



Lecture 18. Equivalent annual annuity

FOR 2022. Financial Analysis for Natural Resources.



School of Forest Resources



About equivalent annual annuity (EAA)

- A.K.A. equal annual equivalent (EAE)
- Converts the NPV of a project or series of irregular cash flows into a value of equal annual payments (end of year).
- EAA useful when comparing projects with annual cash flows to projects with irregular periodic yields
- Appropriate to use when comparing projects with different life spans *when all projects are repeatable.*



Calculating EAA...

$$EAA = NPV \frac{i(1+i)^t}{(1+i)^t - 1}$$

Where t = length of cycle or rotation



An example of EAA...

- A farmer has 100 acres of land on the Mississippi River Delta. He currently has a net annual income of \$30 per acre per year for row crops. He is considering converting his land to forestry due to government cost-sharing programs. His likely cash flow from converting his land to bottomland hardwoods is provided in the table:

Year(s)	Activity	Cash Flow
0	Site prep and planting	(\$15,000)
0	Cost share payments from government	\$7,500
1-15	Government CRP payments	\$4,500
1-60	Net annual revenue	\$225
40	Improvement Thinning	\$30,000
60	Regeneration felling	\$600,000



Complete EAA analysis...

Year(s)	Cash flow	8%
0	(7,500)	(7,500)
1-15	4,500	38,518
1-60	225	2,785
40	30,000	1,381
60	600,000	5,926
	NPV =	41,109

$$EAA = NPV \frac{i(1+i)^t}{(1+i)^t - 1} = \$41,109 \frac{0.08(1.08)^{60}}{(1.08)^{60} - 1} = \$3321.52$$

Timber returns are equivalent to \$3321.52 on 100 acres each year
 Roy crops return \$30/acre/year or \$3000 on 100 acres each year
 Decision: Timber has better financial returns at 8%



Test your skill...

NTLS

Year(s)	Project A	Project B
0	(\$1000)	(\$1500)
5	(\$500)	\$2,100
10		\$3000
20	\$10,000	

Year(s)	Cash Flow for		NPV A	NPV B	NPV A	NPV B
	Project A	Project B	6%	6%	3%	3%
0	(1,000)	(1,500)	(1,000)	(1,500)	(1,000)	(1,500)
5	(500)	2,100	(374)	1,569	(431)	1,811
10	0	3,000	0	1,675	0	2,232
20	10,000	0	3,118	0	5,537	0
		NPV =	1,744	1,744	4,105	2,544

1. Using a 6% interest rate, determine NPV and EAA of each project:

$$NPV_A^{6\%} = (\$1000)(1.06)^{-0} + (\$500)(1.06)^{-5} + \$10,000(1.06)^{-20} = \$1,744 \quad EAA_A^{6\%} = \$1,744 \frac{0.06(1.06)^{20}}{(1.06)^{20} - 1} = \$152.05$$

$$NPV_B^{6\%} = (\$1500)(1.06)^{-0} + \$2100(1.06)^{-5} + \$3,000(1.06)^{-10} = \$1,744 \quad EAA_B^{6\%} = \$1,744 \frac{0.06(1.06)^{10}}{(1.06)^{10} - 1} = \$236.95$$

2. Using a 3% interest rate, determine NPV and EAA of each project:

$$NPV_A^{3\%} = (\$1000)(1.03)^{-0} + (\$500)(1.03)^{-5} + \$10,000(1.03)^{-20} = \$4,105 \quad EAA_A^{3\%} = \$4,105 \frac{0.03(1.03)^{20}}{(1.03)^{20} - 1} = \$275.92$$

$$NPV_B^{3\%} = (\$1500)(1.03)^{-0} + \$2100(1.03)^{-5} + \$3,000(1.03)^{-10} = \$2,544 \quad EAA_B^{3\%} = \$2,544 \frac{0.03(1.03)^{10}}{(1.03)^{10} - 1} = \$298.34$$



Next lecture...

Soil expectation value

a.k.a.

Land expectation value

