

Some Macroeconomic Puzzles: Conjectural Refutations

The Equity Risk Premium: Puzzle?

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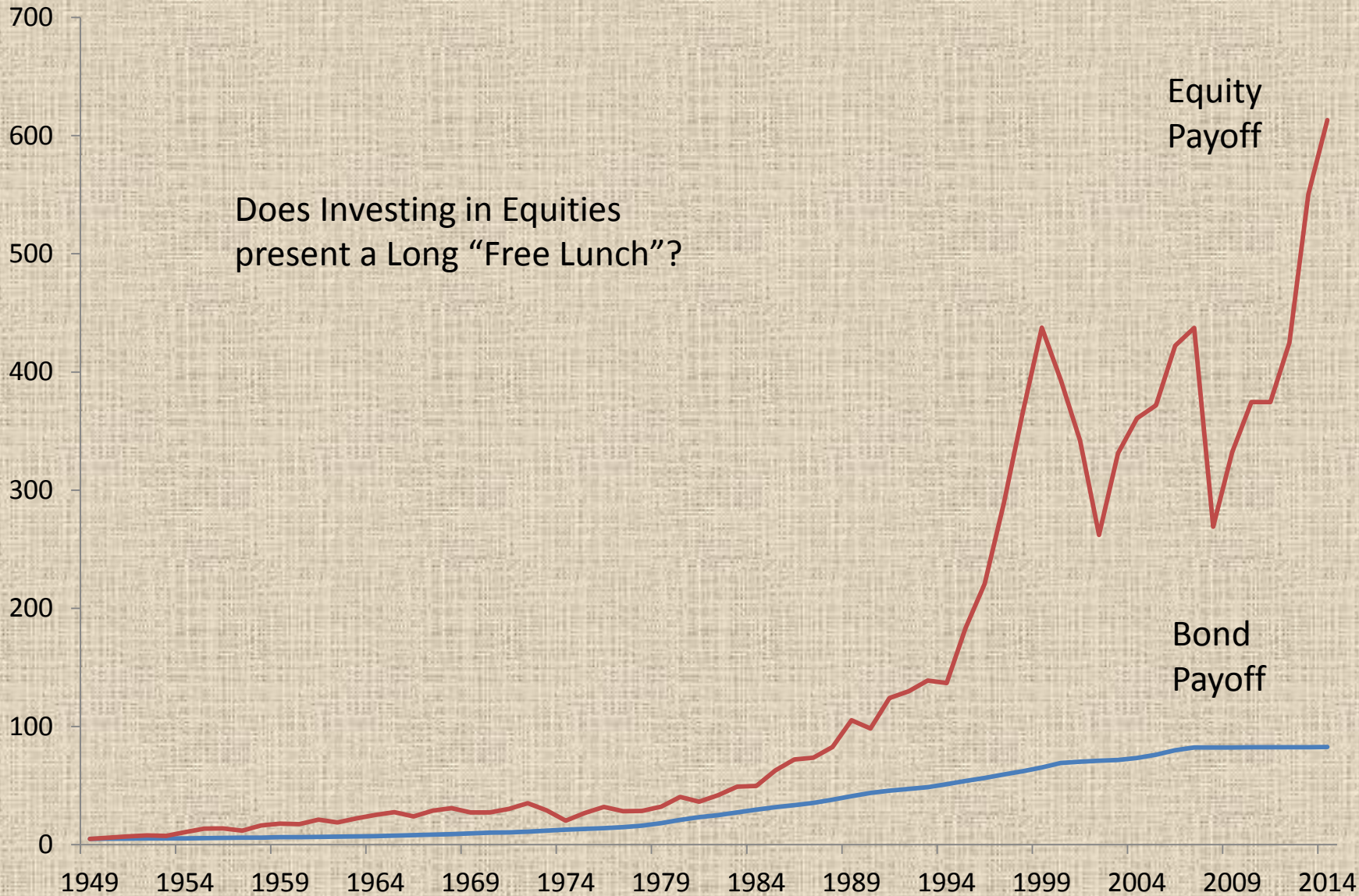
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Equity Premium: Puzzle?

- US\$5 invested in 1950 in short term T-Bill and re-invested by the end of 2014 would have given US\$83 and for equities, the same trade would yield US\$613
- The average annual return on short term bonds was 4.5% and on equities 9.1%
- The standard deviation of short term bonds was 3.1% and for equities 16.8%
- The difference in average returns measures the post-war market price of risk in the US
- It says that in order to bear the risk of holding equities investors require a high rate of return but does this risk premium price fairly the quantity and price of risk?
- Or is the premium excessive? And thereby providing a costly wedge for firms raising capital
- Or is the premium too low? And thereby acting as a disincentive to save.

US\$

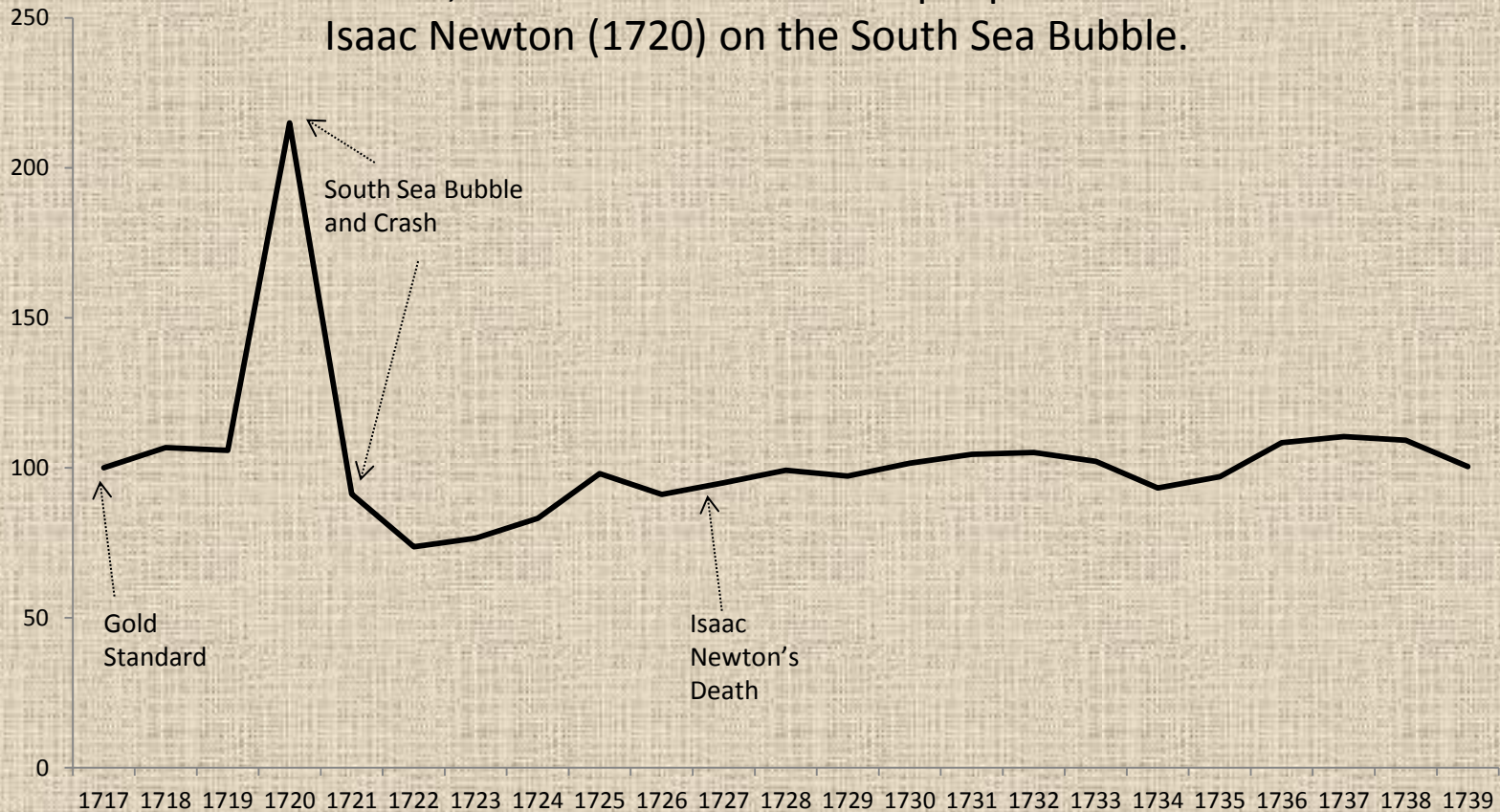


Does Investing in Equities
present a Long “Free Lunch”?

Equity
Payoff

Bond
Payoff

“I can calculate the motions of the heavenly bodies, but not the madness of people.”
Isaac Newton (1720) on the South Sea Bubble.



- On April 20, he sold his shares in the South Sea Company at a 100 percent profit of £7000
- Later he bought a larger number of shares near the market top and he lost £20,000
- Never for the rest of his life could he bear to hear the name South Sea.

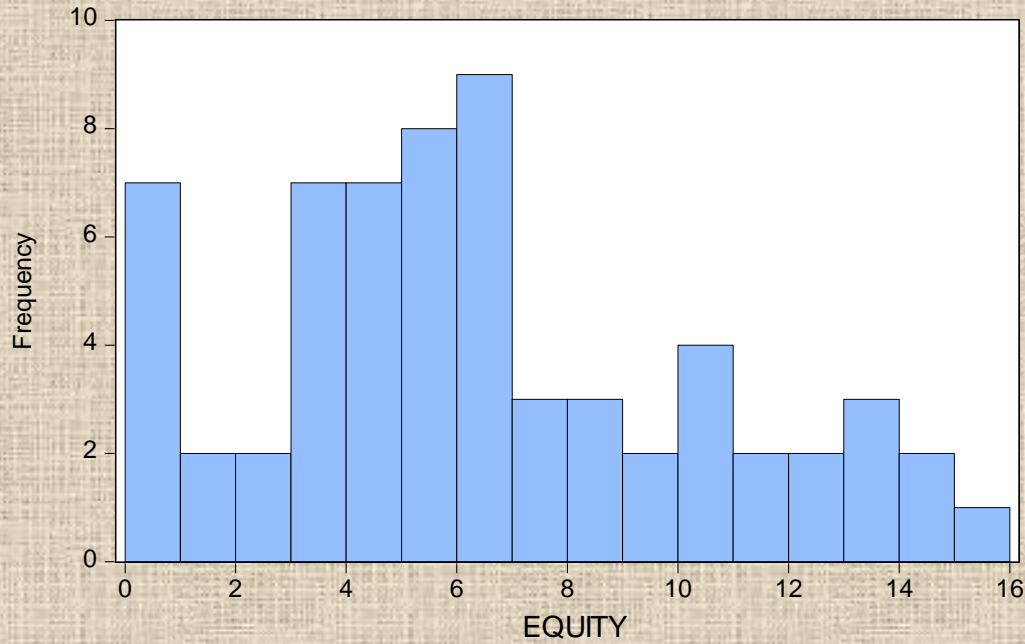
The returns from UK investing

			<i>Bonds</i> ₂₀₁₄	μ_{RoR}	<i>Equities</i> ₂₀₁₄	μ_{RoR}
1717	<i>Newton</i>	£1	£18,6245	4.2%	£3124	2.7%
1815	<i>Waterloo</i>	£5	£21,251	4.3%	£16,293	4.2%
1901	<i>Edward VII</i>	£5	£991	4.8%	£553	4.3%
1951	<i>Churchill</i>	£10	£512	6.5%	£846	7.3%
1981	<i>£50 reissued</i>	£50	£327	5.9%	£566	7.6%

- It certainly helps to live a long time if you can save enough but the picture is slightly different.

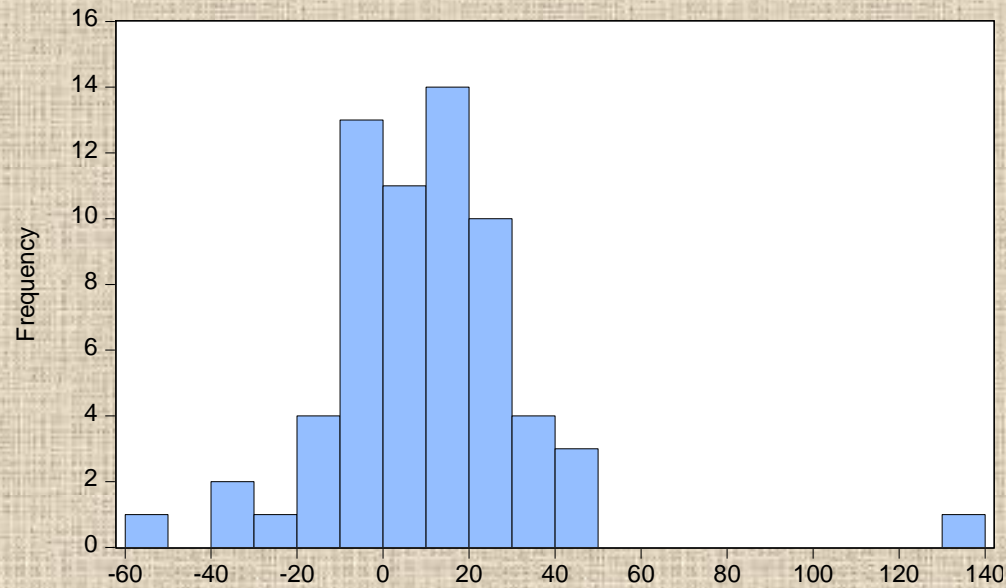
Interest Rate and Equity Returns 1950-2014

INT



No
annual
obs

'Safe
Asset'



'Risky
Asset'

Wealth.

**(Linearised) Mean-
variance indifference
curves**

Risk
Averse

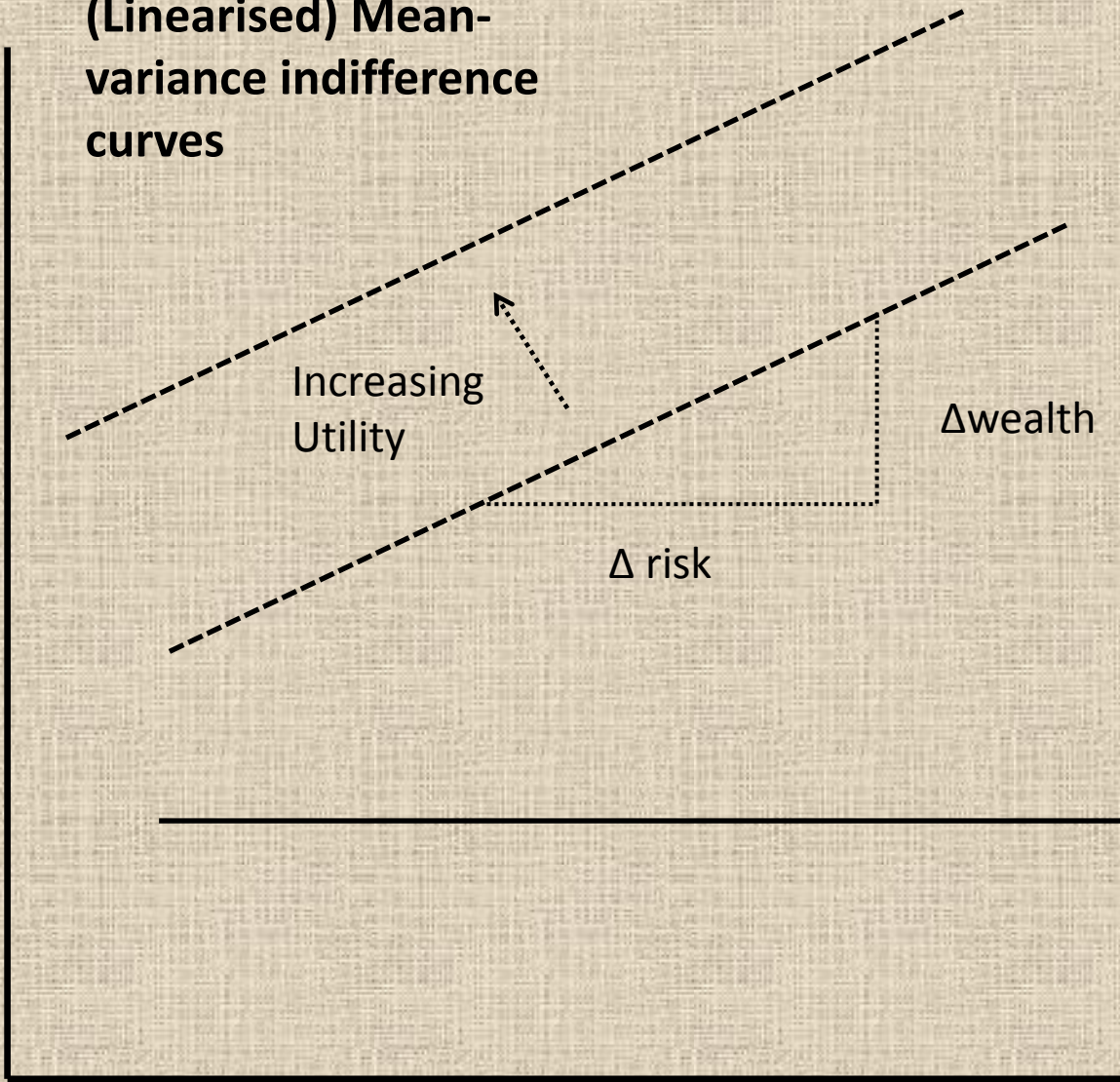
Increasing
Utility

Δ wealth

Δ risk

Risk
Neutral

Standard
Deviation
(returns)



Are Equities too Good to be True?

Wealth.

9.1%

4.5%

3.1%

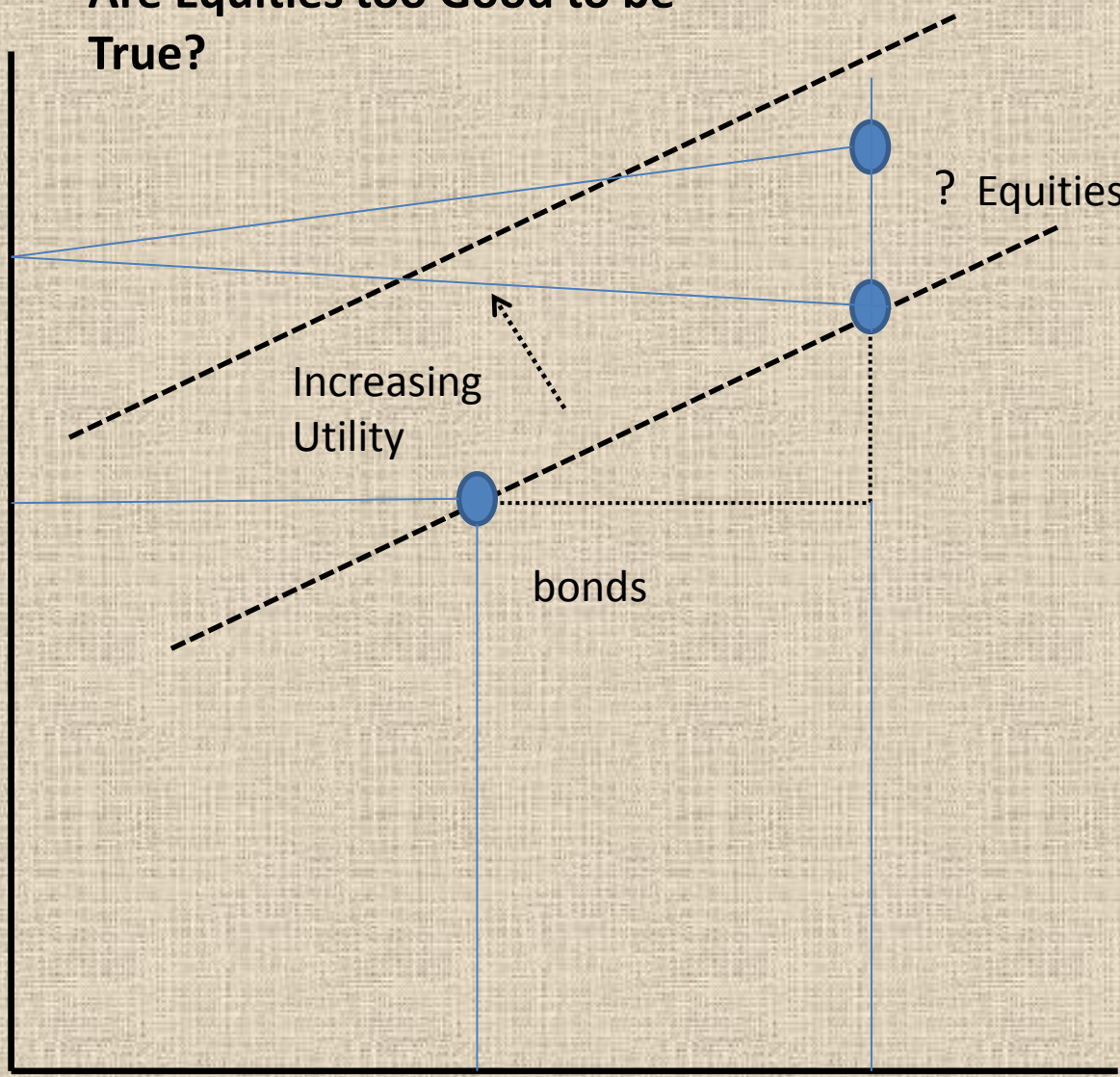
16.8%

Standard Deviation (returns)

Increasing Utility

bonds

? Equities



Consumption, Utility and Risk Premia

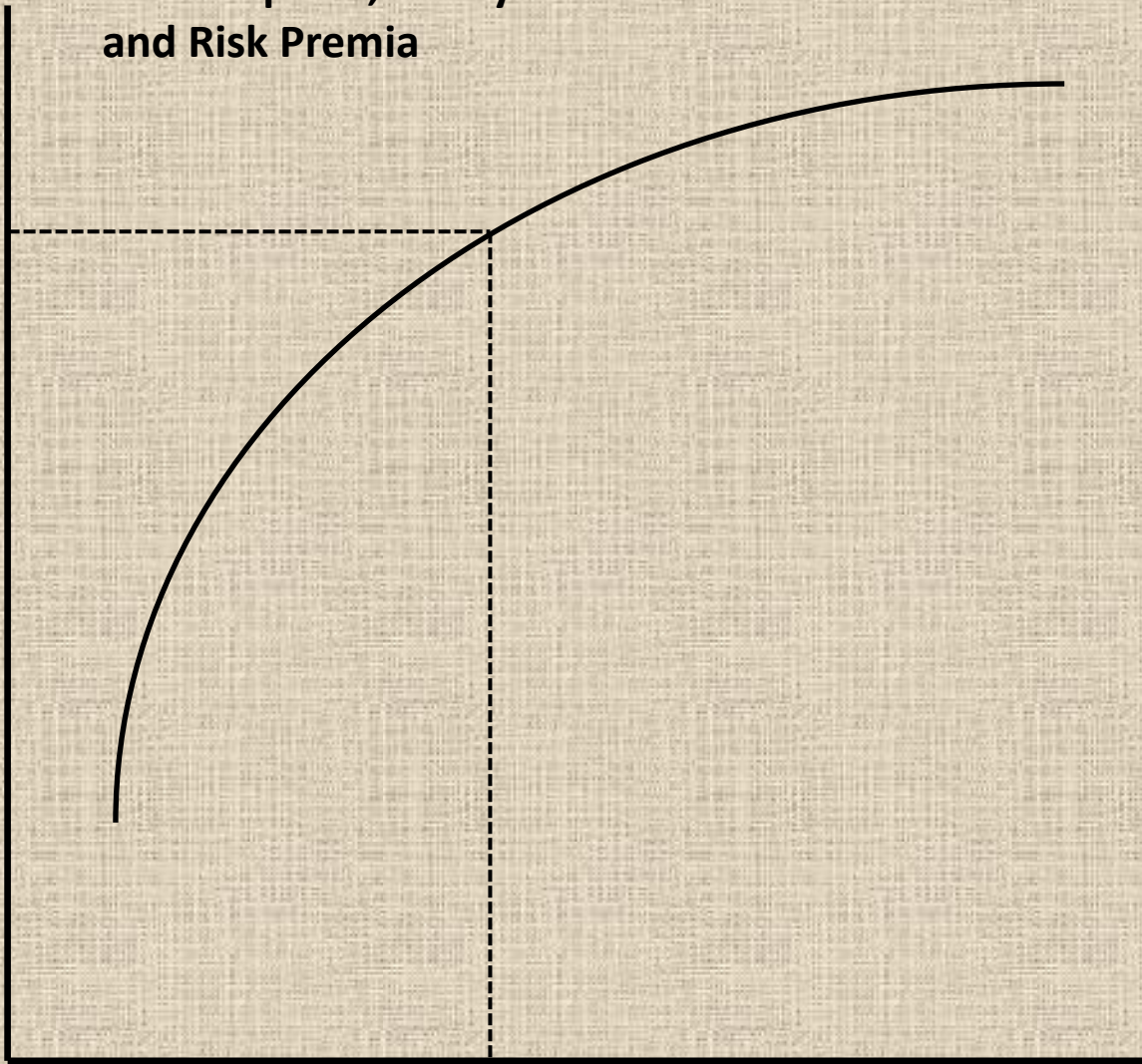
UTILITY

$U(C)^A$

40

CONSUMPTION

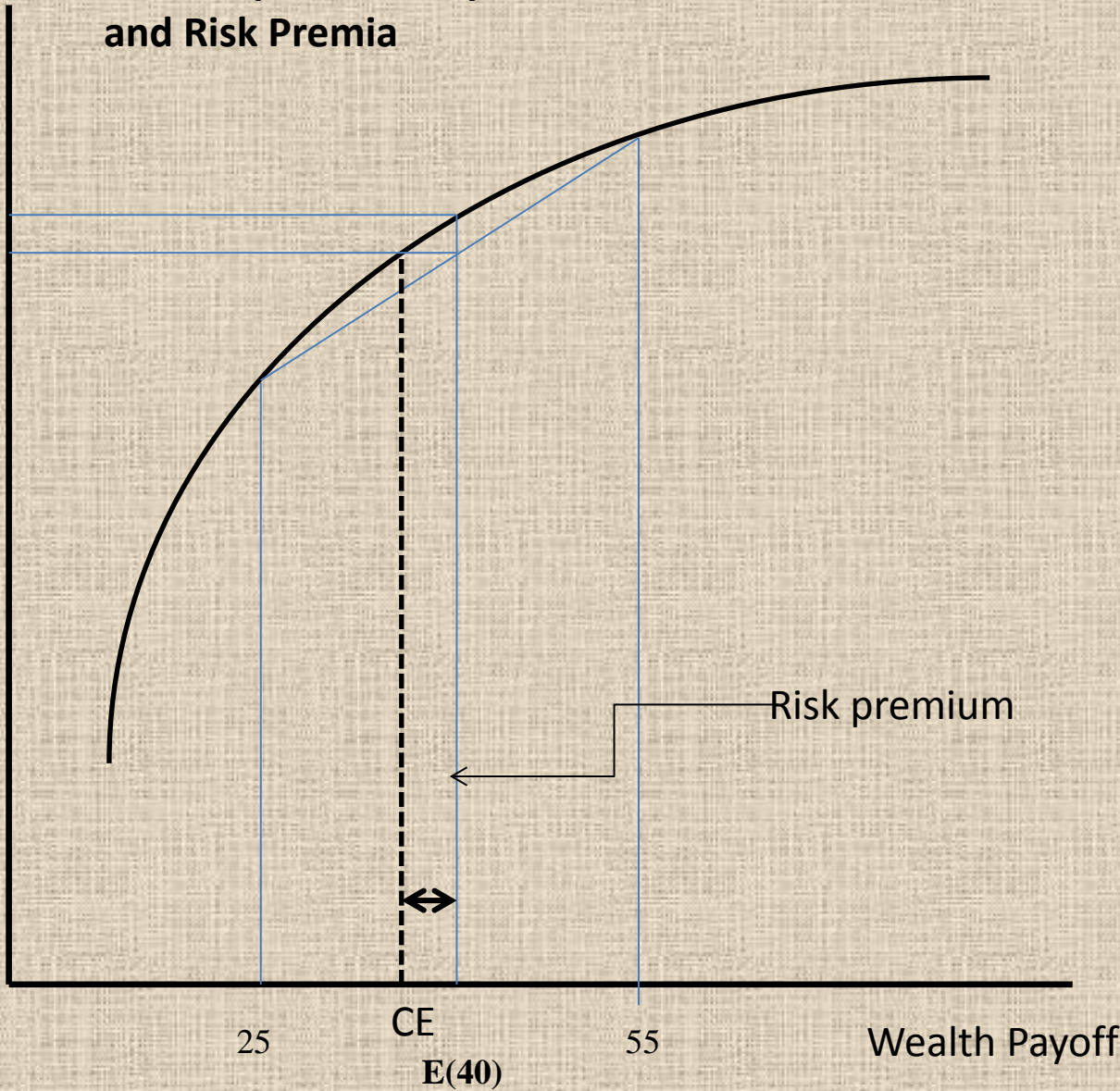
Mapping from consumption to utility
(happiness)



Consumption, Utility and Risk Premia

UTILITY

$U(C)^A$



Risk premium

How to determine the risk premium

$$U(W_t) = \frac{W_t^{1-\gamma}}{1-\gamma}$$

$$\frac{CE_t^{1-\gamma}}{1-\gamma} = \frac{1}{2} \left(\frac{25,000^{1-\gamma}}{1-\gamma} \right) + \frac{1}{2} \left(\frac{55,000^{1-\gamma}}{1-\gamma} \right)$$

	<i>CE</i>
$\gamma = 0$	40,000
$\gamma = 2$	34,375
$\gamma = 5$	29,421
$\gamma = 10$	26,999
$\gamma = 20$	25,929

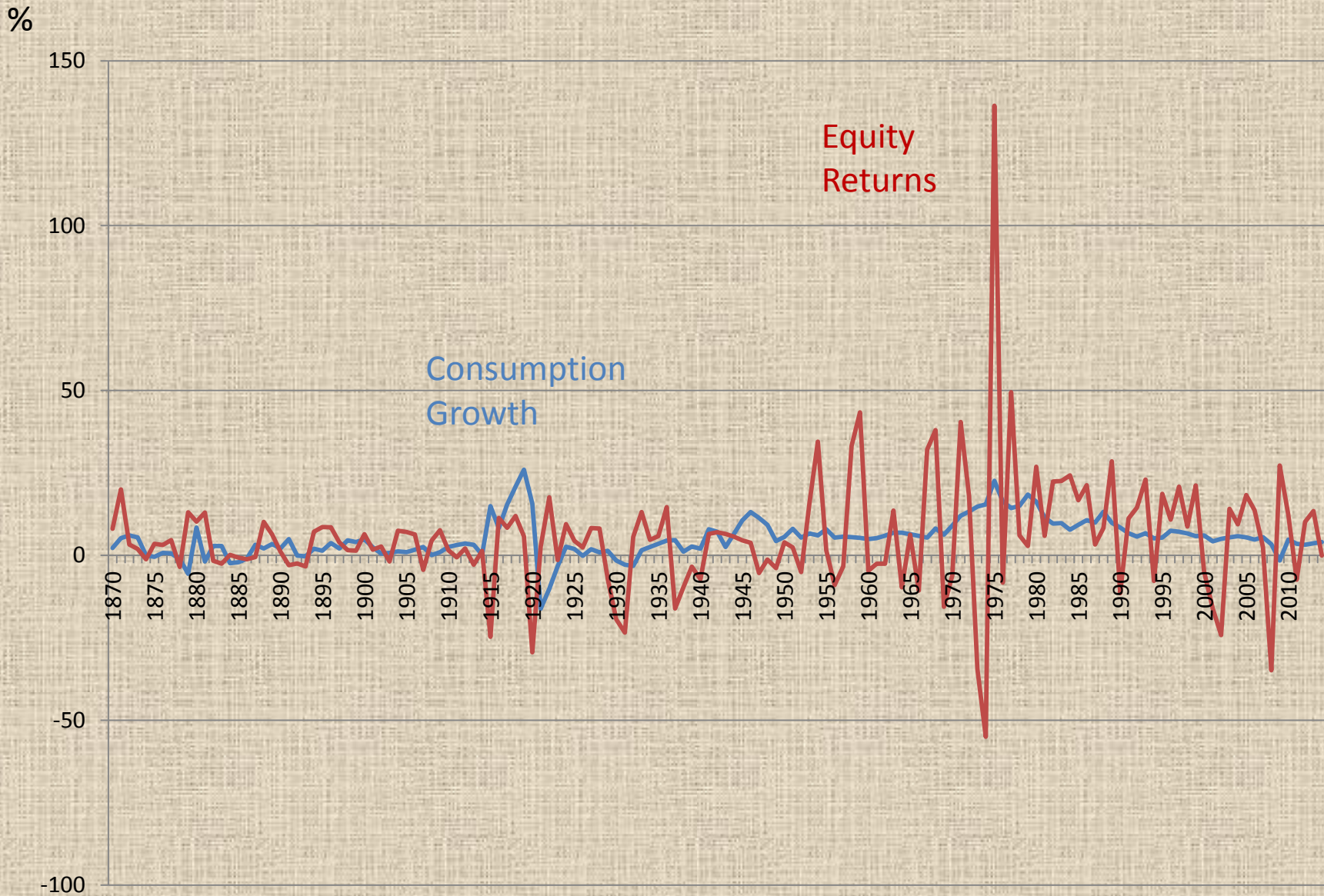
- By the time risk aversion gets very high, you would rather take the lower outcome than face the risk!

$$U(W_t) = \frac{W_t^{1-\gamma}}{1-\gamma}$$

$$\frac{E_t + CE_t^{1-\gamma}}{1-\gamma} = \frac{1}{2} \left(\frac{E_t + 25,000^{1-\gamma}}{1-\gamma} \right) + \frac{1}{2} \left(\frac{E_t + 55,000^{1-\gamma}}{1-\gamma} \right)$$

$E_t = 20,000$	CE
$\gamma = 0$	40,000
$\gamma = 2$	36,250
$\gamma = 5$	31,909
$\gamma = 10$	28,549
$\gamma = 20$	26,672

- With an endowment of £20,000, you would rather accept just over £28K rather than gamble on £25K vs £55K! Improbable?



- Mild positive covariation – so risky

$$\ln E \{R_e\} - \ln R_f = \gamma \sigma_{c, R_e}$$

The excess return on equities is explained by the coefficient of relative aversion and the covariation of consumption growth with equity returns....or

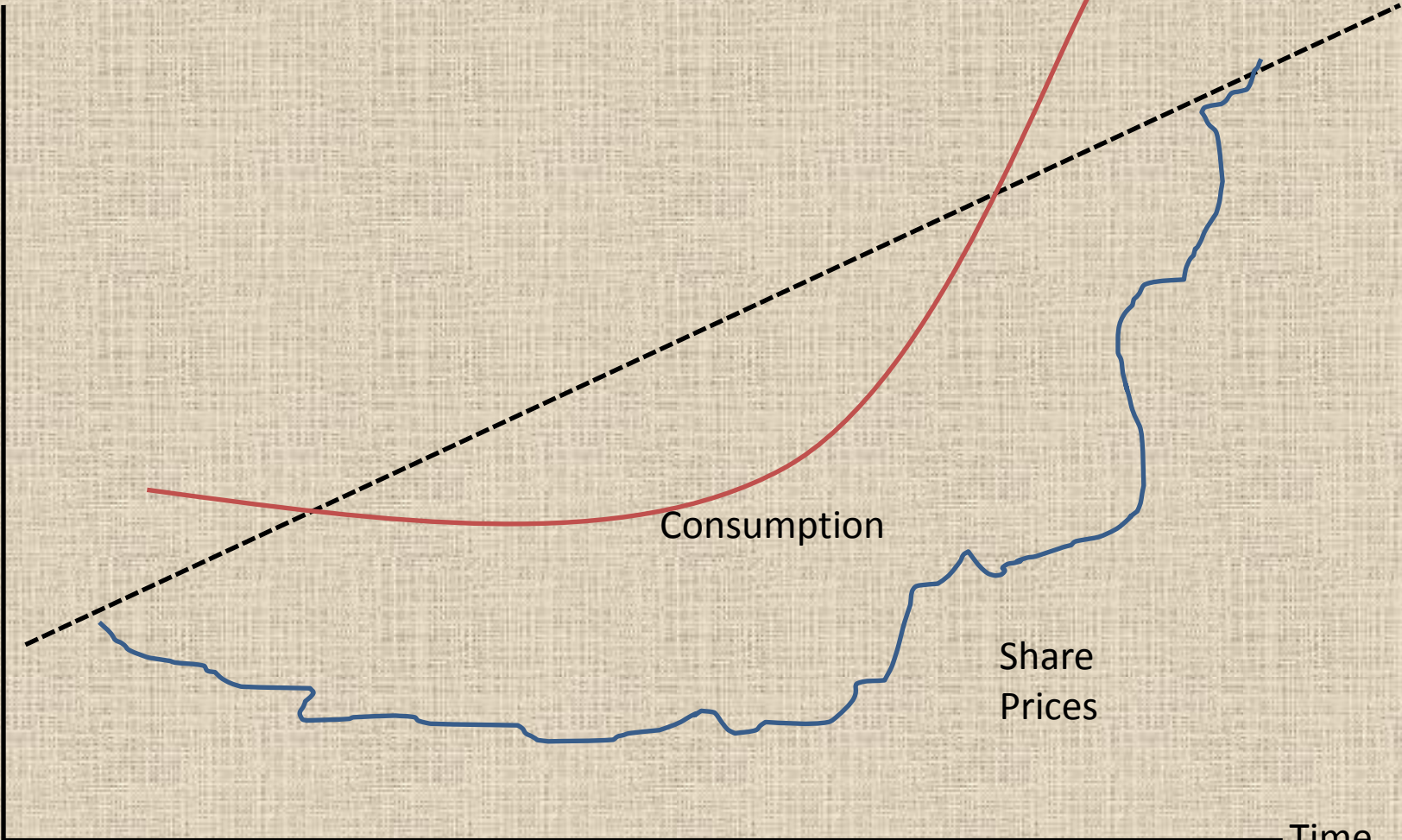
$$\ln E \{R_e\} - \ln R_f = \gamma \sigma_{R_e}^2$$

if we believe that growth in consumption equals return on equity.

- **UK excess return 1950-2014 was 3.4%, with covariation of 0.003 this implies a coefficient of risk aversion of 12+.**

Assets that Do Not Help Risk

Output,
Income



Consumption

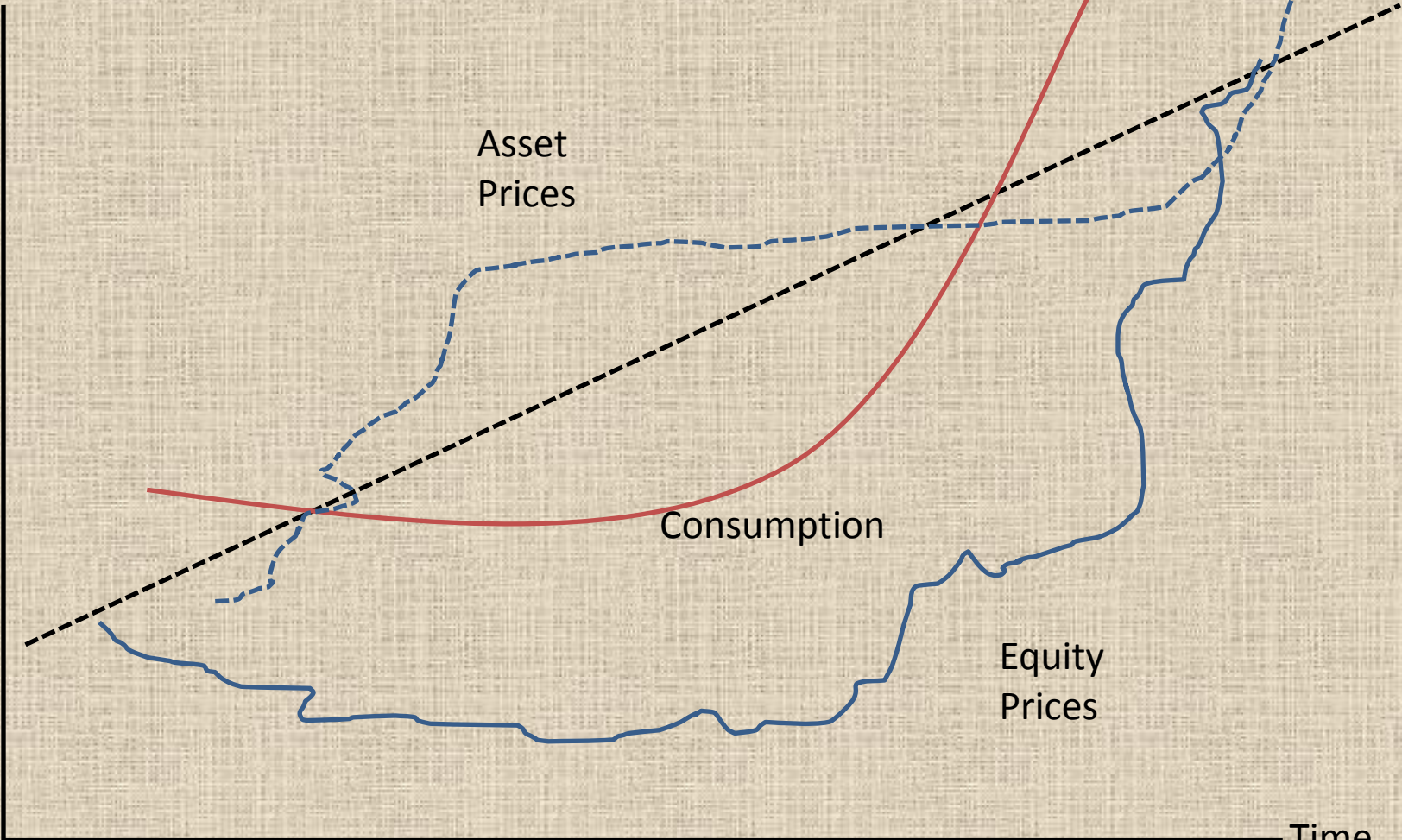
Share
Prices

Time

These share prices are volatile (noisy) and do not help smooth consumption

Assets that Help Risk

Output,
Income



Time

But if they can be stabilised we might value them more
Greenspan put – cut rates when equity prices are low

Explanations

- Not Stable or Innate

The risk premium may be an artifact of a particular time period or series of events

- Survivorship Bias

We might over estimate returns because we do not account for firms that disappear or go bankrupt

- Low T-Bill Rates

Are bond returns too low - affected by tax treatment?

- Utility Function or Risk Measurement

Perhaps the utility function does not deal with losses in the correct manner?

- Heterogenous Households

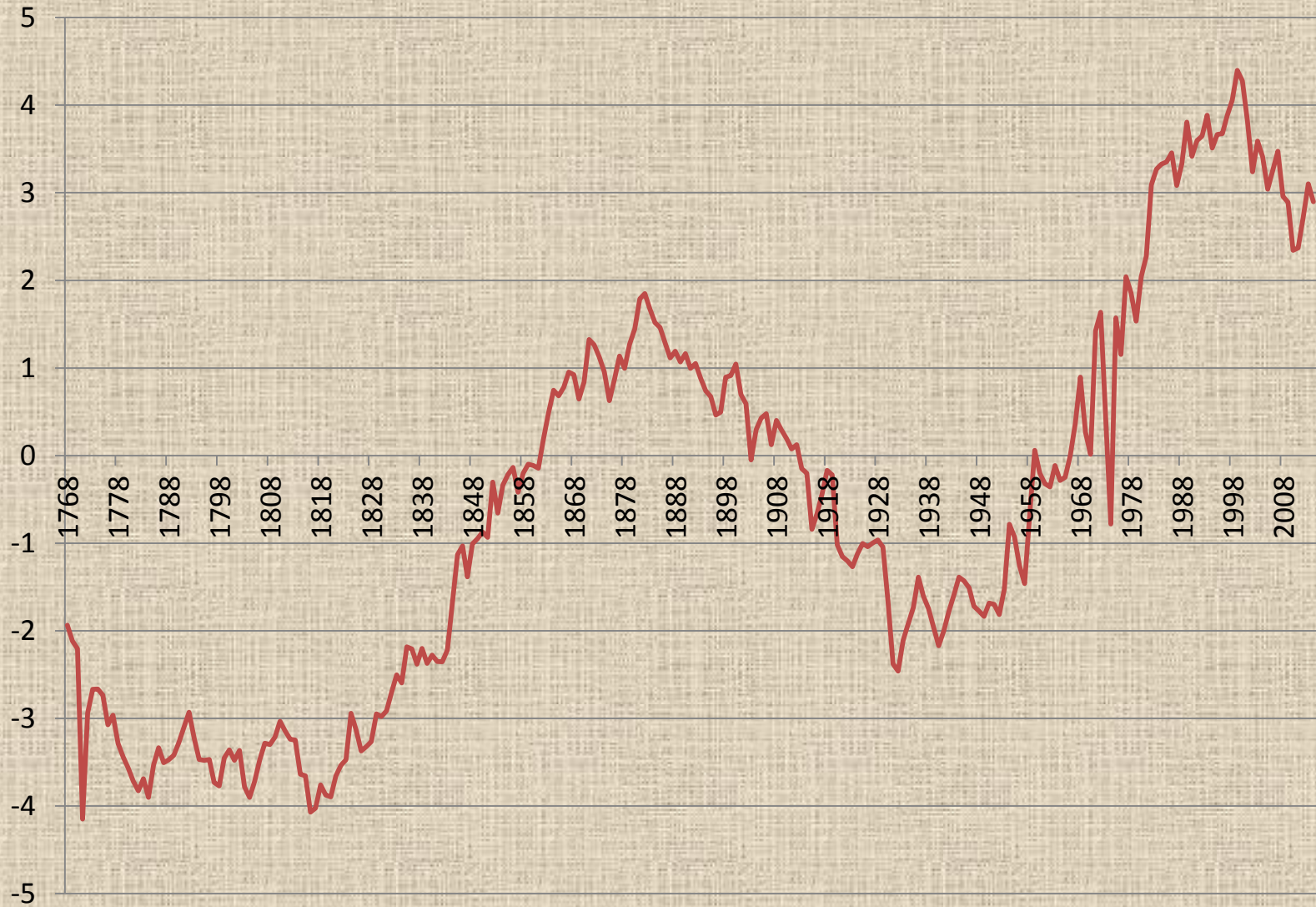
Richer households might be the ones holding equities and thus have face higher risk with respect to equity returns

- Disaster Premia

Perhaps equities give a large pay-out as a rewards for bearing the risk of occasional disasters?



50-year rolling window of excess equity returns over bond returns



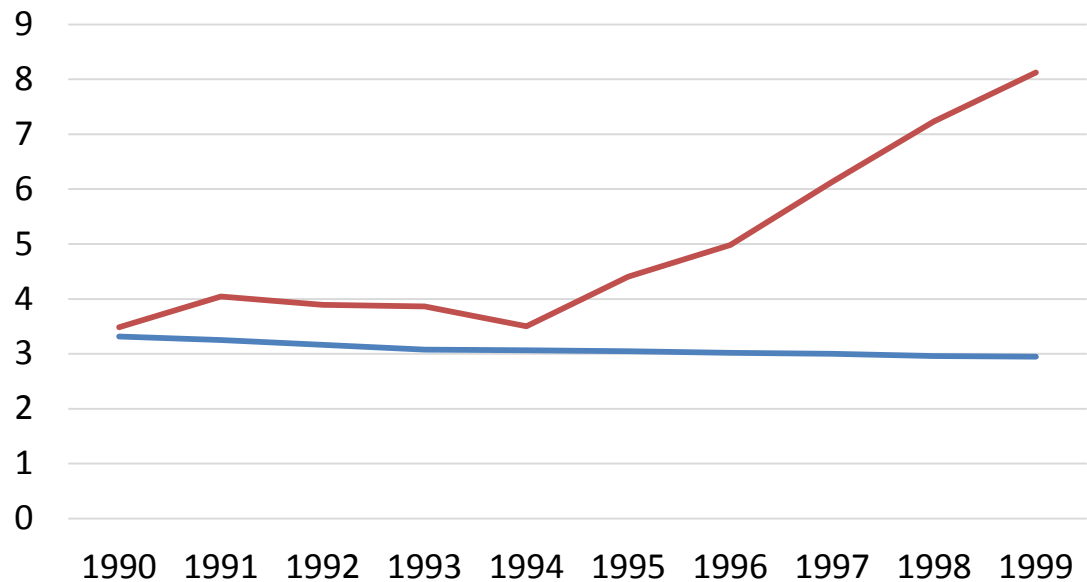
- Not very stable excess returns – upward trend...?

Exploring a Trading Strategy

- Invest £100 or \$100 every year in 1965 constant prices i.e. so we increase the amount saved in line with the RPI (UK) or CPI (US)
- Save every year for 40 years e.g. 1965 to 2004 or 1966 to 2005
- At the end of the 40 years examine your overall relative payoff if you invested in short term bonds or in the equity index
- Compare the two payoffs - as a way of evaluating the return from equities versus that from bonds or the profits from a long term 'bet'
- We can do this exercise for the US, UK, and for shorter horizons
- Does the equity strategy dominate the bond strategy?
- We also do the exercise for a mystery asset(!)

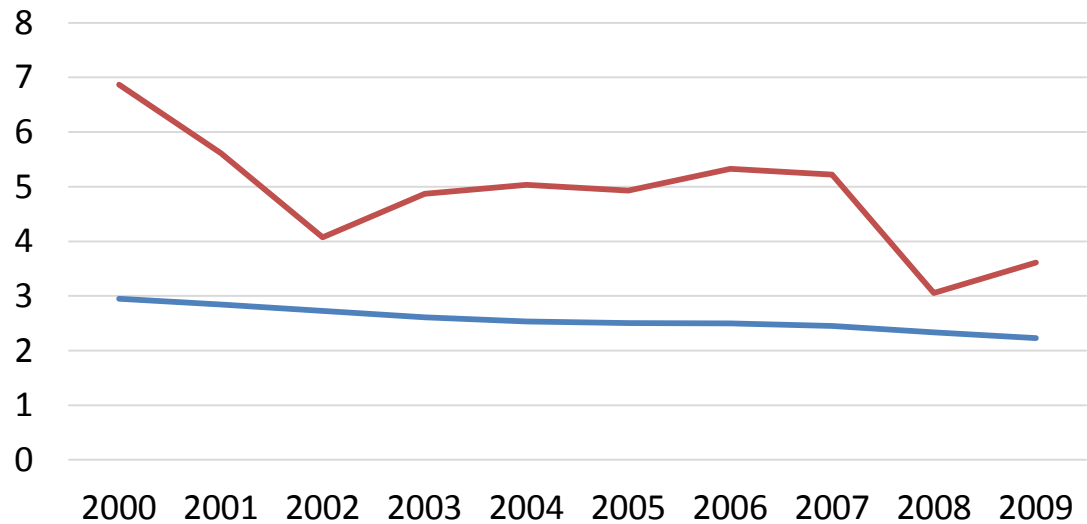
Ratio of
final
pay-out
to
money
put in

40 year, 1951-60, US



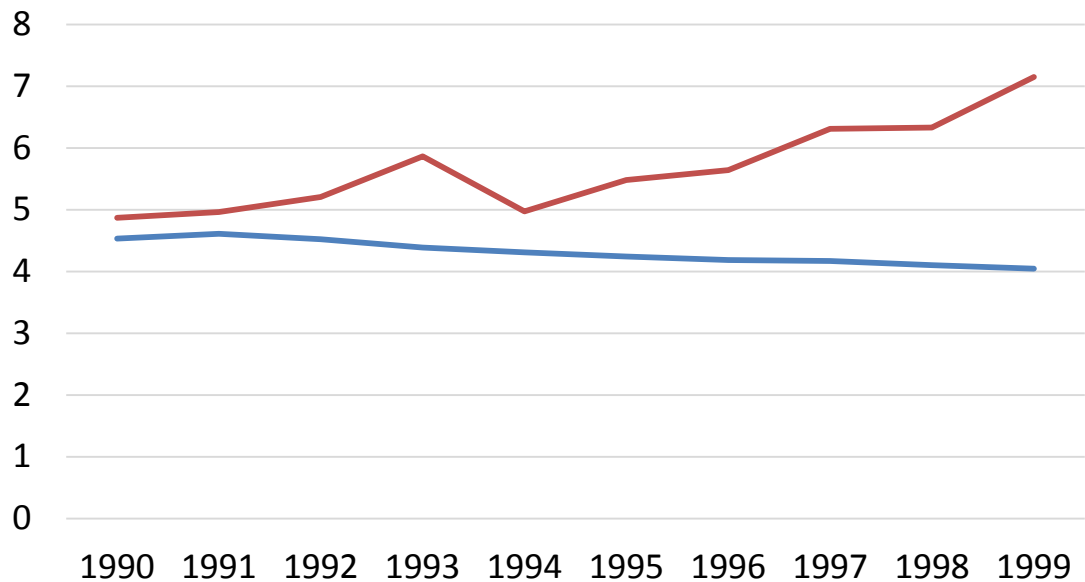
Lucky

40 year, 1961-70, US

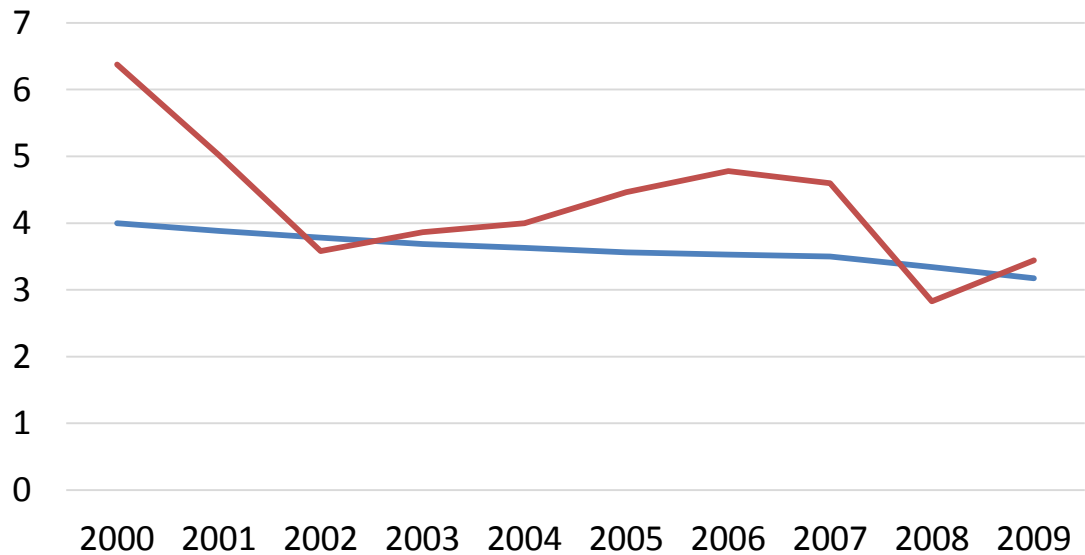


Ratio of
final
pay-out
to
money
put in

40 year, 1951-60, UK



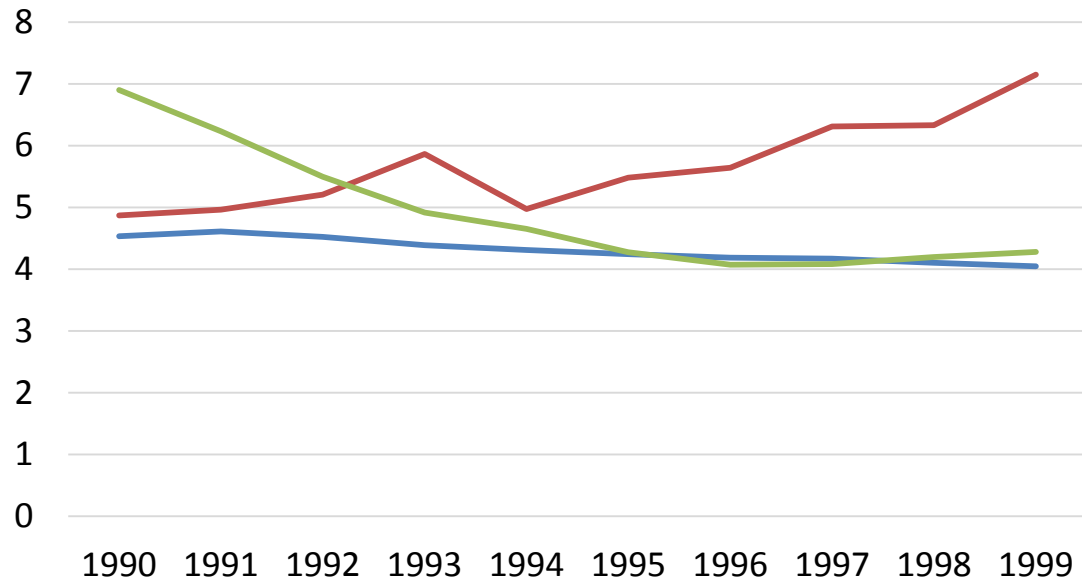
40 year, 1961-70, UK



Not quite
so Lucky

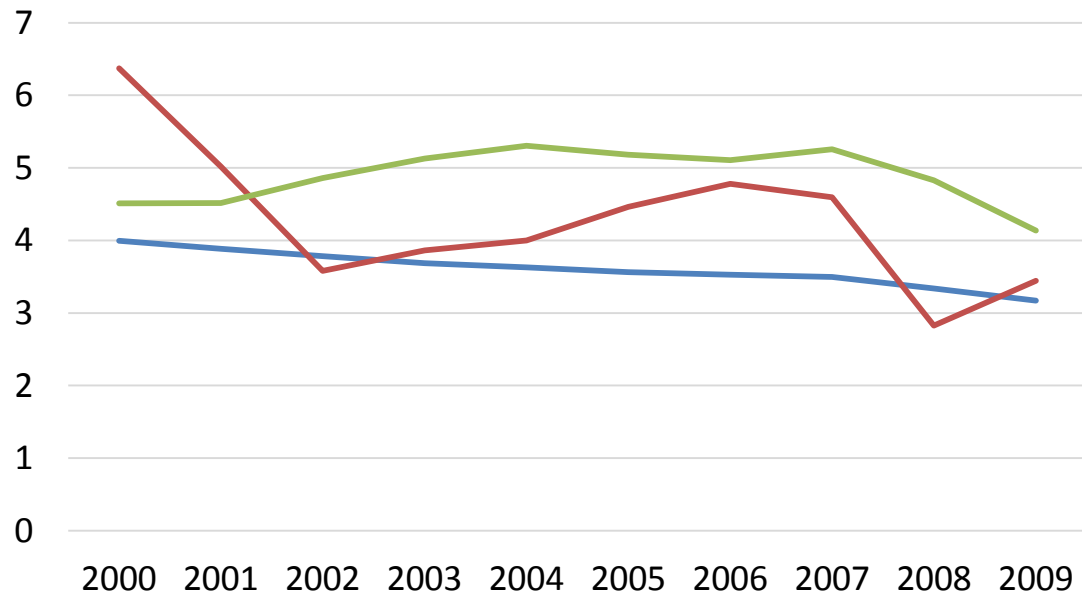
Ratio of
final
pay-out
to
money
put in

40 year, 1951-60, UK + Mystery Asset

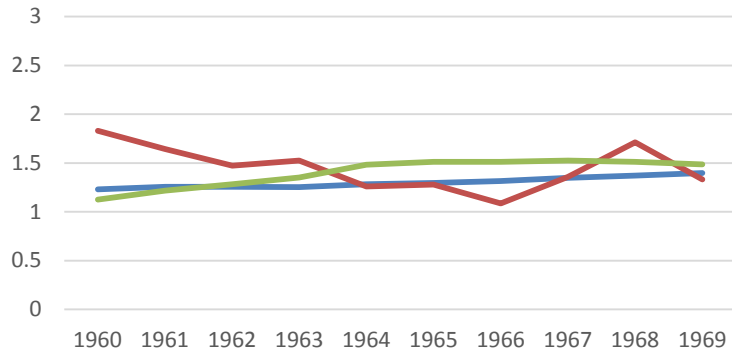


What is the
Mystery
Asset?

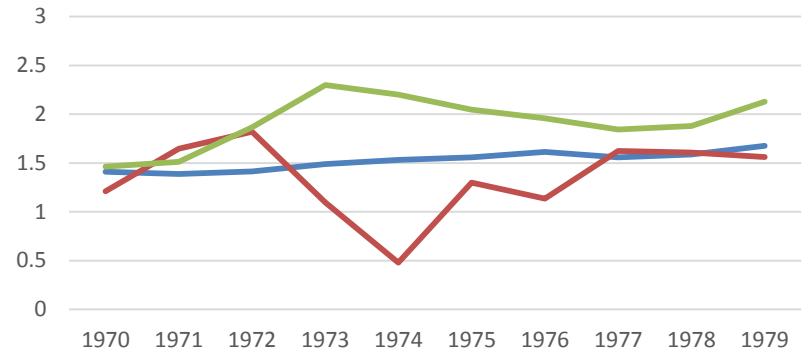
40 year, 1961-70, UK + Mystery Asset



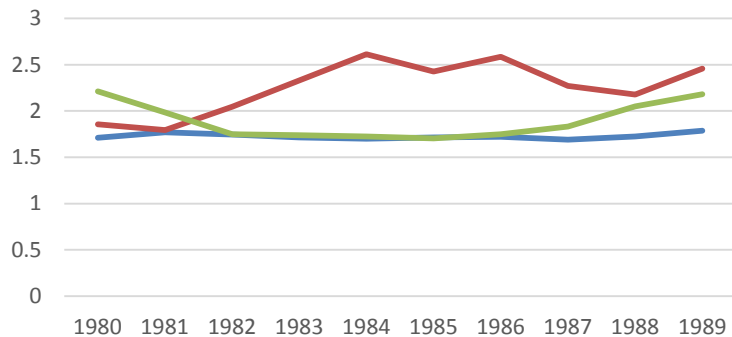
1951-1960



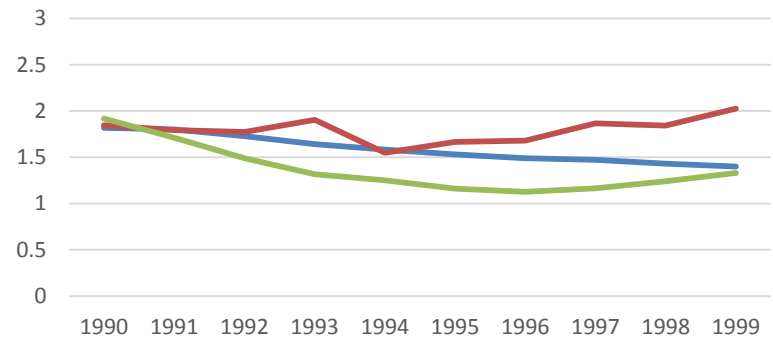
1961-1970



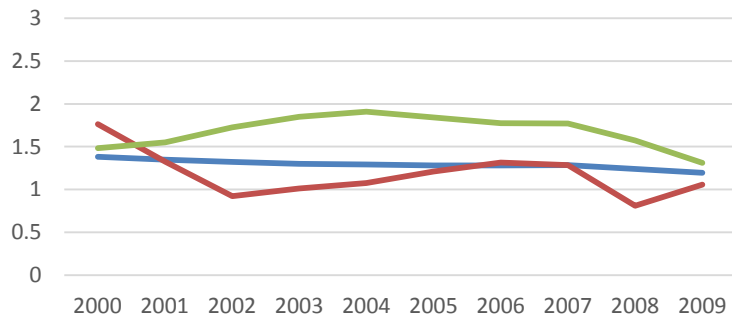
1971-1980



1981-1990



1991-2000



For shorter horizons e.g. when liquidity matters, equities and housing look risky and need a premium over bonds. Source: UK data.

Concluding Remarks

- 1 Investing in equities worries people - as the day-to-day variance is widely reported and can be measured easily
- 2 Equity Premium results from risk aversion (preferences) and from the variance of returns (volatility) particularly w.r. consumption growth
- 3 US postwar data seems to suggest a "free lunch" i.e. a high return relative to the risk premium we might plausibly expect - Q: has this held back growth?
- 4 UK data is less clear - with evidence of a less dominant return - Q: has this held back savings?
- 5 There is considerable random variation in returns
- 6 Some evidence that we have diversified to housing assets in the UK.