

Anomalies: The Equity Premium Puzzle

Siegel and Thaler (1997)

Equity Premium

- Equity return – Risk-free return
- CAPM (Capital Asset Pricing Model)

$$r_A = r_f + \beta_A(r_m - r_f)$$

- r_A = Return on stock A
- r_f = Return on risk-free asset
- r_m = Return on stock market
- β_A = Beta of stock A

Back to Microeconomics ...

- Equity premium is mainly the risk premium
- **Expected Utility Theory**
- Assume a risky asset, denoted by L , as:
 - Prob. p_1 to get W_1
 - Prob. p_2 to get W_2
 - Its expected return is $p_1W_1 + p_2W_2$
- What is the level of utility a consumer get from this asset?

Consumers think of certain returns and risky returns differently

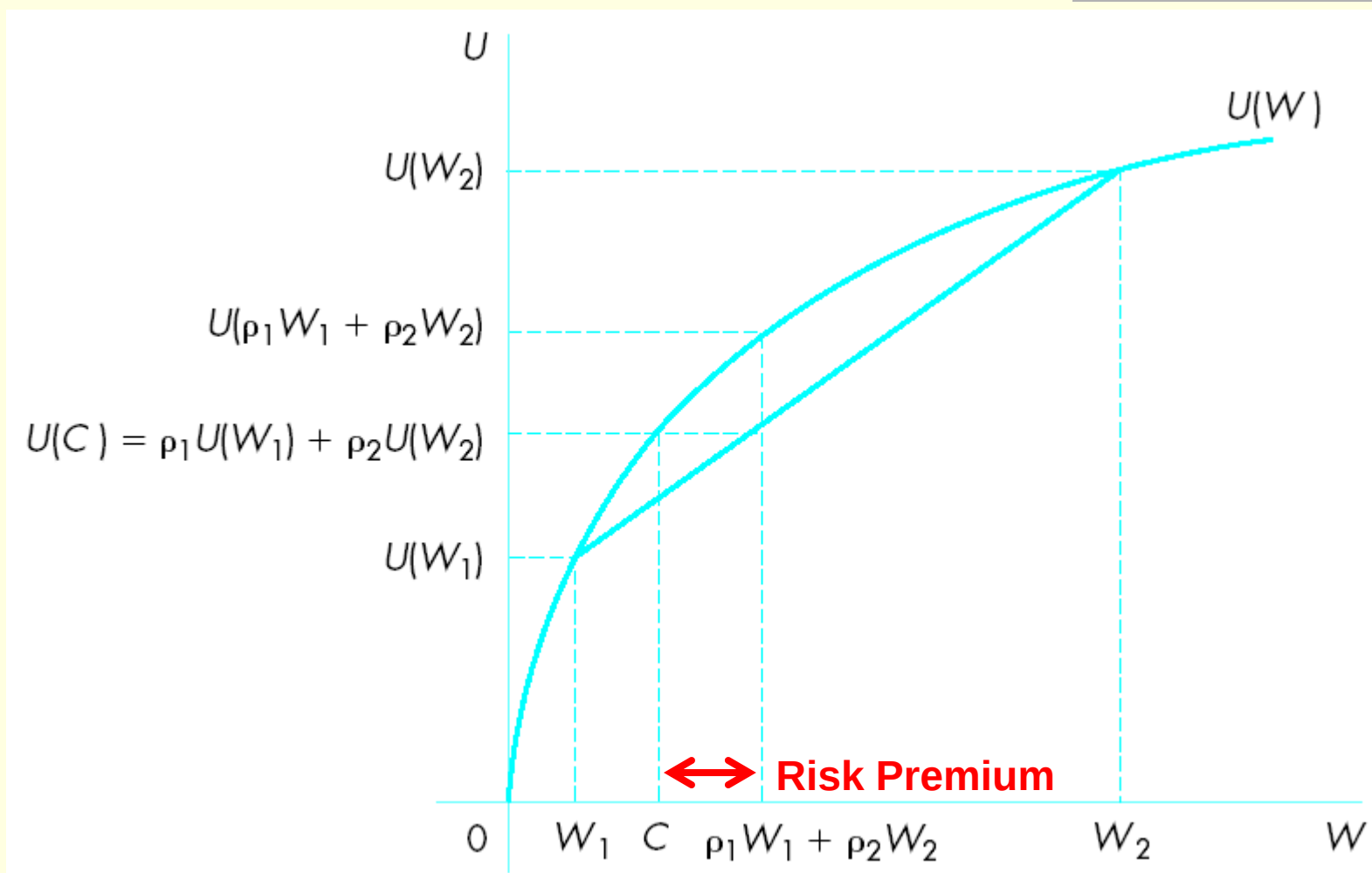
- Expected Utility Theory:

$$EU(L) = p_1U(W_1) + p_2U(W_2)$$

- $EU(.)$ = Expected utility
- $U(.)$ = Utility level from a certain outcome
- It is usually for a risk-averse consumer to have

$$EU(L) < U(p_1W_1 + p_2W_2)$$

Risk Premium is the excess return required on risky returns



Functional Form of the Utility Function

- Usually, economists use functional form of the utility function as:

$$U(W) = \frac{W^{1-A}}{1-A}, 0 < A < \infty$$

- A measures the curvature of the utility function (Arrow-Pratt coeff. of relative risk aversion)
- From this function

$$U'(W) = W^{-A},$$

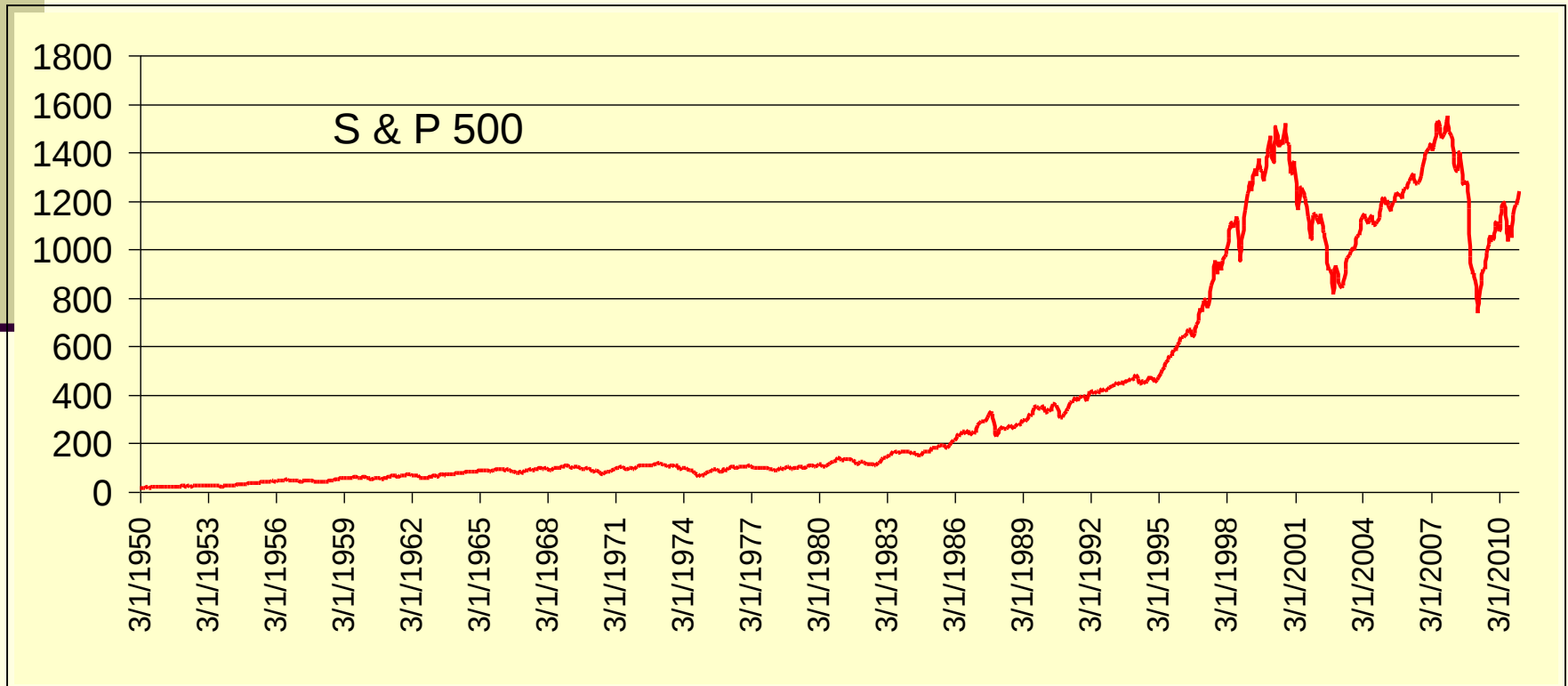
$$U''(W) = -AW^{-A-1}$$

Anomaly (Again)

- An empirical result qualifies as an ***anomaly*** if it is difficult to “rationalize” or if implausible assumptions are necessary to explain it within the paradigm.

Introduction

- \$1,000 in 1925 would become
 - \$12,720 at the end of 1995 with Treasury bills
 - \$842,000 at the end of 1995 with a (value-weighted) portfolio of stocks



The Puzzle (1)

- The difference in returns, 3.7 percent vs. 10.1 percent, is strikingly large
- Let A be the “coefficient of relative risk aversion”
 - It measures the degree people are scarce of risks: The higher value indicates people are more risk-averse
- Mehra and Prescott (1985) obtained the value of A to be between 30 – 40, which they concluded was much too high

The Puzzle (2)

- With A at 30,
 - Suppose you own \$100
 - If you face a gamble with 50% chance to make you wealth \$200 (+\$100) and 50% to get \$50 (-\$50)
 - You would be willing to pay \$49 to avoid this gamble
 - This means you prefer \$51 with certainty than the gamble, which seems absurd

The Puzzle (3)

- There is another aspect
- High value of A implies that individuals should want to smooth consumption over time
- Since the economy becomes richer over time, individuals should all try to borrow from their richer future
- But this common desire to borrow should lead to high real (short-term) interest rates
- However, real interest rate has been low over a long period of time (Risk-free rate puzzle)

To Solve the Puzzle ...

- There are two broad approaches to explaining the equity premium puzzle
 - First, empirical approach
 - Second, theoretical approach

Empirical Questions (1)

- Longer Time Period
 - The time period studied by Mehra and Prescott (1985) may be special
 - Longer time span may solve the puzzle
- According to Siegel (1992), over the 193-year period the excess return on equity has been 5.3 percent (from $10.1 - 3.7 = 6.4$ percent)
 - Still high?

Empirical Questions (2)

- Survivorship Bias
 - Of the 36 stock exchanges that operated at the turn of 20th century, more than one-half of them had significant interruptions
 - Hence, equity risk premium estimated from U.S. data alone is distorted by the fact that it is calculated from a survivor
 - The riskiness of equities is understated by estimates relying on U.S. existing data
- However, the experiences of Japan and Germany do not support this hypothesis

Empirical Questions (3)

- Mean Reversion and Aversion
 - If annual returns are not independent, standard deviation of annual rates of returns may not reflect well to the long-term risk
- However, the finding from Siegel (1992) deepen the puzzle
 - Annual s.d. of returns on stocks is 18.15, while annual s.d. of returns on bonds is 6.14
 - However, actual s.d. of 20-year returns on stocks is 2.76, while on bonds is 2.86

Theoretical Explanations (1)

- Current consumption may be compared with the consumption levels of others
 - “I may get utility not just from my own consumption but from knowing that I am consuming more than you are”
 - Consumption in the future becomes more valuable because consumptions of other people will increase in the future
 - This reduce individual's desire to borrow against future income (consumption) and, hence, lowers the real rate
 - This approach reduces the value of A to six.

Theoretical Explanations (2)

■ Myopic Loss Aversion

- Benartzi and Thaler (1995): All investors are assumed to get utility from the *changes* in the value of their portfolios
- Moreover, investors are “loss aversion” – Losses are assumed to hurt significantly more than gains yield pleasure
- The evaluation period that makes stocks and bonds equally attractive is about 13 months
- Implication: If people did concentrate on long-term results, they would invest more in stocks

Commentary (1)

- Is equity premium a puzzle?
- Eugene Fama (1991):
 - “... a large equity premium is not necessarily a puzzle; high risk aversion may be a fact. Roughly speaking, a large equity premium says that consumers are extremely averse to small negative consumption shocks. This is in line with the perception that consumers live in morbid fear of recessions, even though, at least in the post war period, recessions are associated with small changes in consumption.”

Commentary (2)

- Consumers and investors may make mistakes
- If you think that the equity premium is partially derived from other people's mistakes and fears, then you might find equities very attractive
- Note: Past returns are no guarantee of future returns