Lectures 7: Bond and Interest Rates (Continued)

How is the yield curve used?

- Suppose there is a project for the next 2 years proposed to the investor.

- Let's say the rate of return (annualized) is 10% ($1 m invested, $1.21m received 2 years later).

- But there is a chance that the project can fail.

- Question: is this a good investment opportunity?

- Alternatives: invest in the US government treasury - "safe", we find that the return rate is only around 0.2%-0.3% from the current yield curve.

- Decision making: expected return over the "safe" return vs. the risk involved.

How is the yield curve obtained (from market)

- Bond prices (usually with coupons) quoted from the market

- Use the yield-price formula to obtain the yield (y), where c is the coupon rate

$$\sum_{i=1}^{n} c_i e^{-yt_i} + 100 e^{-yt_n} = P$$

- Each bond has its own maturity and coupon rate besides the price P

- Plot the yield from available bond prices

- Clean up the data points but this is a touchy procedure where sensible judgements based on practical consideration are crucial.

Zero-Coupon Bonds

- The presence of coupon complicates the picture

- Zero-coupon bond: a theoretical artifact, but later became a standard

$$100e^{-yt_n} = P$$

- Clean information regarding the yield

- Zero curve: all the yields from zero-coupon bonds

- Using zero curve (y in the following formula) to price a stream of cash flows:

$$PV(\mathbf{a}) = \sum_{i=1}^{n} a_i e^{-y_i t_i}$$

Alternative but Equivalent Ways to Describe the Yield Curve

- Zero curve: every point on the curve is a zero rate

- Price curve: every point on the curve is a zero coupon bond price

- Forward curve: the "short rate" at a future time, *implied* from the current yield curve, based on no-arbitrage principle. They are

$$r(t), P(t), f(t)$$

- Relation between r and P:

$$e^{-r(t)t} = P(t)$$

- Relation between r and f:

$$f(t) = r(t) + t\frac{\partial r}{\partial t}$$

Types of rates

- US treasury yields: often considered risk-free rates since the US government is not assumed to default!

- LIBOR rates: short for *London Interbank Offer Rate,* sampled rates for financial institutions to borrow from each. They are important indicators to the market and each currency has its own LIBOR market.

- Money market rate: short term rate that is supposed to be very liquid

- Corporate yields: they are usually higher than the corresponding treasury yields to reflect the risk involved.

- Repo rates: rates involved in selling assets now with the understanding that they will be bought back later at a higher price (the repurchase rate).