Széchenyi István University
Kautz Gyula Faculty of Economics

Financial Services and Decisions

11 April, 2010

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Seminar 8

Cash Flow of Loans (Part 2)

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Valuation of annuity loan

- **Basic types of loan construction:**
  - Principal is repaid in equal instalments
  - Annuity loan
- **Annuity loan:**
  - Size of instalment is constant
  - $C_1 = C_2 = \ldots = C_T$
- **What determines the size of instalments?**
  - Time value of money (review)

Time Value of Money
Problem 1

- **Which investment should be taken?**

Year	1	2
Investment „A”	1 million HUF	
Investment „B”		1 million HUF

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Time Value of Money

- A dollar today worth more than a dollar tomorrow
- Why?
- When not?

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Time Value of Money
Problem 2

- **Which investment is most valuable?**

Year	1	2
Investment „A”	3 million HUF	
Investment „B”		4 million HUF

Time Value of Money

- **Cost of alternative (discount rate)**

= it is the return foregone by investing in the project rather than investing in another investments.

- **Rate of return offered by equivalent investment alternatives in the market.**
- **Concept of equivalent investments**

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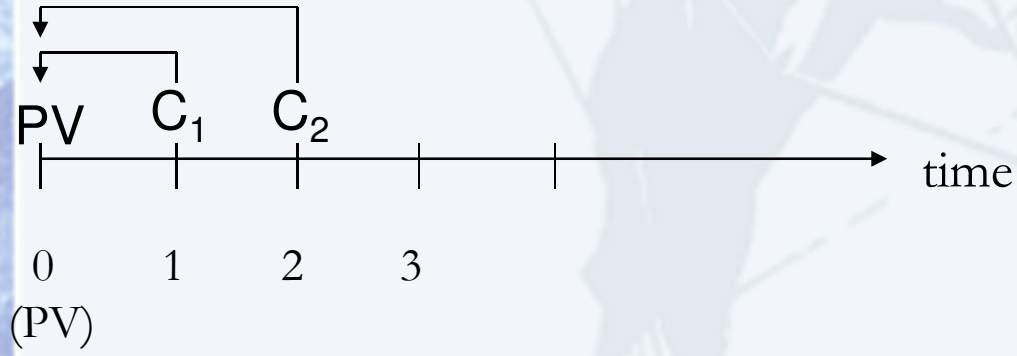
Present Value

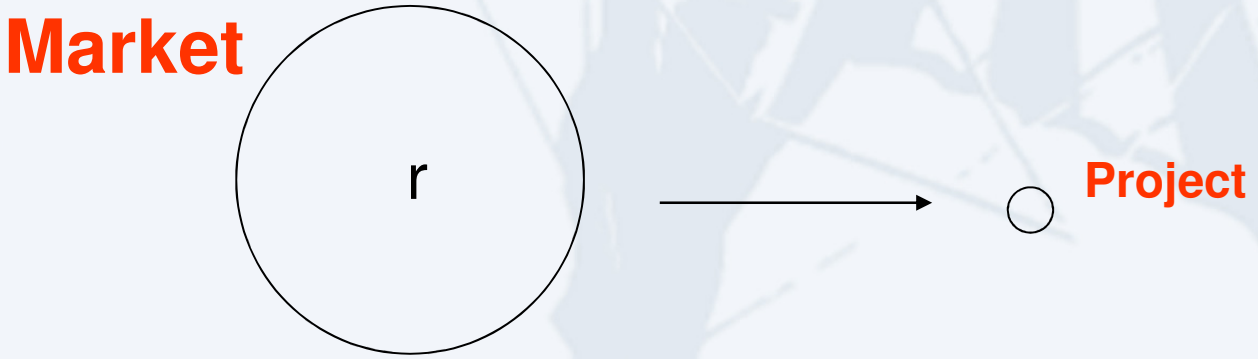
- The amount of cash today that is equivalent in value to a payment, or to a stream of payments, to be received in the future.



Present Value

- **Calculation:**

$$PV(C_t) = \frac{C_t}{(1+r)^t} = C_t \cdot \frac{1}{(1+r)^t} = C_t \cdot DF(r,t)$$



Present Value
Problem 3

- How much does the investment alternative worth? The appropriate discount rate is 15%.

Year	1	2	3
”C” projekt	2 million HUF	1 million HUF	1 million HUF

Present Value

- **Value of projects:**

= sum of present value of expected cash flows

$$\sum PV = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \ldots$$

Annuity

- Stream of equal payments to an individual that occur at predetermined intervals
- The payments may continue for a fixed period
- Annuities are most often associated with insurance companies, loans, bonds

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Annuity

- **The value of an annuity:**

$$\sum PV = \frac{C}{(1+r)^1} + \frac{C}{(1+r)^2} + \ldots + \frac{C}{(1+r)^T}$$

$$\sum PV = PV = \frac{C}{r} \cdot \left[1 - \frac{1}{(1+r)^T} \right] =$$

$$= C \cdot \left[\frac{1}{r} \cdot \left(1 - \frac{1}{(1+r)^T} \right) \right] = C \cdot AF(r,T)$$

Work in groups

True or false?

a) As the discount rate increases, the value of an asset increases.

b) As the expected growth rate in cash flows increases, the value of an asset increases.

c) As the life of an asset is lengthened, the value of that asset increases.

d) As the uncertainty about the expected cash flows increases, the value of an asset increases.

e) An asset with an infinite life (i.e., it is expected to last forever) will have an infinite value.

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Valuation of annuity loans

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What determines instalments?

- **Instalment = C_t** = $R_t + I_t$
  - Repayment = R_t ($\sum R_t = P$)
  - I_t = Payment of interest: $I_t = P_t \cdot i$ ($P_t = P_{(t-1)} - R_{(t-1)}$)
- **Annuity loan:**
  - $C_t = C$ is constant

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Valuation of annuity loans

- Bank's attitude
- Lending is making an investment
- Cash flow of the investment is an annuity
- Return on this investment is the interest rate (i)
- What does this investment worth?
- Size of principal (P) equals the value of annuity

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Valuation of annuity

- **The value of an annuity:**

$$\sum PV = \frac{C}{(1+i)^1} + \frac{C}{(1+i)^2} + \ldots + \frac{C}{(1+i)^T} = P$$

$$\sum PV = PV = \frac{C}{i} \cdot \left[1 - \frac{1}{(1+i)^T} \right] = P \quad \Rightarrow$$

$$C = \frac{P}{\frac{1}{i} \cdot \left[1 - \frac{1}{(1+i)^T} \right]} = \frac{P}{AF(i;T)}$$

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Thank you for your attention

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