



**TOWERS  
PERRIN**

TILLINGHAST

# **How big a problem is longevity risk ? - A comparison from history**

**First International Conference on Longevity Risk and  
Capital Market Solutions**

Michael Johnson - Tillinghast Towers Perrin

18 February 2005

# Contents

1. Introduction
2. Sizing the risk
  - Regulated annuities
  - Closed DB pension schemes
3. A comparison from history
4. Summary

# Introduction; longevity risk

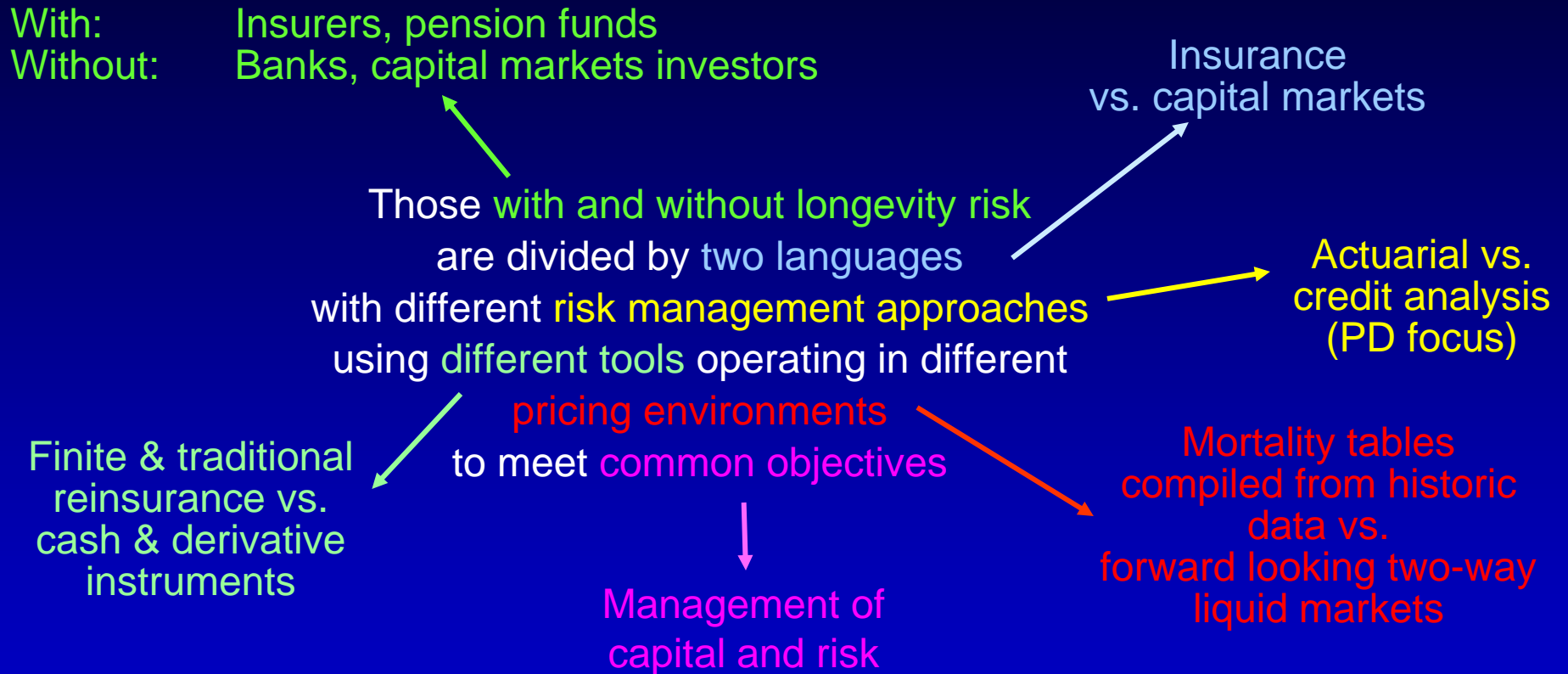
- Currently in vogue, but..... a second order problem (?)
  - Niagara of papers
  - The audience
    - DB pension schemes; multiple perspectives
    - Annuity writers; immediate, deferred
    - Equity release mortgage providers
    - Government, incl. PPF
    - Credit rating agencies
    - You and me
- } Shareholders !

→ Plenty of parties keen to shed longevity risk

## Introduction, cont.

- But what is longevity risk ?
  - Materialises when mortality expectations are not met
  - Indirect consequences; e.g. revaluation of deferred annuities
    - Low, then high, inflation; impact of carry forward of unused LPI indexation
- Is there a potential market and how big ?
  - As an asset class it lacks homogeneity
- How to price it ?
  - Few natural investors
    - Term assurance books
    - Pharmaceutical companies
    - Care homes

# Longevity risk and capital markets; two mindsets ?



The mindset meeting point is the ability to attribute probability distributions to mortality projections; the Holy Grail ?



**TOWERS  
PERRIN**

TILLINGHAST

## **2. Sizing the risk**

# UK perspective

	UK exposure*	Regulation	Ass'ptns disclosure	Exposed parties	How does longevity risk manifest itself ?
<b>Corporate DB pension schemes</b>	£750bn+	Light	Little	Shareholders Employees Pensioners	Balance sheet and STRGL volatility, funding shortfall
<b>Insurer annuities</b> - Immediate - Deferred	£70bn+ Tens of £bns	Tight	Some	Shareholders Policyholders	Reserve strain, reinvestment risk
Equity-release mortgages	£4bn +	Tightening	Some	Shareholders	Negative equity losses incurred by SHIP lenders

\* Richards and Jones, Financial Aspects of Longevity risk

# Annuity writers

## Sizing longevity risk; one approach

- Consider how mortality tables have changed; implications for future tables ?
  - 3 tables of 65 year olds (UK, male):

20 years ago  
10 years ago  
Current

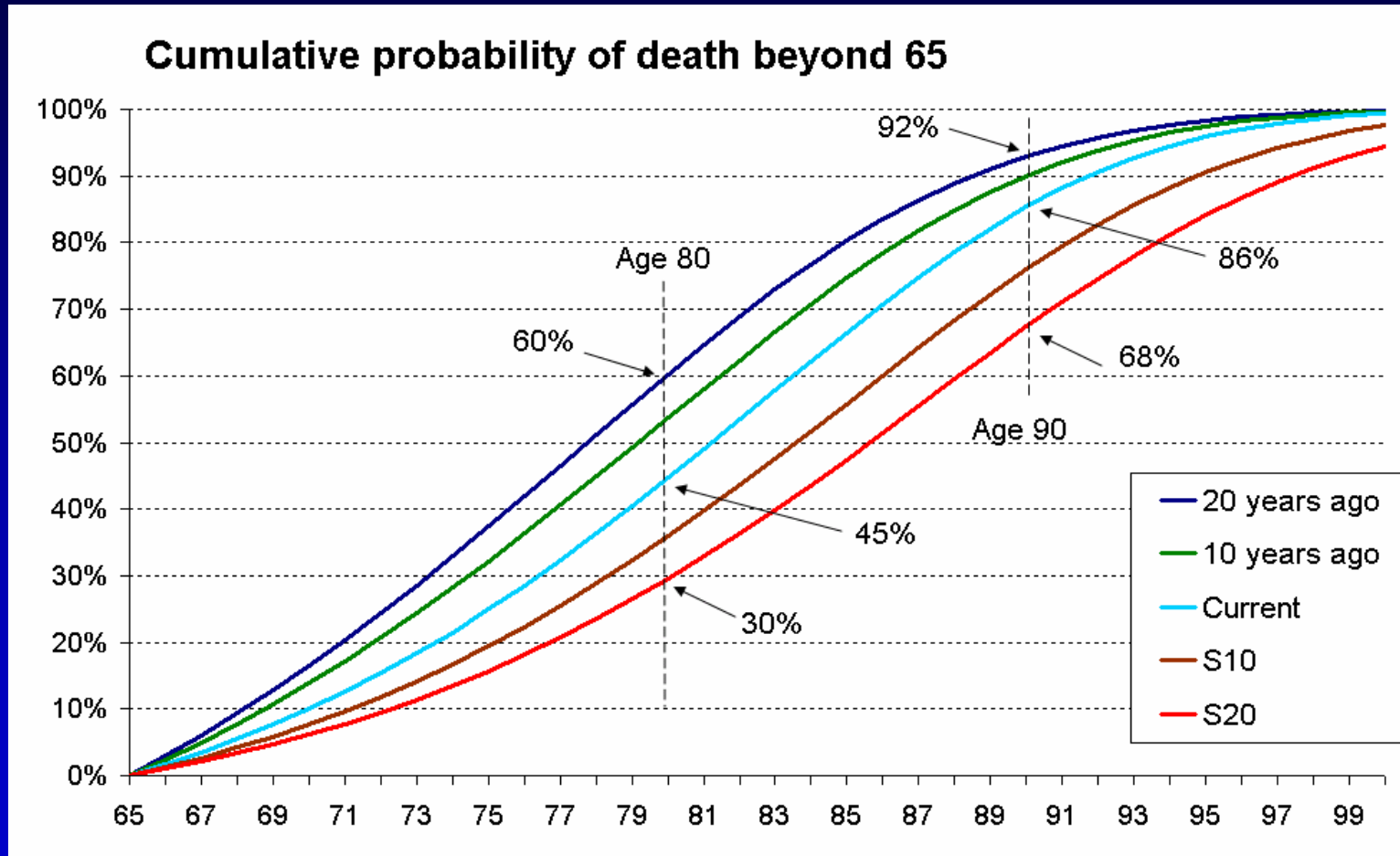
- Two future projection scenarios:

<u>Scenario</u>	<u>Forward projection</u>	<u>Projection basis</u>	<u>e.g. 4% rates</u>
S10	10 years	% rise in AF, last 10 years	8.9%
S20	20 years	% rise in AF, last 20 years	16.2%

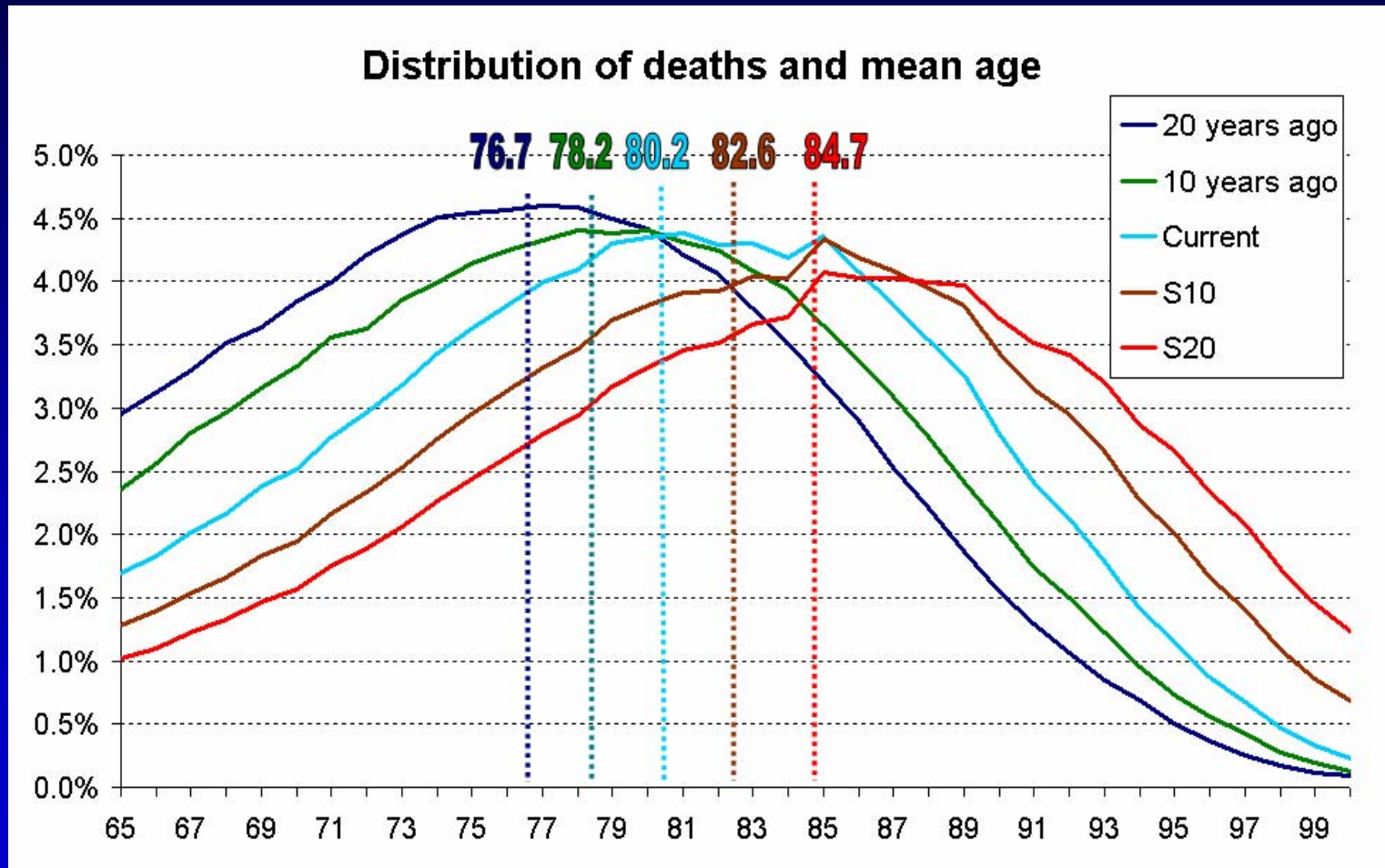
- 4 different interest rate scenarios
  - Focus on annuity factors to quantify risk in £ terms
    - Disaggregate interest rate and longevity impacts
- Scale of additional capital requirement ?

4% 6% 8% 15%

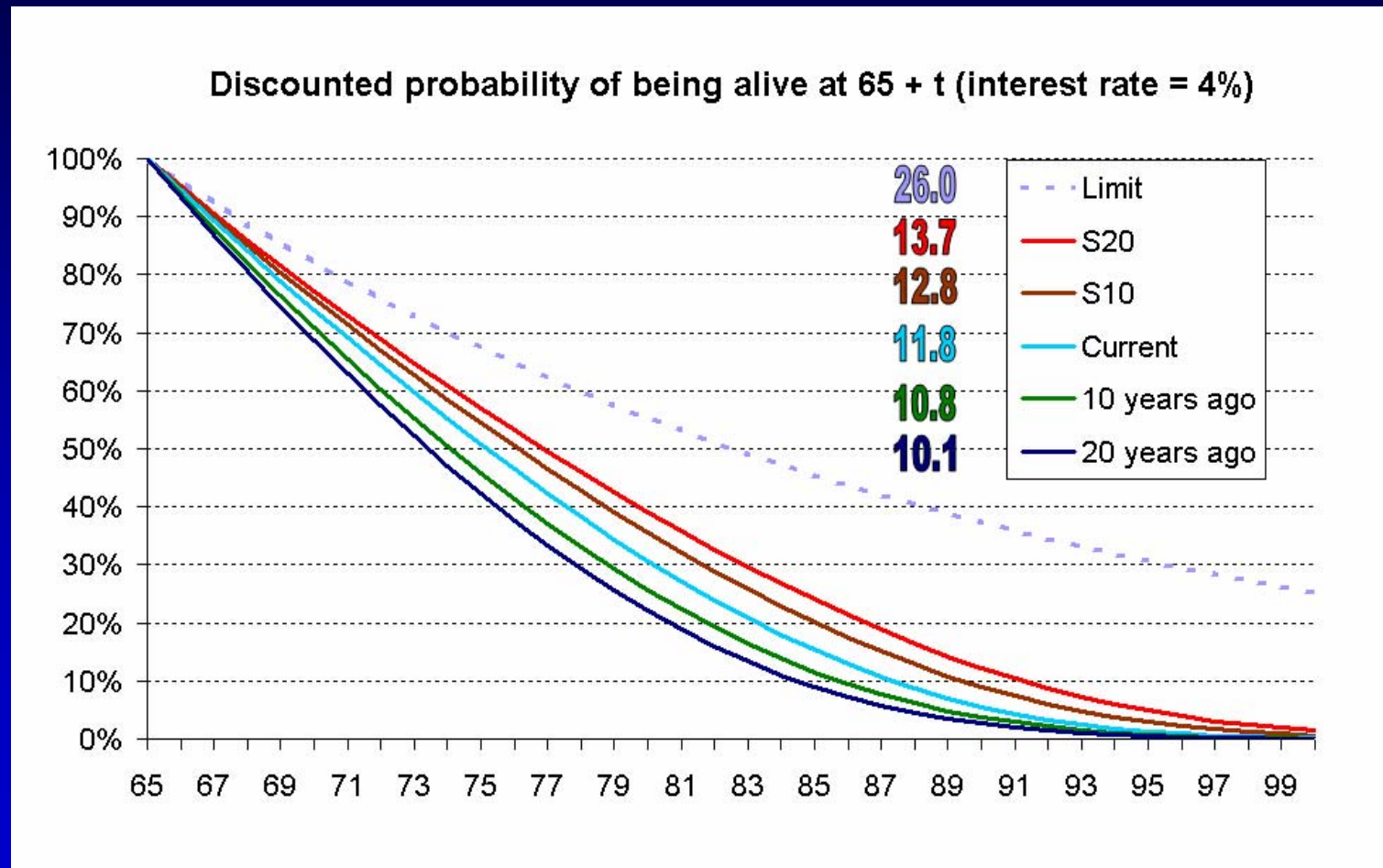
# Results overview



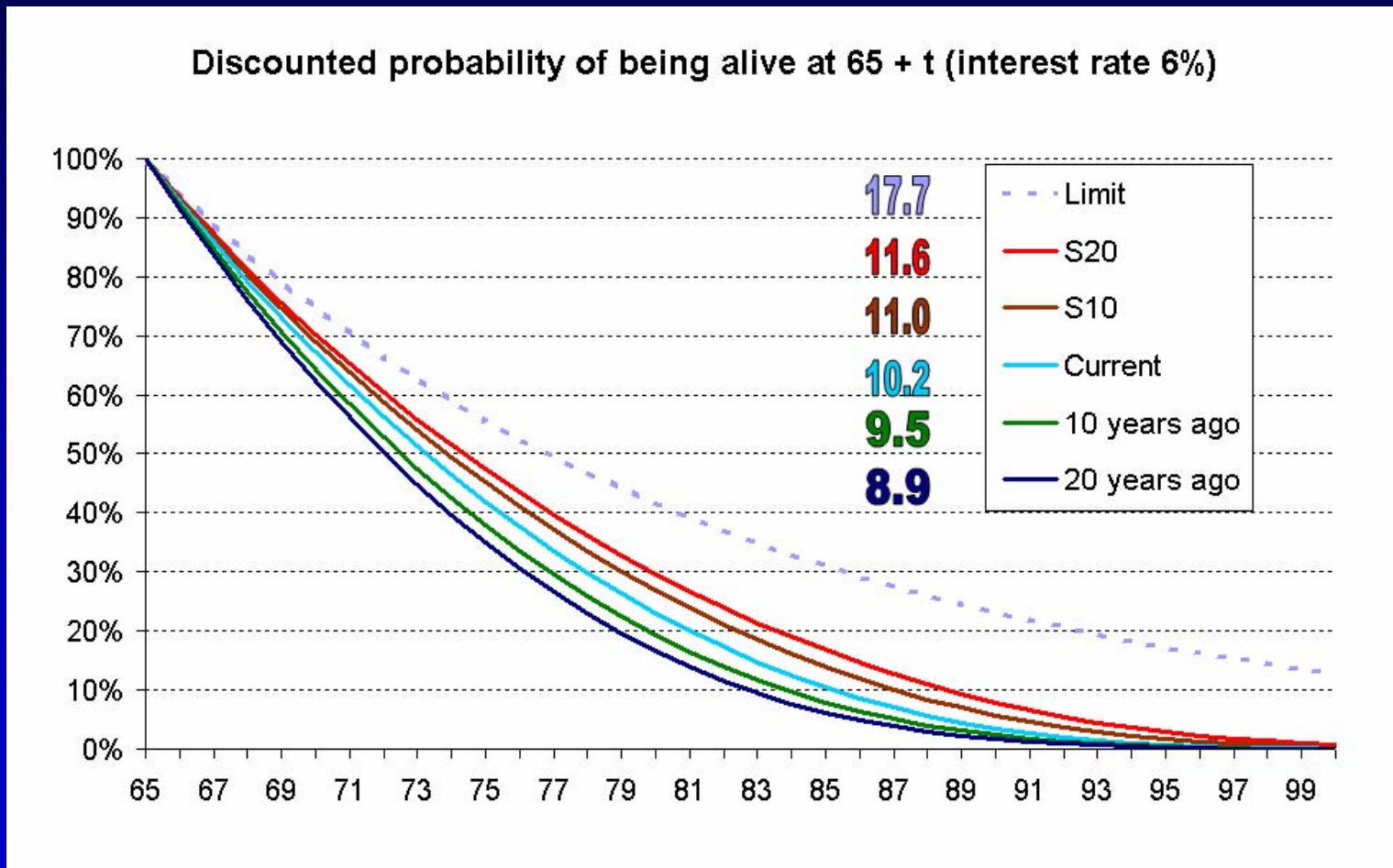
# Mean age of death



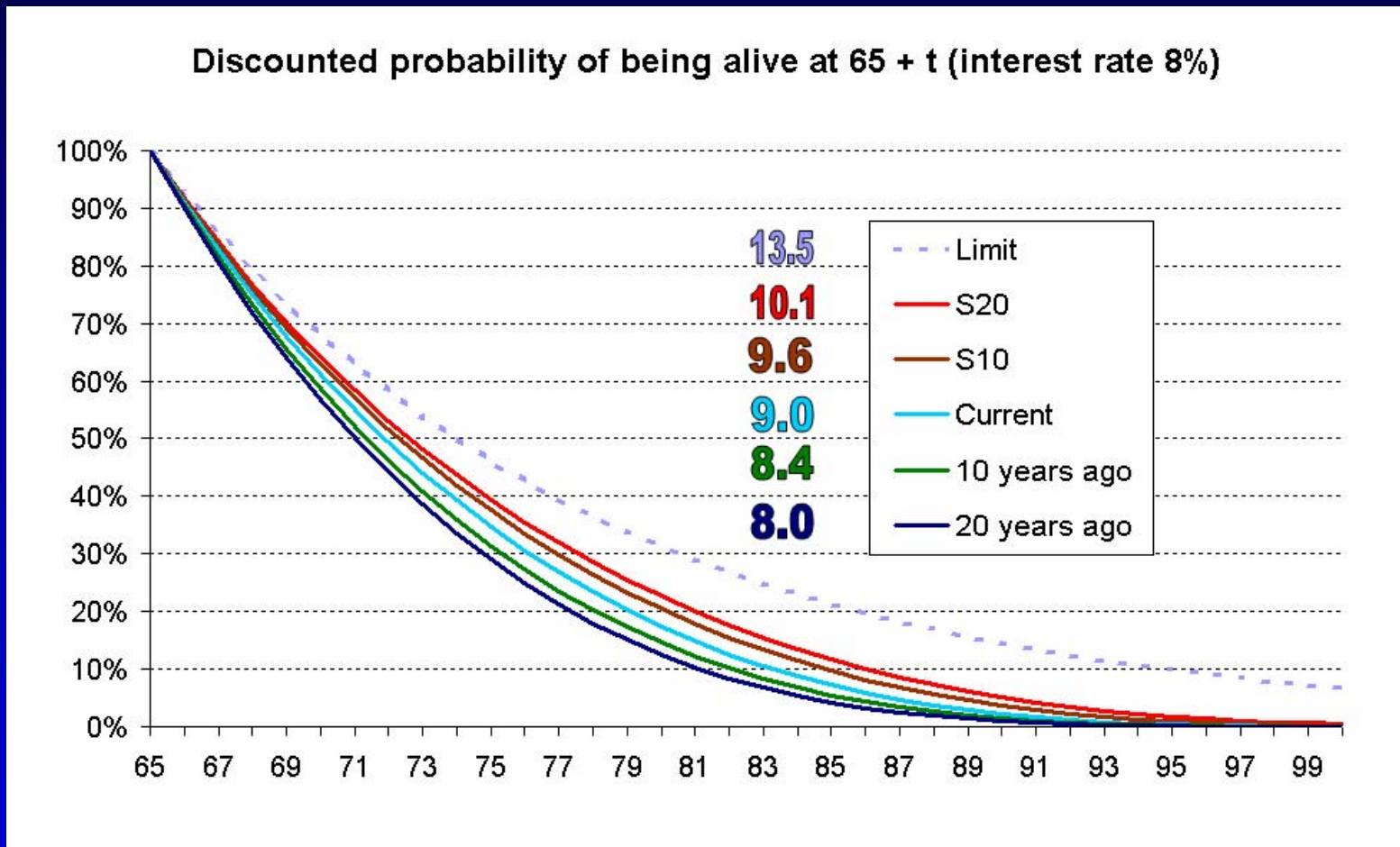
# Expected annuity factors (4%)



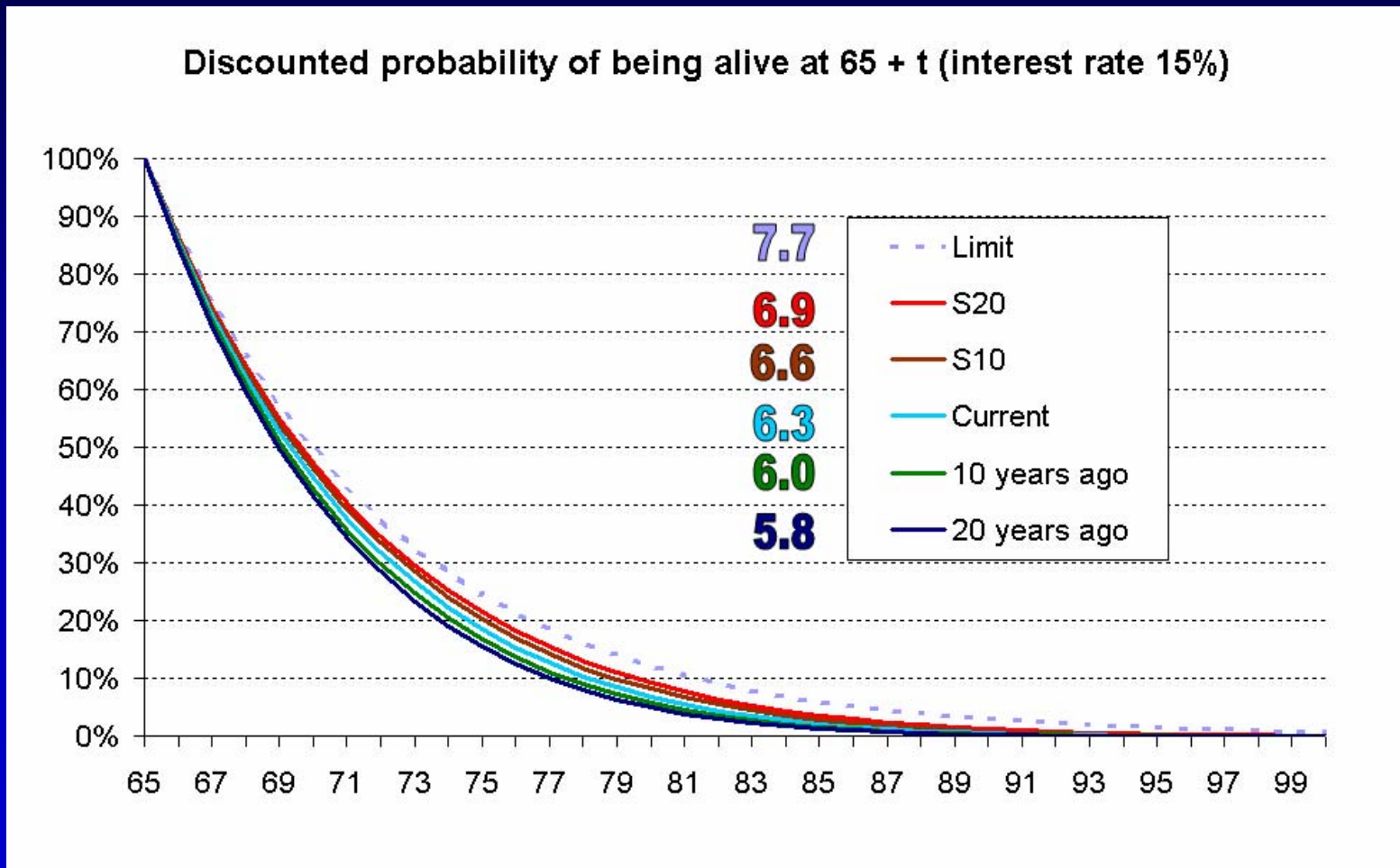
# Expected annuity factors (6%)



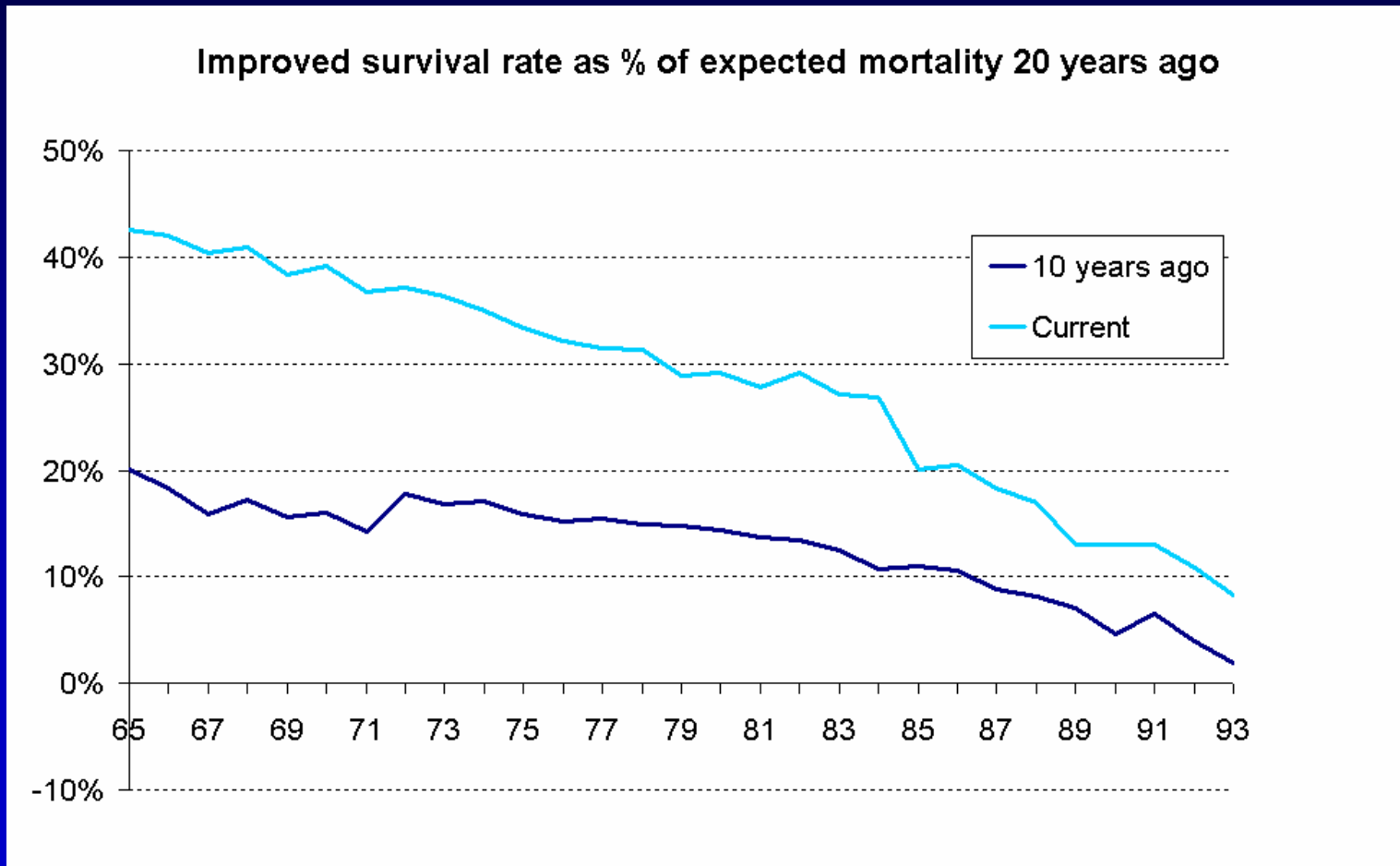
# Expected annuity factors (8%)



# Expected annuity factors (15%)



# Improving mortality; and accelerating



# Longevity trend

Mortality table / projection	Mean age at death	Annuity factor, various discount rates				
		4%	6%	8%	15%	
20 years ago	76.7	10.1	8.9	8.0	5.8	
10 years ago	78.2	10.8	1.6	9.5	8.4	6.0
Current	80.2	11.8	10.2	9.0	6.3	
S10	82.6	1.9	12.8	11.0	9.6	6.6
S20	84.7	13.7	11.6	10.1	6.9	
Limit	$\infty$	26.0	17.7	13.5	7.7	

# Longevity trend

Mortality table / projection	Mean age at death	Annuity factor, various discount rates				
		4%	6%	8%	15%	
20 years ago	76.7	10.1	8.9	8.0	5.8	
10 years ago	78.2	10.8	9.5	8.4	6.0	
Current	80.2	11.8	10.2	9.0	6.3	
S10	82.6	1.9	12.8	11.0	9.6	6.6
S20	84.7	13.7	11.6	10.1	6.9	0.6
Limit	∞	26.0	17.7	13.5	7.7	

# Longevity improvements; implications for capital

Current table  
e.g. 6% rates (AF 10.2)

Assets	10
Annuity reserve	<u>(8)</u>
Total capital	2
RMM	<u>(0.4)</u>
Excess capital	1.6

16%

S20 projection  
6% rates (AF 11.6)

Assets	11.42
Annuity reserve	<u>(9.14)</u>
Total capital	2.28
RMM	<u>(0.46)</u>
Excess capital	1.82

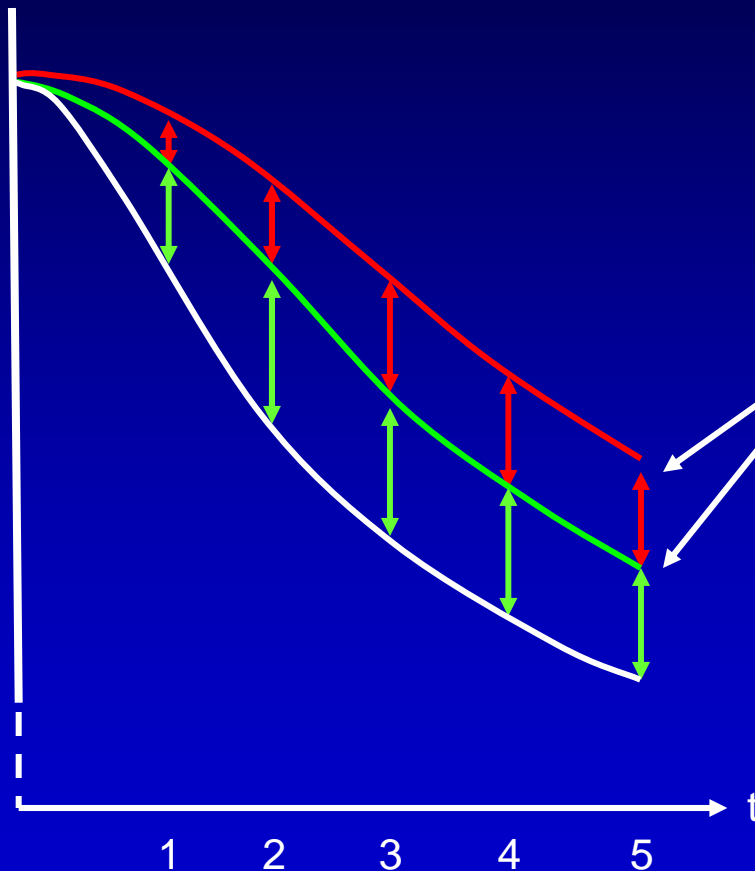
16%

Projections	Additional capital required, various discount rates			
	4%	6%	8%	15%
S10	45%	39%	35%	24%
S20	81%	71%	62%	42%
Limit	605%	367%	252%	106%

$$1.42 / 2 = 71\%$$

# Risk transfer; a starting point ?

Cashflow £

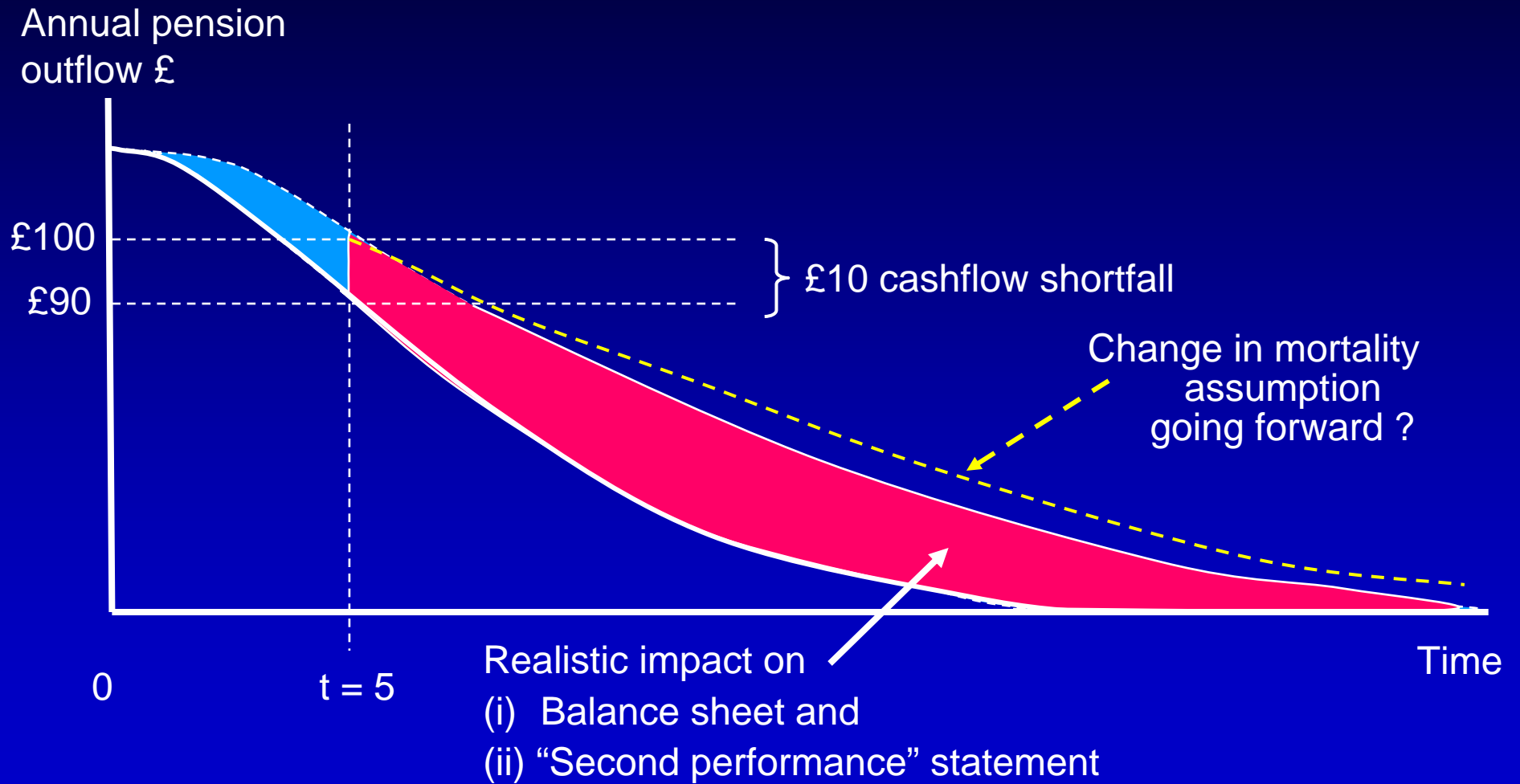


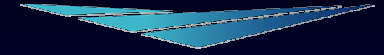
- Expected path (latest mortality table + bit)
- Sponsor's / trustee's risk appetite limit
- ↔ Sponsor / fund meets gap
- Counterparty's exposure limit
- ↔ Counterparty pays fund

Probability of occurrence for 1 year, 2, 3...?

- How much is it worth paying c/p ?
- What kind of yield does c/p require ?
  - Proprietary trader / PC insurer ?
  - 5 year view; liability is capped
- If regulated, capital benefit ? Ref ICAS
- Multi-year mortality swaps

# Closed DB scheme; three concerns





**TOWERS  
PERRIN**

**TILLINGHAST**

## **3. A comparison with history**

## A comparison with history

	<u>LDC debt crisis</u>	<u>DB schemes</u>
Problem size	£150bn +	Very big
Problem arrival	Rapid	Rapid
The hope	Rising markets Economic growth	Rising markets Falling longevity
Symptoms: Short term Med. / long term	Cashflow strain Lack of capital	B/s volatility, some c/f strain Sponsor collapse ?
Creditors' position	Locked in	Locked in (buy-out unattractive)
Acct'g and regulatory environments	Compliant; denial of economic reality ?	Now surfacing the risks
Solutions	Buy time, cut deals with creditors	De-risk, cut deals with employees, pensioners, higher interest rates

## A comparison with history, cont.

- The Brady Plan (1989-90)
  - Debt relief granted in return for:
    - Greater assurance of collectability; P and I collateralised
    - Economic reform
    - Tradable new instruments; > U.S. \$160 bn
  - Facilitated a return to market reality (market-oriented relationship between countries and creditors)
- Bradstock Agreement
  - Trustees agreed to reduce employee benefits
  - To avoid MAD
    - Trustees saved sponsor (scheme an unsecured creditor)
    - Sponsor keen to avoid full buy-out upon wind-up
  - PPF impact ?
    - Employee and pensioner objectives diverge ?



**TOWERS  
PERRIN**

TILLINGHAST

## **4. Summary**

## Longevity; summary

- A big problem but headline “exposure” numbers are misleading
  - The risk; difference between what’s expected and the outcome
  
- DB schemes: reality obscured by timid regulation, legal ambiguity and poor actuarial communication
  - Are equity markets fully pricing in the risk ?
  
- Annuities: regulatory change is surfacing the risks, focused on:
  - risk identification; and
  - introduction of controls
    - Understanding ICAS is key; the ECR & ICA process is motivating clients to reduce risk
  
- Annuity experience is applicable to corporate DB schemes seeking to transfer longevity risk, harnessing a deep understanding of:
  - insurance and pensions industries;
  - regulatory arena; and
  - capital markets

# Longevity; summary

- Longevity primarily attacks shareholders; this suggests equity- or capital-linked solutions (rather than fixed income)
- If a market for longevity fails to develop, PPF could be over-whelmed
  - Facilitate “managed default” on behalf of sponsors, akin to Brady Plan?
- Modelling
  - A quantifiable risk or an unquantifiable uncertainty ?
    - Mortality rates to continue to improve but rate of improvement (incorporated in tables) historically underestimated
    - Will maximal age increase ?
    - Include cat-like characteristics (miracle cures...)
  - The Holy Grail: attributing probability distributions to longevity projections
    - Currently out of reach
- Role of actuaries is to better communicate the risk
  - Catalyse action by those who can act
  - It is unrealistic to solely depend upon the comfort of mathematical authority