Lecture 8

Material for lecture 8 will use the following transparencies along with Table 2 and Figure 1 of chapter 4 of the textbook
Nominal Returns

- *Nominal Return* on a security says how many dollars one gets if one dollar is invested.

- Return on a zero coupon bond held from $t$ to $t + n$:
  \[
  R_{t,t+n} = \frac{Q_{t+n}}{Q_t} - 1
  \]
  where $Q_t$ is bond price at $t$.

- Return on a bond held from $t$ to $t + 1$:
  \[
  R_{t,t+1} = \frac{Q_{t+1} + C}{Q_t} - 1
  \]
  where $Q_t$ is bond price and $C$ is coupon payment.

- To define return on a bond held from $t$ to $t + n$, assume that coupon payments are reinvested.
Real Returns

- *Real Return* says ‘how many goods’ one gets if one unit of goods is invested

- this depends on how value of money in terms of goods is measured: for example use CPI

- for example, one period real return on a zero coupon bond

\[
R_{t,t+1}^{\text{real}} = \frac{Q_{t+1}/P_{t+1}}{Q_t/P_t} - 1 = \frac{Q_{t+1}}{Q_t} \frac{P_t}{P_{t+1}} - 1 = \frac{1 + R_{t,t+1}}{1 + \pi_{t+1}} - 1
\]

where \(Q_t\) is bond price and \(P_t\) is CPI.

- approximately we have

\[
R_{t,t+1}^{\text{real}} = R_{t,t+1} - \pi_{t+1}
\]
Maturity and the Volatility of Bond Returns

- Only bond whose return = yield is one with maturity = holding period

- For bonds with maturity > holding period, \( i \uparrow \) \( P \downarrow \) implying capital loss

- Longer is maturity, greater is price change associated with interest rate change
Maturity and the Volatility of Bond Returns

- Longer is maturity, more return changes with change in interest rate

- Bond with high initial interest rate can still have negative return if $i \uparrow$

- Prices and returns more volatile for long-term bonds because have higher interest-rate risk

- No interest-rate risk for any bond whose maturity equals holding period
Thinking about Uncertain Returns

- need to plan for different return scenarios
- think of returns being generated by a chance mechanism
- use historical series of returns to infer probabilities for future returns
- the *investment horizon* matters a lot for what these probabilities are
- potential problem: probabilities for tomorrow’s returns might depend on current return, or other variables (e.g. boom, recession)
- actually, returns not well predictable over short periods of time, but over long periods there is predictability
Risks to Bondholders (1)

One-Period Nominal Return for a bond with coupon payment $C$, price $Q_t$:

$$R_{t,t+1} = \frac{Q_{t+1} + C}{Q_t} - 1 = \frac{C}{Q_t} + \frac{Q(t + 1) - Q(t)}{Q(t)}$$

- if maturity is one period, then $Q_{t+1}$ is known, nominal return can be foreseen (except perhaps if bankruptcy risk)
- if maturity is longer than one period, price fluctuations imply that bond is a risky asset!
- long bond prices fluctuate if one-period interest rate changes (higher short rate $\rightarrow$ bond prices go down)
Risks to Bondholders (2)

- Real Return on a bond, with expected rate of inflation $\pi_t$:

$$R_{t,t+1}^{real} = R_{t,t+1} - \pi_{t,t+1}$$

(Fisher equation)

- ‘ex post’ (with realized inflation), Fisher equation true by definition

- ‘ex ante’ (with expected inflation), it is hard to test, because expected inflation is not observed

- but: many countries have indexed bonds, so real returns become observable

- in countries with high inflation risk, firms often borrow in foreign currency