



Discount Process Is The Problem

An “Off-Market Approach”

Jon Spain (08 May 2019)

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executive summary

actuarial reflection of reality

single numbers presented as “results”

forecasting approaches

is there a long term?

robust actuarial approaches

random numbers

simple financial contracts

hugely severe DB economic impact

stop relying upon discount process

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executive summary (1 of 2)

seeking actuarial profession's USP

- 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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executive summary (2 of 2)

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 long-term assumptions to 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, they are 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
- formally, discount rate is 2.9% (interest rate is 3.0%)

we don't live in such a secure financial environment

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

future unknowable => no uniquely correct interest rate

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actuarial reflection of reality

there IS one uniquely correct view of 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

... but we cannot do that with deterministic approach

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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

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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

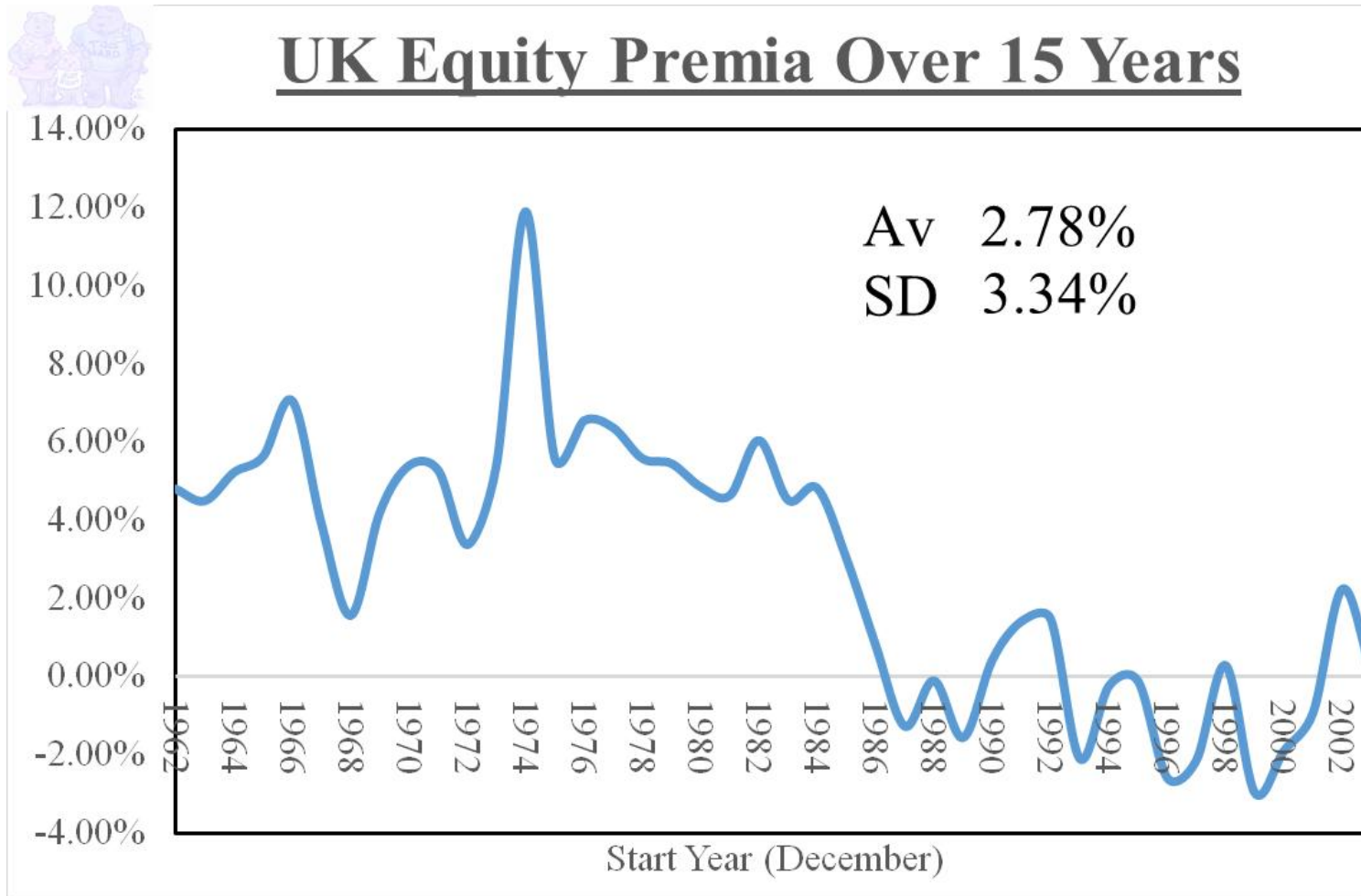
- do SIP and SFP really cover long-term issues (DB)?

equity risk premia (history and likelihood)

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long-term risk premium (UK)?

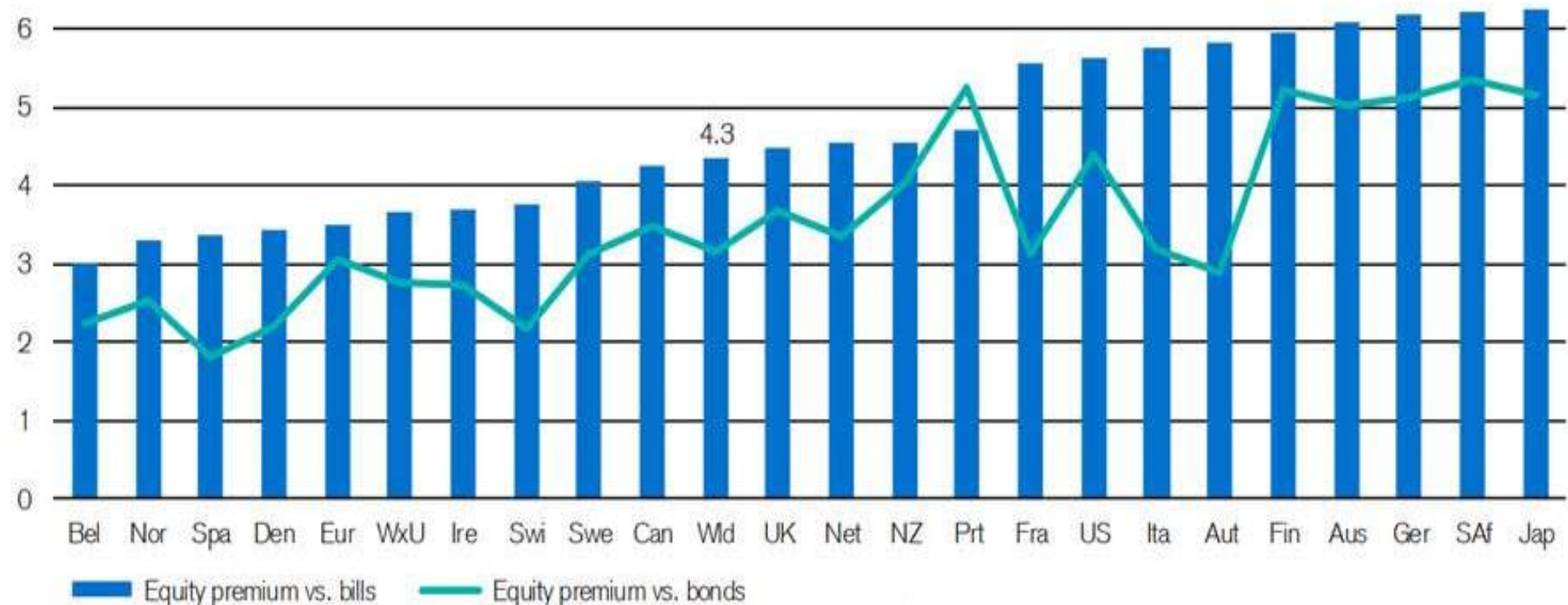


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long-term risk premium (global)?

Worldwide annualized equity risk premium (%) relative to bills and bonds, 1900–2017



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research. Premiums for Austria and Germany are based on 116 years, excluding 1921–22 for Austria and 1922–23 for Germany.

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how likely is equity risk premium?

based upon same random numbers 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

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random numbers

yields and returns modelled (end-1953 until end-2018)

- weighted 75% later, 25% older (“twin regime approach”)

results without correlations alone included

- differences not that significant (based upon earlier work)

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

financials not best modelled as Normal

- nor 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”

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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
- no allowances for demographics, options, profits, tax

how much do basic cashflows cost?

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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?

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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)

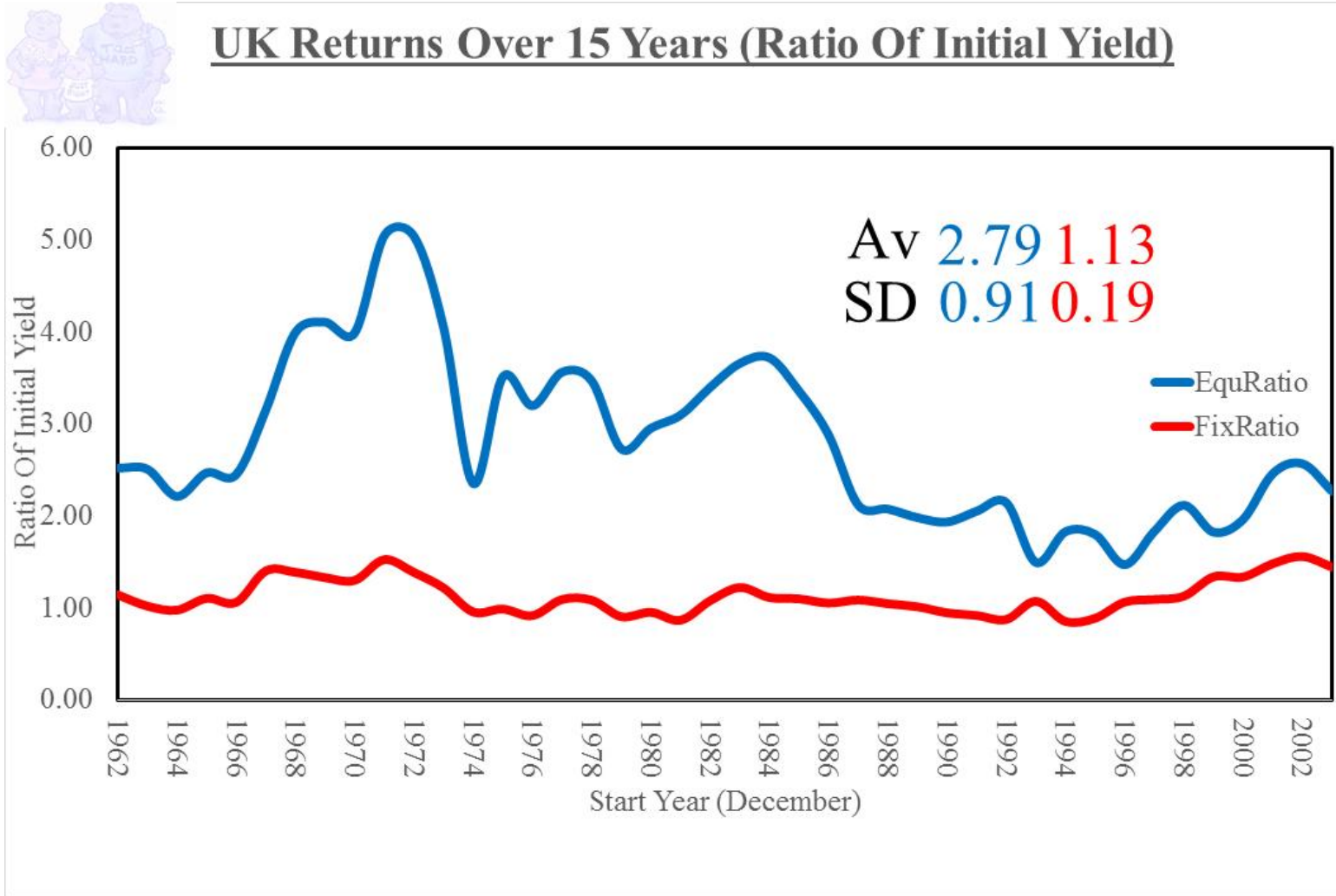
I was privileged to be a member of both WPs

- VRIWP agreed “multiple” approach had potential [agenda](#)



simple financial contracts (4 of 18)

UK Returns Over 15 Years (Ratio Of Initial Yield)



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simple financial contracts (5 of 18)

8 different financials considered for UK alone

- equity returns over 1 year
- equity yields
- long conventional gilt returns over 1 year
- long conventional gilt yields
- long index-linked gilt returns over 1 year
- long index-linked gilt yields
- inflation over 1 year
- inflation over 15 years

UK RPI (longer true data series than for CPI or CPIH)
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simple financial contracts (6 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 sample**
- conventional gilts 1.13 ([see chart](#))
- actual mean experience (don't need to be scalars)

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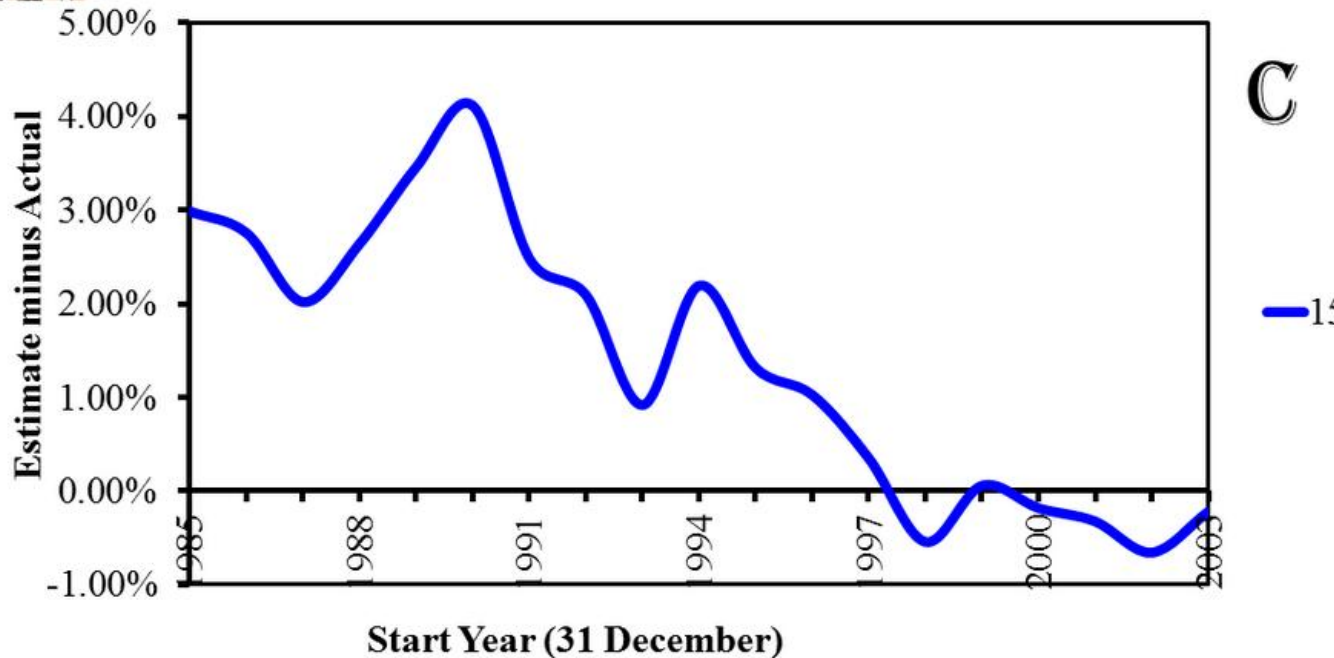
simple financial contracts (7 of 18)

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)



C Av 1.40%
SD 1.48%

—15

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simple financial contracts (8 of 18)

charts are Adobe Flash (Apple devices problematic)

“fund” chart has 6 radio buttons on right (2 cases)

1. contract (annuity or endowment)
2. benefits inflation-protected (“Y” or “N”)
3. term in years (5, 10 or 15)
4. approach (“mark-to-market” or “off-market”)
5. stage (“baseline” or “adjusted”)
 - “adjusted” reflects spot-on discount rate (back-solved)
6. statistic of interest (**dropdown menu for space**, not radio)
7. assets portfolio

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simple financial contracts (9 of 18)

consider fund development example before seeing chart

inflation-linked endowment for term 15 years

invested in Fix

baseline MtM

- 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

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simple financial contracts (10 of 18)

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simple financial contracts (11 of 18)

simplicity is harder than it looks

- Dolly Parton lemma

“return multiples” based upon actual experience

seem reasonable to me

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?

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simple financial contracts (12 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”

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

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

lowering “acceptable margin” will increase “Hi” [agenda](#)



simple financial contracts (13 of 18)

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simple financial contracts (14 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
five columns, 1 to 4 numbered here from 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 (15 of 18)

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simple financial contracts (16 of 18)

endowment linked mean adjustments (% pa) : 15 years

	MtM	Off
FixFix	0.51	0.08
IlgIlg	1.31	0.31
EquEqu	4.52	-0.06
EquFix	3.36	0.85
FixIlg	1.15	0.43
EquIlg	3.66	0.87

figures not same as end-2017

- different approaches (randoms)

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simple financial contracts (17 of 18)

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simple financial contracts (18 of 18)

linked mean adjustments (% pa) dissimilar {"A" v "E"}

	<u>MtM</u>	<u>Off</u>
FixFix (05) E	0.62	0.19
FixFix (10) E	0.54	0.11
FixFix (15) E	0.51	0.08
FixFix (05) A	5.87	5.44
FixFix (10) A	5.78	5.35
FixFix (15) A	5.75	5.32

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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 (30 years)

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

- my personal estimate (MQ5 series is being discontinued)
- choose your own yield adjustment [agenda](#)



stop relying upon discount process

capitalisation was original actuarial tool

- all we had but no longer the only 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](#)