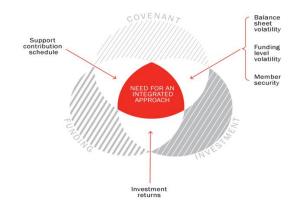




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#### It Starts with an Integrated Approach to Investment, Funding and Covenant



Asset allocation and investment is only part of the solution. There are more levers to pull.

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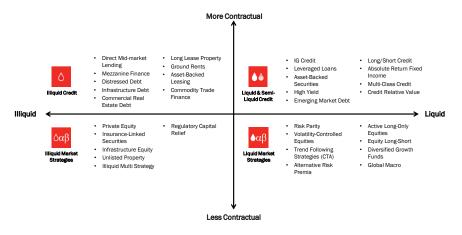
#### Seven Steps to Full Funding



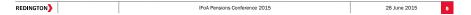
 $\label{lem:control} \textbf{A control cycle process for pension scheme investment management.}$ 

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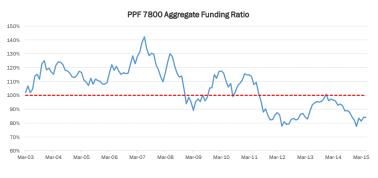
### A Different Way to Categorise Asset Classes, or, An Alternative to 'Alternatives'



#### The dimensions for an asset class in this framework are <u>liquidity</u> and <u>certainty of cashflows</u>.



#### What's the Problem? Measuring Funding Ratio Sensitivities Reveals All...



	Gilts	Global Equities	UK Linkers	Sterling IG Credit Spread
Regression Parameter	-1.830	0.294	-0.348	0.278
Standard Error	0.112	0.035	0.082	0.134
t-stat	-16.403	8.344	-4.218	2.081
p-value	1.69E-34	5.95E-14	4.38E-05	0.0392
Adjusted D2	97%			

Source: PPF, Bloomberg; Redington calculations

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#### (Re)Introducing The Fundamental Law of Active Management

## The fundamental law of active management

Mc2 is the Law, here as well as elsewhere.

Richard C. Grinold

uppose you could start a new investmen management firm. How would you do it? Imagin that your choices even include determining your own skills — not so much the level of skill, but that yo can choose the "what," as in "skill at what." Yo could be an aggressive stock picker, a growth stoc manager, a value-oriented manager, a rotating or you

thosose? This paper tries to give some guidance to help you make those decisions. With a little reading be tween the lines, you can see how these insights might apply to your own investment management operations and allow you to exploit your own particular.

insights into the market. We will be guided a clearly subsequent. "Ye will be guided and feeling subsequent." can call if this with a mancrable amount of humility bootsomer "The Larn' was unearted more than a decade ago under simpler assumptions (a diagonal mode) and various other guisses by William Shappe, Jack Treyner and Richerte Siele, Robert Regusor, and the state of the subsequent to the control of the control of the subsequent to the control of the control of

The Fundamental Law relates three variables: your still (call it c) in forecasting exceptional returns, the brastil (call it bf) of your strategy, and the value times per year), and c as a measure of how well you play. The value added will be measured in terms of annual return. A strategy's value added will be proportional to the strategy's Slarpe ratio (call it SR). The Sharpe ratio itself can be approximated as a simple function of the strategy's skill and breadth!

SR = Mc'.

sevei c and directly with the strategy's breadth. Life all laws in the social sciences, this is a rough cut the truth, based on assumptions that are not que ture and simplified with some reasonable appromations. This law is not an operational tool; its poper is to point out in bread terms the trade oirredved in building an investment strategy.

To accuracy late and understand the Law.

should step back and consider the strategic context of active money management. Our presumption throughout is that active management is conducted in the context of performance analysis. Both managem and client know before the fact how the outcomes of their decisions will be judged.

mark or normal portificio, this appears to make sensi in today's world of specialised feaverment managars. We shall also consider the normal to be, in a sense efficient within the set of investment guidelines had down for the manager. By this consideration, we are raining out to-called tilt straights where the active bet the portions are permanent and are based on the presumption that the normal perfificio is less efficient than the portfolio the manager holds. Information Ratio = Return/Risk

 $IR = IC \times \sqrt{BR}$ 

Information Coefficient (IC) =  $corr[\alpha, \theta]$ 

 $\alpha$  = expected (ex ante) return

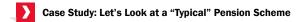
 $\theta$  = actual (ex post) return

Breadth (BR) = number of independent positions

Choices: (1)  $\bf Improve\ IC$  (i.e. get better at forecasting returns) AND/OR (2)  $\bf increase\ breadth$ 

Easier choice seems to be to increase breadth, i.e. take more bets!

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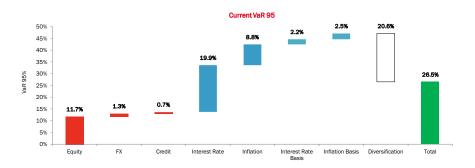


Consider a "typical" UK Pension Scheme with the following characteristics:

- 80% Funded
- Asset Allocation Includes:
  - 60% equities
  - · 25% index-linked gilts
  - 15% corporate bonds
- 30% Hedge Ratio (Rates & Inflation)
- Expected Return of LIBOR + 218 bps

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#### Putting the Scheme Through the Risk Lens

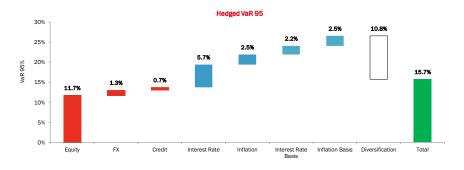


Expected Return: LIBOR + 218 bps / Var95: 26.5% of liabilities

#### Rates, equities and inflation dominate risk - as expected.



#### Quick Win ... Hedge to Funding Ratio

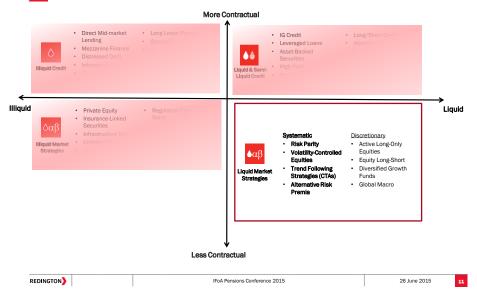


Expected Return: LIBOR + 218 bps / Var95: 15.7% of liabilities

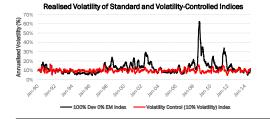
#### Rates and inflation risk moderate with no impact on returns.

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#### A Deeper Look at Systematic Liquid Market Strategies



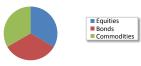
### Risk-Controlled Investment Strategies: Volatility-Controlled Equities and Risk Parity



#### Volatility-Controlled Equities

- **Equity exposure** managed through **futures** to achieve a certain level of volatility
- Results in a relatively **constant allocation of equity risk** through time
- **Options** can be bought on a volatility-controlled index much more cheaply due to minimal vega risk

#### Risk Allocation in a Simple Risk Parity Strategy



#### Risk Parity

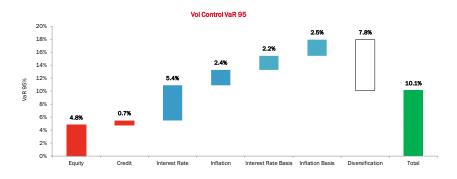
- The extension of volatility-controlled equities to the **multi-asset** space
- Allocate to asset classes on the basis of risk rather than capital
- Typically involves **moderately leveraging** low-risk asset classes

Find more on these strategies at:

http://www.slideshare.net/redingtonmedia/redington-teachinriskcontrolledinvestmentstrategiesmarch2013

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### Change Equity Exposure to Be Volatility-Controlled with Put Protection



Expected Return: LIBOR + 167 bps / Var95: 10.1% of liabilities

Adding volatility-controlled equities significantly reduces risk though brings return down too.

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Most of Norway's Alpha is Driven by Identifiable Risk Factor Exposures



	Full Sample		Pre-2	2008
	Partial		Partial	
	Corr	P-value	Corr	P-value
TERM	-0.17	0.05	-0.25	0.01
CREDITAa	0.40	0.00	0.02	0.81
CREDITBaa	-0.40	0.00	-0.16	0.09
CREDITHY	0.02	0.83	-0.01	0.90
FXCARRY	0.07	0.44	0.13	0.16
LIQUIDITY	0.31	0.00	0.25	0.01
VALGRTH	-0.35	0.00	-0.45	0.00
SMLG	0.21	0.01	0.44	0.00
MOM	-0.03	0.76	0.07	0.48
VOL	0.39	0.00	0.24	0.01

Partial Correlations of Active Returns with Systematic Factors

- Though taking relatively little active risk in the Fund, this active risk had been dominated by a **number of systematic factors**.
- This led to the alternative risk premia movement taking hold with various styles identified that could be invested into directly

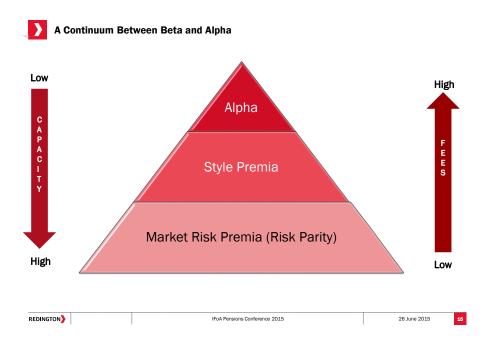
 $What was \ previously \ thought\ of\ as\ alpha\ (active\ return)\ is\ now\ being\ described\ as\ alternative\ beta.$ 

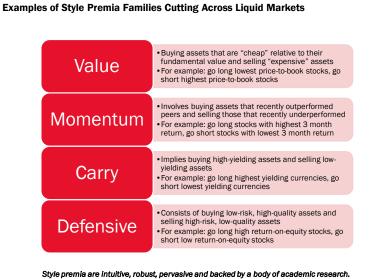
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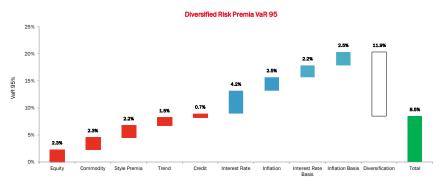




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### Diversify Risk Premia ... The Final Step



Expected Return: LIBOR + 221 bps / Var95: 8.5% of liabilities

#### A truly diversified portfolio with a similar level of returns but with much less risk.

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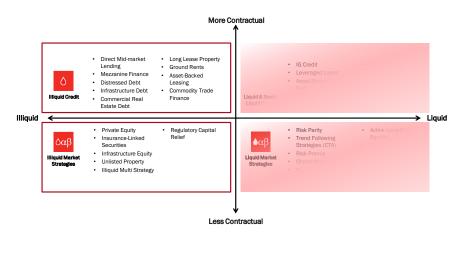
#### Why Aren't People Doing This Already? Unconventionality.

- Perceived complexity and upfront understanding required
- Novelty of approach: what hedge funds have pursued for a long time only now being brought into pension scheme management (same was said of LDI when it first appeared though now is commonplace)
- Leverage, Shorting and Derivatives "the 3 dirty words of finance"
- Straying away from peers
- Higher cost for (long/short) alternative risk premia strategies than for market risk exposures.

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#### What About Illiquids?

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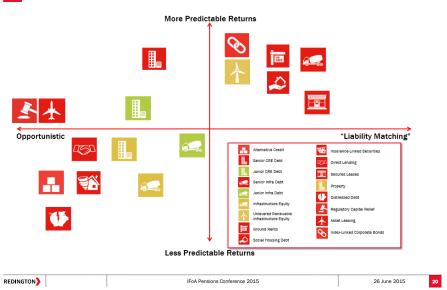


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#### The Gamut of Opportunities in Illiquid Credit and Illiquid Markets



### Implementing Illiquid Asset Classes Can be Challenging

- Illiquidity premia can be difficult to measure (e.g. an appropriate liquid market comparator may not always be available)
- Illiquidity **prevents** you from **changing asset allocation/rebalancing**; this has **cost** which is difficult to quantify though this figure would need to be netted off from the illiquidity premium
- Return history for newer asset classes are **limited** at best (e.g. much of the illiquid credit area was previously dominated by banks)
- In order to get risk measurements consistent with liquid assets, illiquid asset returns need to be de-smoothed:

Geltner-Ross-Zisler Unsmoothing Process

$$r_t = \frac{1}{1-\phi} r_t^* \, - \frac{\phi}{1-\phi} r_{t-1}^* \quad \text{where } |\phi| < 1 \label{eq:rt}$$

Note unsmoothing only affects risk estimates, it does not affect expected returns.

Calculating the illiquidity premium and de-smoothing returns are as much art as they are science.

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### A Health Warning on Market Timing

# Asset allocation could be dangerous to your health

Pitfalls in across-time diversification.

Paul A. Samuelson

he most recent god that failed has been asse allocation strategy—which dairs to be table to detec at any time whether equity investors are to be we rewarded for taking on risks or poorly rewarded. Be gring low veright to equities when they are prone to do poorly and high weight when prone to do well asset allocation techniques are seen to be a variant or

Asset allocators' finest hour came just before the Cetuber 1987 wordsvide crash when they bett brief devotees from losing 23% of portfolio value in a brief line period. Recent success in Wall Steet breeds customers and during 1988-1999 many correct of the asset allocation servisitily missed the high total cuture garnered by stocks here and abroud. Whether 1989 will consensuate cannot now be known.

Whether 1990 will compensate cannot move be know the a dispession in an essay reflecting on it surprising efficiencies of speculative markets and it historical successes of indexers (Semmelon 1999) pointed out how costly it can be to act like a mark timer when in fact you lack ex anite and ex post ability to discern over—and undervaluation of the market.

In particular I mentioned the case of an MI professor who in one year went back and forth sixtee times between all-equilties and zero-equilties. No load was charged for the switches, and because not edemic fool could be so unfucly as to have been wrong every time in his moves, one of first carriess though might suspect that he had done himself little harm While his complacent colleagues stayed all year long half-and-half in stocks and fixed-principal assets, this professor would seem to have achieved his half-andhalf mix by arcsis-time densitienties (to sto speak, Monday-Wednesday-Eriday in stocks and Tuesday-Thursday-Statady in bonds).

be a carelous underestimation of the intelligency of across-time diversification. My demonstration of this insufficiently noticed point, constrained by space and the limits of mathematical sophistication, followed a four-prixed scenario in which the modal outcomes of stock and cash were seen to work out better on a riskcorrected mean basis for those who eschieved accrusition diversification.

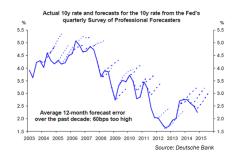
Because the point occasioned some correspondence with pecicleal investors, and is in any sole important in its own right. I present here a tense demcestration of the continees in a randow walk mode of across time diversification in compersion with optimal a-sect-time diversification for rational investor who seek to manistrate the expected value of terminal utility of wealth and who have a specified constannation risk exercises.

I must not pretend to prove too much. If you do have timing ability, flaunt it Bus in the absence of Napoleonic pretensions to claimyrance, your callonal flauntings are more likely to involve twistches of a few percent in your capitaly fraction around some optimal intermediate level rather than the wrings from 10% intermediate level rather than the wrings from 10% is Emeritus at the Massachusetts Institute of Technology in

- Market timing is notoriously difficult (see chart below)

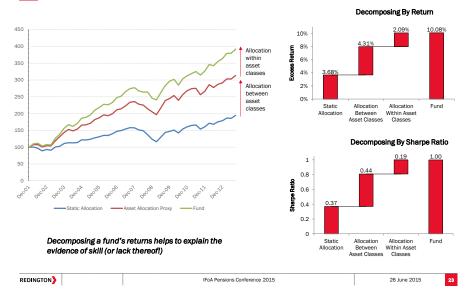
- Any time spent away from an optimal diversified portfolio is mathematically punished (as shown by Samuelson)

- That said, where there is skill in this pursuit, this needs to be **evidenced** both **qualitatively** and **quantitatively** to have conviction



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### Benchmarking and Return Decompositions



### Conclusions

- Asset allocation is one part of investment strategy. Investment strategy itself is part of pension scheme management alongside covenant and funding strategy.
- Pension scheme investment strategy is still heavily **dominated by four risk factors**: (long) equities, (short) interest rates, (short) inflation and (long) credit which represent a **narrow set of bets**.
- Greater risk balance of these factors and also the introduction of alternative risk factors is likely to lead to a more efficient investment strategy (either a similar level of return for a lower level of risk or a higher level of return for the same level of risk).
- **Unconventionality** is one of they key constraints preventing wider adoption. As with LDI, it will take time for this to filter through
- There is a wide array of **Illiquid asset classes** pension schemes are starting to look at. A **framework** needs to be in place to **assess illiquidity premia** and the **requisite compensation** for illiquidity. **Returns** need to be **de-smoothed** to integrate with liquid asset classes.
- Market timing (i.e. tactical asset allocation) is difficult though where there is ability to add value through this pursuit, there needs to be evidence of skill. Decomposing fund returns is one way of identifying this.

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