Discount Process Is The Problem

An "Off-Market Approach"

Jon Spain (03 Dec 2019)

agenda

disclaimer

views expressed are entirely personal

thanks are due to those who discussed issues over time

- … and to those who have refused to engage

in no way endorsed by IFoA or SIAS (yet)

work has not been peer reviewed

not criticising either scheme actuaries or regulator

- just framework within which they are forced to operate

seeking actuarial profession's USP

… please suspend disbelief (or belief) until the end

agenda

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trying to address reality of long-term future funding

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actuarial profession's USP

seeking USP for a long time

- always **balancing options** over different **periods/parties**
- … perhaps "looking **beyond**", rather than "looking **at**"
- not just about mathematics (very little real maths for most)

trying to capture long-term dynamics of markets

at least two specific weaknesses of financial markets

- prone to herding (following trends for too long)
- inability to price tail risk (or even to perceive it)

regulations need to be fit for purpose, not sole drivers

actuaries claim to understand risks

- little real information provided about long-term

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approaches to risk

risk quantification very poorly captured by scalars

financial economics not useful for long-term estimates

- higher investment returns DO reduce costs
- market prices have no predictive return power

huge concentration on risk - without reward recognition

- avoiding losses same as avoiding profits (Redington, 1952)

risks only taken because of potential rewards

- Maurice Ewing ("The Actuary", October 2018)

prudence can only be identified from best estimate

long-term funding regimes need wholesale reform

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what is "mark-to-market" (MtM)?

aims at realistic appraisal of current financial situation

market may sometimes appear illogical

… implying that opportunities exist for profits

markets run by traders

- traders decide where **THEY** want to be (pricing) **NOW**

long-term funding depends upon long-term future

- if there is one (always needs to be considered)

many possible alternatives (labelled "off-market")

why sub-contract L-T assumptions to S-T traders?

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following evidence is essential

actuaries (financial scientists) need to follow evidence

"*I hold every man a debtor to his profession*" (Bacon)

must interpret evidence available as experts (GG or NA)

- otherwise, contributing very little indeed

interpretation is subjective, not objective

nothing wrong with subjectivity, so long as …

- independent (not merely too common groupthink)
- follows evidence available
- with cogent full explanations
- different stakeholders need to understand outcomes

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what is a discount rate?

discounting principle known for over 2 millennia

- only adopted for longer-term finance in late 18th century

suppose precise return of 3 % pa for next year is certain

103 due in a year's time can be financed by initial 100

- converting future cashflows to present
- discount rate is inverse of investment return
- actuaries used to define discount rate as "iv" (2.9%)

we don't live in such a secure financial environment

- lack of certainty, much longer periods, assets not cash

future unknowable => no uniquely correct discount rate

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actuarial reflection of reality

there IS one uniquely correct view of long-term future

… but we don't know it, hence assumptions needed

- when? which way? how far? how long?
- no such thing as free lunch over time
- all the rest is merely commentary

long-term can imply **different** restraints

- can't simultaneously aim "long" **and** "short"

"broadly right" better than "precisely wrong"

risk quantification very poorly captured by scalars

- liquidity problems not identifiable in advance

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single numbers presented as "results"

single numbers are not appropriate results

… for representing many future uncertainties

- NYU Stern (1977) & Z/Yen (2012)
- Simon Carne's SIAS paper (2004)

especially when result never fully specified

- mean? median? mode? specified percentile?

we should be looking at multi-dimensional results

- with confidence intervals (deterministic approach fails)
- aiming at avoiding "fog of certainty" (actuarial noise)

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forecasting approaches

pick a number from the air

- "fudge, judge & bodge" (Staple Inn 25 October 1999)

look at what other actuaries do

- but how did they obtain their numbers?

"actuarial approaches" need to be more robust

we need to focus upon strategy rather than tactics

… so long as we credibly believe we have enough time

- say 15 years or longer

off-market is actuary's tool for soaking up volatility

- seeking long-term funding resilience

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is there a long-term?

predators exist

- private (competition)
- public (regulators)

how much long-term confidence can there be?

- for trustees, members, sponsors, policyholders …

essential for issues to be discussed in depth

stakeholders entitled to follow own views

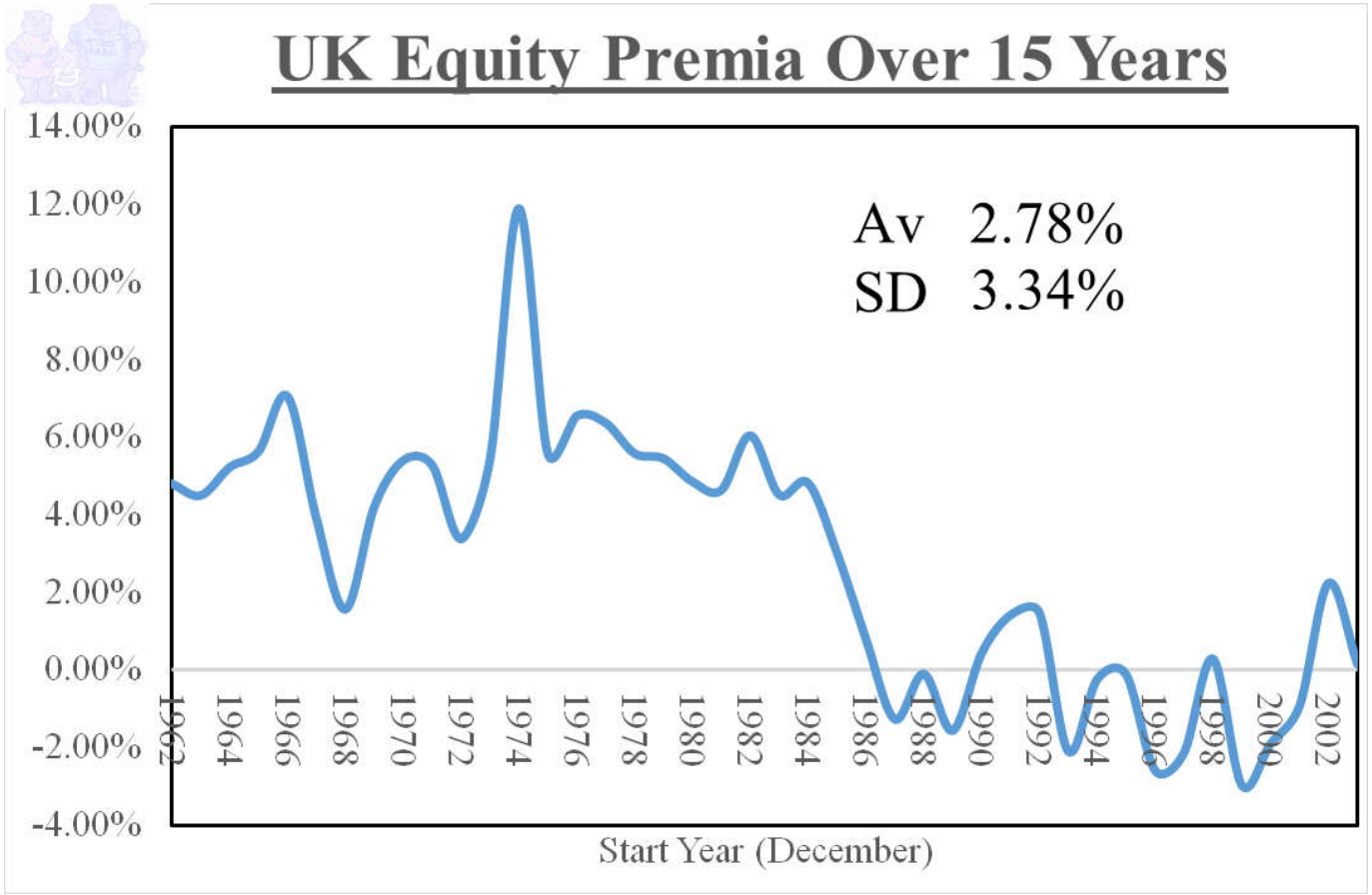
crucial that agreed approaches are fully documented

- do SIP and SFP really cover long-term issues (DB)?

equity risk premia (history and likelihood)

agenda

long-term risk premium (UK)?



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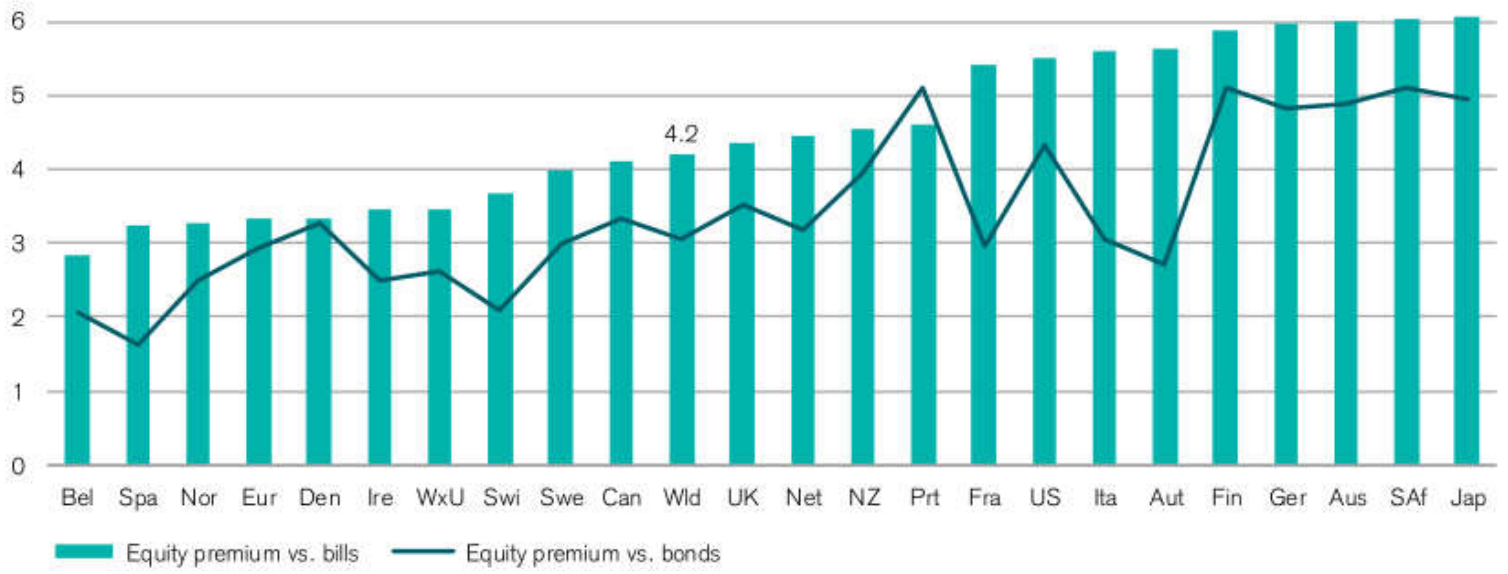
long-term risk premium (global)?

Figure 14: Worldwide annualized equity risk premium (%) relative to bills and bonds, 1900–2018



Sources: Elroy Dimson, Paul Marsh and Mike Staunton, Triumph of the Optimists, Princeton University Press, 2002, and Global Investment Returns Yearbook, Credit Suisse, 2019. Not to be reproduced without express written permission from the authors.

Summary Edition Credit Suisse Global Investment Returns Yearbook 2019 23

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how likely is equity risk premium?

based upon same random numbers ("2018a") used later

compound UK return differences over 15 years

- equities v long conventional gilts

negative	28.4%
positive	71.5%
> 1%	66.6%
> 2%	61.5%
> 3%	56.1%

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robust actuarial approaches (1 of 2)

consistency between future cashflows both ways

market prices have no predictive return power

- Fama ("Random Walks In Stock Market Prices", 1965)

"FE actuaries" normally deny equity risk premium

any extra return fully counterbalanced by risk

… not what we saw on earlier slides

no, equity risk premia won't always be positive

- "Irrational Exuberance" (Shiller, 2000)
- straw man (no such claim actually made)

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robust actuarial approaches (2 of 2)

financial economics hardly applicable over long-term

- no evidence observed anywhere

theoretical academic evidence related to perfect markets

- perfect information not generally available
- it can't be (Grossman & Stiglitz, 1980)

volatility treated as risk - contributing to deficits

concept ("today forever") assumes there is no volatility

- inherent illogical contradiction

no account taken of "path dependence"

- original economic conditions can matter greatly

agenda

base data (1 of 5)

8 different financials considered for UK alone

- equities, conventional gilts and index-linked gilts
- 3 returns over 1 year
- 3 yields
- 2 inflations (over 1 year and over 15 years)
- UK RPI (longer true data series than for CPI or CPIH)

financials modelled annually from end-1953

- until end-2014 and until end-2018
- split into “early [<1985]” and “later [> 1984]” for 2018

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base data (2 of 5)

BaseData	AvEarly	AvLater2014	AvLater2018	LaterDiffAv
FiTRI	7.38%	9.65%	9.22%	-0.43%
IlTRI		8.73%	8.77%	0.04%
EqTRI	19.10%	11.21%	10.52%	-0.69%
FiYield	8.76%	6.14%	5.64%	-0.50%
IlYield		2.24%	1.81%	-0.43%
EqYield	5.12%	3.55%	3.58%	0.03%
Inf01	7.24%	3.55%	3.44%	-0.11%
Inf15	7.37%	5.32%	5.04%	-0.28%

agenda

base data (3 of 5)

BaseData	SDEarly	SDLater2014	SDLater2018	LaterDiffSD
FiTRI	15.90%	10.18%	9.95%	-0.23%
IlTRI		7.78%	8.69%	0.92%
EqTRI	33.89%	15.96%	15.51%	-0.45%
FiYield	3.83%	2.70%	2.90%	0.19%
IlYield		1.54%	1.87%	0.33%
EqYield	1.53%	0.82%	0.79%	-0.04%
Inf01	5.84%	1.89%	1.84%	-0.06%
Inf15	3.31%	2.93%	2.86%	-0.07%

agenda

base data (4 of 5)

BaseData_Whole	Av 2014	Av 2018	
FiTRI	8.48%	8.33%	-0.15%
IlTRI	8.73%	8.77%	0.04%
EqTRI	15.28%	14.68%	-0.60%
FiYield	7.49%	7.15%	-0.34%
IlYield	2.24%	1.81%	-0.43%
EqYield	4.36%	4.32%	-0.03%
Inf01	5.45%	5.28%	-0.17%
Inf15	6.09%	5.85%	-0.24%

agenda

base data (5 of 5)

BaseData_Whole	SD_2014	SD_2018	
FiTRI	13.38%	13.10%	-0.28%
IlTRI	7.78%	8.69%	0.92%
EqTRI	26.84%	26.24%	-0.60%
FiYield	3.56%	3.71%	0.15%
IlYield	1.54%	1.87%	0.33%
EqYield	1.46%	1.43%	-0.04%
Inf01	4.74%	4.65%	-0.09%
Inf15	3.21%	3.19%	-0.01%

agenda

random numbers (1 of 4)

only results without correlations included

- differences not that significant (based upon earlier work)

10,000 scenarios (1 in 200 would be based on 50 cases)

- also used first 2,000 of 10,000 (very much faster to run)

financials not best modelled as Normal or log-Normal

- "near best fits" taken instead (all will be on discrate.com)

current financial conditions "lower than normal"

- random numbers used atypical of "now"

two sets of random numbers fully compiled and used

- 2014 (used for DWP submission 2017) and 2018a

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random numbers (2 of 4)

2014 random data benchmarked to whole experience

2018 benchmarked separately across 2 intervals

- weighted 75% newer, 25% older
- simplified "twin regime approach"

twin regime applied to 2018a raw random data

- then benchmarked to whole overall 2018 experience

2018b data to be benchmarked to each separate interval

- twin regime to be applied to benchmarked random data

I think 2018b should be far more robust than 2018a

- still working on "2018b" (next year for 2019)

agenda

random numbers (3 of 4)

	10,000	10,000	2,000
Whole Period	**Av2014**	**Av2018a**	**Av2018a**
FiTRI	8.44%	8.33%	8.35%
IlTRI	8.37%	8.77%	8.88%
EqTRI	15.30%	14.68%	14.81%
FiYield	7.44%	7.15%	7.20%
IlYield	2.28%	1.81%	1.80%
EqYield	4.39%	4.32%	4.32%
Inf01	5.45%	5.28%	5.18%
Inf15	6.09%	5.85%	5.86%

random numbers chart

agenda

random numbers (4 of 4)

	10,000	10,000	2,000
Whole Period	**SD2014**	**SD2018a**	**SD2018a**
FiTRI	13.35%	13.10%	13.12%
IlTRI	7.68%	8.69%	8.66%
EqTRI	26.83%	26.24%	26.23%
FiYield	3.56%	3.71%	3.74%
IlYield	1.49%	1.87%	1.89%
EqYield	1.47%	1.43%	1.37%
Inf01	4.74%	4.65%	4.58%
Inf15	3.21%	3.19%	3.20%

random numbers chart

agenda

simple financial contracts (1 of 18)

can we cope with simplicity in mark-to-market world?

new financial business being set up

- seeking best estimates WITHOUT formal guarantees

two single-premium contracts (one pricing opportunity)

- term annuity (£1,000 pa in arrears) over 15 years
- pure endowment of £10,000 payable in 15 years
- payments either fixed or fully inflation-linked (RPI)
- no allowances for demographics, options, profits, tax

how much is initially needed to fund basic cashflows?

agenda

simple financial contracts (2 of 18)

mark-to-market taken as implying "using gilt yields"

- nominal terms based upon long conventional
- indexed terms based upon long index-linked

simplistic but good enough

off-market allows longer-term approach

aligned to intended investment policy

- significant part of marketing strategy

how far away from desired destination will we be?

how should initial pricing discount rate be varied?

agenda

simple financial contracts (3 of 18)

how can we set discount rates?

- … which need to be consistent with returns
- … otherwise systematic bias introduced
- … which is the problem with accounting numbers

Pension Fund Valuations & Market Values WP

- report presented at Staple Inn 25 Oct 1999

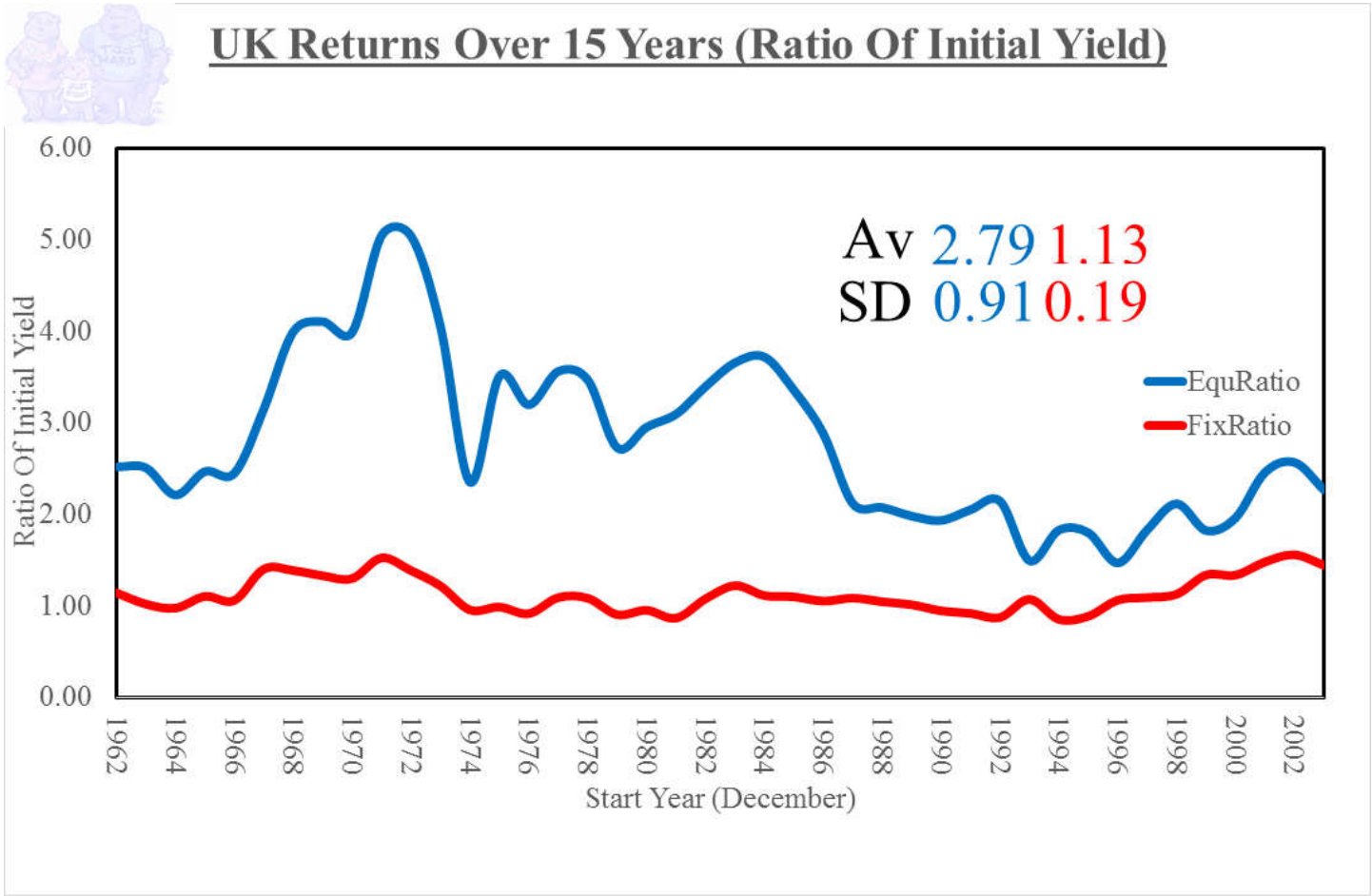
Valuation Rates of Interest WP followed on

- from Jan 2003 until late 2004 (closed down peremptorily)

I was privileged to be a member of both WPs

- VRIWP agreed "multiple" approach had potential agenda

simple financial contracts (4 of 18)



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simple financial contracts (5 of 18)

6 assets portfolios

- conventional gilts alone ("Fix")
- index-linked gilts alone ("Ilg")
- equities alone ("Equ")
- three 50:50 combinations

assumed returns defined as multiple of initial yield

- equities 2.81 (see chart), different period
- conventional gilts 1.13 (see chart)
- actual mean experience (we don't need to use scalars)
- previously used 3.00/1.25

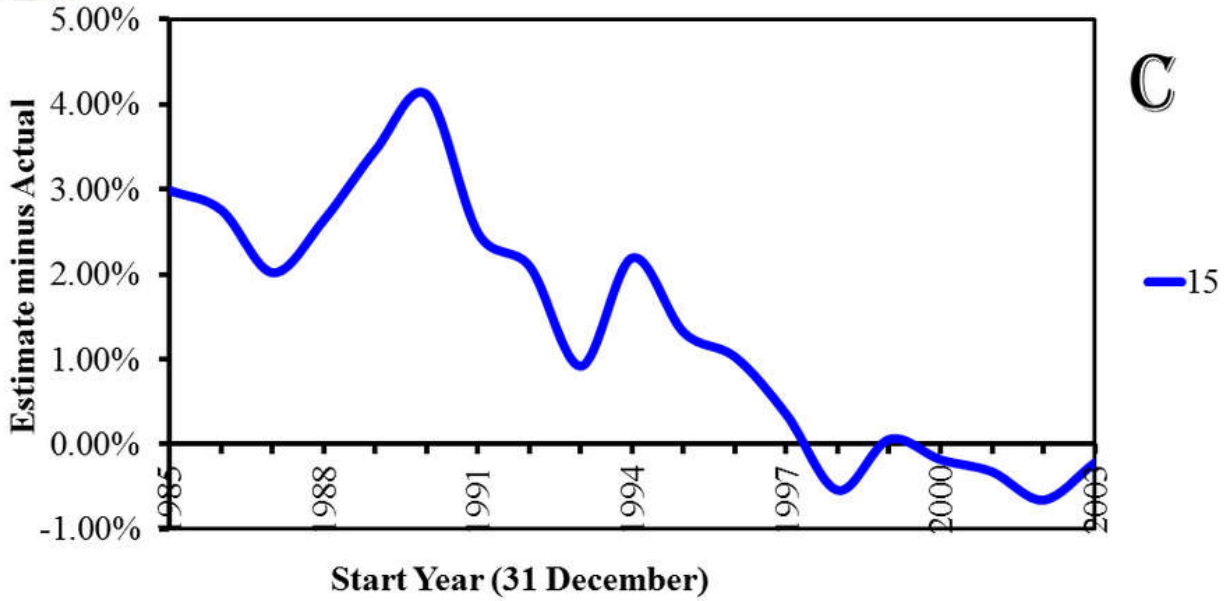
agenda

simple financial contracts (6 of 18)

simple multiple approach just doesn't work for ILGs

I chose "yield + long-term inflation + 1%" (ukrpi.com)

Current UK Gilts Approach : Inflation Error (% pa)



Av 1.40%

SD 1.48%

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simple financial contracts (7 of 18)

consider fund development example

inflation-linked endowment for term 15 years

invested in Fix, baseline MtM

2018a, lower multiple (1.13), using 10,000 randoms

mean end fund value £12,511

- initial discount rate (1.81%) too low

adjusted MtM

- mean end fund value £10,000
- adjusted discount rate (2.32%) just right

agenda

simple financial contracts (8 of 18)

charts are Adobe Flash (Apple devices problematic)

"fund" chart has 6 radio button sets on right (2 cases)

- yellow bars are "red" minus "blue"

1. contract (annuity or endowment)
2. benefits inflation-protected ("Y" or "N")
3. approach ("mark-to-market" or "off-market")
4. stage ("baseline" or "adjusted")
   - "adjusted" reflects spot-on discount rate (back-solved)
5. statistic of interest
6. assets portfolio

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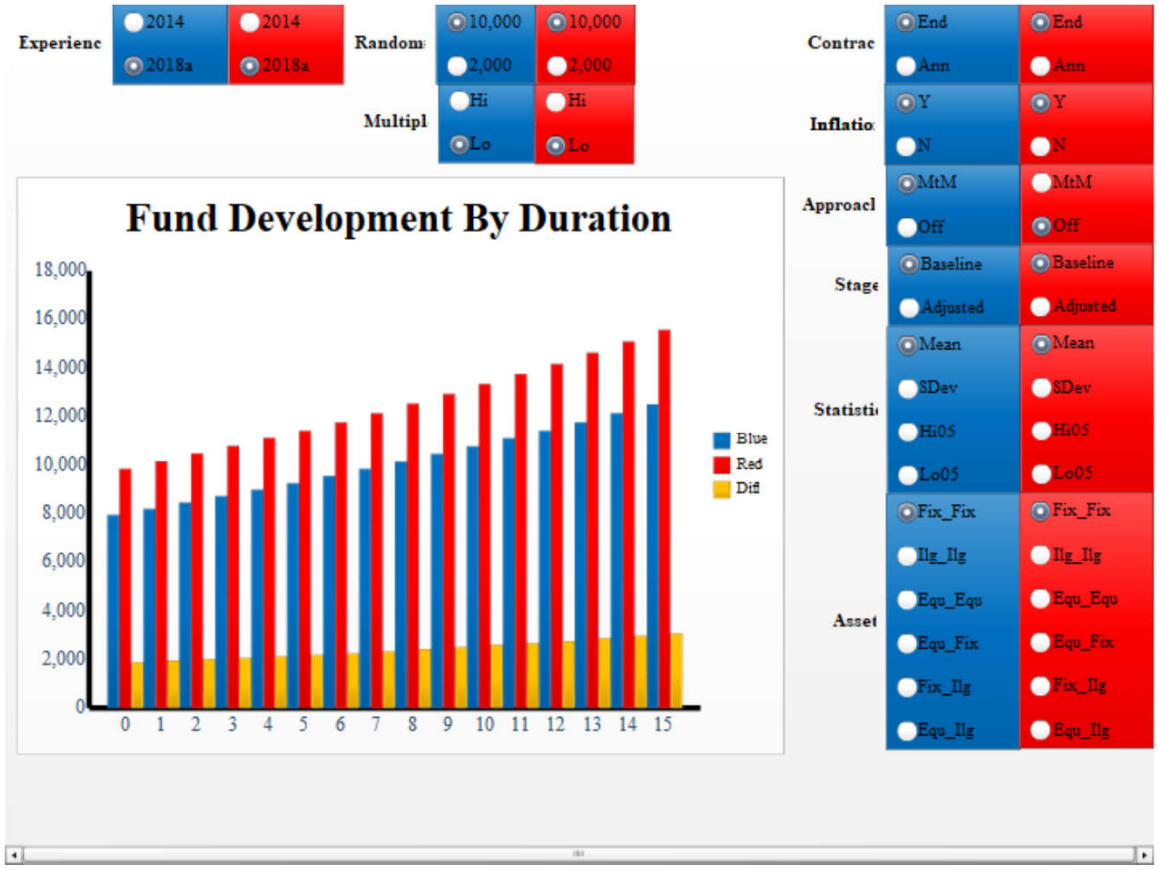
simple financial contracts (9 of 18)



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simple financial contracts (10 of 18)

simplicity is harder than it looks

- Dolly Parton lemma

"return multiples" based upon actual experience

seem reasonable to me but multiples not that significant

sure, other approaches could also work

yes, fund tended to run away beyond desired outcome

- … implying that initial discount rate was too low
- … for budgeting purposes – which is our target

how successful were we in charging enough?

agenda

simple financial contracts (11 of 18)

how often will assets at end be sufficient?

three situations considered:

- not enough “Lo”
- acceptable (upto £1,000 deflated too much) “OK”
- far too much “Hi”

lowering “acceptable margin” will increase “Hi”

RPI-linked endowment in “Fix” over 15 years (“MtM”)

- Lo 44.8%
- OK 6.6%
- Hi 48.6%

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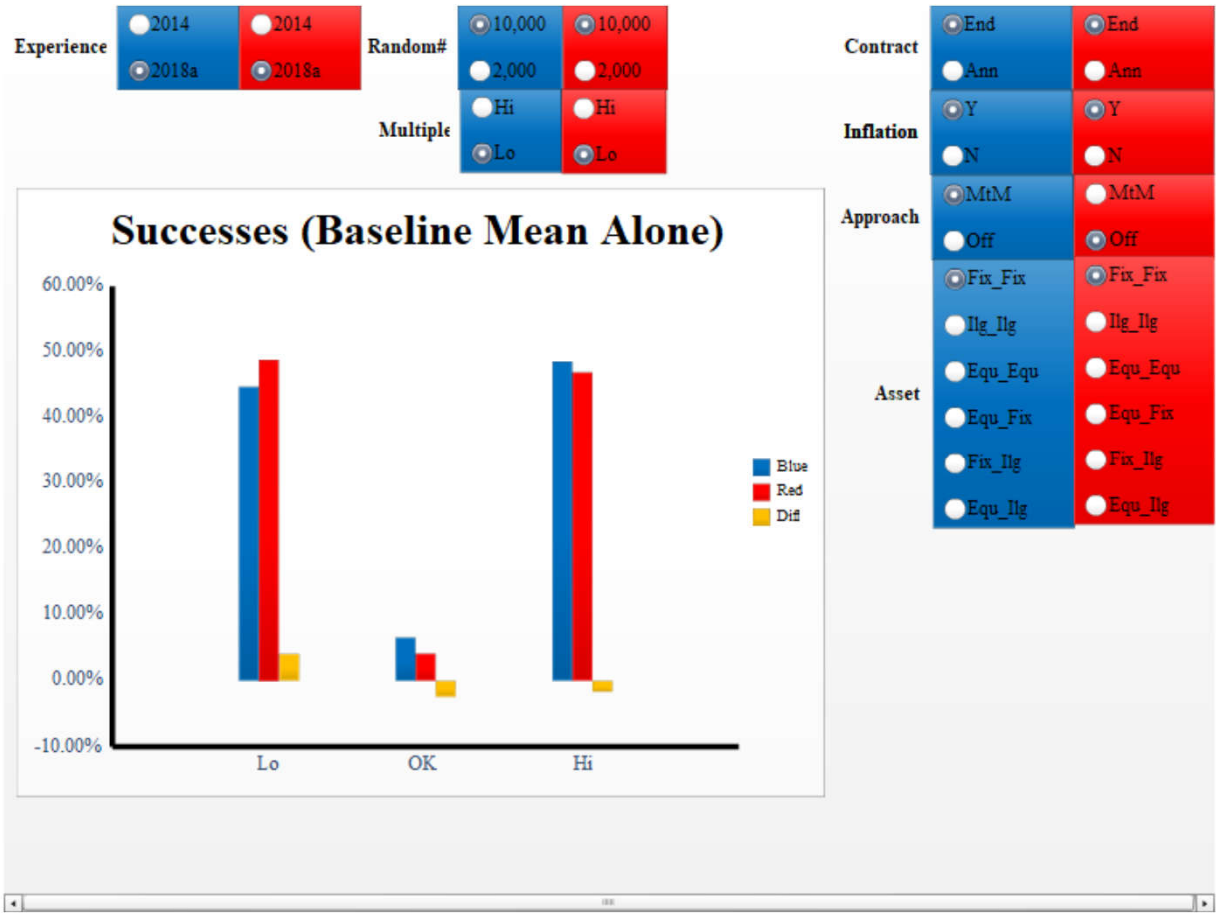
simple financial contracts (12 of 18)



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simple financial contracts (13 of 18)

by how much must we adjust the initial discount rate?

- to achieve precise financial objective at end of term
- zero (annuity) or 10,000 real/nominal (endowment)

same situation as for "fund" and "success" above

four column sets, left to right

1. MtM initial discount rate (1.81% pa)
   - depends upon inflation choice alone
2. Off initial discount rate (2.24% pa)
   - affected by every assumption
3. required MtM adjustment (0.51% pa)
4. required Off adjustment (0.08% pa)

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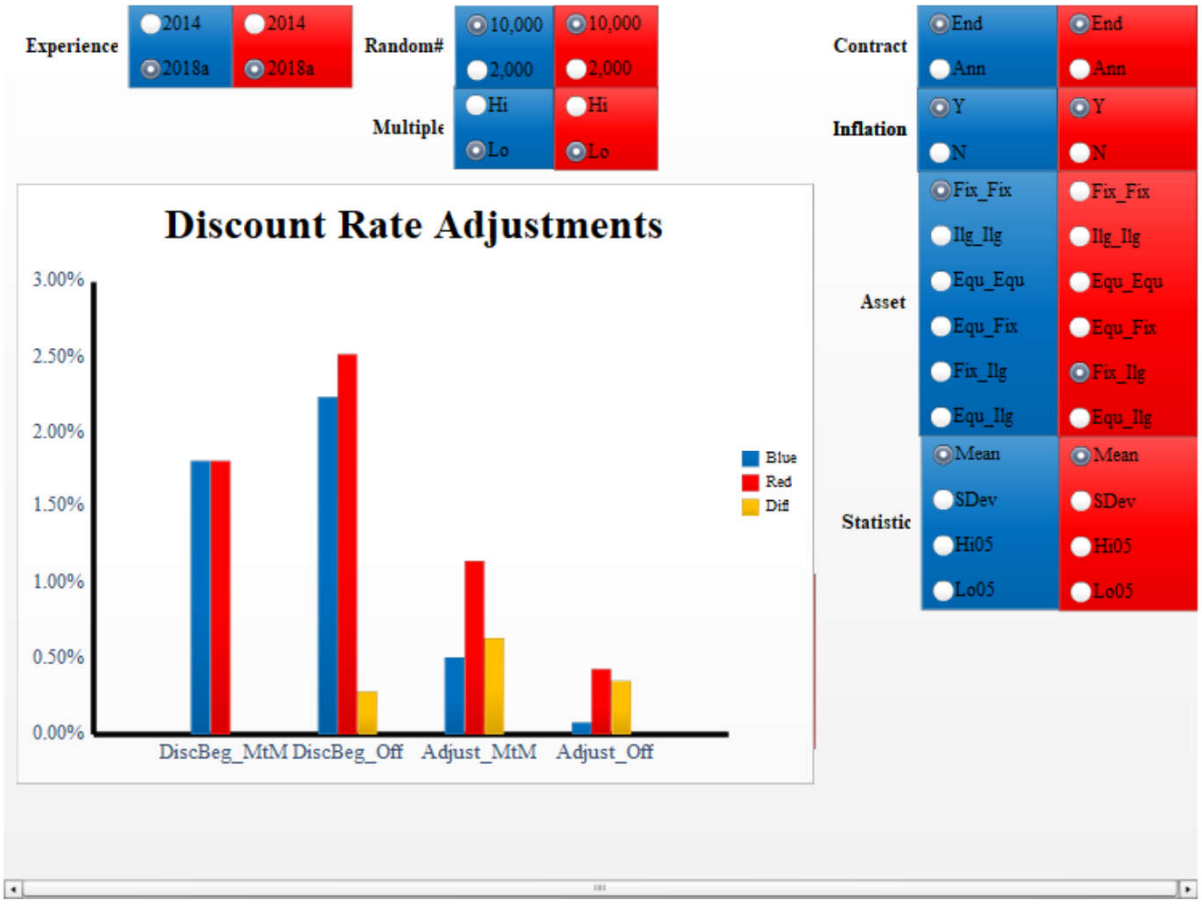
simple financial contracts (14 of 18)



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simple financial contracts (15 of 18)

extracted endowment mean adjustments (% pa)

	2014	2018a
Linked (MtM) : MulHi		
Equ_Fix	3.03%	3.36%
Fix_Ilg	0.39%	1.15%
Equ_Ilg	3.12%	3.66%
Linked (Off) : MulHi		
Equ_Fix	0.17%	0.05%
Fix_Ilg	-0.58%	0.00%
Equ_Ilg	0.22%	0.50%

agenda

simple financial contracts (16 of 18)

extracted annuity mean adjustments (% pa)

	2014	2018a
Nominal (MtM) : MulLo		
Equ_Fix	3.44%	3.39%
Fix_Ilg	0.70%	1.11%
Equ_Ilg	3.54%	3.72%
Nominal (Off) : MulLo		
Equ_Fix	0.52%	0.42%
Fix_Ilg	-0.75%	-0.10%
Equ_Ilg	0.14%	0.47%

agenda

simple financial contracts (17 of 18)

which variables have most impact on adjustment?

mean adjustment considered for 384 combinations

- random (2), experience (2), multiple {*} (2) => 8
- inflation (2), approach (2), contract (2) => 8 => 64
- assets (6) => 384
- {*} multiple only affects Fix and Equ (not Ilg)

so look at varying, say, just inflation ("Y" or "N")

- across all 192 combinations for other variables

random #, experience and multiple have little impact

other 4 variables of far greater significance

agenda

simple financial contracts (18 of 18)

mean required adjustments (% pa) by variable

Inflation				
Y	3.82%	N	0.93%	**2.89%**
Contract				
Ann	3.71%	End	1.04%	**2.67%**
Approach				
MtM	3.60%	Off	1.15%	**2.45%**
Assets				
Fix	1.14%	Ilg	1.55%	**0.41%**
Ilg	1.55%	Equ	3.45%	**1.90%**
Fix	1.14%	Equ	3.45%	**2.31%**

agenda

hugely severe DB economic impact

how could we even have guessed how much in advance?

UK DB employers' contributions (private sector alone)

- nearly 10 years [Q2 2009 – Q4 2018] {ONS MQ5}
- total paid £333.9 b (special £135.5 b, 68% of normal)

suppose discount rate under-estimated by 1.5 % pa (mix)

- can easily reach 1.0 % pa from inflation (ukrpi.com)

implies at least 30% difference in capital value

so at least £100 b (private sector) misallocated in UK

- my personal estimate (MQ5 series has been suspended)
- choose your own yield adjustment

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stop relying upon discount process

capitalisation was original actuarial tool

- all we had but no longer the only long-term tool available
- it hides far more than it reveals ("fake news"?)

discount rates are:

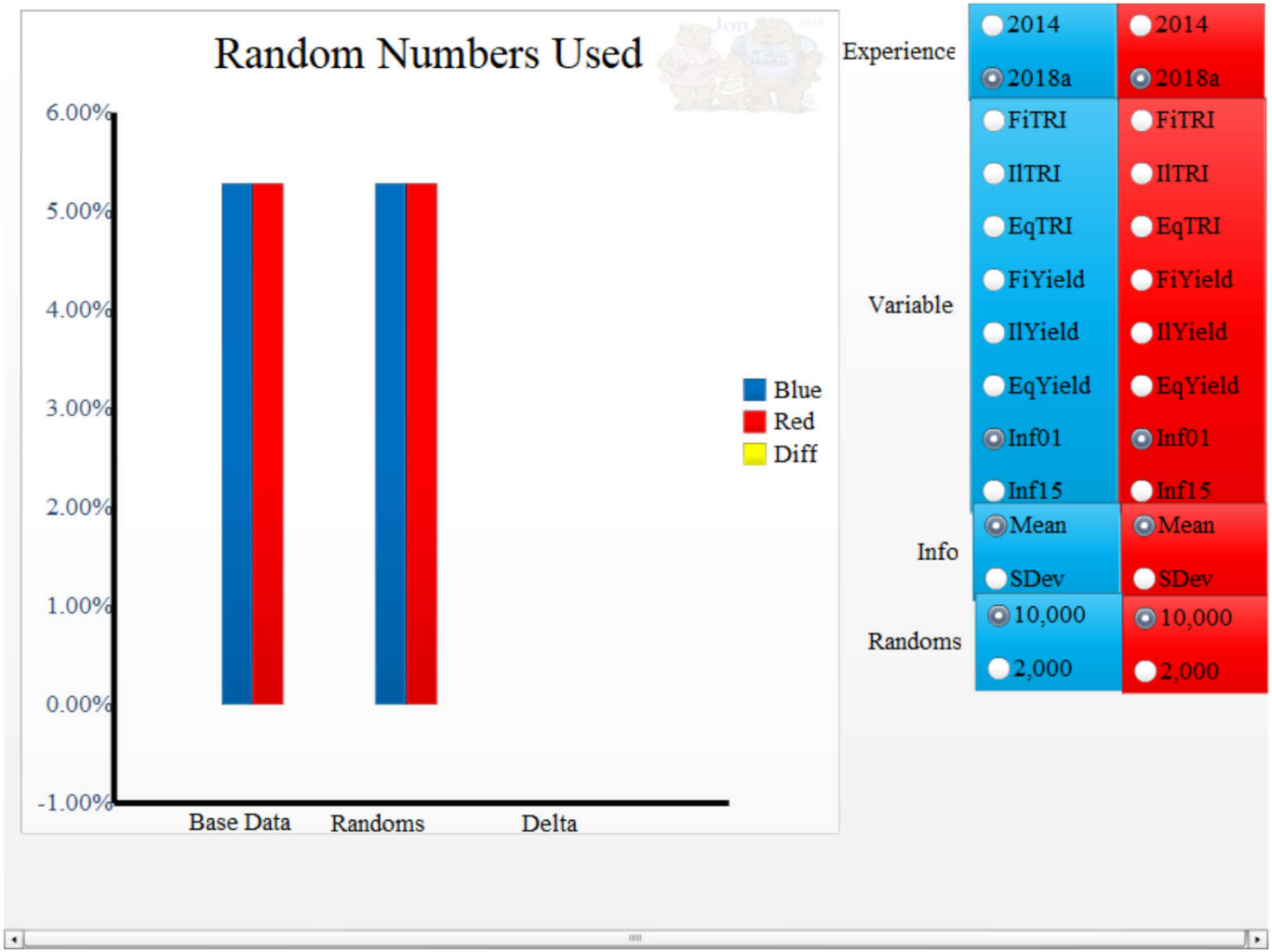
- simple and simplistic
- readily available to anyone
- dangerous in everybody's hands

actuaries should stop using discount rates alone

- for long-term projects with specified intended outcomes
- … because cashflows are the key elements
- if we can't do simple, can we really do complex?

agenda

random numbers chart



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