

Chapter 7

Historical Asset Returns

Road Map

Part A Introduction to Finance.

Part B Valuation of assets, given discount rates.

Part C Determination of discount rates.

- Historical asset returns.
- Time value of money.
- Risk.
- Portfolio theory.
- Capital Asset Pricing Model (CAPM).
- Arbitrage Pricing Theory (APT).

Part D Introduction to corporate.

Main Issues

- Asset Returns
- Historic Asset Returns in U.S.

1 Asset Returns

Asset returns over a given period are often uncertain:

$$r_t = \frac{D_t + P_t - P_{t-1}}{P_{t-1}} = \frac{D_t + P_t}{P_{t-1}} - 1$$

where

- P_{t-1} is the price at the beginning of period
- P_t is the price at the end of period
- D_t is the dividend at the end of period.

Return on an asset is often uncertain ex ante (a random variable). It can be characterized by

- all possible outcomes, and
- probability of each outcome (state).

We can write

- Expected rate of return on an investment is the discount rate for its cash flows:

$$E[r_t] \equiv r_F + \pi$$

where

- r_F is the risk-free interest rate (time value of money)
- π is the risk premium (price of risk).

2 Historical U.S. Asset Returns

Four facts from history of U.S. financial markets:

1. Real interest rate has been slightly positive on average.
2. Return on more risky assets has been higher on average than return on less risky assets:

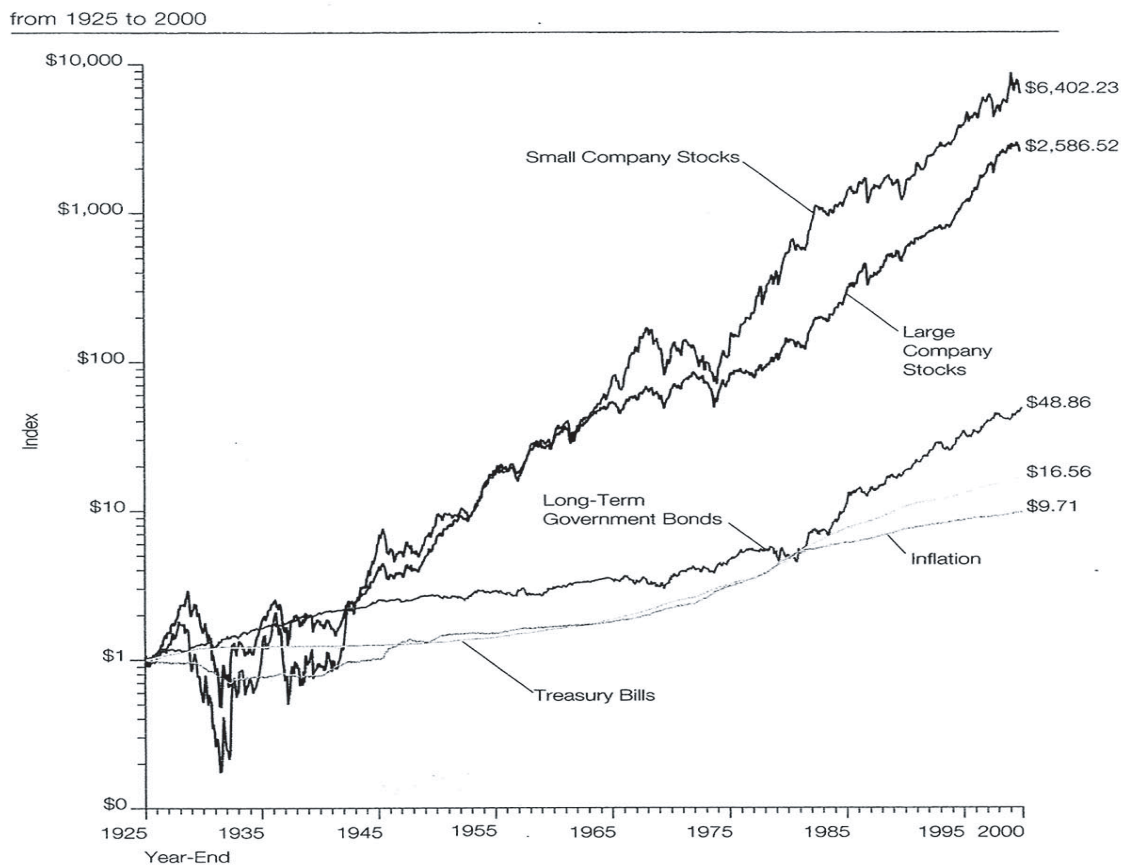
Average Annual Total Returns from 1926 to 2000 (Real)

Asset	Mean (%)	StD (%)
T-bills	3.9	3.2
Long term T-bonds	5.7	9.4
Long term corp. bonds	6.0	8.7
Large stocks	13.0	20.2
Small stocks	17.3	33.4
Inflation	3.2	4.4

Average Annual Total Returns from 1926 to 2000 (Real)

Asset	Mean (%)	StD (%)
T-bills	0.8	4.1
Long term T-bonds	2.7	10.6
Long term corp. bonds	3.0	9.9
Large stocks	9.7	20.3
Small stocks	13.8	32.8

Return Indices of Investments in the U.S. Capital Markets



Real returns from 1926 to 2000

Security	Initial	Total Return
T-Bills	\$1.00	1.53
Long Term T-Bonds	\$1.00	3.81
Corporate Bonds	\$1.00	5.54
Large Stocks	\$1.00	154.95
Small Stocks	\$1.00	508.17

3. Returns on risky assets can be highly correlated to each other:

Cross Correlations of Annual Nominal Returns (1926 – 2000)

	Bills	T-bonds	C-bonds	L. stocks	S. stocks	Inflation
T-bills	1.00	0.24	0.22	-0.03	-0.10	0.41
L.T. T-bonds		1.00	0.91	0.16	0.00	-0.14
L.t. C-bonds			1.00	0.24	0.09	-0.15
Large stocks				1.00	0.79	-0.03
Small stocks					1.00	0.08
Inflation						1.00

Cross Correlations of Annual Real Returns (1926 – 2000)

	Bills	T-bonds	C-bonds	L. stocks	S. stocks
T-bills	1.00	0.58	0.59	0.12	-0.06
L.T. T-bonds		1.00	0.95	0.24	0.04
L.t. C-bonds			1.00	0.30	0.12
Large stocks				1.00	0.79
Small stocks					1.00

4. Returns on risky assets are serially uncorrelated.

Serial Correlations of Annual Asset Returns (1926 – 2000)

Asset	Serial Correlation	
	Nominal return	Real return
T-bills (“risk-free”)	0.92	0.67
Long term T-bonds	-0.06	0.03
Long term corp. bonds	0.07	0.18
Large stocks	0.00	-0.00
Small stocks	0.08	0.05

(Note: The main source for the data in this subsection is *Stocks, bonds, bills and inflation, 2000 Year Book*, Ibbotson Associates, Chicago, 2000.)

3 Homework

Readings:

- BKM Chapter 5.3-5.4.
- BM Chapter 7.1.
- BKM Chapter 5.
- Readings package: “Risk and return in the 20th and 21st centuries” (E. Dimson, P. Marsh, and M. Staunton).