LOS 06. The Time Value of Money

a. interpret interest rates as required rates of return, discount rates, or opportunity costs.

1. Interest rate 三种解释

Interest rates are our measure of the time value of money, although risk differences in financial securities lead to differences in their equilibrium interest rates. Equilibrium interest rates are the **required rate of return** for a particular investment, in the sense that the market rate of return is the return that investors and savers require to get them to willingly lend their funds. Interest rates are also referred to as **discount rates** and, in fact, the terms are often used interchangeably. If an individual can borrow funds at an interest rate of 10%, then that individual should *discount* payments to be made in the future at that rate in order to get their equivalent value in current dollars or other currency. Finally, we can also view interest rates as the **opportunity cost** of current consumption. If the market rate of interest on 1-year securities is 5%, earning an additional 5% is the opportunity forgone when current consumption is chosen rather than saving (postponing consumption).

b. explain an interest rate as the sum of a real risk-free rate and premiums that compensate investors for bearing distinct types of risk.

1. 名义和实际无风险利率

nominal risk-free rate = real risk-free rate + expected inflation rate

2. T-bills 代表名义利率

T-bill rates are nominal risk-free rates because they contain an inflation premium

3. 证券还有些风险

Default risk. The risk that a borrower will not make the promised payments in a timely manner.

Liquidity risk. The risk of receiving less than fair value for an investment if it must be sold for cash quickly.

Maturity risk. As we will cover in detail in the section on debt securities, the prices of longer-term bonds are more volatile than those of shorter-term bonds. Longer maturity bonds have more maturity risk than shorter-term bonds and require a maturity risk premium.

$$\begin{aligned}\text{required interest rate on a security} &= \text{nominal risk-free rate} \\ &+ \text{default risk premium} \\ &+ \text{liquidity premium} \\ &+ \text{maturity risk premium}\end{aligned}$$

4. 国债和个企债券区别

Which of the following risk premiums is most relevant in explaining the difference in yields between 30-year bonds issued by the US Treasury and 30-year bonds issued by a small private issuer?

A Inflation

B Maturity

C Liquidity

C is correct. US Treasury bonds are highly liquid, whereas the bonds of small issuers trade infrequently and the interest rate includes a liquidity premium. This liquidity premium reflects the relatively high costs (including the impact on price) of selling a position.

c. calculate and interpret the effective annual rate, given the stated annual interest rate and the frequency of compounding

1. 名义和实际利率的互换

$$\text{EAR} = (1 + \text{periodic rate})^{m} - 1$$

d. solve time value of money problems for different frequencies of compounding.

1. PV, FV, PMT, n, i 的计算

2. Continuous compounding

$$\mathrm{FV}_N = \mathrm{PV}e^{r_s N}$$

Suppose a $10,000 investment will earn 8 percent compounded continuously for two years. We can compute the future value with Equation 4 as follows:

$$\begin{aligned}
\mathrm{PV} &= \$10{,}000 \\
r_s &= 8\% = 0.08 \\
N &= 2 \\
\mathrm{FV}_N &= \mathrm{PV}e^{r_s N} \\
&= \$10{,}000e^{0.08(2)} \\
&= \$10{,}000(1.173511) \\
&= \$11{,}735.11
\end{aligned}$$

e. calculate and interpret the future value (FV) and present value (PV) of a single sun of money, an ordinary annuity, an annuity due, a perpetuity (PV only), and a series of unequal cash flows

1. [易错] 区分年初还是年末模式
2. 永续年金，PMT=PV*i

f. demonstrate the use of a time line in modeling and solving time value of money problems.

1. 时间轴上移动，要注意年初年末模式