

E: Internal rate of return

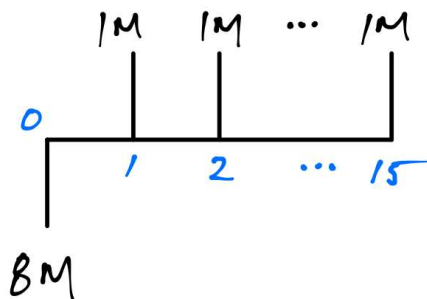
Internal rate of return (IRR):

- Widely used extension to NPV analysis
- **Interest rate** that makes the **NPV of a project equal to zero**
- Can think of as the **breakeven r**

Example: IRR of a 15-year project

Cost: \$8M in 0

Benefit: \$1M per year in 1-15



$$PV_B = \left(\frac{\$1M}{r} \right) \left(1 - \frac{1}{(1+r)^{15}} \right)$$

$$PV_C = \$8M$$

$$NPV = PV_B - PV_C$$

r	PV_B	PV_C	NPV	IRR?
5%	10.4M	8M	2.4M > 0	No: r too small (PV_B too large)
6%	9.7M	8M	1.7M > 0	No: r too small
...	...	8M

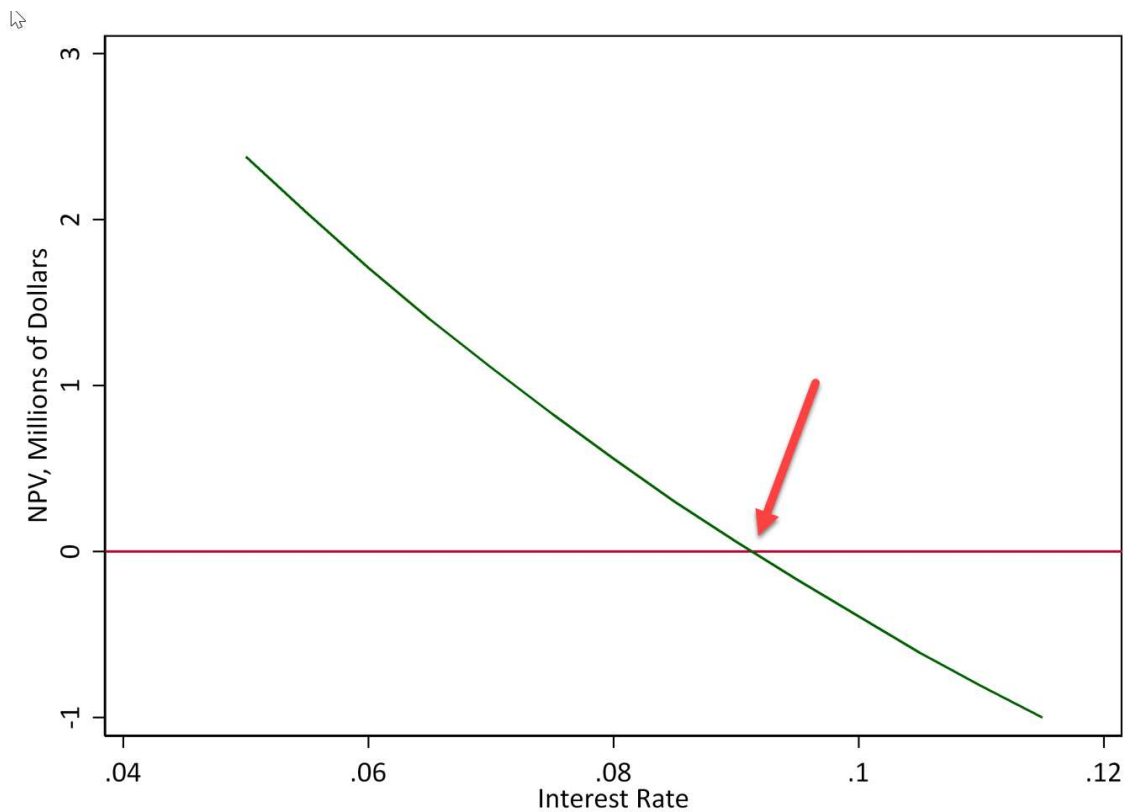
10% 7.6M 8M $-0.4M < 0$ No: r too large (PV_B too small)

To find IRR, solve numerically:

Iterate over r until $NPV = 0$

Result: $IRR = 9.13\%$

Graphing:



Interpretation:

Project is like an asset that pays 9.1%

Will do in g07