

The cost of capital

Insights from regulating in the UK

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Experience

- 1993-now: regulatory economics advisor
 - to governments, companies, regulators
 - UK, Europe, India, Caribbean, Middle East, Africa
 - electricity, gas, water, aviation, rail
- 2013-17: Ofgem, Associate Partner, RIIO Finance
- 2014-18: Chair, UKRN cost of capital working group

UKRN cost of capital working group



- Cross-sector membership
 - Ofgem, Ofcom, Ofwat, CAA, ORR, NI Utility Regulator, SSRO
- Sharing issues, resources and promoting joined-up thinking
- Peer-review of cost of capital decisions
- Commissioned UKRN cost of capital study
 - published March 2018
 - written by leading academics and practitioners
 - www.ukrn.org.uk/wp-content/uploads/2018/11/2018-CoE-Study.pdf

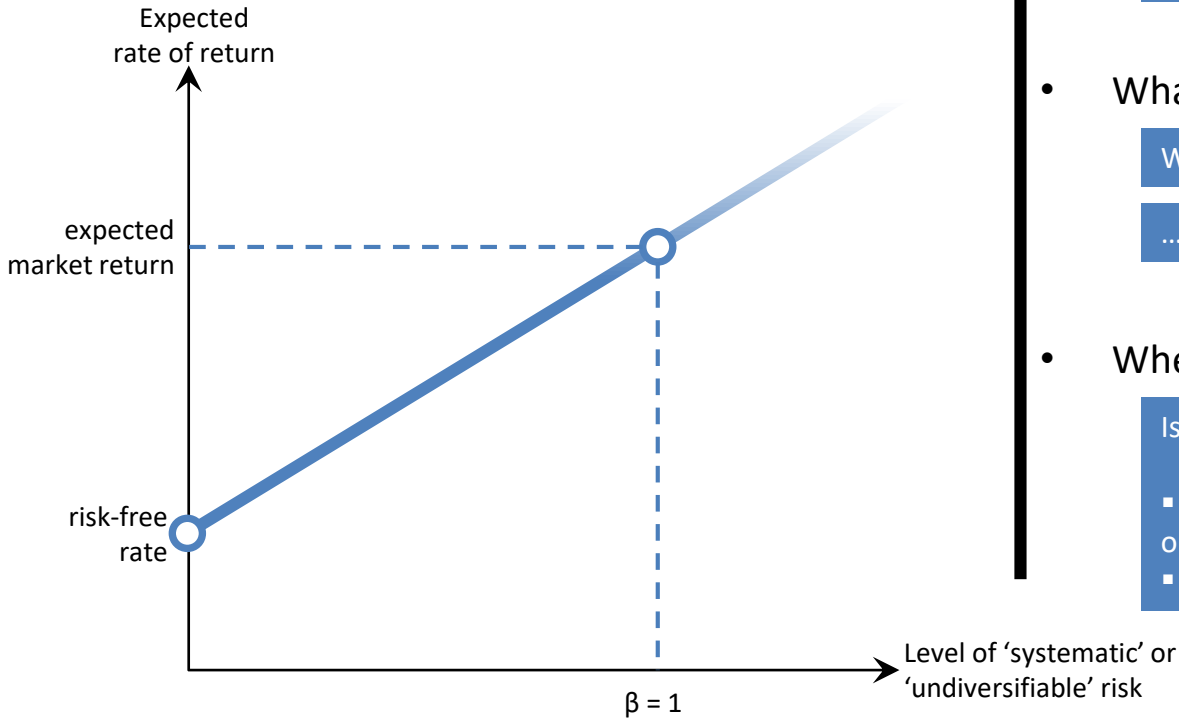
Note on data sources

- Analysis of equity markets based on ‘DMS dataset’ analysis
 - compiled by Elroy Dimson, Paul Marsh and Mike Staunton of London Business School
 - used in the annual Credit Suisse Global Investment Returns Yearbook and related publications
 - calculations carried out by Ian Rowson
- Other sources are separately identified

The 21 markets in the DMS dataset

AU	Australia	DE	Germany	PT	Portugal
AT	Austria	IE	Ireland	ZA	South Africa
BE	Belgium	IT	Italy	ES	Spain
CA	Canada	JP	Japan	SE	Sweden
DK	Denmark	NL	Netherlands	CH	Switzerland
FI	Finland	NZ	New Zealand	UK	United Kingdom
FR	France	NO	Norway	US	United States of America
		WD	World (aggregation of the above markets)		

What it's all about (I)?



Key questions:

- What's the risk-free rate (RFR)?

What do investors expect from a low-risk investment?

- What's the expected market return (EMR)?

What do investors expect from the equity market ...

... from a typical company in the equity market?

- Where are we on the risk spectrum?

Is a regulated business:

- like a typical stock market company
- or ...
- protected from that kind of risk?

What it's all about (II)?

UKRN study's new concepts:

- **RAR** – 'Regulatory Allowed Return'
- **RER** – 'Regulatory Expected Return'

Set **RAR** so that:

$$\mathbf{RER} = \mathbf{WACC}_{(\text{CAPM})}$$

'Unforecastable' downside risks

Which means:

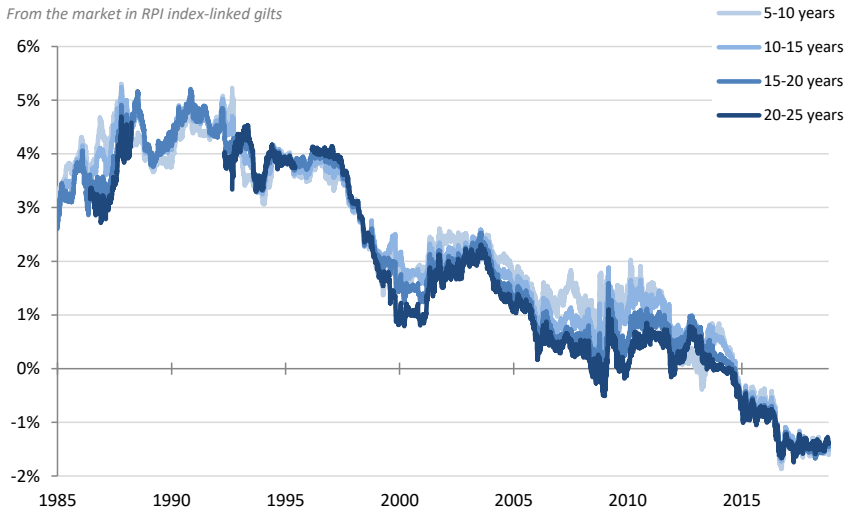
$$\mathbf{RAR} = \mathbf{WACC}_{(\text{CAPM})} + \text{adjustments}$$

country risk
political risks
other difficult-to-forecast factors

Fundamental issue *(in the UK)*

Prospective risk-free rates: implied real forward yield curves

From the market in RPI index-linked gilts



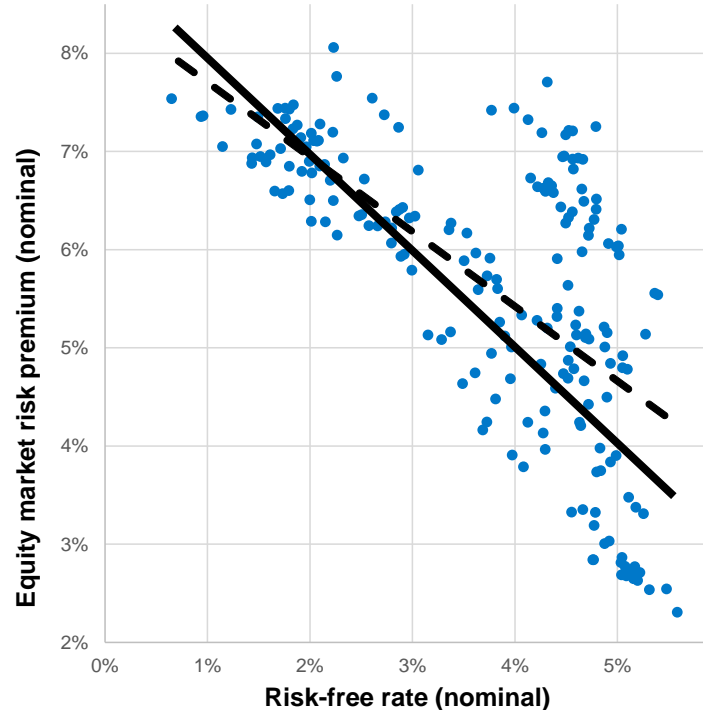
Source: Bank of England yield curves data to 26 October 2018

- Massive investor appetite for regulated asset bases
 - very high transaction values
 - premiums on RAB up to 50%
 - implied 200% premiums on equity
- Justified by “outperformance potential”
- Claims that “required equity returns still ~7% real”
- Claims were stretching credibility in increasingly politicised context

Could this “lower for longer” interest rate environment mean low required returns?

Because market returns are lower?

EMRP from implied DDM vs RFR, 2000-16



- EMR/RFR relationship does not look strong
 - EMRP/RFR inverse relationship suggests EMR is relatively constant
- We need a different explanation for high investor appetite for regulated assets
- A clue in what investors tell us ...

... a shortage of low risk assets offering good financial returns

Or because they are low risk?

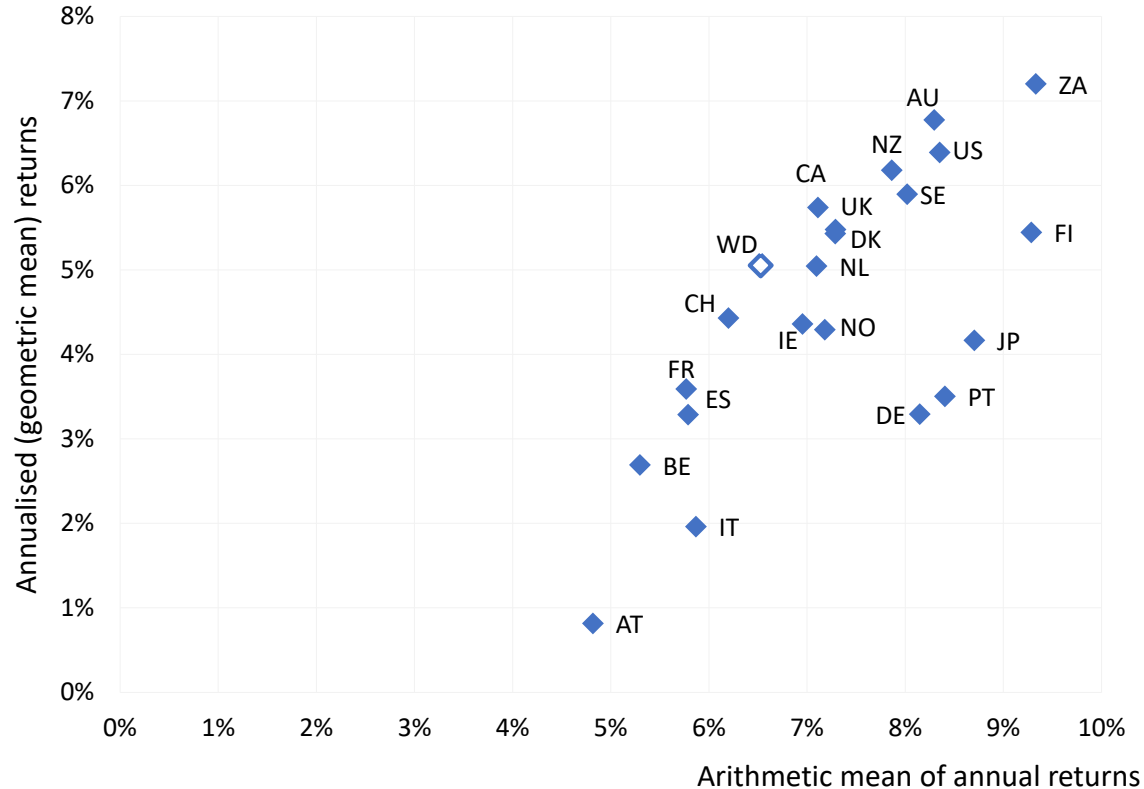
Hold that thought ...

Expected market returns

- UKRN study revised advice given in 2003
 - long-term market returns still best available information
 - give weight to returns experienced on the world market
 - Give weight to geometric mean returns
 - 6 to 7% real (inflation-adjusted) annual returns for longer investment horizons
- Used DMS dataset
 - but advice was a bit compressed into a single page in Appendix E

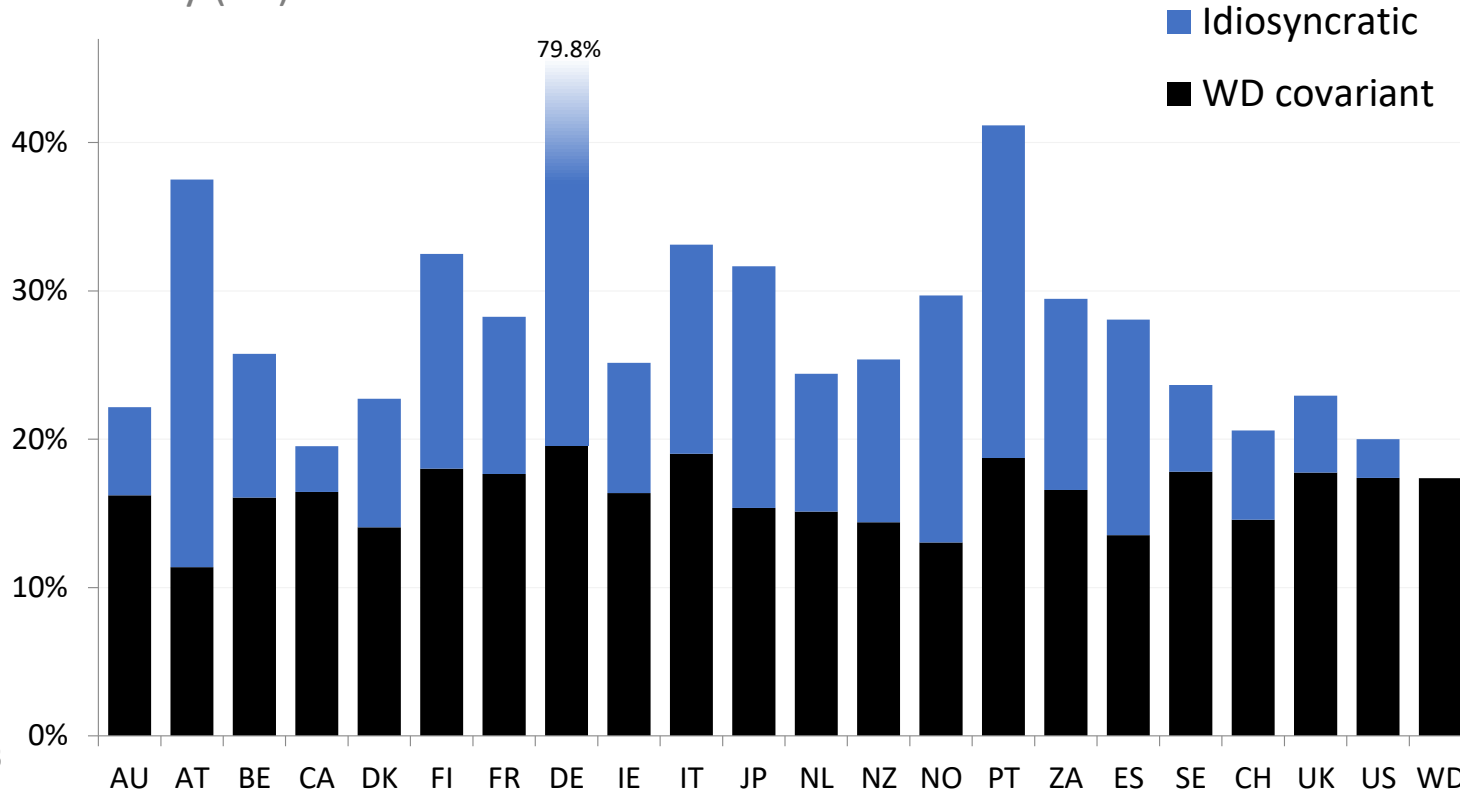
DMS dataset: 21 equity markets, 1900-2016

Annualised (geometric mean 1900-2016) vs. arithmetic mean returns



Market volatility

Variability (SD) of annual returns



Implications of idiosyncratic market risk

- Expected market return estimates
 - markets have more in common with each other than their own distant past
 - reasons for divergence of national market history may not repeat
 - therefore, world market evidence may be most relevant
- Impact on observed beta estimates for companies
 - betas may be overstated if company is sensitive to national environment
 - betas may be understated if company is sensitive to global environment
 - thought may be needed when interpreting betas

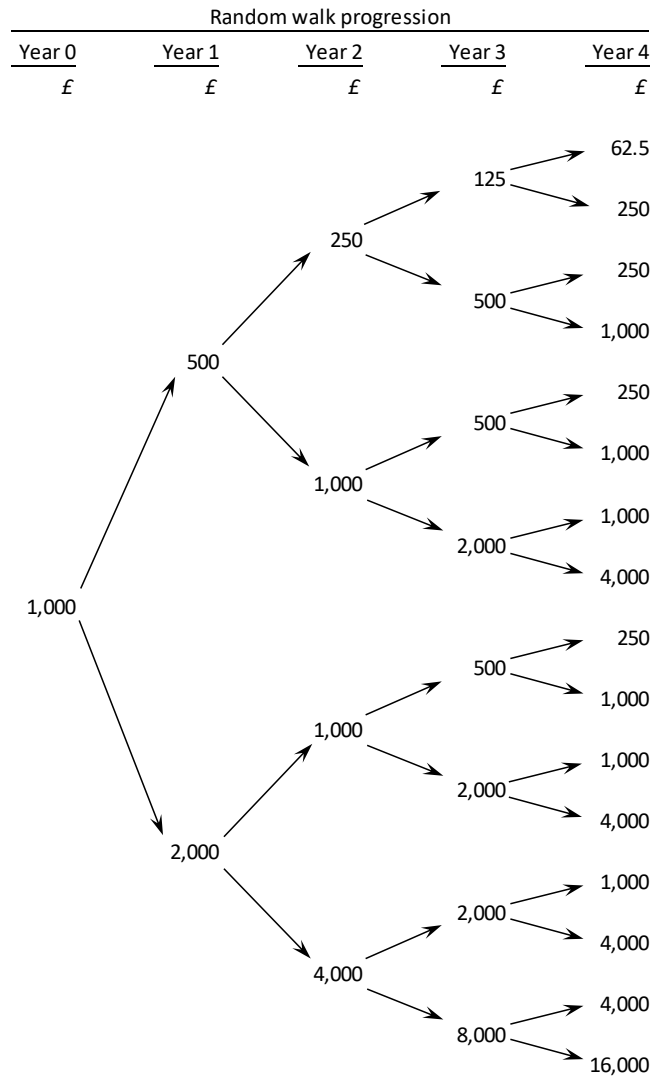
Relevance of holding periods

- Random walks
- Mean reversion
 - evidence of mean reversion
 - effect of mean reversion on expected returns

Random walks

Example

- Equal chance of doubling or halving each year
 - 50% = +100%
 - 50% = - 50%
 - mean = +25%
- Random walk
 - this year's outcome not affected by last year's
- Mean reversion
 - this year's outcome is affected by last year's
 - eg affected by valuation uncertainty
 - corrections can follow runs of good or bad luck



Probabilistic expectation			
Outcomes	Possibilities	Probability	Expected
£			£

62.5	1	6.25%	4
250.0	4	25.00%	63
1,000.0	6	37.50%	375
4,000.0	4	25.00%	1,000
16,000.0	1	6.25%	1,000
	16	100.00%	2,441

4-year rate of return 144%

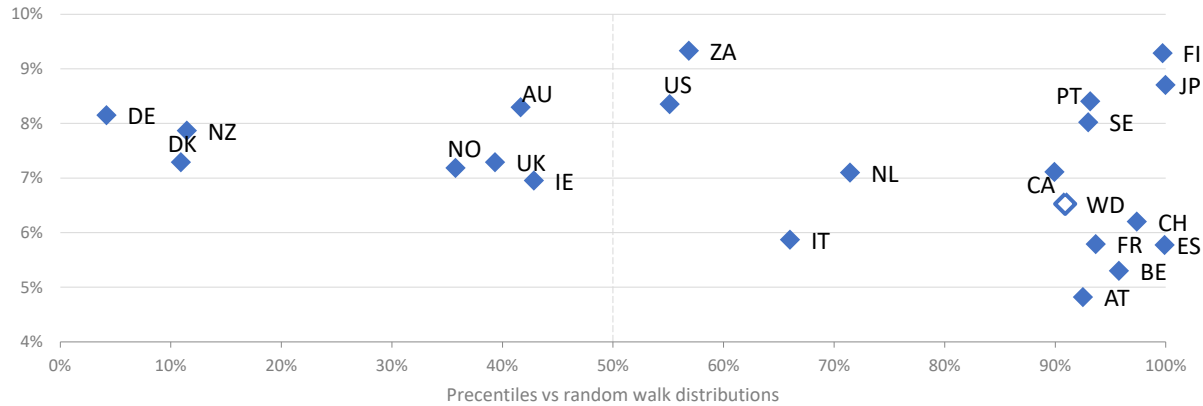
Annualised rate of return $(2.441^{1/4} - 1)$ 25%

most likely outcome = 0%

mean reversion will reduce expected returns towards 'most likely'

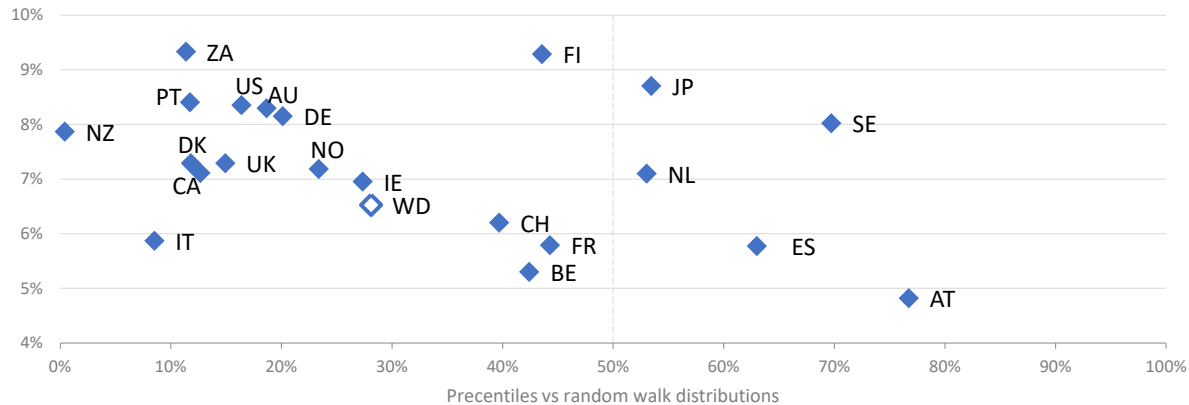
Evidence for mean reversion

Arithmetic mean returns vs. percentiles for AR(1) autocorrelation



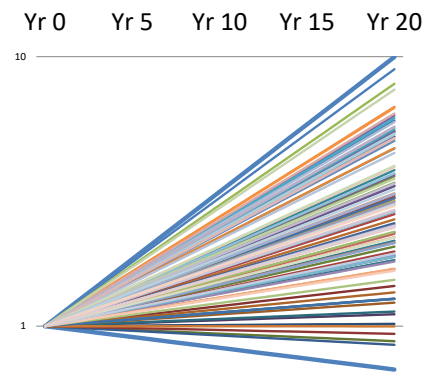
- 1-yr autocorrelation:
 - not random walk
 - 50% markets in top 10%!
 - opposite of mean reversion
 - mean divergence!

Arithmetic mean returns vs. percentiles for 20-year variance ratios

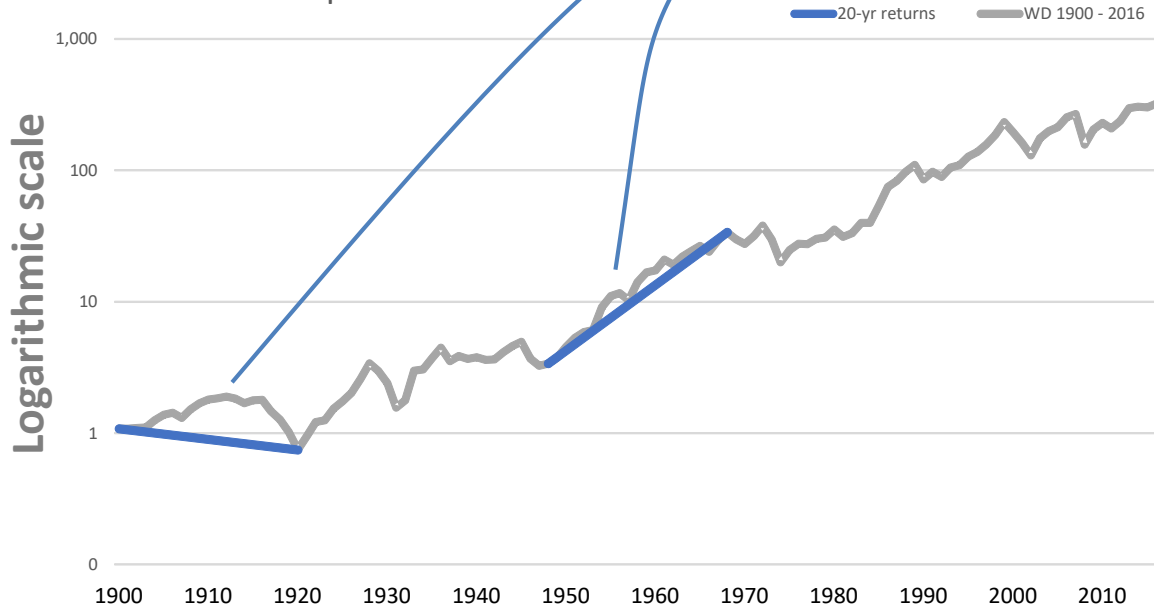


- 20-yr variance ratio
 - strong counter effect
 - reversing 1-yr effect
 - indicates mean reversion

20-year variance ratios



World stock market performance



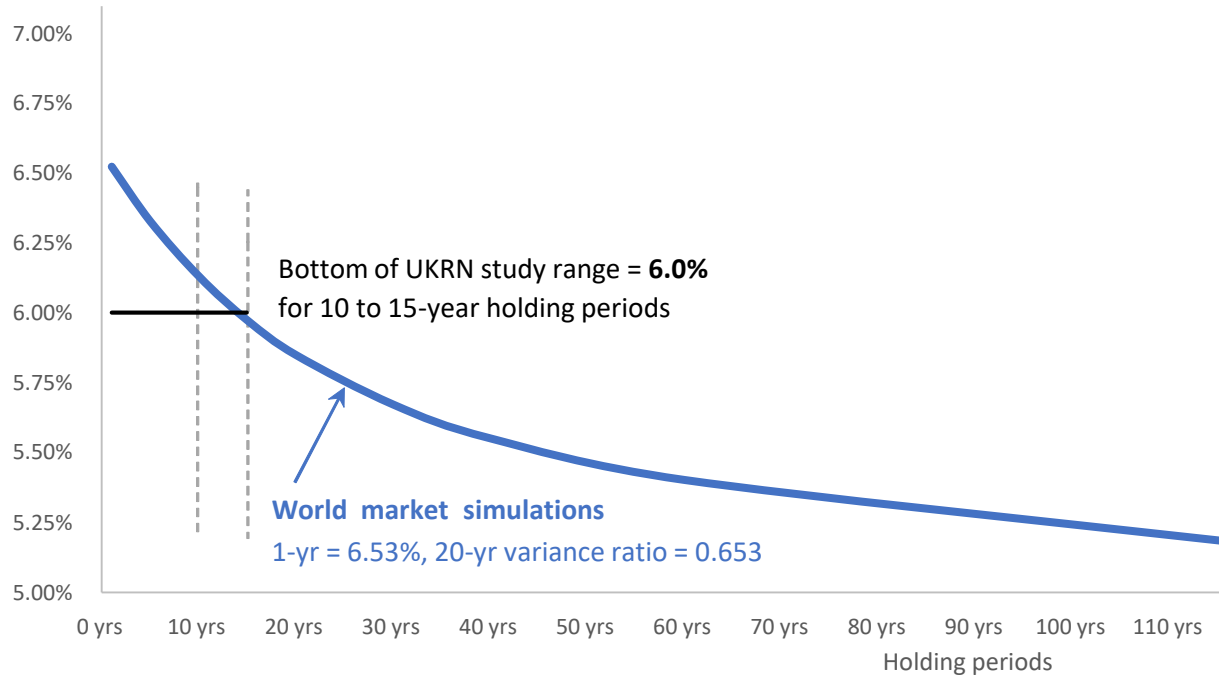
technical note:

- 20 separate non-overlapping 20-year series
- of which 3 > 1, 17 < 1
- range 0.16 to 1.4
- overall ratio = 0.653

Effect of mean reversion in 10,000 simulations

- simulating WD market
- same mean and SD
- simulate mean reversion: 20-yr variance ratio = 0.653

Simulated holding period returns



Back to the question of risk

Recall that we said

- Investor appetite for regulated assets could be explained by
“a shortage of low risk assets offering good financial returns”
- We asked whether a regulated business is
 - like a typical stock market company, or
 - protected from that kind of risk

Solving the risk paradox

- We observe significant betas in regulated companies in stock markets
- But we protect those companies from usual market risk
 - customers have no choice,
 - we practically guarantee their asset bases (financial capital maintenance)
 - we even give companies what they under-recover
- So, where does the risk come from?

Dimensions of risk

	Impact on:		
	Cost of capital	Incentives	Financeability
Volatility	-	(distraction)	✓
Diversifiability	✓ (beta)	-	-
Forecastability	✓ (asymmetry)	(information advantage)	✓
Manageability	-	✓	✓

Drivers of risk

★ risk factor

☆ risk factor, but investors protected by regulatory regime

	Risk driver	Beta-relevant	Net effect on allowed WACC
1	Uncertain demand/outputs required	HIGH	☆☆☆☆ to ★★☆☆
2	Uncertain input prices		n/a to ★
3	Uncertain delivery/productivity/efficiency		n/a to ★
4	Uncertain market interest rates	MEDIUM	☆☆ to ★★
5	Defined benefit pension schemes	MEDIUM	☆ to ★★
6	Stranded network risk		n/a to ★★
7	Political risk	MEDIUM	★ to ★★
8	Regulatory risk		☆ to ★
9	Societal existential risk		n/a
10	Liquidity risk		★
11	Evaluation risk		★

Pervasive role of political risk?

- Political risk could be dominant driver of beta risk
 - sensitivity to consumer interests greatest when economy is struggling
 - politically-driven toughness may co-vary with the market
 - we can't find other explanations for observed beta levels
- Political risk could be dominant driver of forecasting asymmetries
 - inherently difficult to forecast
 - will most likely be asymmetrically downside
 - however, could be offset by other asymmetries, eg information advantage

Implications for regulatory strategy

- Underlying risks could be very low
 - close to public sector financing cost levels
- Addressing political risk is central importance
 - need to reframe ‘bargain’ for consumer
 - expensive risk premium vs. benefits from private sector management
 - requires efficient cost of capital (risk premium consistent with low risk)
 - vicious cycle → virtuous cycle?
- Scope for more intelligent risk-aware regime design