CHAPTER 7: ENGINEERING-ECONOMIC ANALYSIS

Goal is to make money.

How?

\[
\begin{align*}
\{ \text{Raw Materials} \} & \xrightarrow{\text{Reaction}} \{ \text{High Value Chemicals} \} \\
\{ \text{Low Value} \} & \xrightarrow{\text{Separation}} \{ \text{High Value} \}
\end{align*}
\]

Chapter 1: Process Flow Diagram
Chapter 5: Capital Cost
Chapter 6: Operating Cost

Next, Economic Evaluation

1) Does the process generate money?
2) How does the process compare to other processes?

Here: Principles of Economic Analysis

How to manage money.
WILL DO PROFITABILITY & ALTERNATIVE COMPARISON IN CHAP. 8.

II INVESTMENTS & THE TIME VALUE OF MONEY.

WHEN YOU GET YOUR FIRST JOB (& PAYCHECK)

$50,000/yr  =>  $4,167/month

LOOKS PRETTY GOOD, RIGHT?

TAXES TAKE A CHUNK (~25%)
(FEDERAL, STATE, SOCIAL SECURITY, ETC.)

=> $3,125/month

MONTHLY EXPENSES:

RENT/MORTGAGE:  $1,000/month
GAS/ELECTRIC:    $100/month
PHONE:           $40/month
CABLE:           $40/month
WATER/GARAGE:    $40/month
CELL PHONE:      $50/month
Food: $200/month
Transportations: $80/month
Car Payment: $400/month
Clothing: $200/month

$2,150/month

= $975/month

Other expenses:

1) House Insurance ($440/yr)
2) Auto Insurance ($750/yr)
3) House Taxes ($1000/yr)
4) Church ($200/month)

$383/month

= $592/month Discretionary

Not too much.

WHAT TO DO WITH IT?
1. Consume as received
   ⇒ Personal gratification
      ⇒ Entertainment
      ⇒ Drinking
      ⇒ Etc.

2. Save for future consumption
   ⇒ Illness
   ⇒ Unemployment
   ⇒ Retirement
      ⇩ Important because need an income source after you stop working.

   a) Savings
      ⇒ No interest, just store for later

   b) Investments
      ⇒ Earns interest
      ⇒ Grows with time
Upon graduation, you start your first job at $50,000/yr. You decide to set aside 10% or $5,000/yr for retirement in 40 years time, and you assume that you will live 20 years after retiring. You have been offered an investment that will pay you $67,468/yr during your retirement years for the money you invest.

a) How much money would you have per year in retirement if you had saved the money, but not invested it, until retirement?

b) How does this compare with the investment plan offered?

c) How much money was produced from the investment?
So, what is an investment?

An agreement

- Party A gives Party B $ for a specified period,
- At the end of the period, Party B gives Party A the $ plus interest.
\[ P \] - Principal or Present Value
\[ F \] - Future Value
\[ n \] - Years between \( F \) and \( P \)

Amount of \$ earned from investment:
\[ E = F - P \]

Yearly earnings rate (interest rate):
\[ i_s = \frac{E}{Pn} = \frac{(F-P)}{Pn} \]

\[ \downarrow \]
Simple interest rate

Solve for \( \frac{F}{P} \):
\[ n i_s = \frac{F}{P} - \frac{P}{P} \]

\[ \Rightarrow \frac{F}{P} = (1+ni_s) = f(n,i_s) \]
Example 7.2: You decide to put $1,000 into a bank that offers a special rate if left in for 2 years. (Ex: Certificate of Deposit, CD)

After 2 years you will be able to withdraw $1,150.

a) Who is the producer?

b) Who is the investor?

c) What are the values of F, P, i, and n?
SAVINGS:
You invest $P$. Bank returns $F$ ($P + \text{interest}$).

Opposite?

LOAN:
Bank gives you $P$. You return $F$ ($P + \text{interest}$).

How does a chemical company do this?

Figure 7.1. Turrinetal.

Money is a measure of value; investments can be lots of things, but express value in $\$. Is it worth it? Time value of money.
EXAMPLE 7.3 You estimate that in 2 years time you will need $1,150 in order to replace the linoleum in your kitchen. Consider 2 choices:

1) Wait 2 years to take action
2) Invest $1,000 now (with 7.5% interest rate)

What would you do?
7.2 DIFFERENT TYPES OF INTEREST
   ⇒ SIMPLE & RARE
   ⇒ COMPOUND

7.2.1 SIMPLE INTEREST
   ⇒ BASED SOLELY ON INITIAL INVESTMENT

   Interest paid in any year: \( P_i \)
   For investment of \( n \) years: \( nP_i \)
   Total Value in \( n \) years: \( F_n = P + nP_i \)

   \[ F_n = P(1 + n_i) \]

   When used? interest not reinvested.

7.2.2 COMPOUND INTEREST

   \[ F_n = P (1 + i)^n \]

   \( n \) = number of years
   \( P \) = initial investment
   \( i \) = interest rate
   \( F_n \) = future value of investment
   \( i \) = interest

   Where does this come from?
Year 1: \( t=0 \), invest \( P \)

at end of year

\( t=1 \), \( F_1 = P + Pi = P(1+i) \)

Year 2: \( t=1 \), investment = \( P(1+i) = P+Pi \)

at end of year

\( t=2 \), \( F_2 = (P+Pi) + (P+Pi)i \\
= (P+Pi)(1+i) \)

\( = P(1+i)(1+i) = P(1+i)^2 \)

See the pattern?

Year 3: \( t=2 \), investment = \( P(1+i)^2 \)

at end of year

\( t=3 \), \( F_3 = P(1+i)^2 + P(1+i)^3i \\
= P(1+i)^2(1+i) = P(1+i)^3 \)

\( \Rightarrow \) \( F_n = P(1+i)^n \)
How much do I have to invest now to get $F_n$ after $n$ years?

Solve for $P$

$$P = \frac{F_n}{(1+i)^n}$$

**Ex. 7.4** For an investment of $500 at an interest rate of 8% per year for 4 years, what would be the future value of this investment, assuming compound interest?

FYI: Simple interest only?
EX 7.5 How much would I need to invest in a savings account, yielding 6% interest/year, to have $5,000 in 5 years time?

EX 7.6 I need to borrow a sum of money (P) and have two loan alternatives:

a) I borrow from my local bank @ 7% /yr and pay compound interest.

b) I borrow from Honest Sam @ 7.3% /yr and pay simple interest.

N = 3  \ F_n = ?  Basis: P = $1,000
What if the interest rate changes over time?

\[ F_n = P \prod_{j=1}^{n} (1 + i_j) \]

\[ = P \left( (1+i_1)(1+i_2)(1+i_3) \cdots \right) \]

if interest rate stays same...

\[ = P (1+i)^n \]

---

7.3 Time Basis for Compound Interest Calculations

Nominal interest rate

\[ \Rightarrow \text{like your car or mortgage rate.} \]

But you pay monthly, so in a period, only pay \( \frac{1}{12} \) of the interest.

\[ r = \frac{\text{Nominal yearly interest rate}}{\text{# periods/yr}} \]

\[ \text{Rate} \]
EX. 7.7 For the case of 12% / yr compounded monthly, what are \( m, r, \) and \( i_{\text{nom}} \)?

7.3.1 Effective Annual Interest Rate

- Takes compounding into effect but acts like rate for yearly period.

\[
F = P (1 + i_{\text{eff}}) = P \left( 1 + \frac{i_{\text{nom}}}{m} \right)^m
\]

\[
i_{\text{eff}} = \left( 1 + \frac{i_{\text{nom}}}{m} \right)^m - 1
\]

EX. 7.8 What is the effective annual interest rate for a nominal rate of 8% / yr when compounding monthly?
Fig. 7.1

- Periodic cash transactions (nothing on fractional year)
- Payments made at end of year
- Proportional arrows

- Negative for investment in a project (Company)
- Positive for investment in a project (Project)

- Usually in terms of investor (Company)

Discrete OR Cumulative
### 7.4.1 DISCRETE CASH FLOW DIAGRAM

- Clear and unambiguous.
- Used to avoid errors.

### Ex. 7.1b Balance Sheet

<table>
<thead>
<tr>
<th>Borrow/Payback</th>
<th>Year End</th>
</tr>
</thead>
<tbody>
<tr>
<td>-500</td>
<td>1</td>
</tr>
<tr>
<td>-1200</td>
<td>2</td>
</tr>
<tr>
<td>-1500</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>+2000</td>
<td>5</td>
</tr>
<tr>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

Payoff loan \{ \_ + x \}

### Investor View?

```
2000
```

```
\downarrow 1500
\downarrow 1200
\downarrow 1000
```
To get \( X \), need interest rate. (Ex. 7.13)

**Ex 7.11**
\[ P = \$10,000 \quad \text{Payment} = \$320/\text{mo.} \]
30 monthly payments

Bank View:

\[ \begin{array}{cccccccc}
\text{Month} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\text{Payment} & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\
\text{Balance} & -10,000 & \$320 & \$320 & \$320 & \$320 & \$320 & \$320 & \$320 \\
\end{array} \]

Our view would be inverse.

**7.4.2** Cumulative Cash Flow Diagram

=> Running total of cash flow during project.

**Ex 7.12** The yearly cash flows estimated for a project involving the construction and operation of a chemical plant producing a new product are provided in the discrete CFD given below. Using this information, construct a cumulative CFD.
7.5 Calculations from Cash Flow Diagrams

- Accounting for Time Value of Money
- Bring Everything to Same Point in Time, then Compare.
- What Point in Time is Irrelevant
Ex. 7.13 8% / yr

a) $x = ?$

b) What is $x$ with no interest?
b) WHAT IF \( i = 0 \)?

DID I HAVE TO DO ANALYSIS AT YR 7?
WHAT IF AT YR 4?

Most often
@ \( t=0 \) or
\( t=\text{final} \).
3. Regular payment of amount, $A$, over many years:

\[ A \atop \begin{array}{ccccccc} 0 & 1 & 2 & 3 & 4 & 5 & \ldots \ \text{n yr} \end{array} \]

Remember, to compare, need everything at one time.
Rather than year by year, can develop a formula:

\[ F_n = A(1+i)^{-1} + A(1+i)^{-2} + A(1+i)^{-3} + \ldots + A(1+i)^{-n} \]

Geometric series: \(a, ar, ar^2, \ldots, ar^{n-1}\)

\[\text{Sum } S_n = F_n\]

3. \(\frac{F_n}{A} = r^{n-1}\)

3. \[ F_n = A \left[ \frac{(1+i)^n - 1}{(1+i) - 1} \right] = A \left[ \frac{(1+i)^n - 1}{i} \right] \]

Notice: No payment at year 0.
7.5.2 Discount Factors

Looking to Shorthand Our Notation

\[ \frac{F}{A} = \frac{(1+i)^n - 1}{i} = f(i, n) \]

General Terms

\[ \frac{X}{Y} = \frac{F}{A} \quad \Rightarrow \quad \text{Discount factor for } \frac{X}{Y} = f(X/Y, i, n) \]

Why Useful?

Want \( \frac{F}{A} \).

Discount factor for \( \frac{F}{A} \) = \( f(F/A, i, n) \)

Discount factor for \( \frac{F}{A} \) = \( f(F/A, i, n) \)

Discount factor for \( \frac{P}{A} \) = \( (P/F, i, n)(F/A, i, n) \)

Discount Factors in Table 7.1 (Tuma et al.)

Examples →
Ex 7.14 You have just won $2,000,000 in the Texas Lottery as one of 7 winners splitting up a jackpot of $14,000,000. It has been announced that each winner will receive $100,000/yr for the next 20 yrs. What is the equivalent present value of your winnings if you have a secure investment opportunity providing 7.5%/yr?

Ex 7.15 Consider Example 7.11, involving a car loan. The discrete CFD from the bank's point of view was shown previously. What interest rate is the bank charging for this loan?
I invest money in a savings account that pays a nominal interest rate of 6%/YR compounded monthly. I open the account with a deposit of $1,000 and then deposit $50 at the end of each month for a period of two years followed by a monthly deposit of $100 for the following three years. What will be the value of my savings account at the end of the five-year period?
THREE PIECES:

1) THE INITIAL INVESTMENT
2) THE 24 MONTHLY INVESTMENTS OF $50
3) THE 36 MONTHLY INVESTMENTS OF $100
In Example 7.1, we introduced an investment plan for retirement. It involved investing $5,000/yr for 40 years leading to retirement. The plan then provided $67,468/yr for 20 years of retirement income.

a) What yearly interest rate was used in this evaluation?

b) How much money was invested in the retirement plan before withdrawals began?
INFLATION

=> CAUSE FOR TIME VALUE OF MONEY (AT LEAST PARTLY)
NOT BECAUSE VALUE DECREASES, BUT BECAUSE THINGS BECOME MORE EXPENSIVE.

Typically keep track of w/ Cost Indexes.
Can also express as rate of inflation: 

\[ CEPCI (j+n) = (1+f)^n CEPCI (j) \]

\[ \uparrow \quad \uparrow \quad \uparrow \]
\[ F \quad i \quad f \]

[Ex. 7.18] What was the average rate of inflation for the costs associated w/ building a plant (chemical) over the following periods?

a) 1980 - 1992
b) 1992 - 1998

<table>
<thead>
<tr>
<th>Year</th>
<th>CEPCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>318</td>
</tr>
<tr>
<td>1992</td>
<td>358</td>
</tr>
<tr>
<td>1998</td>
<td>390</td>
</tr>
</tbody>
</table>
EVERYTHING WE'VE DONE IS CASH, NOT PURCHASING POWER. NEED TO INCLUDE INFLATION.

\[ F' = \frac{F}{(1+f)^n} = \frac{1}{(1+f)^n} \cdot P (1+i)^n \]

\[ i' = \left( \frac{1+i}{1+f} \right) - 1 \]
Ex 7.19 In this example, we consider the effect of inflation on the purchasing power of the money set aside for retirement in Example 7.17. Previously, we calculated the amount of cash available at the time of retirement in forty years to be $774,000. This provided an income of $67,468/yr for 20 years.

a) Assuming an annual inflation rate of 2%, what is the purchasing power of the cash available at retirement?

b) What is the purchasing power of the retirement income in the first and 20th year of retirement?
c) How does Part A compare with the total annuity payments of $5,000/yr for 40 years?
NOTE:

You were making $50,000/yr and invested $5,000/yr.

Retirement only give you $20-30K/yr w/ 6% interest.

To increase? (suggest)

1) The amount invested
2) Interest rate
3) Time over investment.

$\Rightarrow$ Inflation must be considered.
3.7 DEPRECIATION OF CAPITAL INVESTMENT

→ FINITE LIFETIME

→ VALUE OF PHYSICAL PLANT DECREASES OVER TIME.

→ EQUIPMENT WEARS OUT

→ EQUIPMENT BECOMES OBSOLETE

→ WHEN PLANT CLOSED, SALVAGE VALUE ONLY A FRACTION OF ORIGINAL VALUE.

Cannot deduct full value of plant at once.

Therefore, Depreciation.

Amount & rate set by government.

EX 7.20 Consider a person who owns a business with the following annual revenue and expenses:

\[
\begin{align*}
\text{Revenue from Sales:} & \quad \$356,000 \\
\text{Rent:} & \quad (22,000) \\
\text{Employee Salaries:} & \quad (100,000) \\
\text{Employee Benefits:} & \quad (32,100) \\
\text{Utilities:} & \quad (7,000) \\
\text{Misc. Expenses:} & \quad (5,000) \\
\text{Overhead Expenses:} & \quad (40,000) \\
\text{Before Tax Profit:} & \quad \$150,000
\end{align*}
\]
The owner of the business decides that, in order to improve the manufacturing operation, she must buy a new packing and labeling machine for $120,000, which has a useful operating life of 4 years and can be sold for $30,000 scrap value at that time. This, she estimates, will increase her sales by 5% per year. The only additional cost is an extra $1,000/yr in utilities. The new, before-tax profit is estimated to be:

\[
\text{Before-tax profit:} \\
\frac{\$150,000 + 17,800 - 1000}{4} = \frac{166,800}{yr} \\
\Delta = +\$16,800/yr.
\]

Using a before-tax basis, it can be seen that her $100,000 investment yields $16,800/yr. The alternative to buying the new machine is to invest money in a mutual fund that yields 10% before tax. At face value, the investment in the new machine looks like a winner. However, let us take a close look at the cash flows for each case.
**Table E7.20** Cash flows for both investment opportunities (\$ in 1000)

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment Machine</th>
<th>Investment investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-100</td>
<td>-100</td>
</tr>
<tr>
<td>1</td>
<td>16.8</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>16.8</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>16.8</td>
<td>12.1</td>
</tr>
<tr>
<td>4</td>
<td>16.8+2</td>
<td>13.31</td>
</tr>
<tr>
<td>Total</td>
<td>-30.8</td>
<td>10+100</td>
</tr>
</tbody>
</table>

Big difference at end. (Recall initial investment)

**EQUIPMENT IS A LONG-TERM INVESTMENT ⇒ DEPRECIATION FOR TAX PURPOSES (AS OPERATING EXPENSE)**

**3.7.1** **Fixed Capital, Working Capital, + Land**

**What can be depreciated?**

Total Capital Investment = Fixed Capital + Working Capital

Fixed Capital: \( C_{TM} \) or \( C_{GR} \)  
Cost to Build Plant.  
Can **NOT** Depreciate.

Working Capital: Startup + Financing to cover first few months before revenues start  
(Salaries, raw materials, emergencies)
• Working capital is recovered at the end of a project.
• Because working capital is recoverable, can not be depreciated.
• Working capital is ~ 15-20% of FC1.

7.3.2 Different Types of Depreciation

Fixed Capital Investment, FC1:
• FC1 - Land
• Can be depreciated

Salvage Value, S:
• FC1 - Land at end of plant life,
• Small fraction of FC1
• Often assumed = 0

Life of the Equipment, n:
• Specified by IRS
• Does not affect actual working life
• Only affects how long can take depreciation
• CPI equipment is 9.5 yrs

Total Capital for Depreciation:
\[ D = FC1 - S \]
YEARLY DEPRECIATION:

Depreciation is each year changes. Each year denoted $d_k$ (kth year)

BOOK VALUE:

The amount of depreciable capital that has not yet been depreciated,

$$BV_k = FC_{I_L} - \sum_{j=1}^{k} d_j$$

METHODS TO DETERMINE DEPRECIATION EACH YEAR:

1) Straight Line
   IRS APPROVED
2) Double declining
3) Sum of the years digits & Antiquated

1) STRAIGHT LINE DEPRECIATION, SL:

An equal amount of depreciation is charged each year over the depreciation period allowed.

$$d_{k}^{SL} = \left[ \frac{FC_{I_L} - S}{n} \right]$$

$\Rightarrow$ Linear decrease in plant value.
3) SUM OF THE YEARS DIGITS DEPRECIATION, SYOD:

\[
d_{ SYOD }^k = \frac{[n+1-k][FCI_2 - S]}{\frac{n}{2}[n+1]}
\]

2) Double declining balance Depreciation, DDB:

\[
d_{ DDB }^k = 2 \frac{2}{n} \left[ FCI_2 - \sum_{j=0}^{j=k-1} d_j \right]
\]

Double based on "2" 150%. Declining would be "1.5"

Note: Salvage value not a part of calculation.
To avoid depreciating more than D, final year's depreciation is reduced.

**EX. 7.21** The fixed capital investment (excluding the cost of land) of a new project is estimated to be $150,000, and the salvage value of the plant is $100,000. Assuming a seven-year equipment life, estimate the yearly depreciation allowances using:

a) SL  
b) SYOD  
c) DDB
a) SL:

b) Solya:
DDB GIVES BULK OF DEPRECIATION EARLY.
SL GIVES SLOWEST DEPRECIATION EARLY.

HAVE TO FOLLOW IRS RULES, BUT DDB BEST
BECAUSE SEE IMPACT EARLY (REMEMBER THE
TIME VALUE OF MONEY).
CURRENT DEPRECIATION METHOD -  
MODIFIED ACCELERATED COST RECOVERY SYSTEM.  
(MACRS)

→ BASED ON ½ year system.
→ Chemical plant equipment
   - 9.5 yrs = n
   - S = 0

→ Alternative
   - n = 5 yrs
   - Better because more depreciation ⇒ less taxes.
     (think like itemized taxes + adjusted income)
   - Also time value of money.

MACRS:

a) DDB early
b) Switch to SL when SL > DDB.
c) SL until end of depreciation period, on remaining balance

Also, →


<table>
<thead>
<tr>
<th>Year</th>
<th>Depreciation for 1/2 yr</th>
<th>See Table 7.2 (Tart et al.)</th>
<th>Last Year: Depreciation for 1/2 yr</th>
</tr>
</thead>
</table>

How to get those values?

**EX 7.22** The basic approach is to use DDB method and compare to SL method.

**Basis:** $100

<table>
<thead>
<tr>
<th></th>
<th><strong>DDB</strong></th>
<th><strong>SL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>[ \frac{2}{5} \times \frac{100 - 0}{100 - 0} = 40 ] (but on 1/2 yr)</td>
<td>[ \frac{20}{3.5} = 5.71 ]</td>
</tr>
<tr>
<td>2</td>
<td>[ \frac{2}{5} \times \frac{80 - 20}{100 - 20} = $13.20 ]</td>
<td>[ \frac{66.80}{4.5} = $14.84 ]</td>
</tr>
<tr>
<td>3</td>
<td>[ \frac{2}{5} \times \frac{60 - 20 - 32}{100 - 20 - 32} = $11.52 ]</td>
<td>[ \frac{48}{3.5} = $13.71 ]</td>
</tr>
<tr>
<td>4</td>
<td>[ \frac{2}{5} \times \frac{40 - 20 - 32 - 19.2}{100 - 20 - 32 - 19.2} = $11.52 ]</td>
<td>[ \frac{28.8}{2.5} = $11.52 ]</td>
</tr>
</tbody>
</table>
\[ \frac{2}{5} (100 - 20 - 32 - 19.2 - 11.52) = \frac{288}{2.5} = \$11.52 \]

\[ (0.5) \frac{2}{5} (100 - 20 - 32 - 19.2 - 11.52) = \frac{0.5(288)}{2.5} = \$5.76 \]

\[ 1/2 \text{yr} = \$1.15 \]

Total: \[ 20 + 32 + 19.2 + 11.52 + 5.76 = 100 \]

ERROR IN BOOK (p. 250)

7.8 Taxation, Cash Flow, and Profit.

- Directly impacts profits.
- Complex \( \Rightarrow \) Attorneys (lots).
  Why? Maximize benefit (loopholes).

- Rates change frequently.
  Table 7.3 (still to current).

Large corporations, tax rate is 35%. Federal.

Also have to pay: state, city, local taxes.
Overall usually 40-50%.
EXPENSES:
  \[ \text{COM}_d + d \]

INCOME TAX:
  \[ (\text{Revenue} - \text{Expenses})(\text{Tax Rate}) \]
  \[ (R - \text{COM}_d - d)(t) \]

AFTER TAX (NET) PROFIT:
  \[ \text{Revenue} - \text{Expenses} - \text{Income Tax} \]
  \[ (R - \text{COM}_d - d)(1 - t) \]

AFTER TAX CASH FLOW:
  \[ \text{NET PROFIT} + \text{DEPRECIATION} \]
  \[ (R - \text{COM}_d - d)(1 - t) + d \]

\( t \) = tax rate
\( \text{COM}_d \) = Cost of Manufacturing minus depreciation
\( d \) = depreciation
\( R \) = Revenue from sales.
EX 7.23  For the project given in Example 7.21, the manufacturing costs, excluding depreciation, are $30,000/yr, and the revenues from sales are $75,000/yr. Given the depreciation values calculated in Example 7.21, calculate the following for a 10-yr period after the start-up of the plant:

a) The after tax profit

b) The after tax cash flow, assuming a taxation rate of 30%.

Soyd:
b) SL:

SOYD:

DDB:
ON SOYD + DDB, MORE CASH FLOW IN EARLY YEARS, AND THIS MONEY IS WORTH MORE THAN SAME OR SLIGHTLY HIGHER AMOUNTS LATER. (TIME VALUE OF MONEY).

END CHAP. 7.