

14.01 Principles of Microeconomics, Fall 2007
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Lecture 32

Investment, Savings, Time and Capital Markets

Outline

1. Chap 15: *Present Discount Value*
2. Chap 15: *Bond*
3. Chap 15: *Effective Yield*
4. Chap 15: *Determine Interest Rate*

1 Present Discount Value

Present discount value (PDV) determines the value today of a future flow of income.

	Today	1 year	2 year
Payment A	100	100	0
Payment B	20	100	100

Table 1: Two Payments.

Consider the two payments, A and B, in Table 1.
 Because the present value of 1 dollar in n years is

$$\frac{1}{(1+r)^n},$$

where r is the interest rate, the present values of A and B are

$$100 + \frac{100}{1+r},$$

and

$$20 + \frac{100}{1+r} + \frac{100}{(1+r)^2},$$

respectively.

- If r is low, PV of B is larger than PV of A.
- If r is high, PV of A is larger than PV of B.

Several examples are provided in Table 2.

Value of r	0.05	0.10	0.15
PV of A	195.24	190.90	186.96
PV of B	205.94	193.54	182.57

Table 2: Present Values.

2 Bond

A bond is a contract in which a borrower (issuer) agrees to pay the bondholder (the lender) a stream of money.

For instance, a payment consists of a coupon payment of 100 dollars per year for 10 years, and a principal payment of 1000 dollars in 10 years.

PV of the bond is

$$PV = \frac{100}{1+r} + \frac{100}{(1+r)^2} + \dots + \frac{100}{(1+r)^{10}} + \frac{1000}{(1+r)^{10}}.$$

With a higher interest rate, the present discount value is lower (see Figure 1).

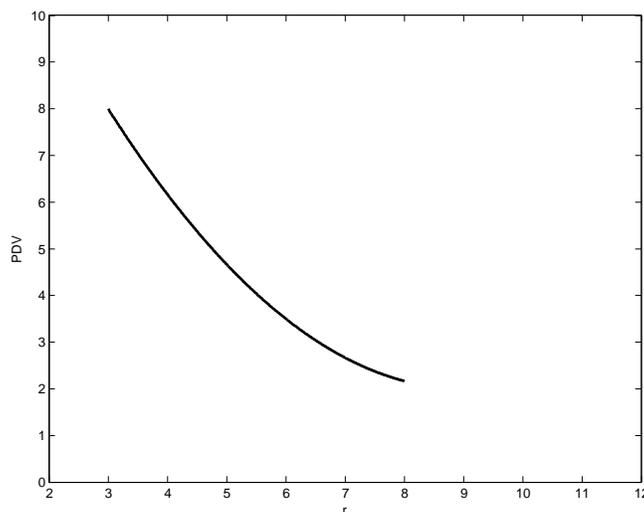


Figure 1: Present Discount Value and Interest Rate.

Perpetuity is a bond that pays a fixed amount of money each year forward:

$$PV = \frac{100}{1+r} + \frac{100}{(1+r)^2} + \dots = \frac{100}{r}.$$

3 Effective Yield

Effective yield is the interest rate that equates the present value of a bond's payment stream with the bond's market price.

Riskier bonds have higher yields. An effective yield equals risk-free interest rate plus risk premium.

When we choose between projects, we can compare the present value, or compare the yield rate, and choose the higher one.

Time (Year)	0	1	2
Project A (Dollar)	-50	5	55
Project B (Dollar)	-20	4	24

Table 3: Two Projects.

Assume

$$r = 15\%.$$

PV of A is -4, and PV of B is 11. PV of B is higher; thus firm should invest in B.

Now calculate the yield rates.

For project A,

$$50 = \frac{5}{1 + r_A} + \frac{55}{(1 + r_A)^2},$$

$$r_A = 10\%.$$

For project B,

$$20 = \frac{4}{1 + r_B} + \frac{24}{(1 + r_B)^2},$$

$$r_B = 20\%.$$

Here yield rate of B is higher. Firm should invest in B again.

In this case, the results of both criteria are consistent; however, they are not always consistent.

4 Determine Interest Rate

The interest rate is the price that borrowers pay lenders to use their funds. It is determined by supply and demand for loanable funds. Demand for loanable funds comes from firms and governments that want to make capital investments. Supply of loanable funds comes from household savings (see Figure 2).

Suppose a consumer only lives for two periods, intertemporal utility function $u(C_1, C_2)$ will be maximized, under the budget constraint

$$PV = Y_1 + \frac{Y_2}{1 + r} = C_1 + \frac{C_2}{1 + r},$$

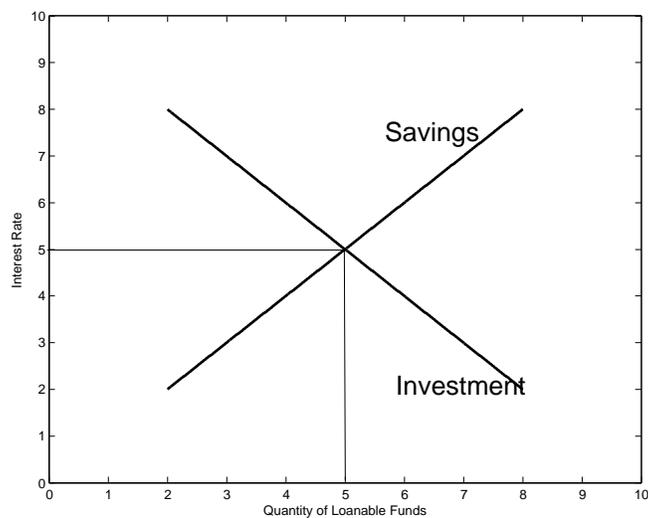


Figure 2: Supply and Demand of Funds.

in which C_1 and C_2 stand for consumptions in period 1 and 2, and Y_1 and Y_2 are incomes in period 1 and 2 respectively.

When the consumer's utility is maximized

$$\frac{\frac{\partial u}{\partial C_1}}{\frac{\partial u}{\partial C_2}} = 1 + r.$$