

How risky is my investment?

Presentation to the Society of Actuaries in Ireland by
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Agenda

- Background
- Current approaches to illustration of risk
- A proposed new approach
- Thoughts on regulation
- Comparing investment funds
- The magic of diversification
- Conclusions

It's the outcome, stupid

- Kevin Murphy (24th May 2005)
 - Paper to the Society of Actuaries in Ireland
 - Actuarial profession needs investment tables
- *“...build a deep insight into the outcomes that are possible from the various products which we are involved in with our clients.”*
- *“a simple investment table”* based on long-term investment assumptions.

Current Illustrations of Market Risk

- How does an authorised advisor illustrate the relative risk of the funds she recommends?
- Standard deviation is available
 - Difficult to get a feel for the risk involved
- Past periods of outstanding returns on the positive and negative side
 - May be unrepresentative of risk

Can we do better?

Large repository of past daily
returns for many funds



Bootstrap Re-Sampling Technique

- Pioneered by Bradley Efron in 1979
- Data set: Past daily returns of fund
- Procedure: Randomly sample, register observed daily return & replace daily return in data set
- Repeat procedure
 - 21 times to build up return for a calendar month
 - 259 times to build up return for a calendar year
 - 1,295 times to build up return for 5 calendar years

Irish Equity Fund

	1% of returns less than	5% of returns less than	25% of returns less than	Mean return	25% of returns greater than	5% of returns greater than	1% of returns greater than
Calendar Month	-10.5%	-7.1%	-2.3%	1.0%	4.3%	9.3%	13.0%
Calendar Year	-25.6%	-16.2%	-0.8%	12.9%	25.0%	47.4%	65.5%
Five Calendar Year Annualised	-6.9%	-1.9%	5.7%	12.9%	17.2%	26.2%	33.0%
Five Calendar Year Period	-30.1%	-9.3%	31.8%	83.7%	121%	220%	316%

Data set: Daily returns from 1st October 1996 to 21st November 2007.

Currency Fund

	1% of returns less than	5% of returns less than	25% of returns less than	Mean return	25% of returns greater than	5% of returns greater than	1% of returns greater than
Calendar Month	-9.9%	-6.5%	-2.0%	1.0%	4.0%	8.6%	12.1%
Calendar Year	-23.5%	-14.3%	0.3%	13.2%	24.5%	45.5%	62.2%
Five Calendar Year Annualised	-5.5%	-0.8%	6.4%	13.2%	17.3%	25.7%	32.0%
Five Calendar Year Period	-24.6%	-3.7%	36.6%	85.8%	122%	214%	300%

Data set: Daily returns from 30th March 2005 to 21st November 2007.

Fixed Income Fund

	1% of returns less than	5% of returns less than	25% of returns less than	Mean return	25% of returns greater than	5% of returns greater than	1% of returns greater than
Calendar Month	-2.8%	-1.7%	-0.4%	0.5%	1.4%	2.7%	3.7%
Calendar Year	-4.6%	-1.4%	3.2%	6.6%	10.0%	15.0%	18.8%
Five Calendar Year Annualised	1.4%	2.9%	5.0%	6.6%	8.1%	10.3%	11.9%
Five Calendar Year Period	7.4%	15.4%	27.9%	38.0%	47.3%	63.0%	75.1%

Data set: Daily returns from 1st October 1996 to 21st November 2007.

Consensus Fund

	1% of returns less than	5% of returns less than	25% of returns less than	Mean return	25% of returns greater than	5% of returns greater than	1% of returns greater than
Calendar Month	-6.1%	-4.1%	-1.2%	0.8%	2.8%	5.8%	8.0%
Calendar Year	-15.0%	-8.5%	1.4%	9.4%	16.8%	29.3%	38.8%
Five Calendar Year Annualised	-2.5%	0.7%	5.4%	9.4%	12.3%	17.6%	21.4%
Five Calendar Year Period	-11.8%	3.5%	30.1%	56.8%	78.8%	124%	163%

Data set: Daily returns from 1st October 1996 to 21st November 2007.

Comparison – One Calendar Year

	1% of returns less than	5% of returns less than	25% of returns less than	Mean return	25% of returns greater than	5% of returns greater than	1% of returns greater than
Fixed Income Fund	-4.6%	-1.4%	3.2%	6.6%	10.0%	15.0%	18.8%
Consensus Fund	-15.0%	-8.5%	1.4%	9.4%	16.8%	29.3%	38.8%
Currency Fund	-23.5%	-14.3%	0.3%	13.2%	24.5%	45.5%	62.2%
Irish Equity Fund	-25.6%	-16.2%	-0.8%	12.9%	25.0%	47.4%	65.5%

How useful are these tables?

- Illustration of risk: Magnitude & chances
- Risk tolerance
- Relative risk of different funds is illustrated

Assumptions Underling Bootstrap Re-Sampling Technique

- Daily returns are independently & identically distributed
- Not the case for all assets
 - Daily returns of equity indices are serially correlated
 - Ramu Ramanathan: *Introductory Econometrics with Applications*
- How does the invalidity of this assumption affect the tables?

Serial Correlation

- Not all investment fund daily returns exhibit serial correlation
- Positive serial correlation
 - Downside & upside returns understated
- Negative serial correlation
 - Downside & upside returns overstated

Should We Correct for Serial Correlation?

- No universally agreed method of correcting for serial correlation in a bootstrap re-sampling
- While not perfect, bootstrap re-sampling is an improvement on current risk disclosure

Regulation

➤ MiFID

- Useful in explaining risk to customers
- Simple rules for producing the tables
 - Publish daily return
 - Anyone can verify figures
 - Track record to be used
 - All daily returns for a given strategy
 - Changes in strategy
 - Only when publicly announced

Regulation

- How do the tables fit with the 'assumed' growth rates for illustrations?
- Expected return figure may be higher or lower than 'assumed' growth rate
 - Not incompatible; different objectives
- Expected return representative of past returns which are readily available
- Availability of risk information is important in consumer's decision making process
 - Table forces a serious conversation about risk

Comparing the Performance of Investment Managers



Valid Comparison

- The volatility of the managers being compared should be very similar
- The investment strategy should be similar
- The opportunity set of the two managers being compared should be similar

Managed Pension Funds

Manager	10-Yr. Annualised Return to 30 th Sept. 2007	Rank	10-Yr. Annualised SD of Monthly Returns to 30 th Sept. 2007
A	9.0	1	12.09
B	7.8	2	10.32
C	7.7	3	10.99
D	7.5	4	11.03
E	7.5	5	11.19
F	7.4	6	11.12
G	7.2	7	9.86
H	6.9	8	11.73
I	6.9	9	11.02
J	6.6	10	11.39
K	6.6	11	11.39
L	6.3	12	11.38
M	6.1	13	11.90
N	5.2	14	11.26

Source: Hewitt with authors' computations.

Managed Pension Funds

Manager	10-Yr. Annualised Risk-Adjusted Return to 30 th Sept. 2007	Risk-Adjusted Rank
B	8.5	1
A	8.4	2
G	8.2	3
C	7.9	4
D	7.6	5
E	7.5	6
F	7.5	7
I	7.0	8
H	6.6	9
J	6.5	10
K	6.5	11
L	6.2	12
M	5.8	13
N	5.2	14

Source: Hewitt with authors' computations.

Diversification

- Who got the Nobel prize in economics for simply saying:
 - Not the number of assets
 - Rather, number of assets that don't have their periods of positive & negative returns at the same time?
- Risk of Irish Equity Fund & Currency Fund taken in isolation is rather high
- Taken together risk is significantly lower
 - Tend not to have periods of positive & negative returns at the same time

Consensus (75%) & Currency (25%) Fund Combination

	1% of returns less than	5% of returns less than	25% of returns less than	Mean return	25% of returns greater than	5% of returns greater than	1% of returns greater than
Calendar Month	-4.3%	-2.7%	-0.6%	0.9%	2.4%	4.5%	6.0%
Calendar Year	-7.2%	-2.1%	+ 5.5%	11.4%	17.1%	26.0%	32.6%
Five Calendar Year Annualised	2.6%	5.0%	8.6%	11.4%	13.7%	17.6%	20.3%
Five Calendar Year Period	13.7%	27.7%	50.8%	71.9%	90.3%	124%	152%

Data set: Daily returns from 30th March 2005 to 21st November 2007.

What Does Lower Risk Mean?

<u>Event</u> Peak-to-Trough Fall in Value Over the Next 10 Years of More Than:	Chances of Event Assuming a Risk Level of 10.1% p. a.	Chances of Event Assuming a Risk Level of 8.8% p. a.
20%	50%	27%
25%	24%	9%

Assumptions underlying simulation of results: Both the managed fund and the diversified managed fund produce net-of-fees returns of 6% per annum and their returns are normally distributed.

Summary & Conclusions

- More informative risk disclosure for certain investment funds
- Adjust managers' returns for risk before comparing them
- Diversification matters a lot
 - Done properly, you can get equity returns with lower risk than equities