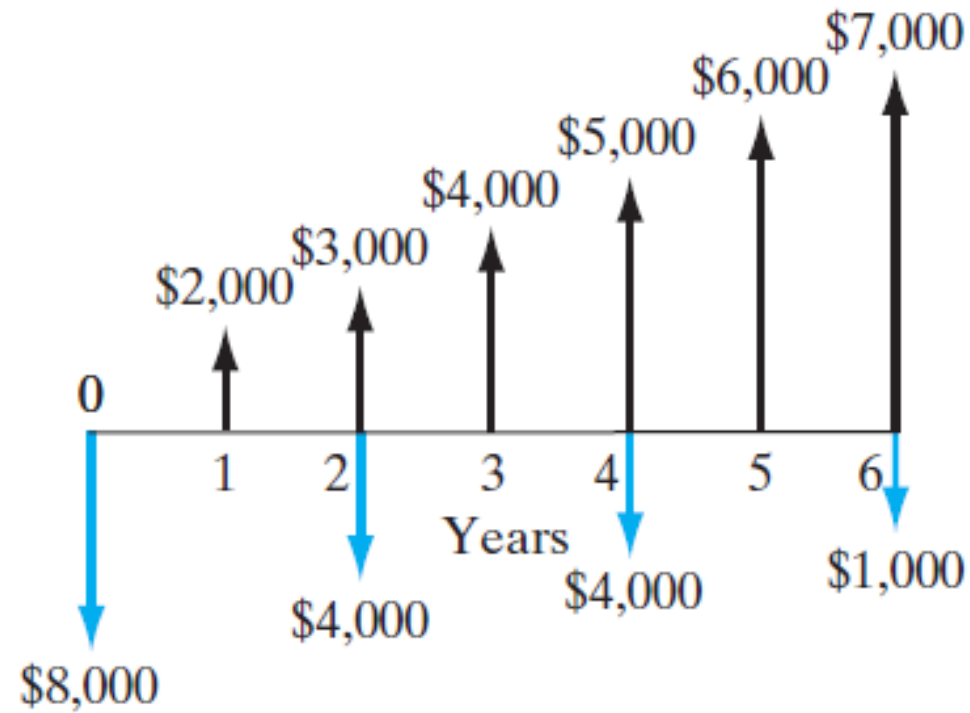


AE analysis is recommended over NPW analysis in many key real-world situations for the following reasons:

1. In many financial reports, an annual equivalent value is preferred to a present-worth value.
2. Unit costs often must be calculated to determine reasonable pricing for items that are on sale.
3. The cost per unit of use of an item must be calculated in order to reimburse employees for the business use of personal cars.
4. Make-or-buy decisions usually require the development of unit costs for the various alternatives.
5. Minimum-cost analysis is easy to do when it is based on annual equivalent cost.

Consider the accompanying cash flow diagram. Compute the equivalent annual worth at $i = 13\%$.



Ans: \$ 627

Two types of power converter Alpha and Beta are under consideration for a particular application. An economic comparison is to be made at an interest rate of 10%. Following cost estimation has been obtained. Determine the annual equivalent costs of the two systems and hence select the best alternative.

Cost Particular (in ₹)	Alpha	Beta
Purchase price	10,000	25,000
Estimated service life	5 years	9 years
Salvage value	3,000	5,000
Annual operating costs	2,500	1,200

A consulting firm proposes to provide “self-inspection” training for clerks who work with insurance claims. The program lasts one year, costs ₹ 20,000 per month, and professes to improve quality while reducing clerical time. A potential user of the program estimates that savings in the first month should amount to ₹ 8000 and should increase by ₹ 4000 per month for the rest of the year. However, operational confusion and work interference are expected to boost clerical costs by ₹12,000 the first month but this amount should subsequently decline in equal increments at the rate of ₹1000 per month. If the required rate of return on money is 12% compounded monthly and there is a stipulation that the program must pay for itself within 1 year, should the consultant be hired.

A company engaging in selling of laboratory equipment estimates that profit from sales should increase by ₹2,00,000 per year if a mobile demonstration unit is built. A large unit with sleeping accommodation for the driver will cost ₹9,70,000 while a smaller unit without sleeping cabin will be Rs. 6,30,000. Salvage values for the large and small units after 5 years will be, ₹97,000 and Rs.35000 respectively. Lodging costs saved by the larger unit should amount ₹1,10,000 annually, but its transportation costs will exceed those of the smaller unit by ₹31,000. With the money at 9% should a mobile demonstration unit be built?

And if so which size is preferable?

Danford Company, a manufacturer of farm equipment, currently produces 20,000 units of gas filters per year for use in its lawn-mower production. The costs, based on the previous year’s production, are reported below. It is anticipated that gas-filter production will last five years. If the company continues to produce the product in-house, annual direct material costs will increase \$3000/year (For example, annual material costs during the first production year will be \$63,000.) Direct labor will also increase by \$5000/year. However, variable overhead costs will increase at the rate of \$2000/year and the fixed overhead will remain at its current level over the next five years. John Holland Company has offered to sell Danford 20,000 units of gas filters for \$25 per unit. If Danford accepts the offer, some of the manufacturing facilities currently used to manufacture the filter could be rented to a third party for \$35,000 per year. The firm’s interest rate is known to be 15%. What is the unit cost of buying the gas filter from the outside source? Determine whether Danford should off load or manufacture?

Item	Expense (\$)
Direct materials	\$ 60,000
Direct labor	\$180,000
Variable overhead	
(power and water)	\$135,000
Fixed overhead	
(light and heat)	\$70,000
Total cost	<hr/> \$445,000

Southern Environmental Consulting (SEC), Inc., designs plans and specifications for asbestos abatement (removal) projects in public, private, and governmental buildings. Currently, SEC must conduct an air test before allowing the re-occupancy of a building from which asbestos has been removed. SEC subcontracts air-test samples to a laboratory for analysis by transmission electron microscopy (TEM). To offset the cost of TEM analysis, SEC charges its clients \$100 more than the subcontractor's fee. The only expenses in this system are the costs of shipping the air-test samples to the subcontractor and the labor involved in shipping the samples. With the growth of the business, SEC is having to consider either continuing to subcontract the TEM analysis to outside companies or developing its own TEM laboratory. Because of the passage of the Asbestos Hazard Emergency Response Act (AHERA) by the U.S. Congress, SEC expects about 1,000 air-sample testing per year over eight years. The firm's MARR is known to be 15%.

Subcontract option. The client is charged \$400 per sample, which is \$100 above the subcontracting fee of \$300. Labor expenses are \$1,500 per year, and shipping expenses are estimated to be \$0.50 per sample.

TEM purchase option. The purchase and installation cost for the TEM is \$415,000. The equipment would last for eight years, at which time it should have no salvage value. The design and renovation cost is estimated to be \$9,500. The client is charged \$300 per sample, based on the current market price. One full-time manager and two part-time technicians are needed to operate the laboratory. Their combined annual salaries will be \$50,000. Material required to operate the lab includes carbon rods, copper grids, filter equipment, and acetone. The costs of these materials are estimated at \$6,000 per year. Utility costs, operating and maintenance costs, and the indirect labor needed to maintain the lab are estimated at \$18,000 per year. The extra income-tax expenses would be \$20,000.

(a) Evaluate which option is better?

(b) How many test samples will make both options equal?

6.28 The estimated cost of a completely installed and ready-to-operate 40-kilowatt generator is \$30,000. Its annual maintenance costs are estimated at \$500. The energy that can be generated annually at full load is estimated to be 100,000 kilowatt-hours. If the value of the energy generated is \$0.08 per kilowatt-hour, how long will it take before this machine becomes profitable? Take the MARR to be 9% and the salvage value of the machine to be \$2,000 at the end of its estimated life of 15 years.

ANS: 5.185 years

6.34 The following cash flows represent the potential annual savings associated with two different types of production processes, each of which requires an investment of \$12,000:

n	Process A	Process B
0	−\$12,000	−\$12,000
1	9,120	6,350
2	6,840	6,350
3	4,560	6,350
4	2,280	6,350

Assuming an interest rate of 15%,

- (a) Determine the equivalent annual savings for each process.
- (b) Determine the hourly savings for each process if it is in operation 2,000 hours per year.
- (c) Which process should be selected?

Ans: Process B (\$1.0734/hr)

5.17 An electric switch manufacturing company has to choose one of three different assembly methods. Method A will have a first cost of \$40,000, an annual operating cost of \$9000, and a service life of 2 years. Method B will cost \$80,000 to buy and will have an annual operating cost of \$6000 over its 4-year service life. Method C will cost \$130,000 initially with an annual operating cost of \$4000 over its 8-year life. Methods A and B will have no salvage value, but method C will have some equipment worth an estimated \$12,000. Which method should be selected? Use Annual worth analysis at an interest rate of 10% per year.

Ans: method C