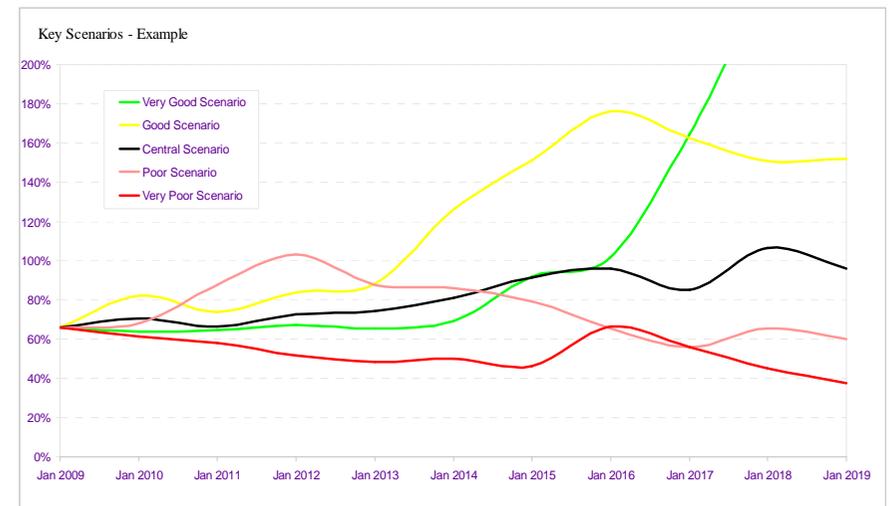
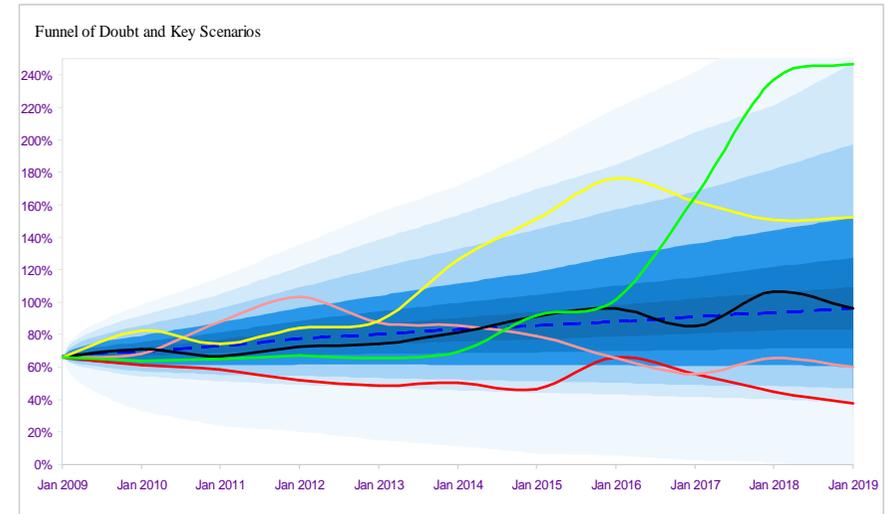
Example of a stochastic (ALM) 'run'



Asset-Liability Modelling

Scenarios

- For each key financial measure we rank simulations in ascending order, how the results in the form of five scenarios
 - Very good** - expect 95% of the results to lie below i.e. a 1 in 20 chance of the result being as good or better
 - Good** - expect 83% of the results to lie below it i.e. a 1 in 6 chance of the result being as good as this or better
 - Central** - the central result, so that half the results are expected to be better and half worse.
 - Poor** - expect 83% of the results to lie above it i.e. a 1 in 6 chance of the result being as bad as this or worse
 - Very poor** - expect 95% of the results to lie above it i.e. a 1 in 20 chance of the result being as bad as this or worse
- The path of a given outcome will follow a much less smooth pattern however, as illustrated by the five scenarios.
- Note that a given poor scenario for one strategy may be a good scenario for a different strategy, and that a good scenario at a point in time may be poor at another.



Asset Classes

Asset Classes – Global Equities

- ▶ An equity is a share in **listed** companies on stock markets of developed countries:
 - **Global** equity includes every (developed) country worldwide including Cyprus and Greece.
 - **International** equity is equity outside the domestic market (ex-Cyprus / Greece)
 - **Emerging market** equity is equity listed on exchanges in emerging markets (e.g. Latin America, Eastern Europe)
 - ▶ Global equity behaves like domestic (Greek / Cypriot) equity, but
 - Different mix of industries and sectors reflecting world economy
 - Much more diverse, more choice, more opportunity and a more even industry spread
 - Lower market volatility in general
 - Currency (non-€) risk
- *Investing globally reduces concentration risk*

Asset Classes – Global Equities: Key features

- ▣ An investment in the future profits of listed companies
 - ▣ Financial risk: shareholders have the last claim on a company's balance sheet!
 - ▣ Very volatile performance in short-term
 - ▣ Two parts to return:
 - dividends (income) and
 - capital gain (growth)
 - ▣ For accepting equity risk, we expect to be compensated over the long-term with additional returns over bonds: the equity risk premium
- *Investing in Mutual Funds increases diversification and thus reduces risk*

Asset Classes – Global Bonds

- ▶ A bond is an investment in the debt of a listing issuer (borrower) for which the investor (lender) receives fixed interest payments (coupons) and a return of the investment (principal) on maturity.
- ▶ Bonds are issued by governments, sovereigns, public authorities, credit institutions, companies and supranational institutions.
- ▶ As with global equity, **global** bonds includes bonds issued in every (developed) country worldwide including Cyprus and Greece

→ *Investing globally reduces concentration risk*

Asset Classes – Global Bonds: Key features

- ▶ Extremely diverse set of fixed interest securities by:
 - Type (e.g. Eurobond, Index-Linked, Mortgage-Backed security, convertible)
 - Borrower
 - Currency/region
 - Credit risk (the risk that the issuer will fail to meet its obligations, indicated by credit ratings assigned by agencies such as Standard & Poor's, Moody's and Fitch)
 - Coupon and term
- ▶ Lower risk than equities: bondholders have a **prior** claim on a company's balance sheet
- ▶ Far less volatile performance than equities
- ▶ Two components to return
 - **Coupons** (income)
 - **Capital** movement (revaluation)

→ *Investing in Mutual Funds increases diversification and thus reduces risk*

Asset Classes – Property

- ▶ Institutional investment in property is typically through buildings that are for commercial use:
 - Can be extended to land or buildings that are suitable for development and residential or industrial use.
- ▶ Hence, the expected return through investing in property is derived from two sources:
 - Income (rental payments from tenants)
 - Capital appreciation of the property
- ▶ In the long term, property performance depends on rental growth, which in turn depends on demand for space generated by economic activity. In addition, social and technological change may particularly affect certain sectors.
- ▶ Property has historically been likened to equities or bonds at different times. However, the characterisation of property is made harder since it is both a ‘financial’ asset and a ‘commodity’.
- ▶ The risk-return profile of property lies between equities and bonds over the long term. As property has different return drivers to other asset classes (i.e. sector output) it can provide diversification to returns.

Asset Classes – Property: Key features

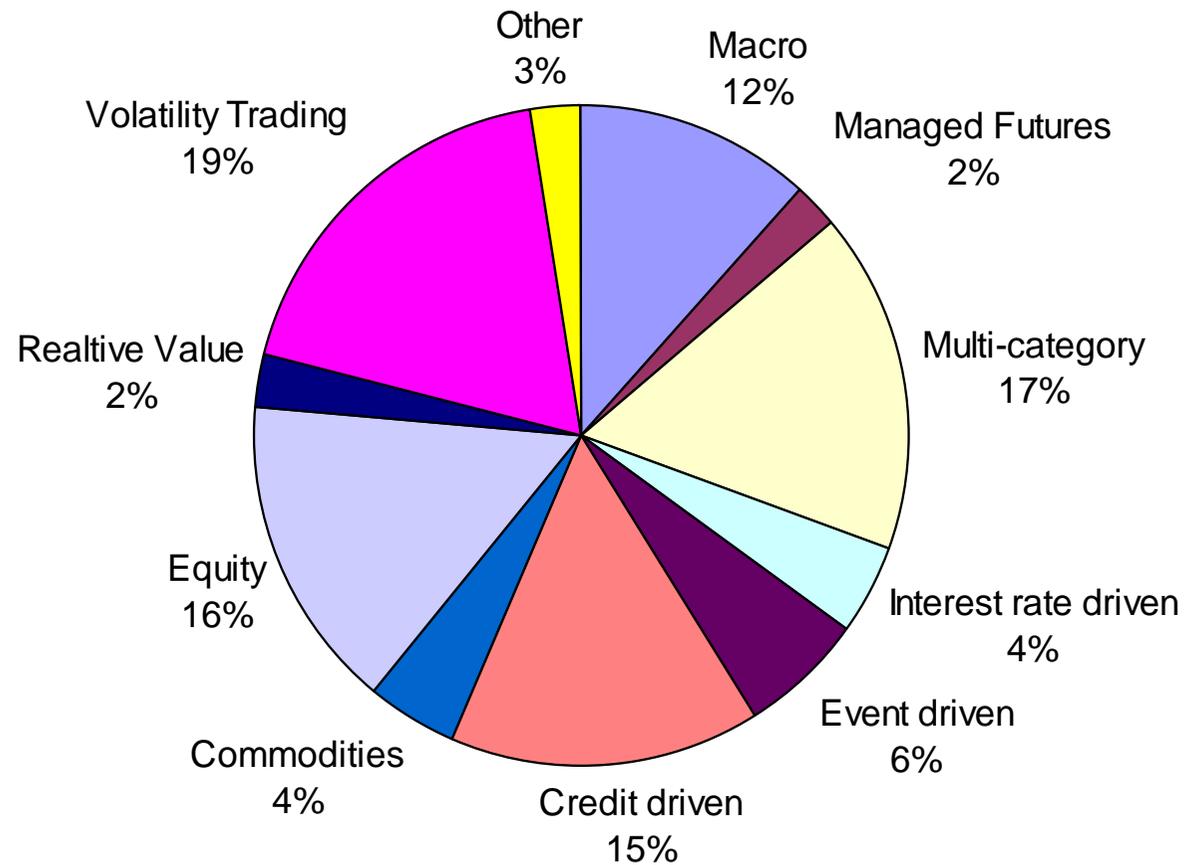
- ▶ Diversifying asset class
 - Correlations from the property sector to other asset classes (e.g. equities and bonds) are low.
 - ▶ Inflation Hedge
 - ‘Real’ link to economic growth
 - ▶ Income returns can be useful when there are liabilities to match
 - Future cashflow needs that can be met by rental income
- *Investing in Mutual Funds increases diversification and thus reduces risk*

Asset Classes – Absolute Return Fund of Funds

- Absolute Return Fund of Funds (ARFoFs) is a type of hedge funds which aim to produce positive returns in both up and down markets
- Typically target a return of LIBOR + 3-6% with a low standard deviation
- Invest in a number of alternative investments for diversification thus have extremely wide variety of strategies and funds such as strategies using financial derivatives:
 - **Event Driven** – investment in companies undergoing significant change such as spin-offs, mergers, liquidations, bankruptcies
 - **Value Driven** – seek companies that manager believes the market has undervalued
 - **Market Neutral** – exploit differences in stock prices by being long and short in stocks within the same sector, industry, country
- Are usually pooled funds, actively managed
- Preservation of capital is usually a key objective
- Usually domiciled offshore

Asset Classes – Absolute Return Fund of Funds: Typical Allocation

Typical Allocation: Fund of Hedged Funds



Asset Classes – Absolute Return Fund of Funds: Advantages & Disadvantages

Advantages

- ▶ Diversifies across managers and across a range of strategies
- ▶ Aim to achieve low correlation to traditional assets and serve as diversifier
- ▶ Attempt to add value from manager selection and top-down calls
- ▶ Access to closed funds
- ▶ Trustees need to exercise less investment judgement
- ▶ Reduced burden of monitoring and due diligence

Disadvantages

- ▶ Not always the best allocation for the client
- ▶ Individual manager performance may be diluted
- ▶ Extra layer of fees
- ▶ Some ARFoFs may have liquidity constraints
- ▶ Will have exposure to risks of underlying strategies

Asset Classes - Infrastructure

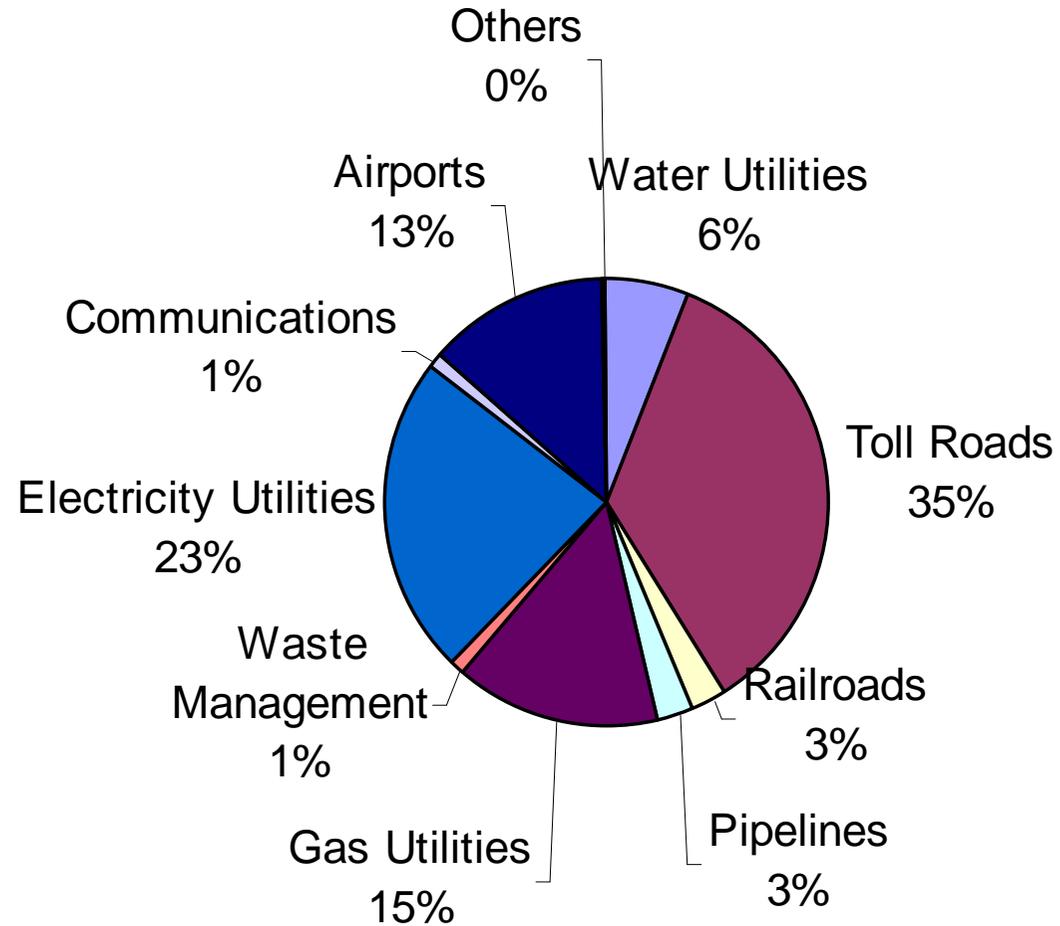
- ▶ Investment in Infrastructure requires an equity share in companies that hold and / or operate an infrastructure project
- ▶ Co-financing projects with the Government – This type of infrastructure project involves the cooperation of private companies with the Government
- ▶ The Infrastructure market is global and is expected to grow significantly over the next decade

There are three main ways to invest in Infrastructure:

- ▶ Direct investment e.g. venture / equity share
- ▶ Investment in **listed** infrastructure funds
 - Increases liquidity, but limited options for pension funds
- ▶ Investment in **unlisted** infrastructure funds
 - Requires a large amount of involvement

Asset Classes – Infrastructure: Typical Allocation

Typical Allocation: Infrastructure Global



Asset Classes – Infrastructure: Advantages & Disadvantages

Advantages

- ▶ High expected returns – with greater investment risk due to the nature and size of projects
- ▶ Long term, stable cash flows with a possible link to inflation – services (roads, electricity, water)
- ▶ Low levels of investment in infrastructure by many countries
- ▶ Offer diversification to the portfolio – low correlation to other asset classes

Disadvantages

- ▶ Lack of liquidity
- ▶ Political and Operational risks
- ▶ High Management Costs
- ▶ Typically little or no return for the first 12 – 18 months
- ▶ Difficulty in measuring performance
- ▶ Lengthy procedures

→ *Investing in Mutual Funds increases diversification and thus reduces risk*

Asset Classes – Private Equity

- ▶ Private Equity is a form of financing that typically entails entrepreneurial funding, business expansion, business acquisitions, balance sheet restructuring, or the privatizing of a public company—conducted both inside and outside the public securities markets
- ▶ Managers attempt to create value by:
 - Acquiring controlling and non-controlling interests in companies
 - Actively build and sell those companies
- ▶ Managers do not trade stocks of minority positions in publicly traded companies as public equity managers do
- ▶ Three ways to invest in private equity:
 - Direct investment (i.e., purchase ownership in a company)
 - Investment in a primary partnership
 - Investment in a commingled partnership, known as a fund of funds
- ▶ Vehicle selection depends on many factors, including plan size

Asset Classes – Private Equity: Advantages & Disadvantages

Advantages

- Investment Horizon – long-term investing
- Impact of Superior Returns – with only a small allocation to Private Equity
- Access – investable universe usually not available to the everyday investor

Disadvantages

- Illiquidity
- Results Dependent on Management
- High Fees – typically 2% management fee and 20% carried interest
- No Perfect Benchmark Time Commitment
- Capital calls at short notice
- Legal documents are complex
- Information Flows – Reports and performance data available on a quarterly basis with 60 days lag
- Leverage

→ *Investing in Mutual Funds eliminates some of the disadvantages and increases diversification*

Legal Framework in Cyprus

Law 208(I)/2012 and Directives 1/2010 & 2/2010

- The legal framework for the establishment and operation of occupational pension and provident funds in Cyprus is dictated by Law 208(I), 2012
- This is the local implementation of the EU Directive 2003/41/EC
- The law covers the following areas (among others):
 - The powers, duties and role of the Trustees
 - Disclosures to the Regulatory Authority
 - Communication with members
 - Investment framework
 - Funding framework



Law 208(I)/2012 and Directives 1/2010 & 2/2010

- Directives 1/2010 & 2/2010 were issued by the Regulatory Authority on 22 January 2010
- Require Pension and Provident Funds to submit:
 - Statement regarding the individual standing of each Trustee
 - Statement regarding the professional experience of the Trustee Board
 - Statement of Investment Principles (“SIP”)



Law 208(I)/2012 and Directives 1/2010 & 2/2010

- The Directives also clarify the requirement for hiring of professional advisers by the Trustee Boards

1. Consultant for Generic Investment Matters (Aon Hewitt)

- Role: asset-liability study, setting of strategic asset allocation, risk management and preparation of Statement of Investment Principles
- Who: For Defined Benefit or Hybrid Schemes such as the CYTA Pension Fund this can only be carried out by Actuaries with at least 3 years relevant experience

2. Consultant for Specific Investment Matters (Asset Managers)

- Role: implementation of asset strategy, selection of securities (stocks, bonds etc)
- Who: Investment Licensed Firms (EPEY)

Law 208(I)/2012 and Directives 1/2010 & 2/2010

Investment Guidelines

- Investment in instruments non-traded in organized markets (e.g. property and alternatives) – **max 40% of total fund assets**
- Investment in alternative asset classes excluding property – **max 15% of total fund assets**
- Exposure to foreign currencies – **max 10% per currency and 30% in aggregate, of total fund assets**
- Self-investment – **10% of total fund assets**
- Maximum credit exposure to a bond issuer – **10% of total outstanding debt**
- Maximum equity exposure to any company – **5% of issued share capital**
- Maximum exposure to any on property plot – **10% of total fund assets**

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