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, $1.21 m 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

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

• 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:

\[ PV(a) = \sum_{i=1}^{n} a_i e^{-y_i t_i} \]
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, \textit{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).