Introduction to Performance Measurement

26th September 2014
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Return Methodologies

- MWR & TWR

- Arithmetic or Geometric

- Compounded & Annualised

- Benchmark Calculations

- Relative Returns

- Performance Attribution

Return Methodologies
Money Weighted Return (MWR)

- The intuitive i.e. 'not rocket science' calculation

- The rate of return achieved over a period of time based upon a portfolio's initial and final values, income and cash flow

- It is calculated as follows:

$$\frac{(FMV - IMV - NI) + I}{\text{Average Capital Employed}} \times 100$$

KEY

FMV = Final Market Value

IMV = Initial Market Value

NI = Net Investment

I = Income

- The quantum of assets has a bearing on the outcome

- Not all 'participants' have a bearing on this quantum so…………..

Return Methodologies
Time Weighted Return (TWR)

- The problem?

  ➢ £100 earned on a value of £1000 = 10%

  ➢ £50 earned on a value of £5000 = 1% = result c11%?   but……..

  ➢ £150/£3000 (average) = 5% !

- The Trustee impacts the quantum of assets through withdrawal e.g. pension payment

- Time weighted return is used to compare the performance of a portfolio removing this impact of cash flows

- Facilitates comparison of funds with different cash flows

- Facilitates comparison of portfolios with similar mandates

- Simply derived by compounding MWRs calculated over each period between 'external' cash flows

Return Methodologies
Arithmetic or Geometric?

- The arithmetic difference adequately describes the relationship between a portfolio and its target, it is unsuitable for the construction of time series', quantifying growth in value or for inter fund comparison

- Whilst intuitively unappealing, a 'geometric' calculation (more jargon) overcomes these factors because it recognises the compounding effect of returns

- This is best illustrated by an example. . .

Return Methodologies
Arithmetic or Geometric Example?

- A fund returns 7% each quarter, and the corresponding benchmark is 5%. Clearly the fund is 2% different (better) than benchmark each quarter and intuitively, 8% over the year, as below;

	Period 1	Period 2	Period 3	Period 4	Year
Fund	7.0	7.0	7.0	7.0	28.0
Benchmark	5.0	5.0	5.0	5.0	20.0
Difference	**2.0**	**2.0**	**2.0**	**2.0**	**8.0**

- Applying these to a portfolio valued at £100 gives us;

	Start Value	Period 1	Period 2	Period 3	Period 4	Year
Fund	100	107.0	114.5	122.5	131.1	
Benchmark	100	105.0	110.3	115.8	121.6	
% Difference		**1.9**	**1.9**	**1.9**	**1.9**	**7.8%**

- The **compounding** effect means that the relative % change in value isn't 8%, but 7.8%

Return Methodologies
Compounding Returns

- The process by which returns (or their contributions) are combined to produce longer term time series' – the statistical tricks are;

➤ £101.3 v £100 = a 1.3% return, and 101.3/100 = 1.013

➤ £97.4 v £100 = -2.6% return, and 97.4/100 = 0.974

- In a simple example, if the monthly returns in October, November and December are +1.3%, -2.6% and +3.2% respectively then the quarterly return is:

$$(1.013 \ x \ 0.974 \ x \ 1.032) = 1.018 = 1.8\%$$

- Simply, the individual percentage returns are divided by 100 and 1 added
- The recognisable outcome is simply readjusted by subtracting 1 then multiplying by 100

Return Methodologies
Annualised Returns

- The 'average' return (per annum) which an asset would have had to earn to achieve its actual return over periods greater than one year

- For example; a portfolio's annual returns over three consecutive years are +11%, +32% and +26%. The actual return over three years, obtained by compounding the annual returns, is:

$$[\ (\ 1.11 \ \times \ 1.32 \ \times \ 1.26 \ ) - 1 \ ] \ \times \ 100 \ = \ 84.6\%$$

- The annualised return is the cube root of the three year return, i.e.,

$$[\ \sqrt[3]{ \ (1 \ + \ 0.846 \ )} - 1 \ ] \ \times \ 100 \ = \ 22.7\%$$

- i.e. three years at an average of 22.7% p.a. would give an actual return of 84.6%

Return Methodologies
Benchmark Calculation

- A benchmark is a yardstick against which the portfolio is to be measured and can be made up of a single index or a composite of indices

- Examples: FTSE, S&P 500, MSCI World, BarCap Global Aggregate

- A composite benchmark is calculated as follows:

Investment	Weight %	Benchmark Return	Contribution
US Equities	35	5.0	35/100 x 5.0 = 1.75
World ex US Equities	35	3.0	35/100 x 3.0 = 1.05
Global Bonds	30	4.0	30/100 x 4.0 = 1.20
Total Benchmark			**4.0**

Return Methodologies
Relative Return

- The ratio of return achieved by the portfolio and that achieved by it's chosen benchmark over a given time period

- For example, if a portfolio returned 26% against 20% for its benchmark, the relative return is:
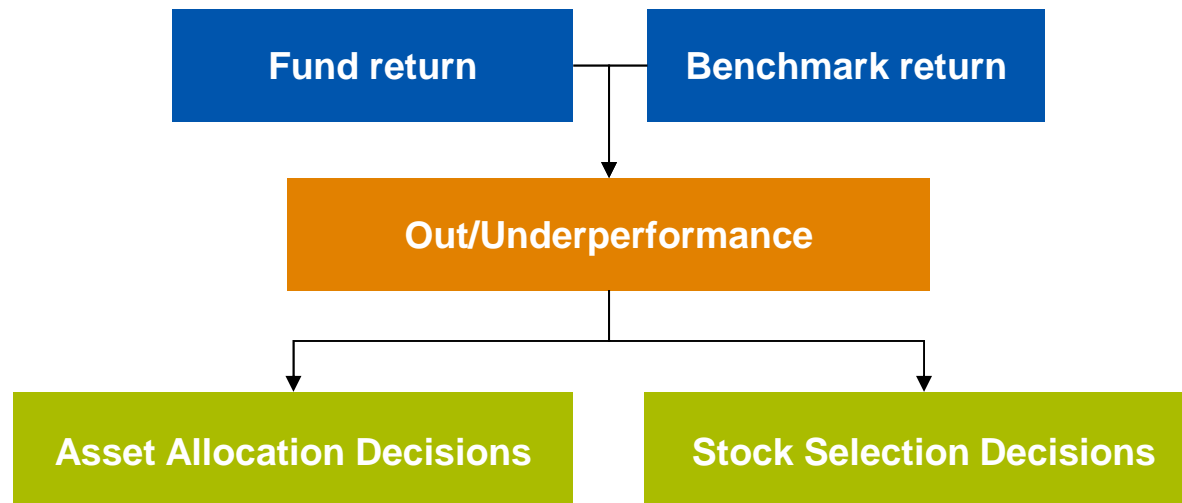
$$\left[\frac{1.26}{1.20} \right] - 1 \ \times \ 100 \ = \ 5\%$$

- Using a ratio allows the size of the underlying returns as well as the size difference to be taken into account

Return Methodologies
Performance Attribution

- An explanation of the difference between the fund and benchmark return by attributing the impact of key investment decisions.

Return Methodologies
Performance Attribution

- Performance Attribution addresses the two key investment decisions;

1. **Asset Allocation (or Policy)**

   – Did you have more/less invested in a good/poor performing investment category relative to the benchmark?

2. **Stock Selection (or Manager Contribution)**

   – Were the returns achieved in each category better or worse than the benchmark?

Return Methodologies
Performance Attribution - Asset Allocation Calculation

- For example, an asset class comprises 50% of a fund's benchmark but only 45% of the actual allocation. It has returned 4% against the index of 2% and the overall benchmark is 5%.

- The Asset Allocation (or Policy) impact is calculated as follows:

$$\textbf{Portfolio weight} - \textbf{Benchmark weight} \quad \text{x} \quad \frac{\textbf{Index Return}}{\textbf{Total Benchmark Return}}$$

$$45\% \; - \; 50\% \; = \; \text{-5\%} \quad \text{x} \quad \frac{1.02}{1.05} \quad = \; \text{-2.9\%}$$

$$= \quad \textbf{+0.1\%}$$

- So, this Fund has benefited by 0.1% from underweighting an underperforming asset class

Return Methodologies

Performance Attribution - Stock Selection Calculation

- Using the same example the Stock Selection (or Manager Contribution) impact is calculated as follows:

$$\text{Portfolio weight} \quad \times \quad \frac{\text{Portfolio Return}}{\text{Index Return}}$$

$$45\% \quad \times \quad \frac{1.04}{1.02} \quad = \quad +2.0\%$$

$$= \quad +0.9\%$$

- So, this Fund has gained a further 0.9% from the manager's performance relative to the benchmark that was set

Return Methodologies
Sample Performance Attribution

Asset Allocation				Stock Selection		
% Asset Weight		**Performance Contribution**	**Investment Category**	**Performance Contribution**	**% Return**	
Fund	**B'Mark**				**Fund**	**B'Mark**
60	70	-0.1	US Equities	-0.8	10.0	11.5
30	30	0.0	Global Equities	-0.4	5.0	6.5
10		-0.5	Cash	0.1	5.0	4.5
		-0.6		-1.2		

8.0

Fund Return

-1.8

Relative Return

10.0

B'Mark Return

Evaluation & Measurement
Consider Temperature Checks (Peer Group)

Fund Returns

	--------- 2010 ---------				--------- 2011 ---------				--------- 2012 ---------				1yr	3yrs % pa	5yrs % pa
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4			
Fund	6.1	-5.6	8.2	5.2	1.6	1.4	-8.8	5.6	6.3	-1.3	4.3	1.9	11.5	8.0	3.6
Benchmark	6.3	-6.7	8.2	5.7	1.4	1.5	-9.0	5.2	5.6	-1.9	3.3	3.0	10.2	7.2	3.2
Relative	-0.2	1.2	-0.0	-0.5	0.2	-0.1	0.2	0.4	0.7	0.6	0.9	-1.1	1.1	0.7	0.3
Ranking	(61)	(18)	(56)	(68)	(25)	(58)	(37)	(51)	(20)	(19)	(8)	(90)	(20)	(26)	(46)

16

Evaluation & Measurement
Realistic Timescales

- Markets are cyclical

- Manager performance is cyclical

Value v Growth
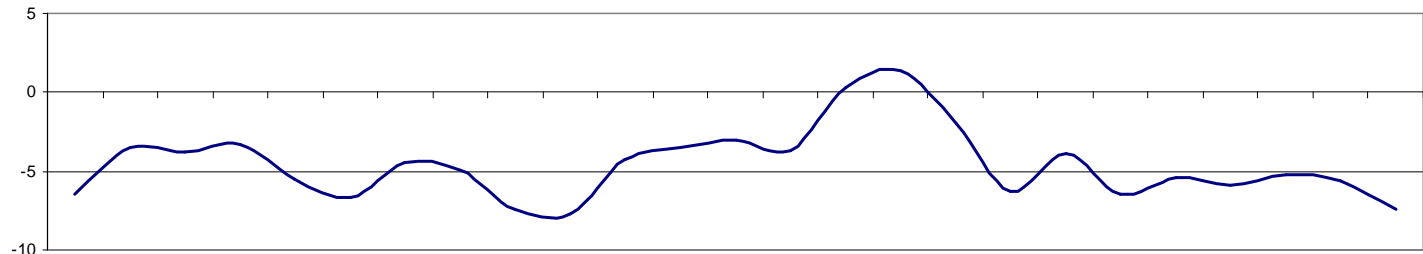

Manager Alpha
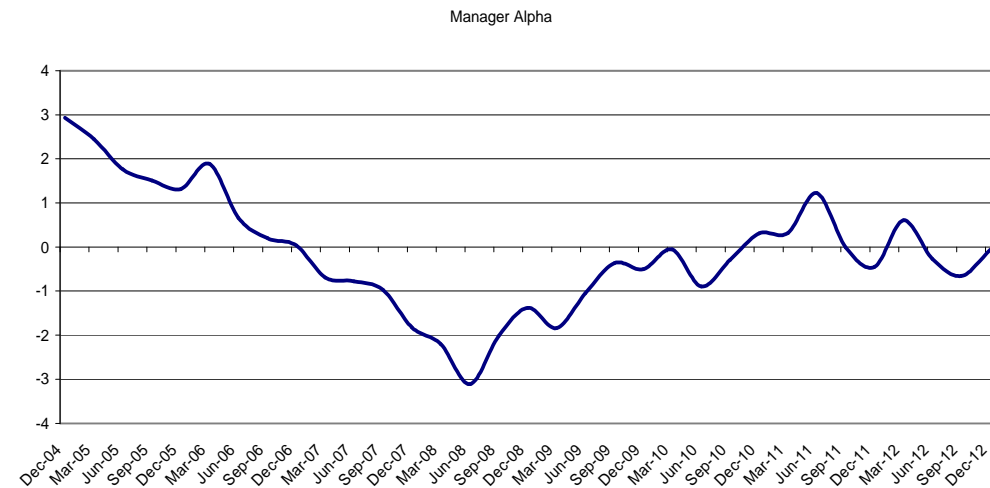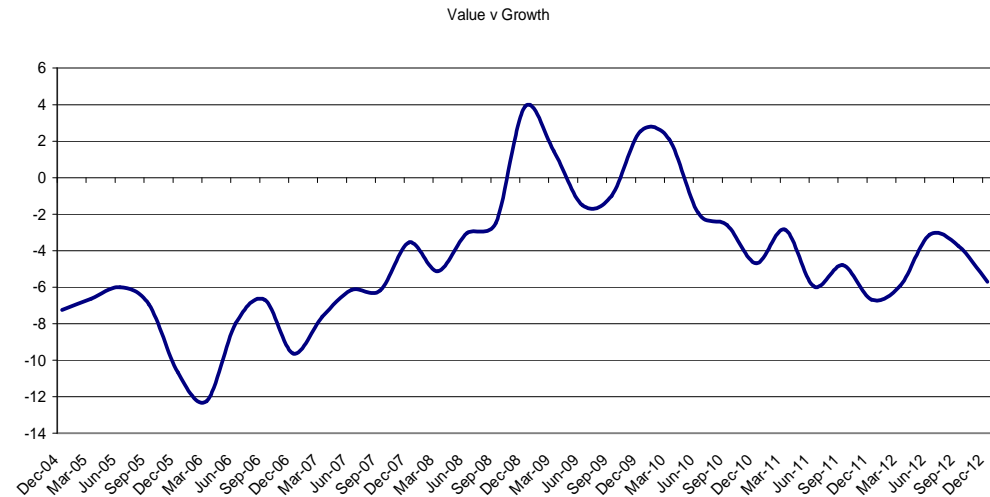
Evaluation & Measurement
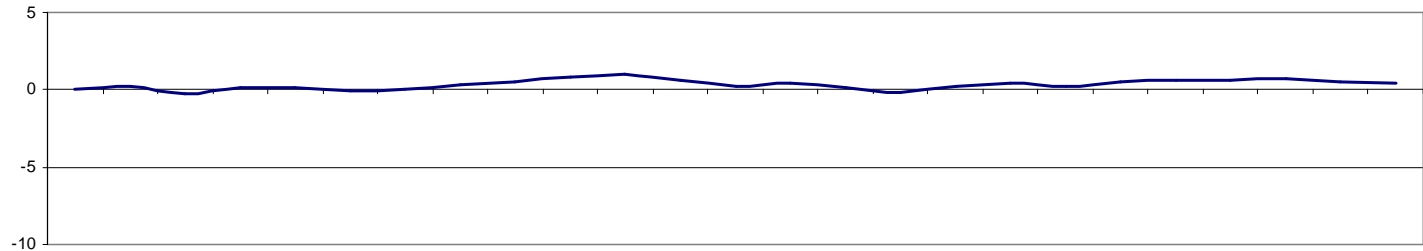## Appreciate What Really Matters

TOTAL FUND v TARGET
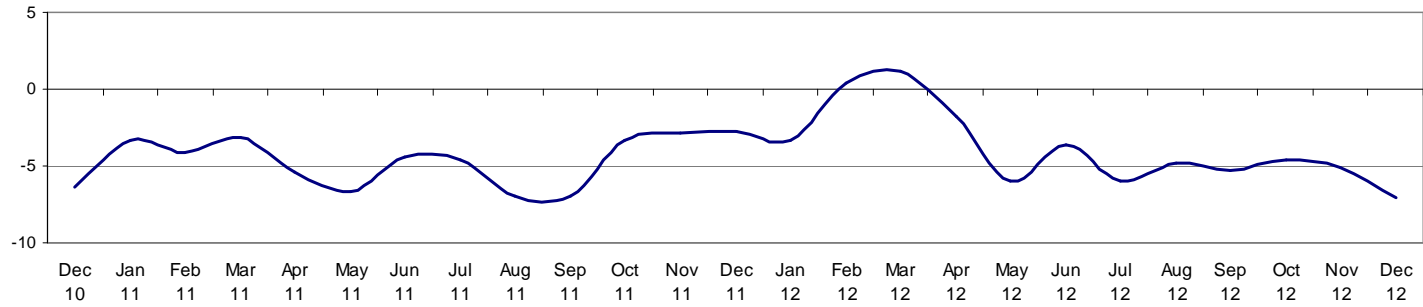
BENCHMARK BETA

ALPHA

Performance Measurement
Summary

- The process is simple

- It's important to identify and monitor the performance of all contributors – asset strategy and asset managers

- Appreciate what really matters

- There is a clearly defined and appropriate order in which to define a fund's 'working' benchmark

- This benchmark needs to be continually monitored

- Be realistic about timescales

Introduction to Risk

Introduction to Risk

- Performance is not just about returns

- Risk is important; risk parameters should be an integral part of setting investment strategy

- Risk is the confidence attaching to a particular outcome
  (High risk = Low confidence and vice versa)

- Risk generally defined as volatility of returns

- Standard deviation is a measure of volatility

Introduction to Risk

Types of Risk Measures

Ex-Post

- Translated from Latin means "after the fact"

- Observes historical risk and return values

Ex-Ante

- Translated from Latin means "before the event"

- Refers to future events, such as future returns

- Uses forward looking analytics such as VaR

Introduction to Risk

- People come in lots of different heights. Let's think about the height of UK men.

- The average man is 5'9". This means half of all men are taller than 5'9", and half are shorter than 5'9".

- Men's height falls onto what's called a standard distribution, or a bell curve.

- Out of one hundred men, about 2/3 of them, are between 5'6" and 6'. About 2/3 of all men are 5'9" ± 3".

- About 1/3 of them are outside this range, with about half of those on each side. So, about 1/6 are 6'1" or taller, and about 1/6 are 5'5" or shorter.

- Consider returns

Introduction to Risk

- Here are 50 funds' performances

- Most funds are clustered around a range band
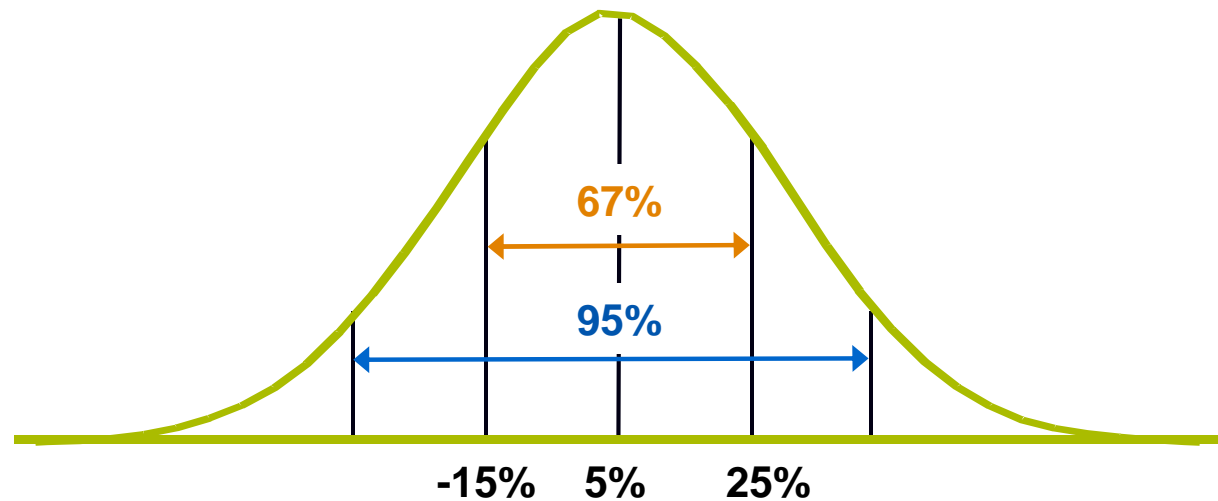
- We can represent this statistically
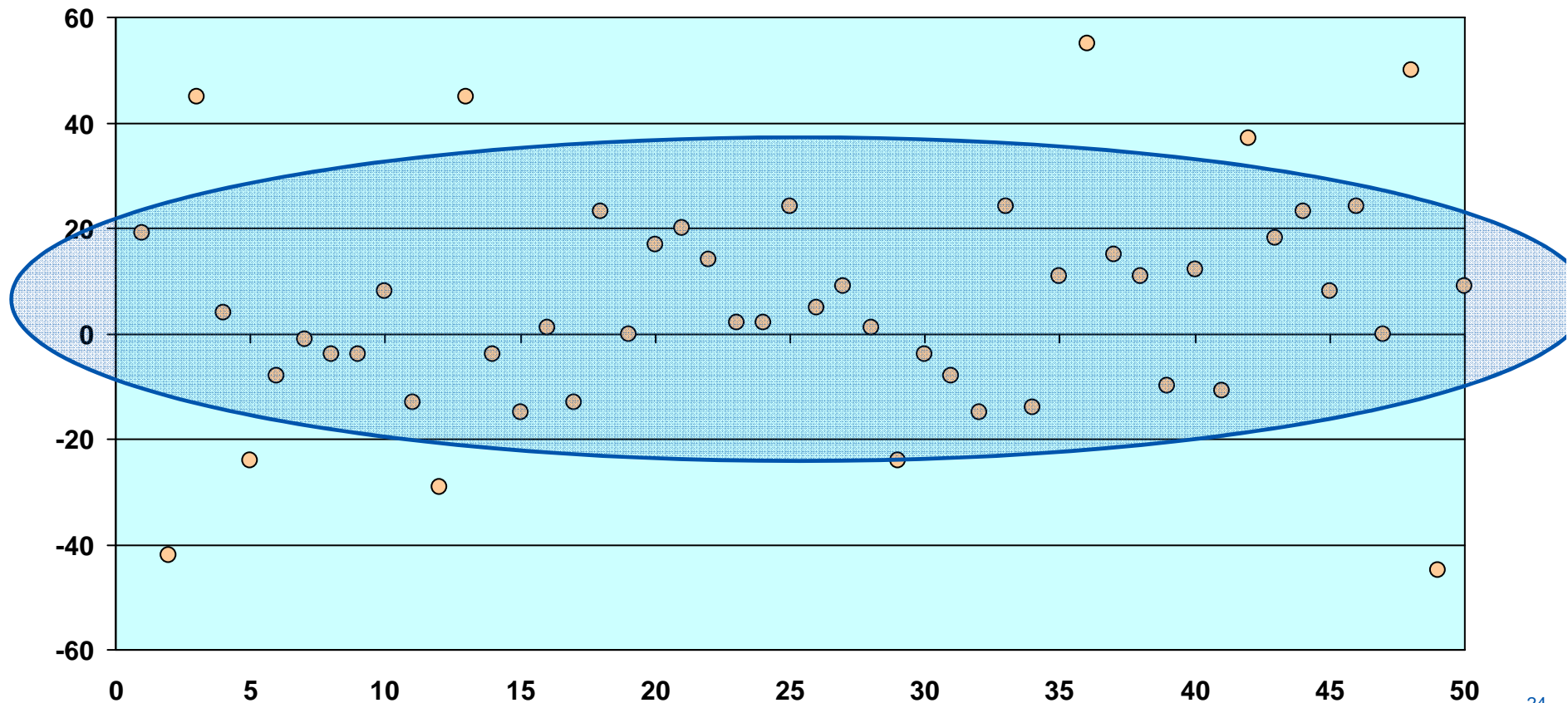
Introduction to Risk
Standard Deviation

- In a normal distribution, about 2/3rds (67%) of the area under the curve lies within one standard deviation of the mean.

- In our example, the mean is 5%, Standard Deviation is 20% and 2/3rds of observations lie between -15% and 25%.

67%

95%

-15%   5%   25%

Introduction to Risk
Other Key Terms

Volatility *or* Absolute Risk

- Measures the standard deviation of the portfolio returns

Tracking Error *or* Relative Risk *or* Active Risk

- Measures the standard deviation of the difference between the portfolio and benchmark returns

Introduction to Risk
Comparing Profiles

- It's important to consider risk and return when looking at investments

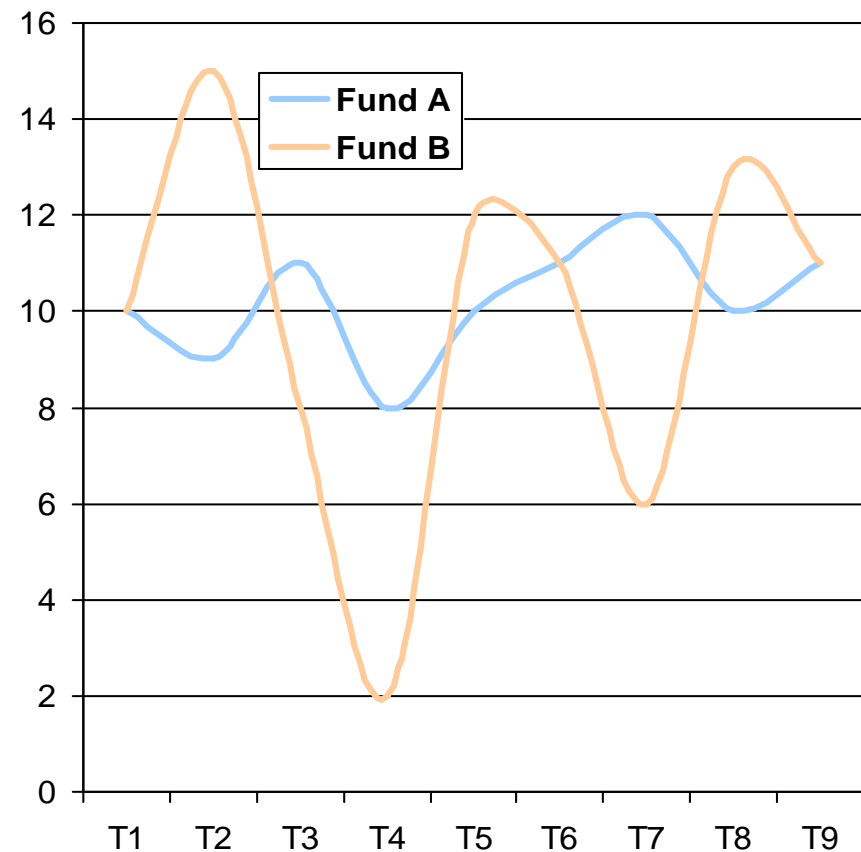- Which fund below is better from a risk reward perspective?

	Annualised Return (% p.a.)
Fund A	12.5
Fund B	12.5

Introduction to Risk
Comparing Profiles

- Fund B has a very different profile than Fund A

- Fund A has delivered a better risk adjusted return

- Generally expect extra return for greater risk - otherwise why take it on?

- There are no guarantees though!

Introduction to Risk
Comparing Profiles

- By using the return series, you can calculate the standard deviation

	Year 1	Year 2	Year 3	Year 4	Annualised Return (% p.a.)	Standard Deviation (% p.a.)
Fund A	+10	+15	+8	+17	12.5	4.2
Fund B	+22	+15	-5	+20	12.5	12.4

- Both funds achieve the same annualised return with different levels of risk

- Fund A has delivered a much better *risk adjusted* return

- This table of data contains much better information

Introduction to Risk
Correlation

- Important to understand correlation

- Not all asset types grow or contract at the same rate or same time

- Careful blending of these can shape overall volatility

  ➤ positively correlated assets will amplify volatility

  ➤ negatively correlated assets will dampen volatility

- This is key to risk budgeting

Introduction to Risk
Information Ratio's (I.R.)

- A simple measure used to quantify a mangers skill in converting risk into excess return (alpha)

- Put simply;   Relative **RETURN** divided by the relative **RISK**

- Skilled active management purports to offers IR's > 0.5

- Our research over many years shows;

    0.2 – 0.3 is top quartile or skilled

    0.5 is top decile or extremely skilled

-     The current average is positive, but near zero after fees!

Skill is not a commodity . . . . It can't be bought . . . . It can't be predicted . . . . It doesn't persist
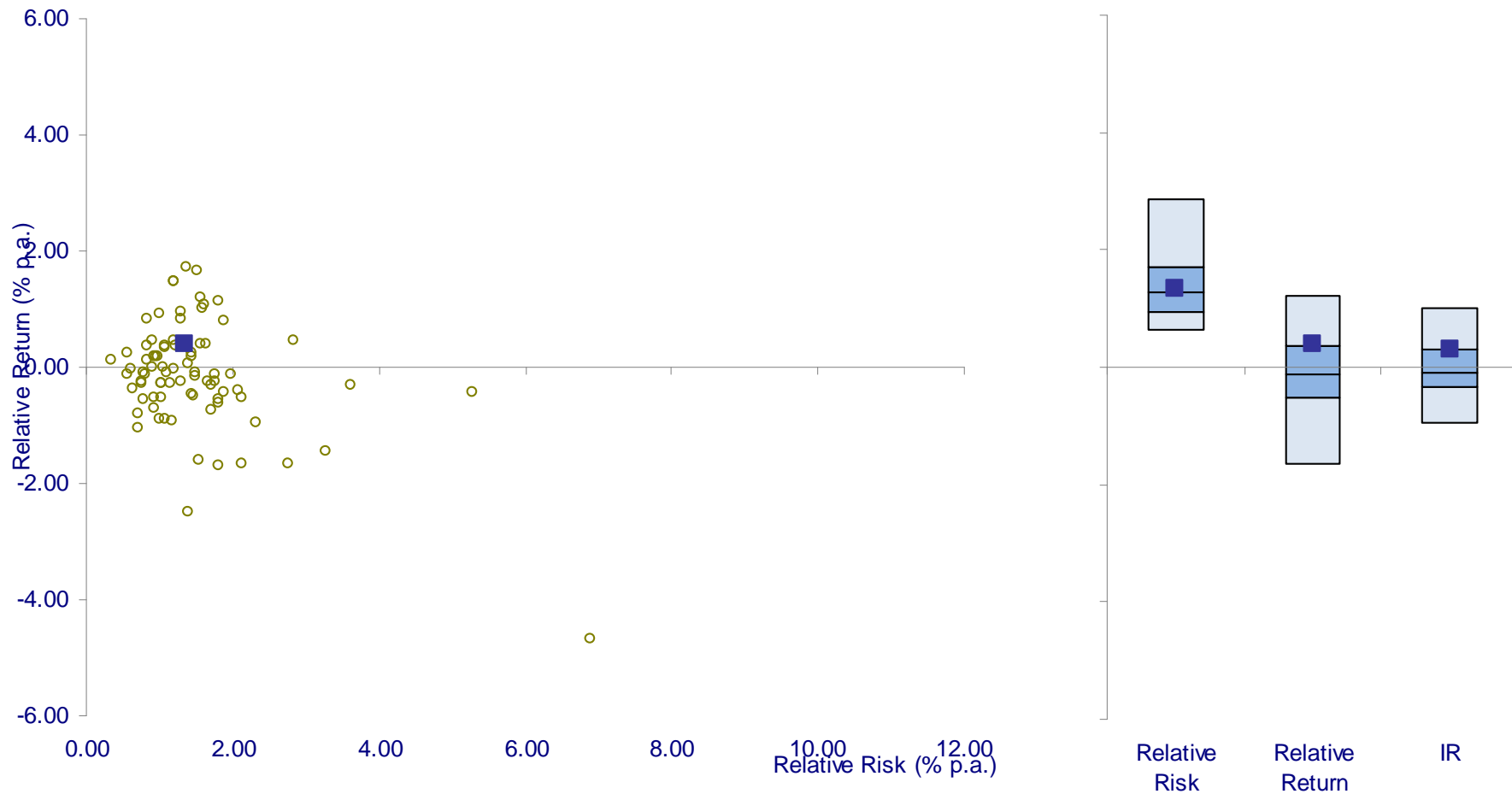
Introduction to Risk
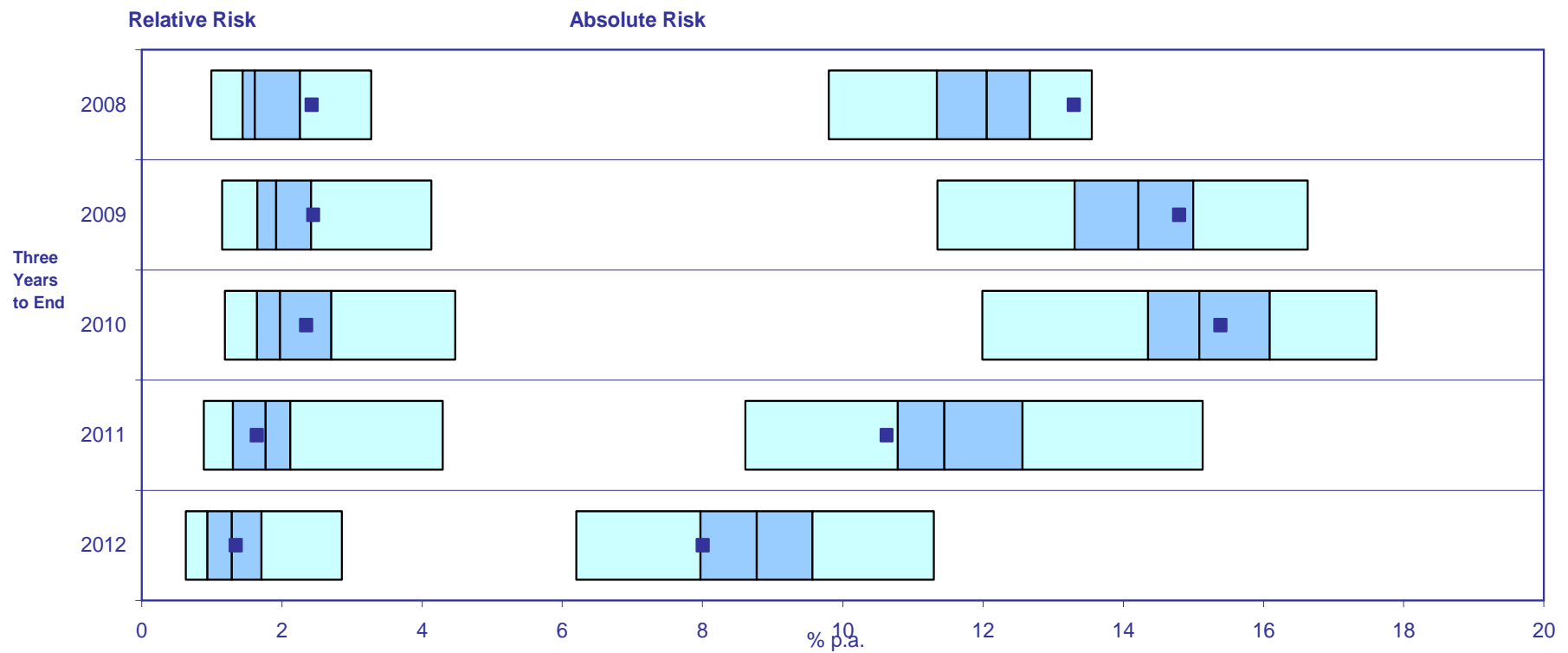## Evaluation – Absolute Risk & Return
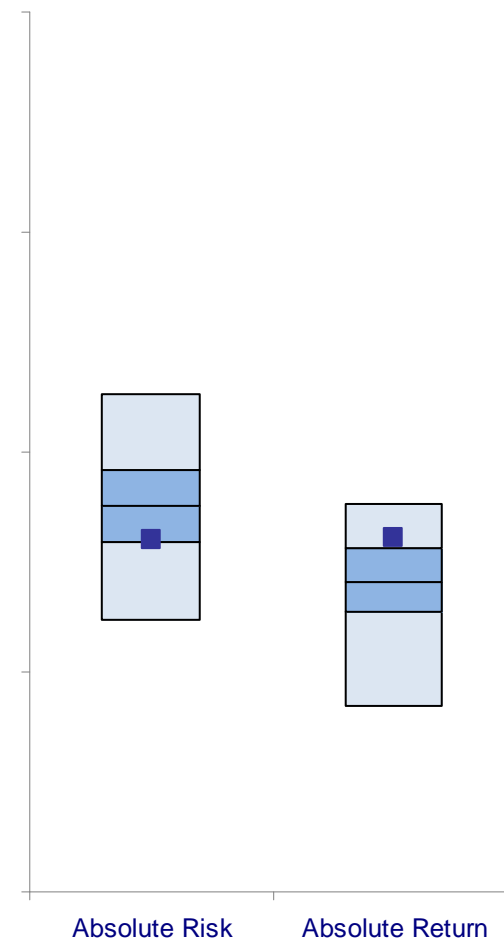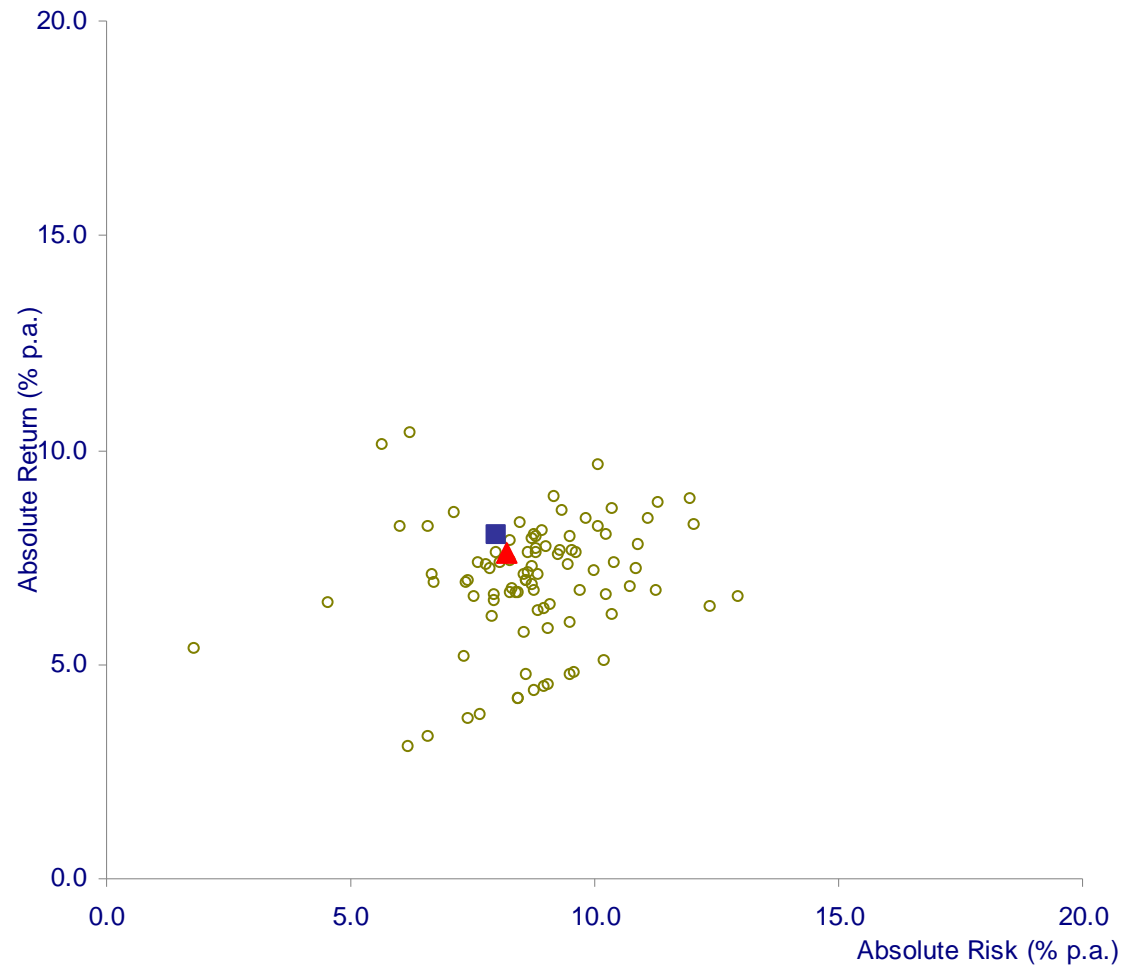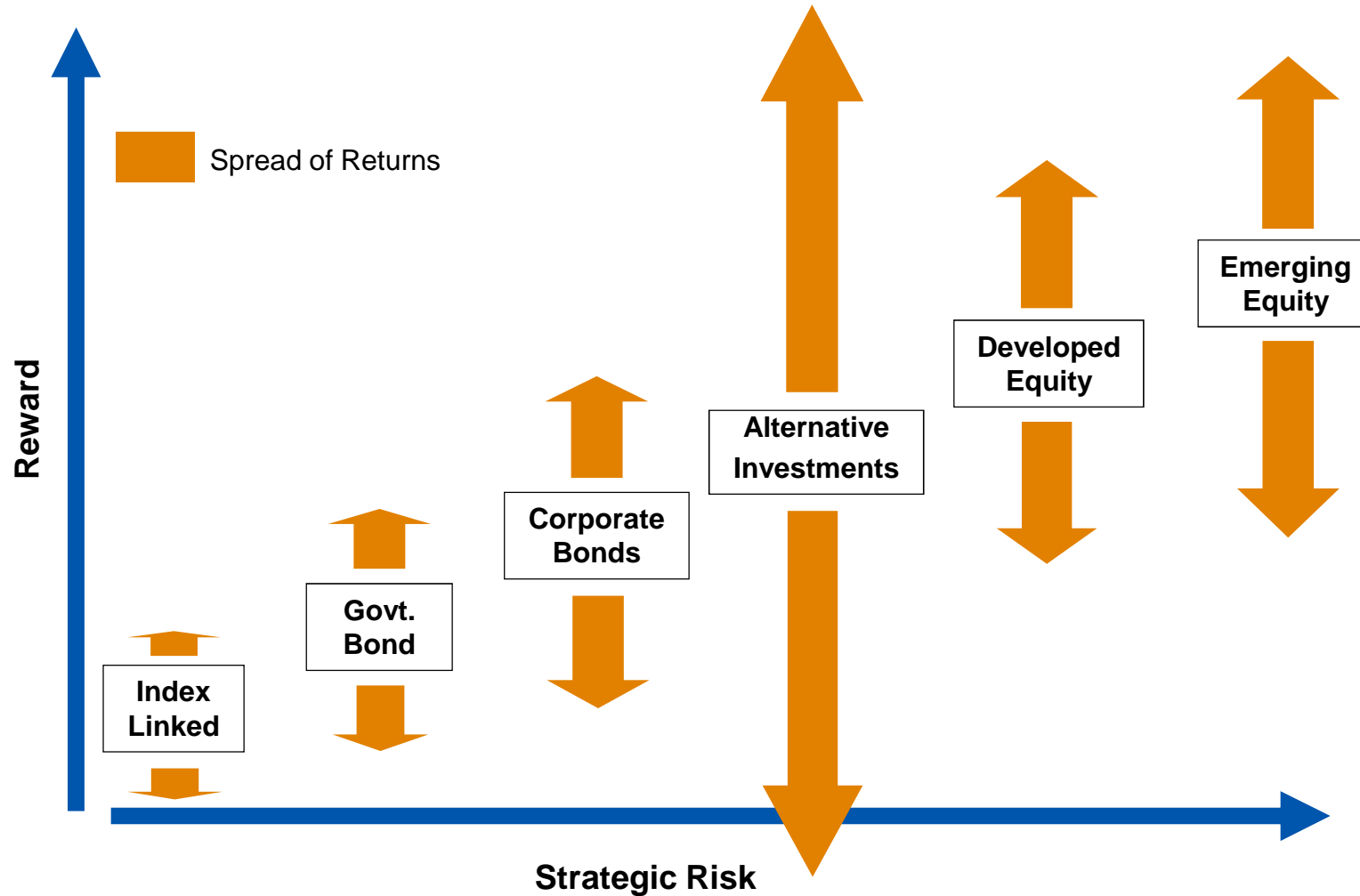
Introduction to Risk
Relative Profile

Introduction to Risk
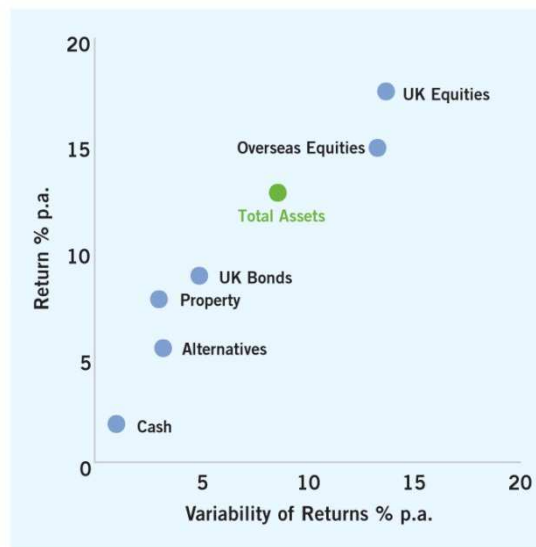## Important to Monitor Progress/Track Changes

Introduction to Risk
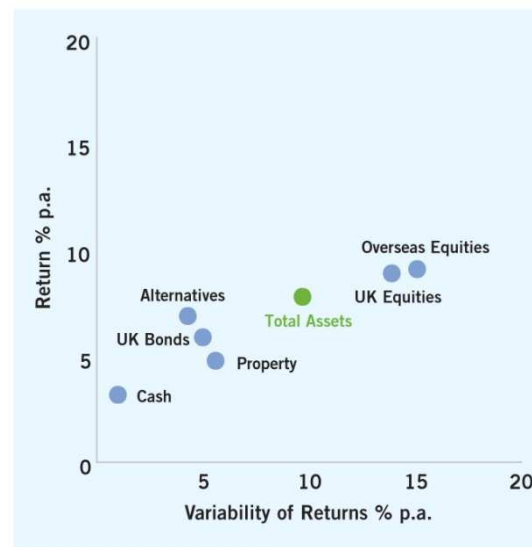## Long Term Risk & Return Trade off

Long Term LA Universe Risk and Return to end March 2014

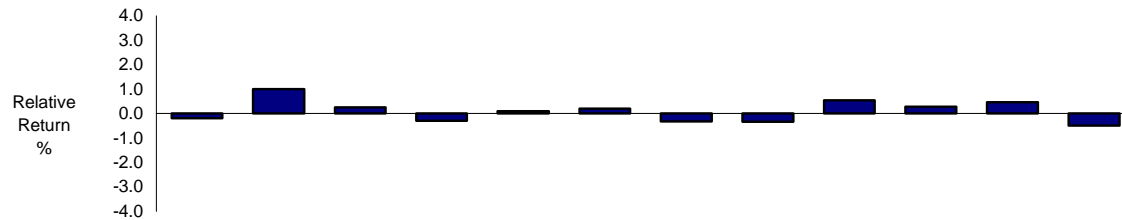Last 5 Years

Last 10 Years

Last 20 Years

* Source: State Street Investment Analytics, 2014.

Past performance is not a reliable indicator of future results.

Introduction to Risk

Is the whole Fund behaving as budgeted?

Quarterly Returns

This is the whole Fund

Fund	6.1	-5.6	8.2	5.2	1.6	1.4	-8.8	5.6	6.3	-1.3	4.3	1.9
Benchmark	6.3	-6.5	7.9	5.5	1.5	1.2	-8.5	6.0	5.7	-1.5	3.8	2.4
Relative Return	-0.2	1.0	0.2	-0.3	0.1	0.2	-0.3	-0.3	0.5	0.3	0.5	-0.5

Annualised Rolling 3 Year Returns

Returns are very satisfactory relative to benchmark

Fund	2.4	-0.8	1.4	2.5	5.5	6.3	6.8	10.2	14.7	12.2	8.6	8.0
Benchmark	1.7	-1.6	0.7	2.5	5.3	6.3	5.9	9.9	14.9	12.0	8.0	7.6
Relative Return	0.7	0.9	0.7	0.1	0.1	0.1	0.8	0.3	-0.1	0.2	0.6	0.4
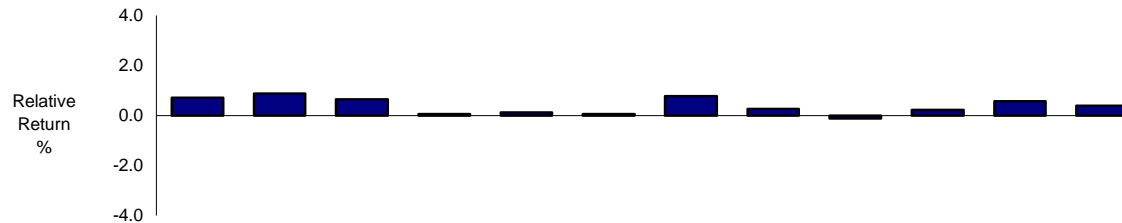
Rolling 3 Year Risk
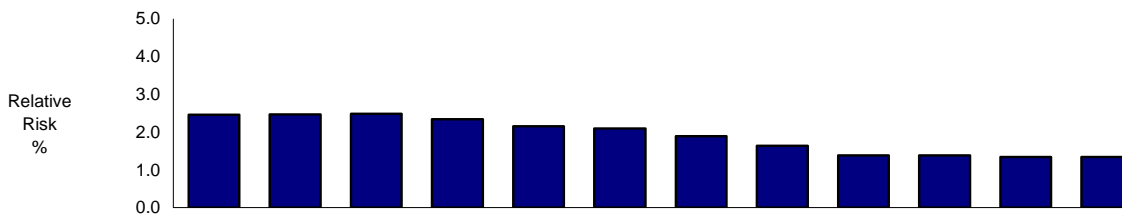
Risk has reduced, is quite low and the IR's positive

Relative Risk	2.5	2.5	2.5	2.3	2.2	2.1	1.9	1.6	1.4	1.4	1.3	1.3
Information Ratio	0.3	0.4	0.3	0.0	0.1	0.0	0.4	0.2	-0.1	0.2	0.4	0.3

37

Introduction to Risk
Are Our Managers' Behaviours Appropriate

Quarterly Returns
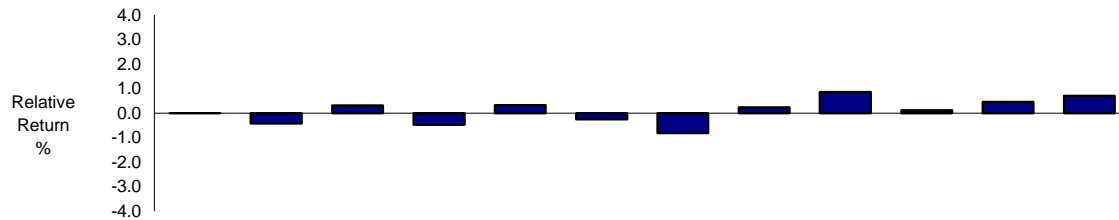
Fund	2.5	2.7	4.5	-2.7	0.4	1.9	4.1	3.9	1.3	3.0	3.9	1.5
Benchmark	2.5	3.2	4.2	-2.2	0.1	2.2	4.9	3.7	0.5	2.9	3.4	0.8
Relative Return	-0.0	-0.4	0.3	-0.5	0.3	-0.3	-0.8	0.2	0.8	0.1	0.4	0.7

Annualised Rolling 3 Year Returns

Fund	7.4	9.4	9.7	7.1	6.5	8.2	9.1	7.7	9.0	9.2	8.5	9.3
Benchmark	7.5	9.5	9.4	6.9	5.9	7.8	8.7	7.9	9.1	9.2	8.4	8.9
Relative Return	-0.0	-0.0	0.2	0.2	0.5	0.4	0.4	-0.2	-0.1	-0.0	0.1	0.3

Rolling 3 Year Risk
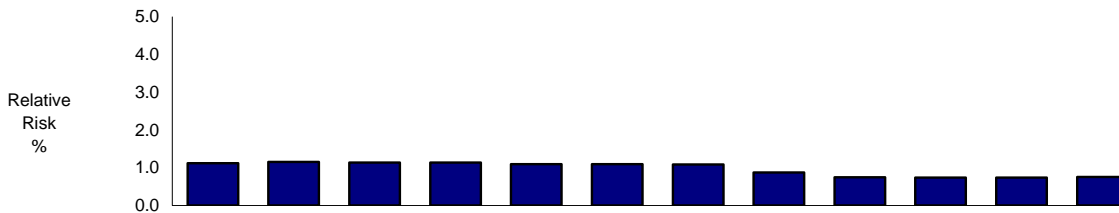
Relative Risk	1.1	1.2	1.1	1.1	1.1	1.1	1.1	0.9	0.7	0.7	0.7	0.8
Information Ratio	-0.0	-0.0	0.2	0.2	0.5	0.3	0.4	-0.2	-0.2	-0.0	0.2	0.4

This is an active Bond portfolio

Returns are very satisfactory relative to benchmark

Risk is appropriate for the asset class

38

Introduction to Risk

Are Our Managers' Behaviours Appropriate

Quarterly Returns
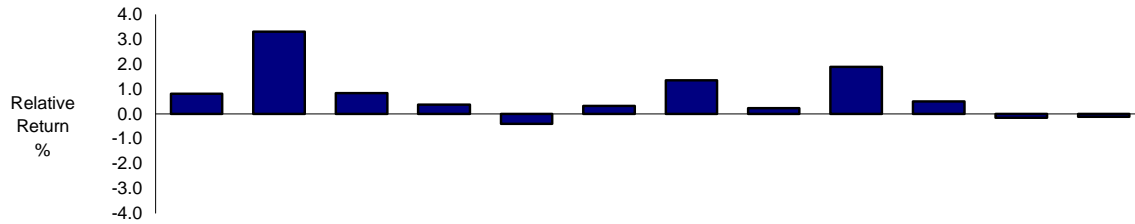
Fund	9.0	-8.3	12.1	8.6	1.6	1.4	-14.6	7.1	10.3	-3.5	4.4	3.8
Benchmark	8.1	-11.3	11.2	8.2	2.0	1.1	-15.8	6.9	8.3	-4.0	4.6	4.0
Relative Return	0.8	3.3	0.8	0.4	-0.4	0.3	1.4	0.2	1.9	0.5	-0.2	-0.1

This is an active core Equity portfolio

Annualised Rolling 3 Year Returns
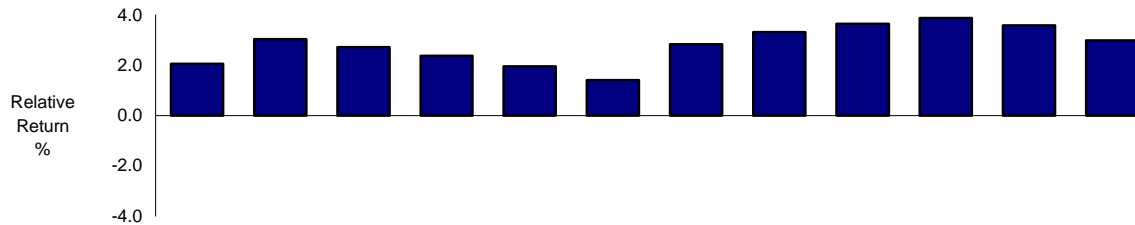
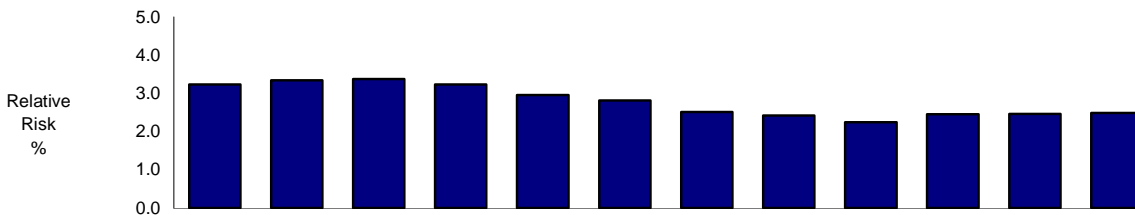|												
Fund	4.9	0.3	3.6	5.9	9.3	9.8	9.0	14.3	21.8	16.9	10.5	9.8
Benchmark	2.8	-2.7	0.8	3.4	7.2	8.3	6.0	10.7	17.5	12.5	6.6	6.6
Relative Return	2.1	3.0	2.7	2.4	1.9	1.4	2.8	3.3	3.6	3.9	3.6	3.0

Returns are extremely satisfactory

Rolling 3 Year Risk

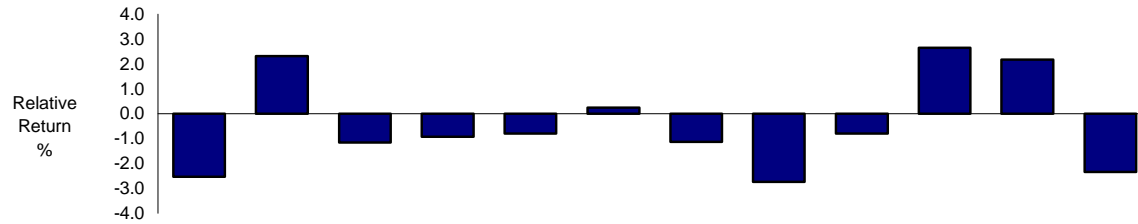|												
Relative Risk	3.2	3.3	3.4	3.2	3.0	2.8	2.5	2.4	2.2	2.5	2.5	2.5
Information Ratio	0.6	0.9	0.8	0.7	0.7	0.5	1.1	1.4	1.6	1.6	1.5	1.2

Risk is appropriate (possibly even low) for the mandate but the IRs hugely positive

39

Introduction to Risk
Are Our Managers' Behaviours Appropriate

Quarterly Returns

Relative Return %

Fund	7.1	-8.7	7.4	8.5	1.3	0.5	-15.8	4.6	8.1	-1.0	6.1	-0.1
Benchmark	9.9	-10.7	8.7	9.5	2.1	0.3	-14.8	7.6	9.0	-3.6	3.9	2.3
Relative Return	-2.5	2.3	-1.1	-0.9	-0.8	0.3	-1.1	-2.7	-0.8	2.6	2.2	-2.3

This is a high alpha equity portfolio

Annualised Rolling 3 Year Returns

Relative Return %

Fund	3.4	6.5	11.7	10.0	6.4	5.1
Benchmark	5.8	9.7	17.1	13.2	7.4	6.9
Relative Return	-2.3	-2.9	-4.6	-2.8	-1.0	-1.7
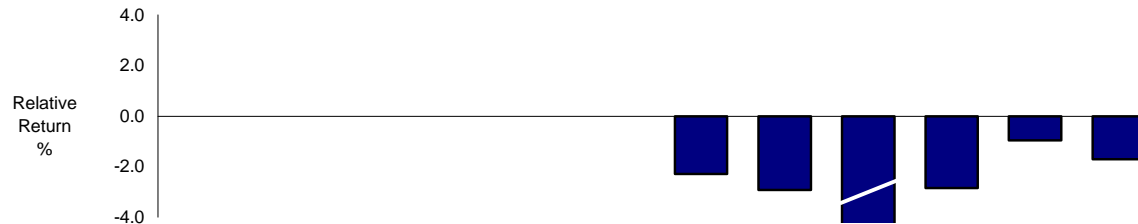
Returns are disappointing but becoming less so

Rolling 3 Year Risk

Relative Risk %

Relative Risk	5.1	4.8	3.9	3.9	3.7	3.7
Information Ratio	-0.4	-0.6	-1.2	-0.7	-0.3	-0.5

Risk is higher but commensurate with the higher target set

40

Local Authority Universe 5 Years to end March 2014

Risk & Return - What Matters

Return % p.a.

Variability of Returns % p.a.

Introduction to Risk
Summary

- Risk is not a bad thing

- Risk is all about variability and confidence in outcomes

- Risk is required to outperform

  asset class risk to outperform a risk free rate

  manager relative risk to outperform the asset benchmark

- Investment strategy cannot be set without explicit reference to risk

- Risk can set boundaries for appropriate behaviour

- Risk can highlight inappropriate behaviour

Trends & Observations

- Accessing equity

- Accessing bonds

- Funds seeking better risk adjusted returns

- Running costs

- Appetite for reporting net of fees

- Focus on benchmarks

Contact details for further information

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