What Equity Premium?

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Two Asset-Pricing Puzzles

- Campbell-Shiller:

  Deviations from avg(P/E)=15 too large: "bubbles" & "crashes."

- Mehra-Prescott:

  The equity premium is too high relative to prediction of theory.

Summary

- Large deviations in P/Es from 15: A puzzle?

  Not in light of dramatic changes in taxes and regulations.

- The equity premium: A puzzle?

  Not in light of taxes, diversification costs, and regulations.

The Theory

Theory Used

- Household:

  $\max \sum_t \beta^t U(c_t, n_t)$

  s.t. $\sum_t p_t\{c_t + v_t(s_{t+1} - s_t)\} \leq \sum_t p_t\{(1 - \tau_{dist})d_t s_t + w_t n_t + \psi_t\}$

- Corporation:

  $\max \sum_t p_t d_t (1 - \tau_{dist})$

  where $d_t = (1 - \tau_{corp})[f(k_{m,t}, k_{u,t}, z_t n_t) - w_t n_t - \delta_m k_{m,t} - x_{u,t}]$
  $-[k_{m,t+1} - k_{m,t}] + \tau_{subs} x_{m,t}$

Main Theoretical Result

$$v_t = (1 - \tau_{dist}) \left[(1 - \tau_{subs}) k_{m,t+1} + (1 - \tau_{corp}) k_{u,t+1} \right]$$

v	equilibrium price of corporate equity
τ_{dist}	tax rate on dividends
τ_{corp}	tax rate on corporate income
τ_{subs}	subsidy on corporate tangible investment
k_m	*measured* tangible corporate capital stock
k_u	*unmeasured* intangible corporate capital stock

NOTE: Result still holds in two-sector model with all taxes on!

Estimating Unmeasured Intangibles

- BEA's measure of after-tax NIPA corporate profits:

$$\Pi = (1 - \tau_{corp})\{\underbrace{[r_m - \delta_m - \tau_{prop}]k_m}_{\text{from tangibles}} + \underbrace{r_u k_u - x_u}_{\text{from intangibles}}\}$$

- Assume ***economic*** returns across capitals equated:

$$i = (1 - \tau_{corp})[r_m - \delta_m - \tau_{prop}] = r_u - \delta_u$$

- Then simple algebra shows:

$$\Pi = i\, k_m + (i - g)(1 - \tau_{corp})\, k_u$$

where $x_u = (g + \delta_u)k_u$ and g is growth rate of economy

Three Corollaries

1. Capital-output ratio affected by profits tax not distribution tax.

2. If tax is deferred to retirement, price not lower by τ_{dist}.

3. τ_{dist} is

   - personal tax rate if distribution by dividends
   - capital gain tax rate if distribution by share buy-backs

Large Deviations in P/Es

Stock Market Levels

- Large deviations in P/E from historical average generate concern.
- What level of the stock market is justified by fundamentals?
  - Was the stock market overvalued in the 1920s or 1990s?
  - Was the stock market undervalued in the 1970s and 1980s?

Surprising Results

- Stock values *should* have been:
  - High in the 1920s and 1990s ... and were.
  - Low in the 1970s and 1980s ... and were.

What Drives the Results?

- Significant changes in tax and regulatory policies.

Relating Results to U.S. Qualitatively

- 1920s:

  Low tax rates and subsidies

  $\Rightarrow$ High capital-output and value-output ratios

- 1940s-1950s:

  Very high tax rates on distributions and corporate income

  $\Rightarrow$ Lower capital-output and value-output ratios

- 1970s-early 1980s:

  Big subsidies

  $\Rightarrow$ Lower value-output ratio

  But .... legislation effectively lowered tax on distributions

  $\Rightarrow$ transition to higher value-output ratio by late 1990s

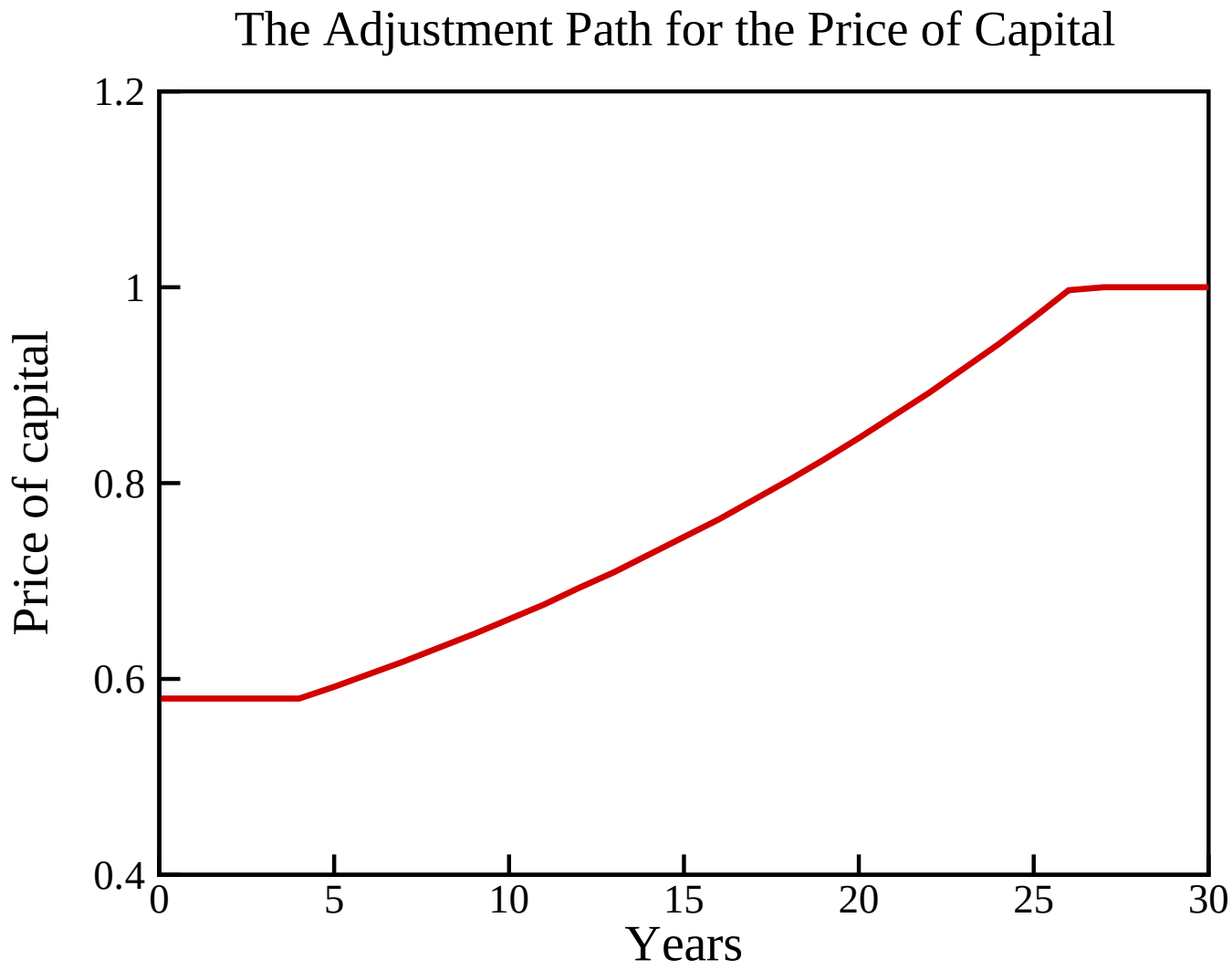
	1929†	1960-69	1998-01
Predicted Fundamental Value			
Domestic tangible capital	1.14	.56	.84
Domestic intangible capital	.73	.23	.35
Foreign capital	.00	.09	.38
Total Rel. to GDP	1.89	.88	1.57
Total Rel. to Earnings (P/E)	21	14	28
Actual Market Value			
Corporate equities	1.67	.90	1.58
Net Debt	≈ 0	.07	.03
Total Rel. to GDP	1.67	.97	1.61
Total Rel. to Earnings (P/E)	19	15	28

† August 30, 1929

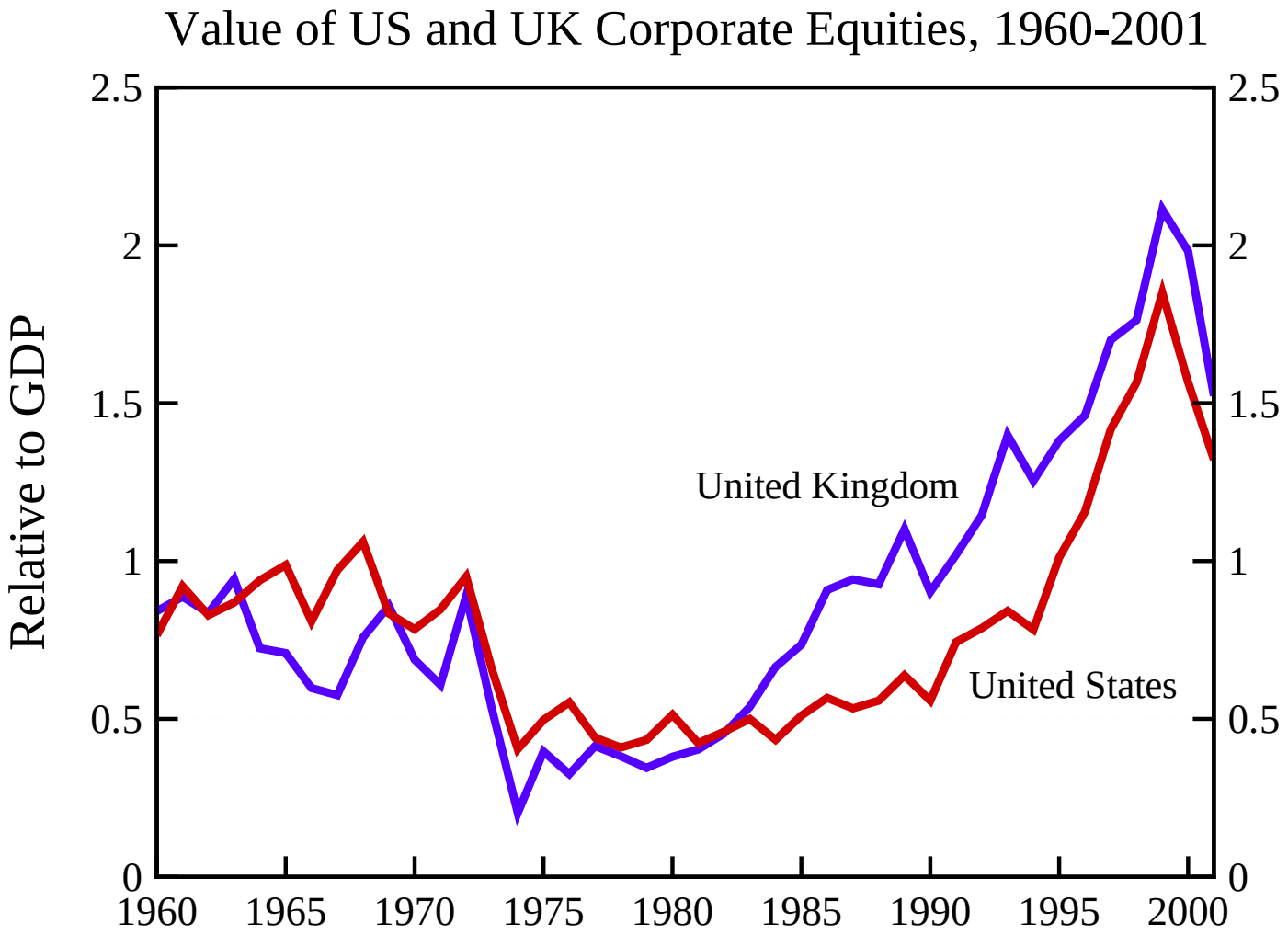
Low Equity Prices in 1970s

- Starting 1973: value-output ratio fell in half
- Three significant contributors:
  - Switch to debt-financing
  - Investment tax credits and accelerated depreciation allowances
  - Expectations of subsidies in place in Europe

Transition following Tax Reform: An Example



Evidence from the UK



	US		UK	
	1960-69	1999-01	1960-69	1990-01
Tax Rates (%)				
Corporate Profits				
End of Period	45	35	43	29
Average	43	35	48	31
Corporate Dividends				
End of Period	42	17	47	4
Average	41	17	49	−5
Investment Subsidy				
End of Period	2	0	13	1
Average	2	0	3	1
Capital Stocks/GDP				
Domestic Tangible	.99	1.03	1.23	1.45
Domestic Intangible	.71	.65	.66	.51
For./Dom. Profits	.11	.29	.04	.29

	US		UK	
	1960-69	1998-01	1960-69	1998-01
Predicted Values:				
Domestic tangible	.56	.84	.57	1.32
Domestic intangible	.23	.35	.20	.35
Foreign capital	.09	.38	.03	.48
Total	.88	1.57	.81	2.15
Actual Market Values				
Corporate Equity	.90	1.58	.77	1.85
Net Debt	.07	.03	.04	.39
Total	.97	1.61	.81	2.24

UK vs. US in 1970s and 1980s

- UK had larger capital subsidies in 1970s/1980s than US
  - Theory: predicts larger fall in equity prices for UK in 1970s
  - Data: supports this

- UK had earlier, more dramatic fall in effective tax on distributions
  - Theory: predicts earlier and more dramatic rise in equity values
  - Data: supports this

Summary: Large Deviations in P/Es

- Trends in stock values aren't puzzling in light of theory
- Future research should focus:
  - More on taxes and regulations
  - More on variations across periods
  - Less on century-long averages

The Equity Premium Puzzle

Facts Highlighted by Mehra-Prescott

- Real returns for 1889-1978 on
  - S&P 500 stocks: 6.98%
  - 90-day bills: .80%

    Difference: 6.18% per year

$\Rightarrow$ a very large difference

Puzzle Highlighted by Mehra-Prescott

- With:
  - Lucas' (1978) pure endowment economy
  - Two assets: risky stock and risk-free bond
  - Calibrated to US consumption process

- Find: tiny equity risk premium (.35% vs 6.18%)

A Reexamination

Mehra-Prescott	McGrattan-Prescott
No taxes	Taxes
No diversification costs	Diversification costs
No regulations	Regulations

Implication for Long-term Returns

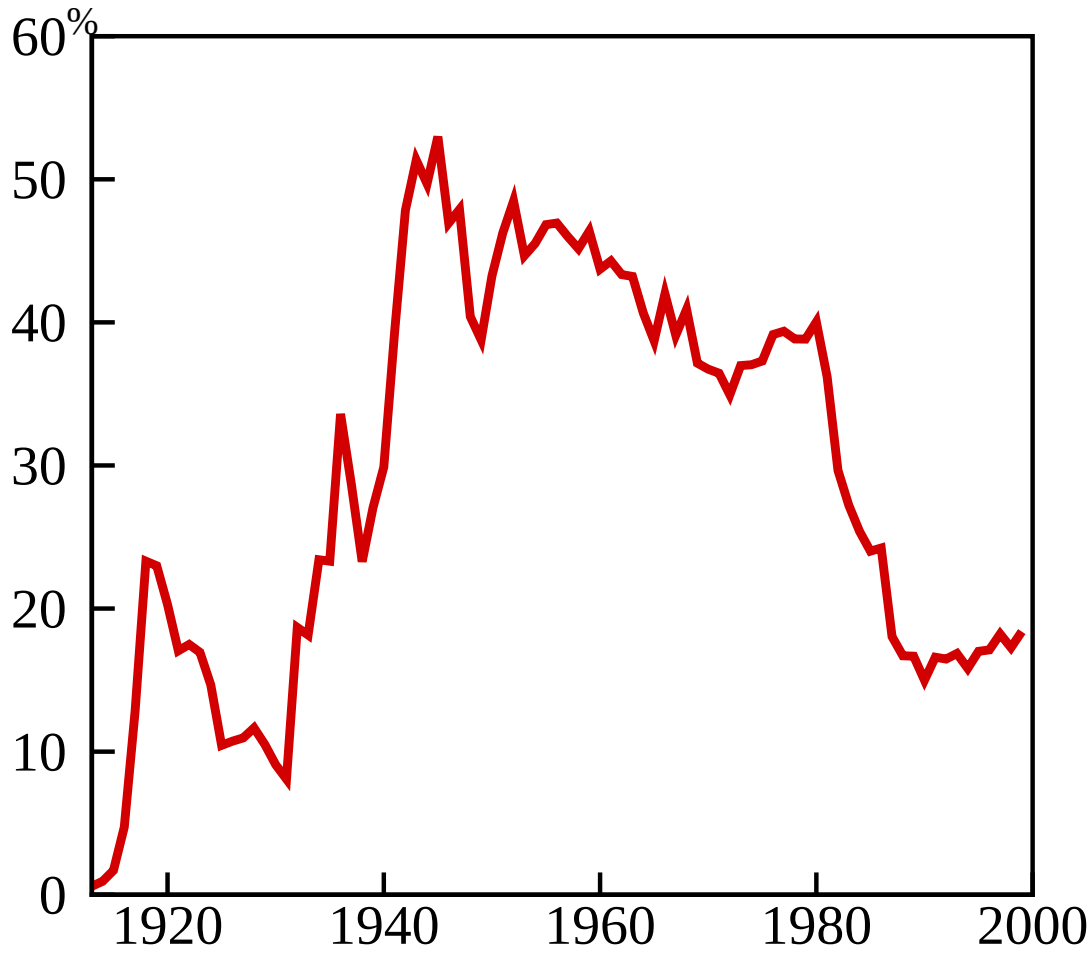
- Long-run savings in equities, debt, and capital determined by:

$$0 = E_t \left[\frac{u_c(c_{t+s}, l_{t+s})}{u_c(c_t, l_t)} (r^i_{t+s} - r^j_{t+s}) \right], \quad i, j \in \{e, d, k\}$$

- We want estimates of returns actually received on long-term savings

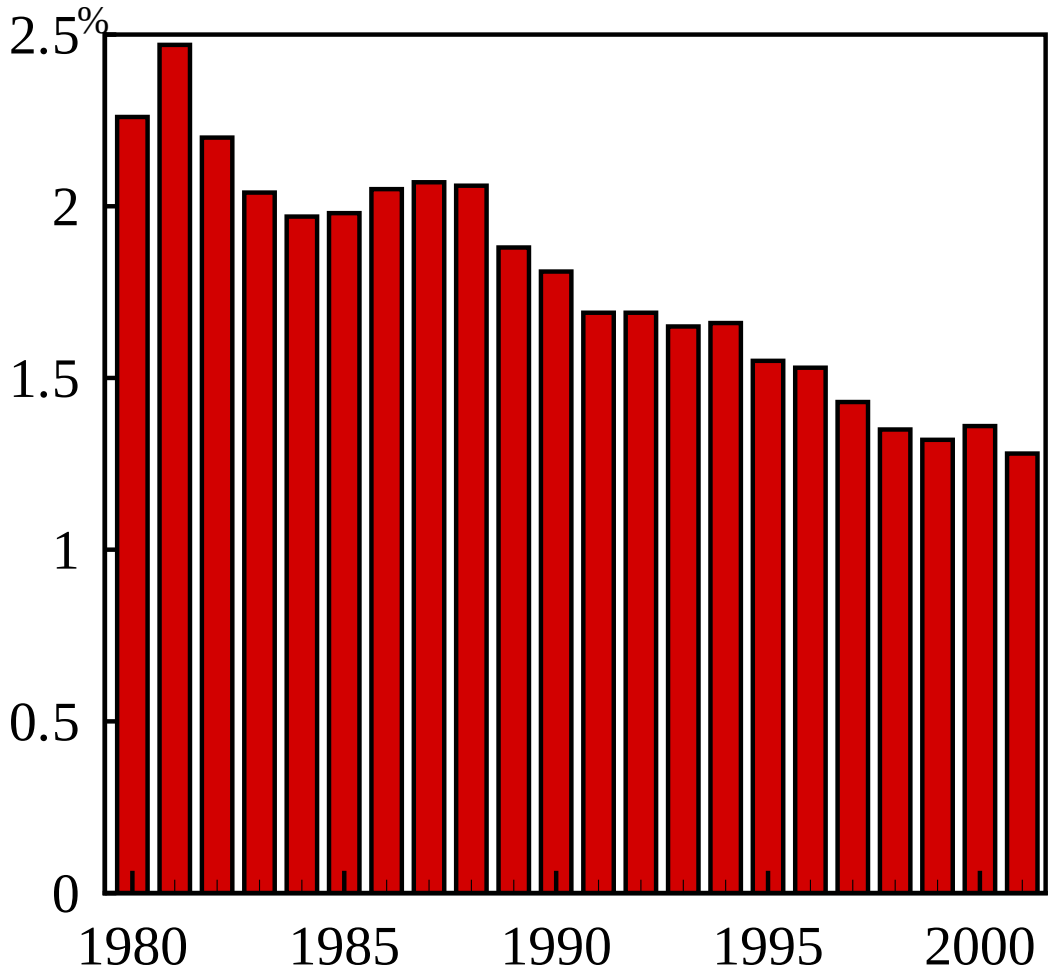
A Reexamination of U.S. Data

Dividend Tax Rates High in Some Periods

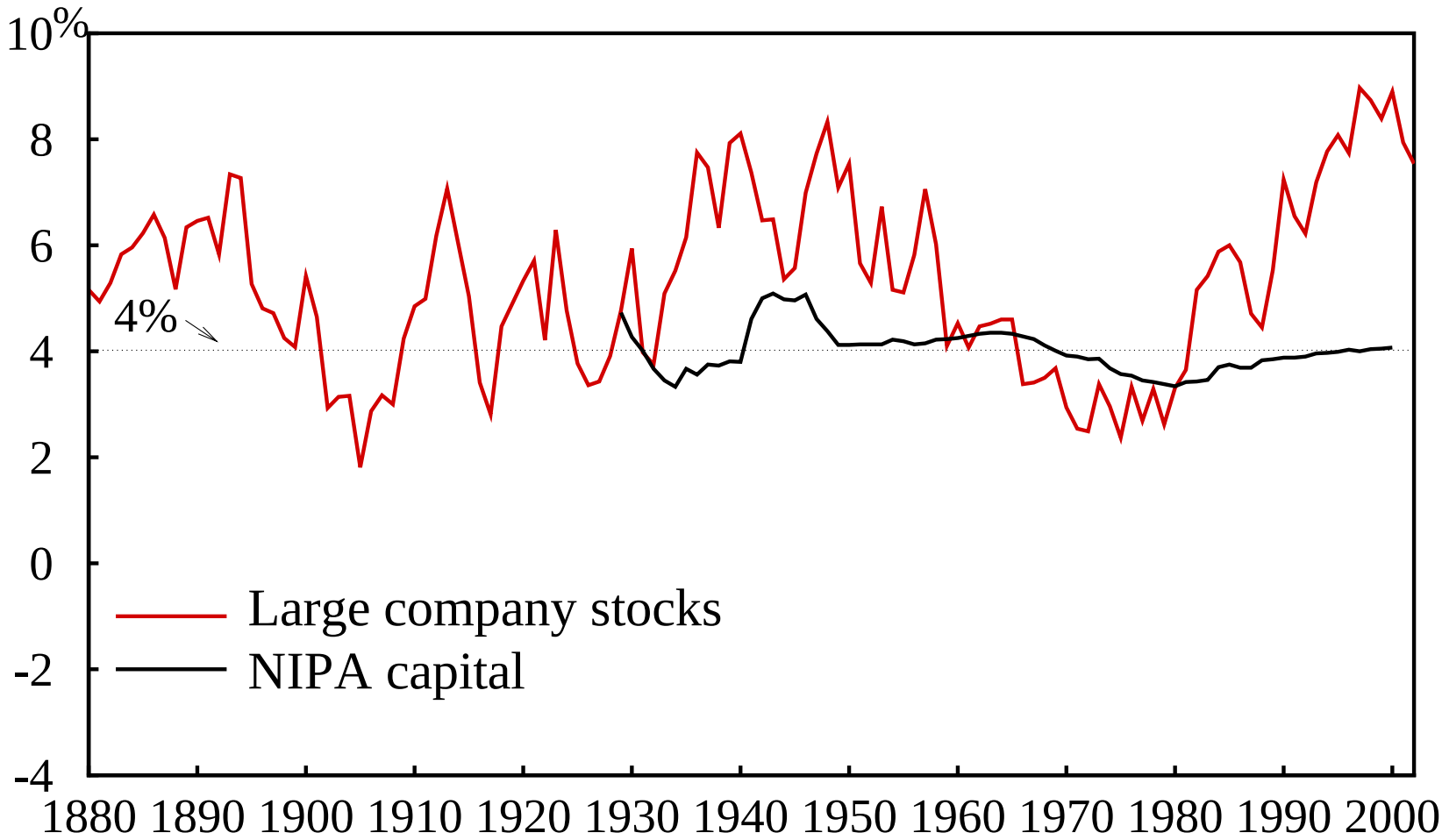


Tax Rate on Dividend Income

Equity Diversification Costs High Too



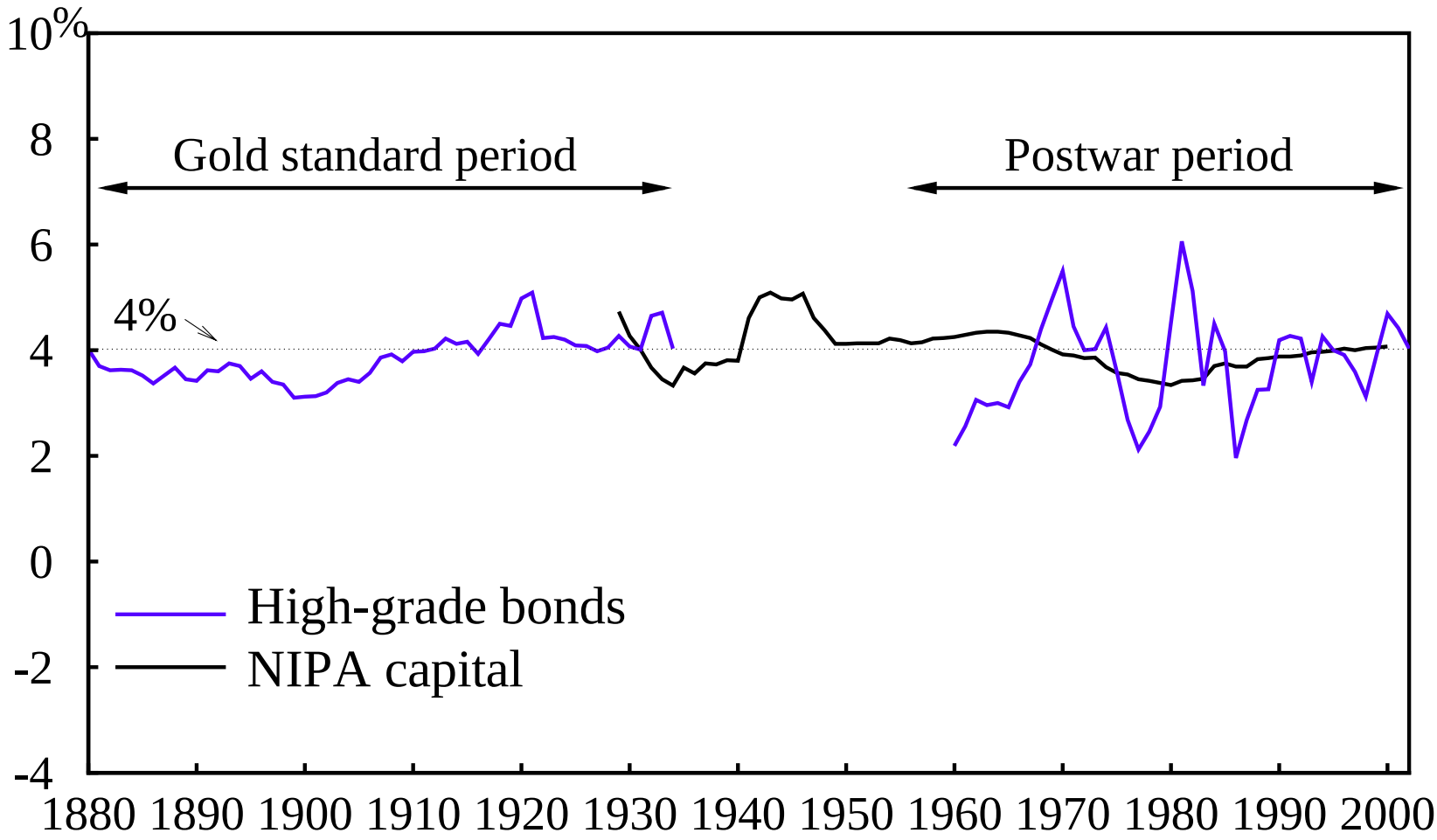
Equity & Capital Returns: Not that different



What About Debt?

- As with equity, want to account for
  - Taxes
  - Diversification costs
  - Inflation
- Will also review important regulations during WWII

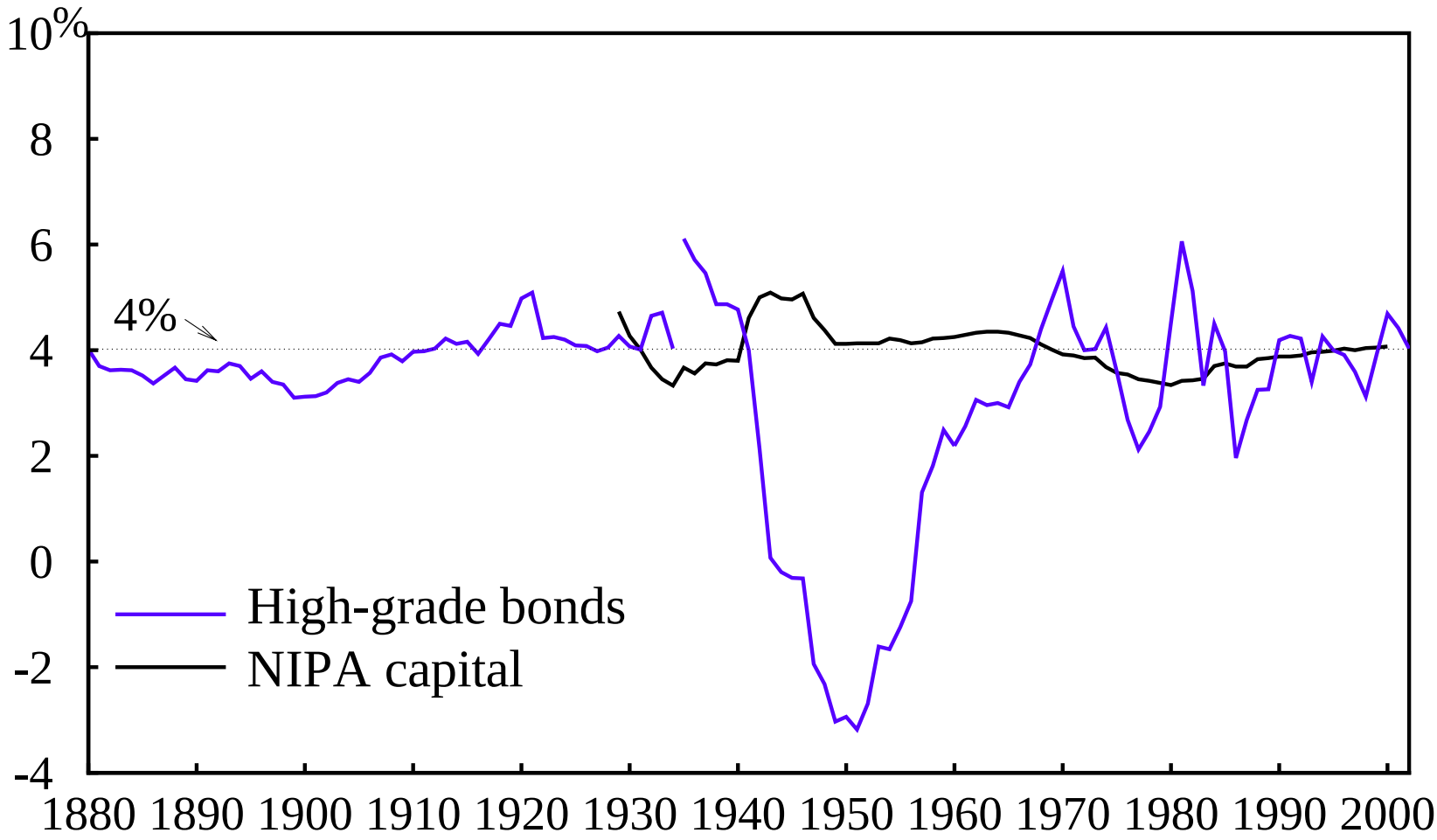
Capital & Debt Returns: Not That Different



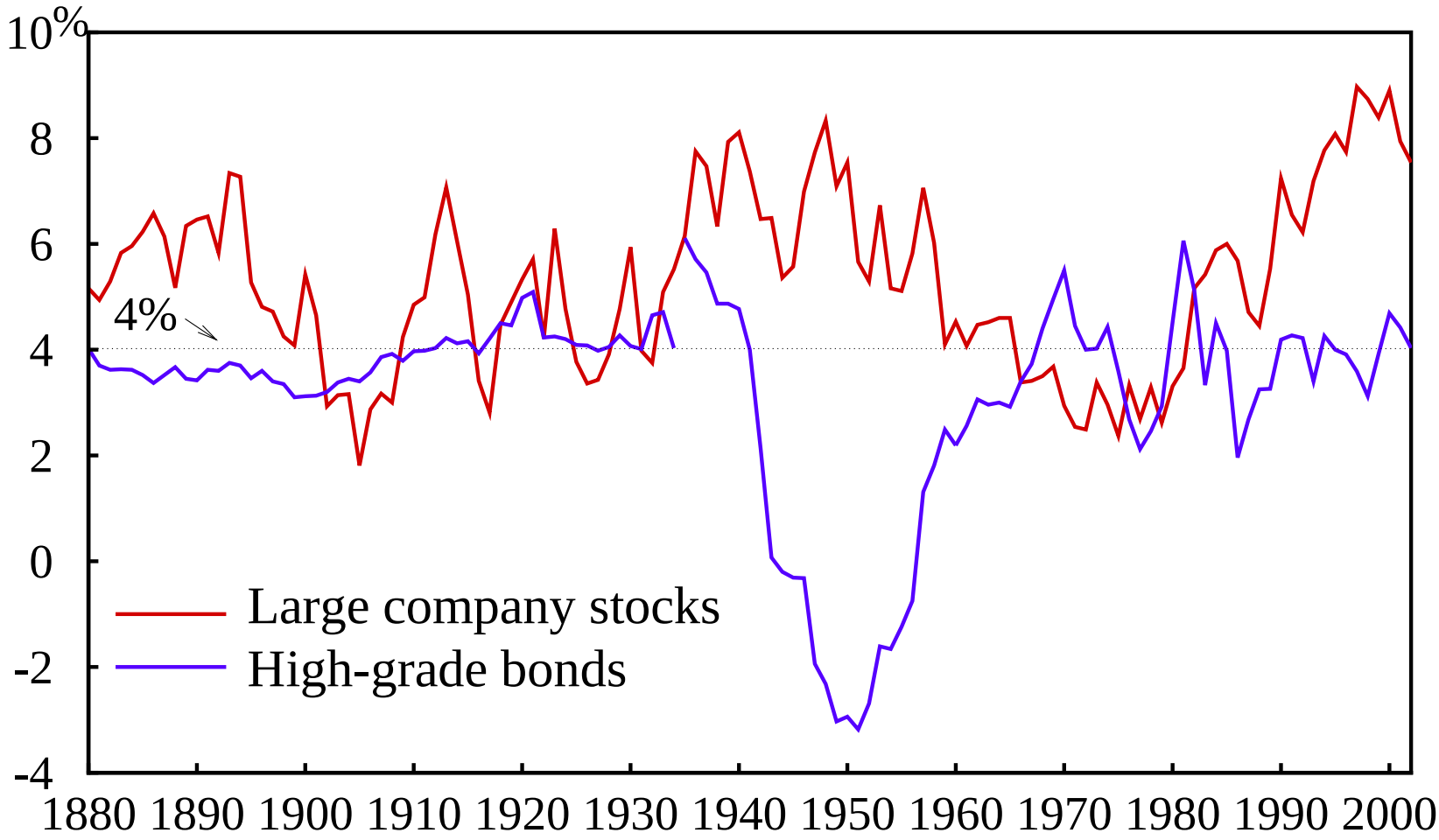
Regulations Are Important

- Big deviation in war because of restrictions on:
  - Expenditures: Regulation W and restricted production
  - Investments:
    - Fixed schedule of government rates $\leq 2\frac{1}{2}$ %
    - Legal list of assets for life insurance, trusts, savings banks
- In other periods, average returns not that different

Capital & Debt Returns Including War Years



A Long-Run Look at Returns



Summary: The equity premium puzzle

- Average returns aren't puzzling in light of theory
- Future research should focus:
  - More on returns of diversified securities held long-term
  - More on taxes and regulations
  - Less on nondiversifiable aggregate risk

Conclusions

- Tempting to blame stock market anomalies on "behavioral" swings.

- Our approach is to
  - Use growth theory for theoretical benchmark
  - Ask, On what dimensions does theory match or miss?
  - Introduce features not previously considered

- Our main findings:
  - Critical changes in taxes and regulations important
  - Still need work before we crack volatility puzzle