

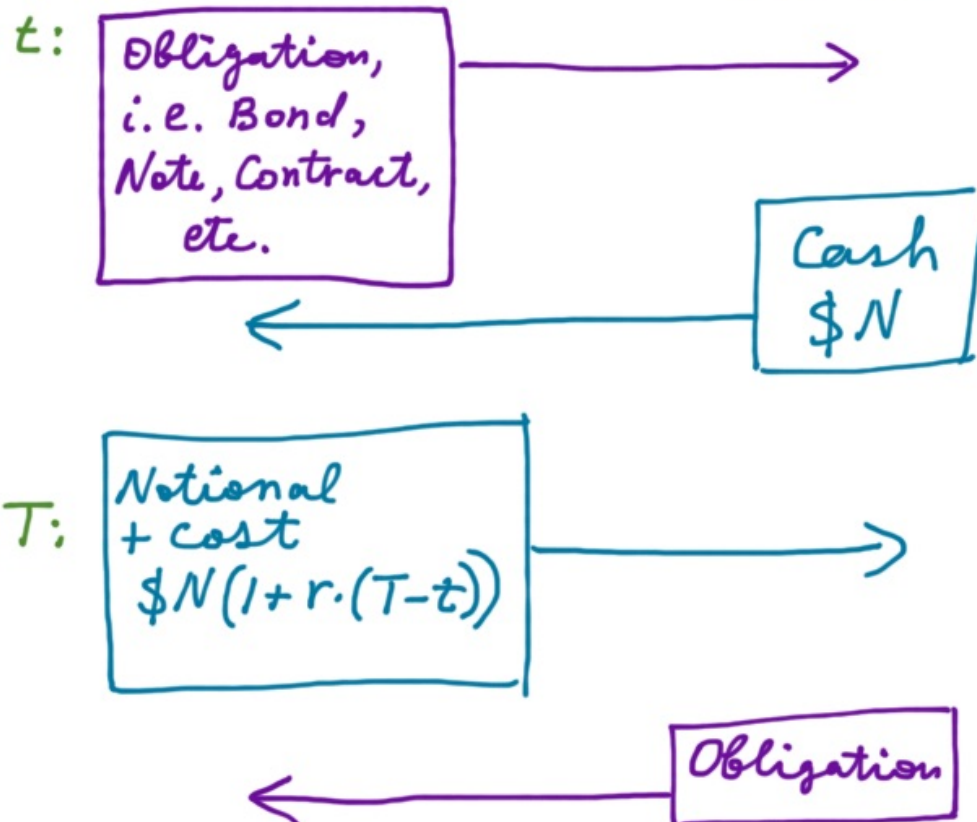
What is cost of money?

The cost I realize when I borrow money.

How do I realize the cost of money?

Borrower

Lender



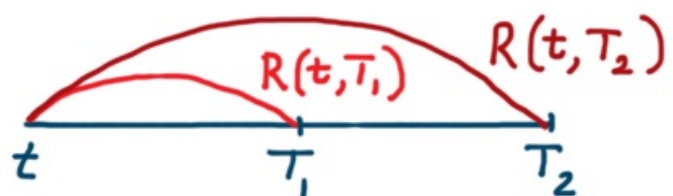
$$\text{Cost} = \$N \cdot r \cdot (T-t)$$

Cost can be paid upfront, at the end or distributed over the period.

r = interest rate

$(T-t)$ = term or tenor.

How does interest rate depend on tenor?



What can relationship between $R(t, T_1)$ and $R(t, T_2)$ be?

In what economic environment we expect

$$R(t, T_1) < R(t, T_2) ?$$

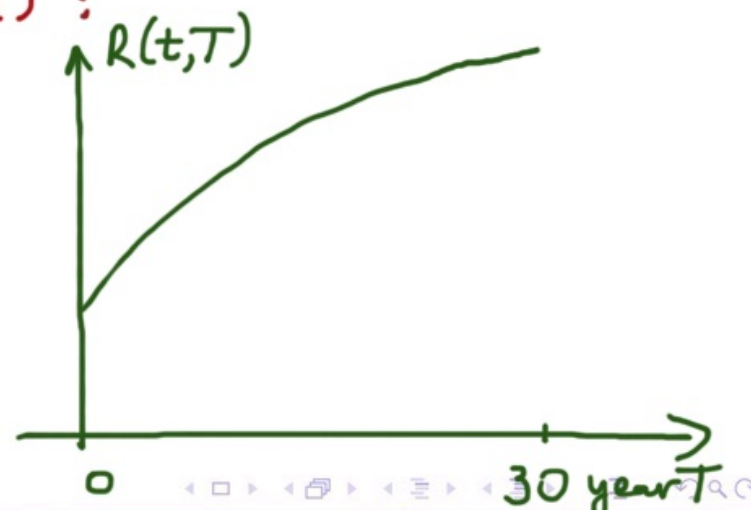
In what economic environment we expect

$$R(t, T_1) > R(t, T_2) ?$$

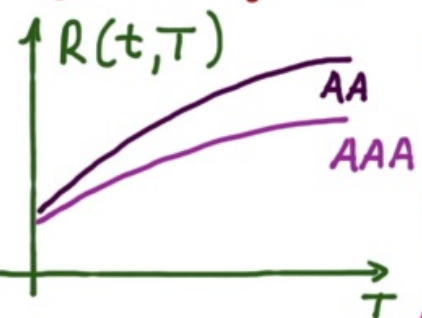
Term curve: $T \rightarrow R(t, T)$

t - time of observation
(today)

T - maturity



How does interest rate depend on credit quality of the borrower?

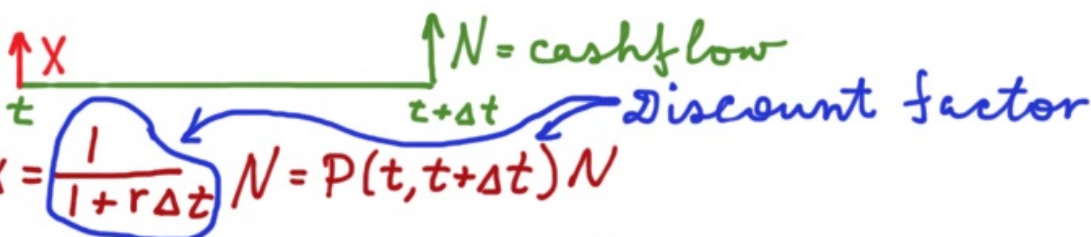


Which curve corresponds to a better credit quality?

Simple vs. Compounded Interest.

Interest calculated over 1 period is called simple. t : Invest N ; $t + \Delta t$: Receive $N(1 + r \Delta t)$; Interest $Nr \Delta t$.

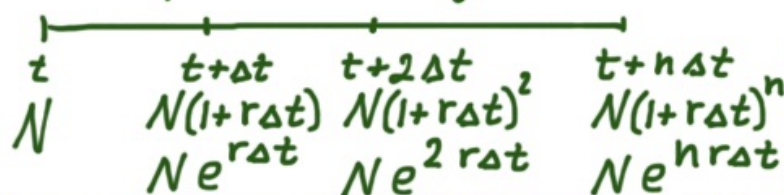
Discounting.



$$X(1 + r \Delta t) = N \Rightarrow X = \frac{1}{1 + r \Delta t} N = P(t, t + \Delta t) N$$

$$\Delta t \rightarrow 0 \Rightarrow 1 + r \Delta t \approx e^{r \Delta t}; P(t, t + \Delta t) \approx e^{-r \Delta t}.$$

Compounding.

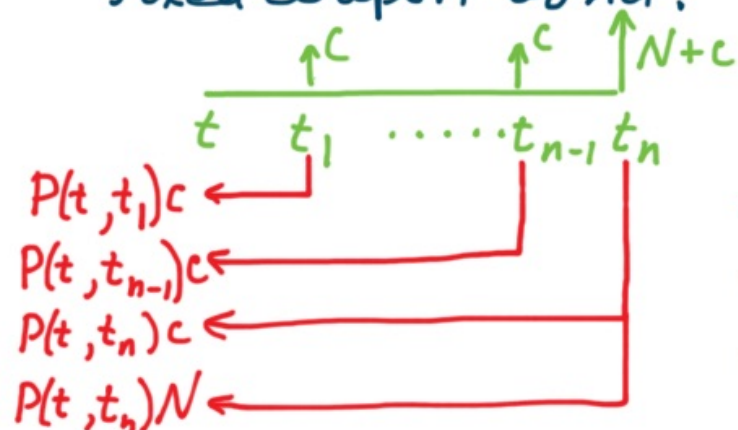


Discount factors:

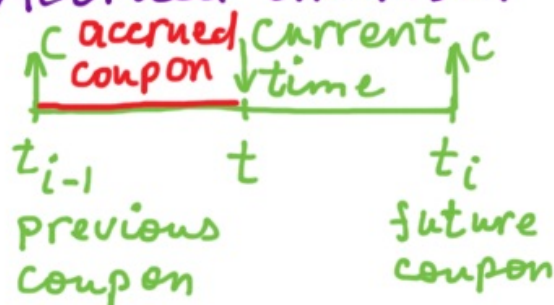
$$(1 + r \Delta t)^{-i} \quad e^{-i r \Delta t}$$

Bond mathematics.

Fixed coupon bond.



Accrued interest.



t present value:

$$N \left[c \sum_{i=1}^n \tau_i P(t, t_i) + P(t, t_n) \right]$$

where N is the notional, t_n is the maturity time, $\tau_i = t_i - t_{i-1}$ are coupon pay periods with appropriate day count.

Clean price: present value of all future payments.

Invoice price: clean price plus accrued interest.

