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The Equity Risk Premium and the Cost of Capital

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Outline

- Building Blocks of the Cost of Capital:
  - the Equity Risk Premium
- Past Practice
  - Use Average Historical Returns
- Arguments for a Lower Premium
  - Individual Risk Aversion
  - Dividend Growth Measures
  - Survivorship Bias
- the Consensus and the Consequences

Building Blocks of the Cost of Capital

- the Risk-Free Rate
- the Measure of Risk
  - in the CAPM, the Beta
- the Risk Premium
  - i.e., the price of risk
  - in the CAPM, the equity risk premium

$$R_a = R_f + \beta_a (R_m - R_f)$$

- add-ons or extensions for: small firms, country risk, etc.

For Example…

- **the Risk-Free Rate:** **5%**
- **the Measure of Risk:** **0.75**
  - **in the CAPM, the Beta**
- **the Risk Premium:** **8%**
  - **i.e., the price of risk**
  - **in the CAPM, the equity risk premium**

$$R_a = R_f + \beta_a (R_m - R_f)$$

$$11\% = 5\% + 0.75\,(8\%)$$

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Estimating the Risk Premium

- **Historical Average Equity Return over Bonds**
- **Ibbotson database, from 1926**
  - **first published in 1976**
- **Arithmetic Average of Annual Returns**
  - **over 30-year horizon the arithmetic average is about 2% higher than the geometric average**
- **Stock Returns over T-Bills or T-Bonds**
  - **long-term bonds produce a 1%-2% lower premium**

Reported Historical Risk Premia

Edition	Publication Date	Average Risk Premium	Data Used
2nd	1984	8.3%	1926-1981
7th	2003	9.1%	1926-2000

Richard Brealey and Stewart Myers
Principles of Corporate Finance

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Demand Side Evidence: Equity Premium Puzzle

- How much return should an investor require as compensation for risk?
- Parameterize a utility function; what are standard estimates for the degree of risk aversion?
- How risky is a portfolio of stocks?
- What is the premium this implies?

Mehra & Prescott result: plausible premiums are 1%-3%

Supply Side Evidence: Dividend Growth Model

- **What rate of return can be justified by observed or expected dividend payouts?**

$$P = \frac{DIV_1}{R_m - G} \qquad R_m = \frac{DIV_1}{P} + G$$

$$R_m = 3\% + 6\% = 9\%$$

$$R_m - R_f = R_p = 9\% - 5\% = 4\%$$

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Ex Ante vs. Ex Post

- **Earlier in the 20th Century, what did people think was a reasonable premium for stocks over bonds? …1.5%?**

> ***"The customary way to find the value of a risky security has always been to add a 'premium for risk'.***
>
> ***Interest Rates, Past Present and Future***
> ***Long-term government bonds – 4%***
> ***Good stocks – 5 ½%***
>
> **John Burr Williams**
> ***The Theory of Investment Value*, 1938**

History Written by the Winners

- exchanges existing at the start of the 20th century…

Amsterdam, Belgrade, Berlin, Bombay, Brussels, Budapest, Buenos Aires, Cairo, Caracas, Copenhagen, Dublin, Frankfort, Geneva, Helsinki, Hong Kong, Istanbul, Johannesburg, Lisbon, London, Madrid, Melbourne, Mexico City, Milan, Montreal, Moscow, New York, Oslo, Prague, Rio de Janeiro, Santiago, Seoul, Stockholm, Tokyo, Vienna, Warsaw, Wellington

- we study returns on the NYSE because
  - it survived
  - and performed well enough to generate adequate data and first interest

Survivorship Bias Numerical Illustration

- **Suppose that…**
  - **the risk free rate is 4%**
  - **the true equity risk premium is 4%**
  - **so that the expected return on equities is 8%**
  - **and that the probability of survival of the market over a long-term is 80%**
- **Then the expected return on equities, conditional on the market still surviving is 12%**
  - **i.e., the conditional observed risk premium is 8%,**
  - **twice the true risk premium**

from Brown, Stephen, William Goetzmann and Stephen Ross, "Survival," *Journal of Finance* 50, n. 3, 853-873.

Is That What We See, Survivorship Bias?

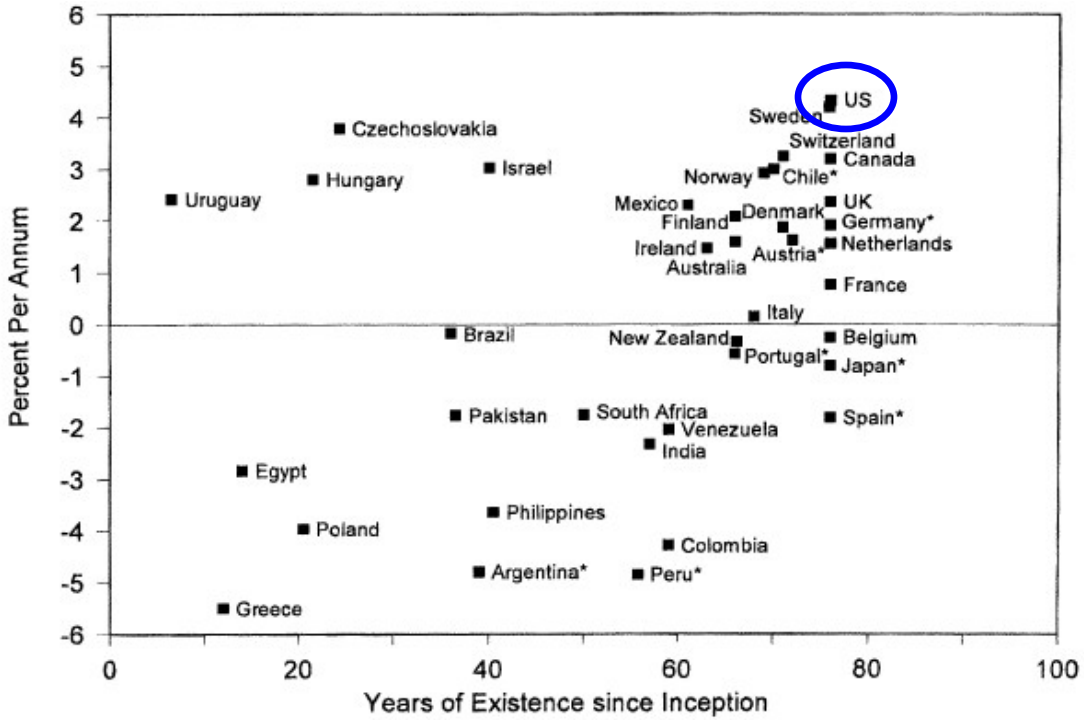

Figure 1. Real returns on global stock markets. The figure displays average real returns for 39 markets over the period 1921 to 1996. Markets are sorted by years of existence. The graph shows that markets with long histories typically have higher returns. An asterisk indicates that the market suffered a long-term break.

from Jorion, Philippe, and William Goetzmann, "Global Stock Markets in the Twentieth Century," *Journal of Finance* 54, n. 3, 953-980.

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How Representative is Recent Experience?

- Looking further back in history puts recent high premia in a different perspective

Data Used	Avg. Stock Return	Avg. Realized Premium
1872-1949	8.67%	4.62%
1949-1999	14.56%	8.41%
1872-1999	10.97%	6.10%

How Representative is Recent Experience?

- Looking further back in history puts recent high premia in a different perspective

Data Used	Avg. Stock Return	Avg. Realized Premium	Premium from Div Growth
1872-1949	8.67%	4.62%	4.35%
1949-1999	14.56%	8.41%	3.54%
1872-1999	10.97%	6.10%	4.03%

- Estimates made using the dividend growth model are more stable through various historical periods

What's the Underlying Problem Here?

- **Stock returns are extremely volatile and any forecast of expected returns has a wide confidence band**

Premium of Stock – T-Bill 1927-2002	
Mean, E(R)	7.49%
Std dev, σ(R)	20.9
Std. error, $\sigma/\sqrt{T}$	2.38
Mean +/- 1σ (66%)	5.11% – 9.87%
Mean +/- 1σ (95%)	2.73% – 12.25%

…And About Those Recent Returns

- what if the risk-premium had been high, but was declining?
  - what the econometricians call non-stationarity
- a decline in the risk-premium would produce an ***increase*** in stock prices … a 1% drop in the risk premium can produce a 50% increase in the stock price
- this would drive up the measured premium of stocks over bonds
- doubles the error in using the historical average…
  - not only do we miss the decline in the premium,
  - we actually estimate an increase in the premium!

Where Does This Take Us?

- Many experts have revised downward their estimate of the equity risk premium
- No simple formula for calculating the premium; all the various sources of information must be weighed
- Survey of academic economists: mean of 3-3.5% on a 1 year horizon and 5-5.5% on a 30 year
- Survey of CFOs: 3.8% over T-Bonds and 5.6% over T-Bills

a drop of 2-3% points, at least

The Upshot

- **What is an appropriate discount rate for an oil company with an unlevered Beta of 0.4**
- **Before:** $8.2\% = 5\% + 0.4\,(8\%)$
- **After:** $7.0\% = 5\% + 0.4\,(5\%)$

The Upshot (cont.)

- **What is an appropriate discount rate for an electric utility with an unlevered Beta of 0.15**
- **Before:** $6.2\% = 5\% + 0.15\,(8\%)$
- **After:** $5.75\% = 5\% + 0.15\,(5\%)$

The End

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