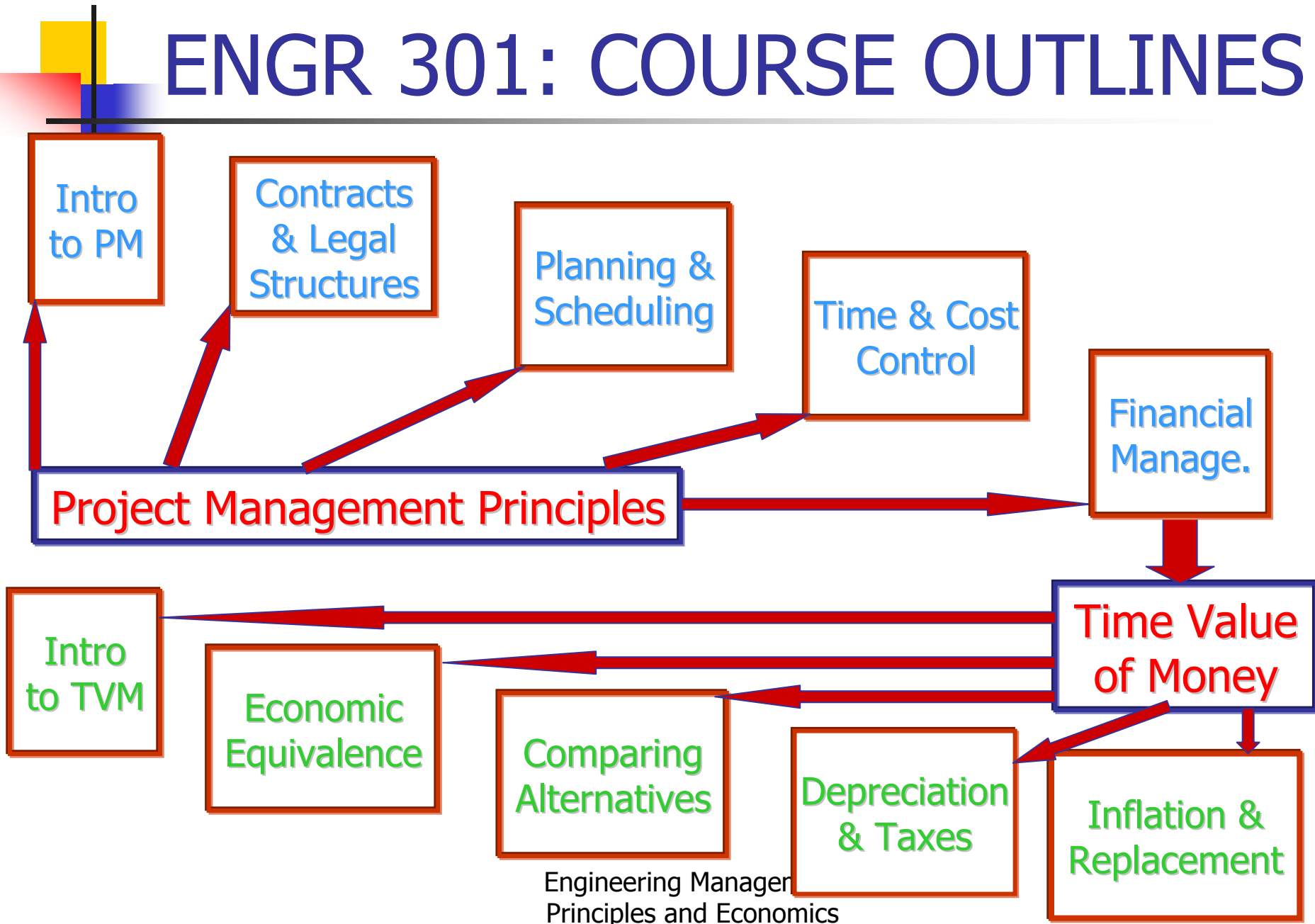
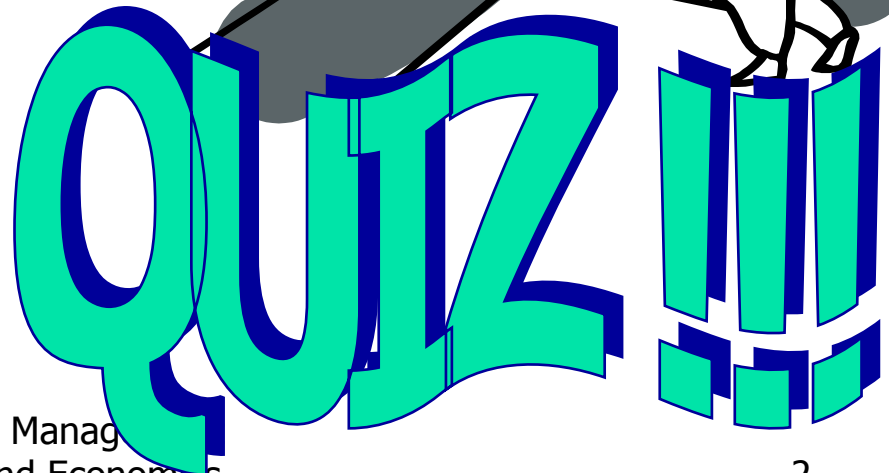
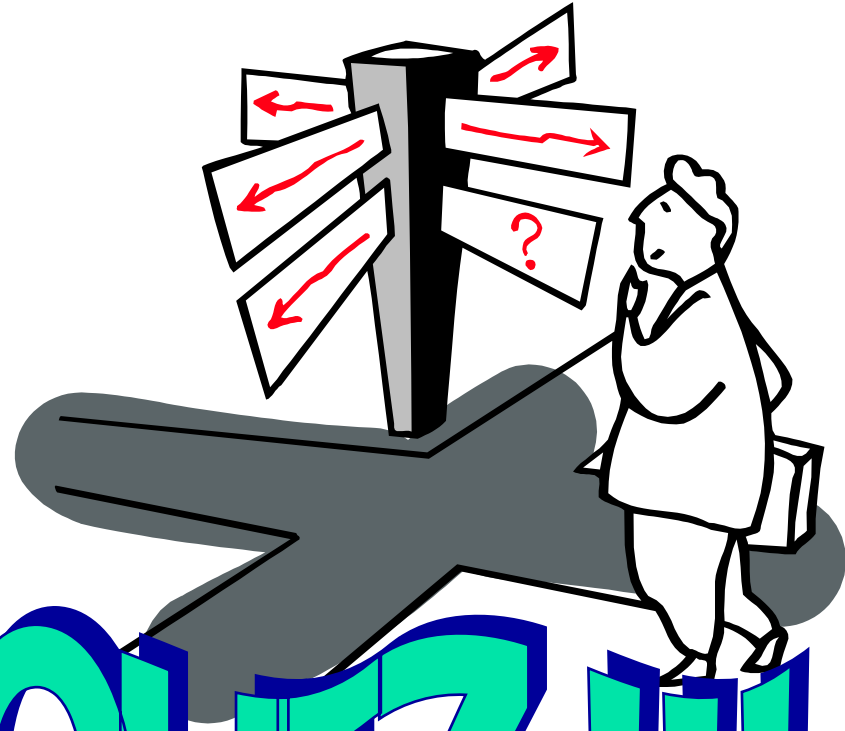
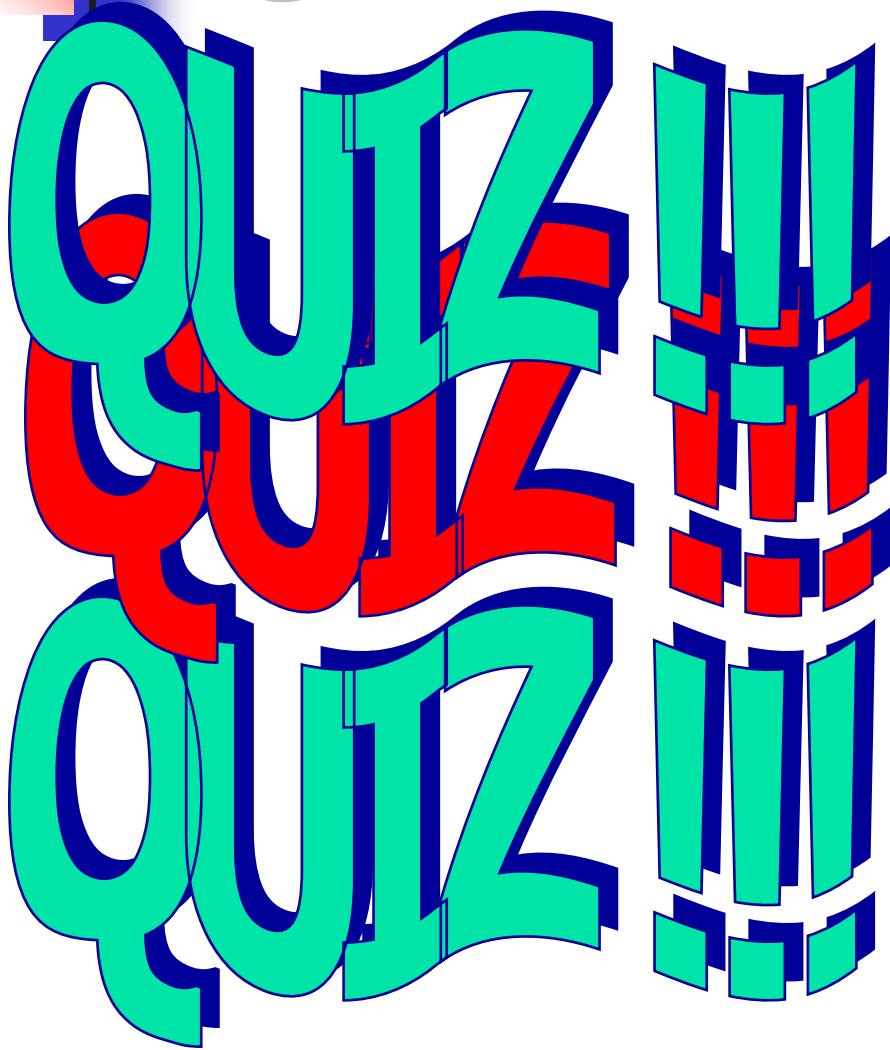


ENGR 301: COURSE OUTLINES



QUIZ !!!





ETHICS and PROFESSIONALISM

■ Quiz:

- What is a project?
- What is Project Management (PM)?
- What are the PM knowledge areas?
- What are the different types of organizational structure frame?
- To execute a project, different parties have to participate. There has to be some kind of contractual relationship among them. What are the various types of contracts? Their characteristics?



ETHICS and PROFESSIONALISM

■ Quiz:

- Each organization should have legal and management structures. List them and briefly describe each considering their advantages and disadvantages?
- What is time management? How? Planning and scheduling! How?
- Often we hear the expression: time & cost control! Describe? Comment?



ETHICS and PROFESSIONALISM

■ Quiz:

- Is economic analysis study important particularly to engineers? Explain?
- What is
 - Present value (PV)?
 - Final value (FV)?
 - Annual value (AV)?
 - Present worth (PW)? Annual worth (AW)?
 - Minimum attractive rate of return (MARR)? Internal rate of return (IRR)?



ETHICS and PROFESSIONALISM

- Quiz:

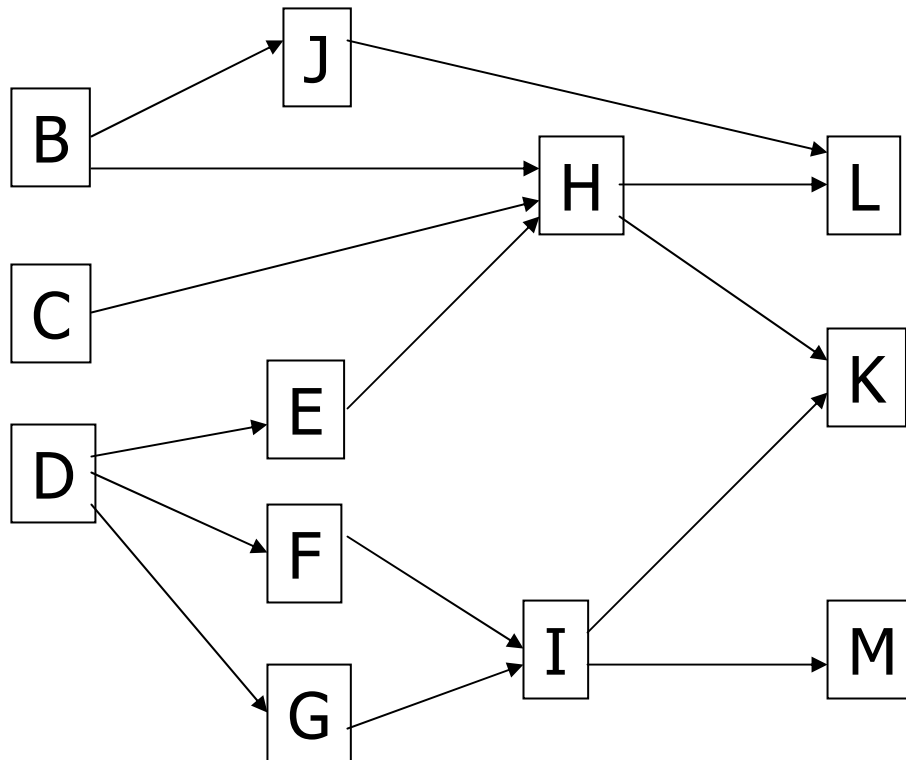
- What is
 - depreciation? How?
 - inflation? How?
 - tax? How?



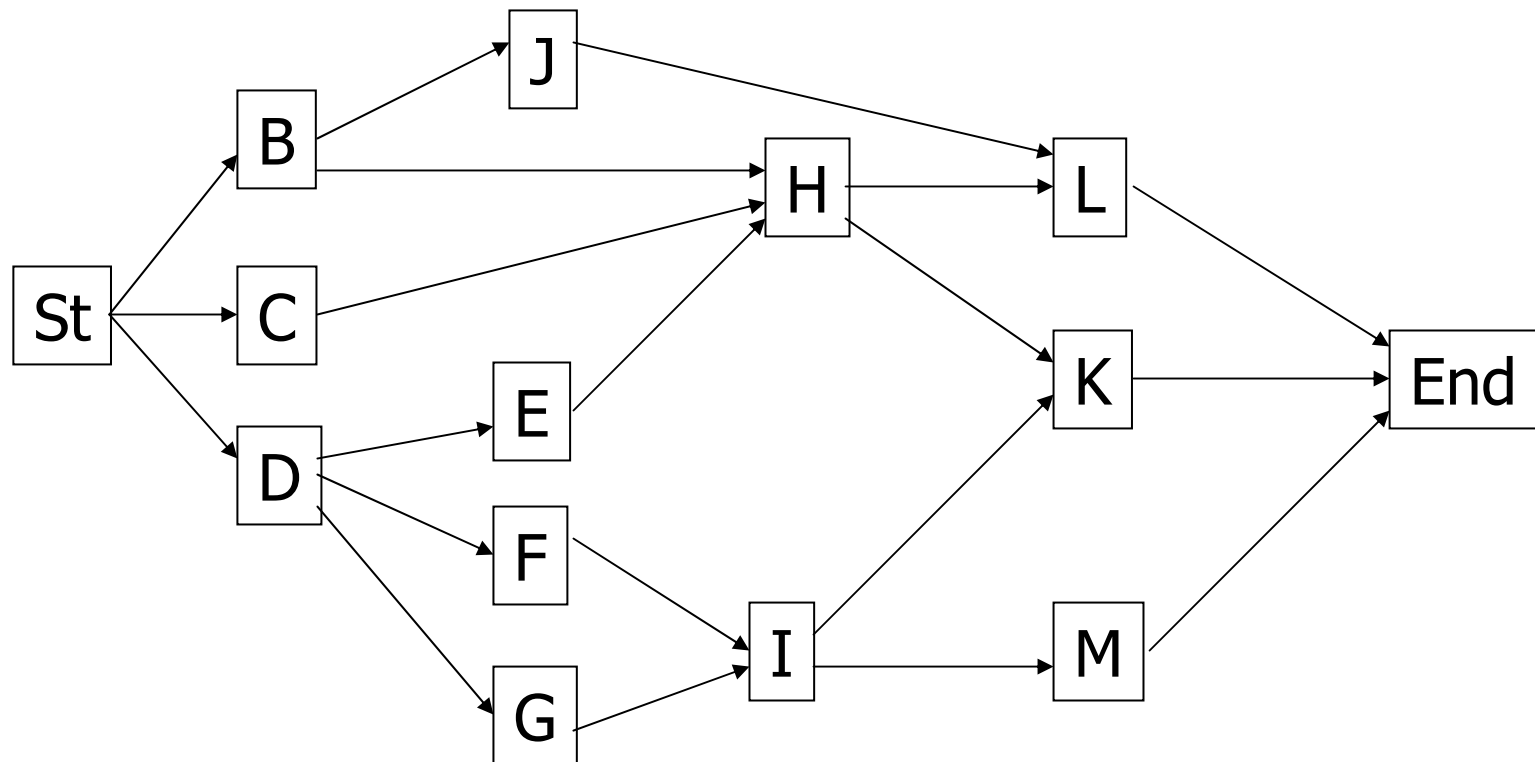
EXAMPLE # 1

Activity	Precedes	Duration (Days)
B	H,J	25
F	I	5
G	I	10
C	H	18
D	E,F,G	22
K	---	14
L	---	25
E	H	2
H	L,K	8
I	K,M	10
J	L	14
M	---	22

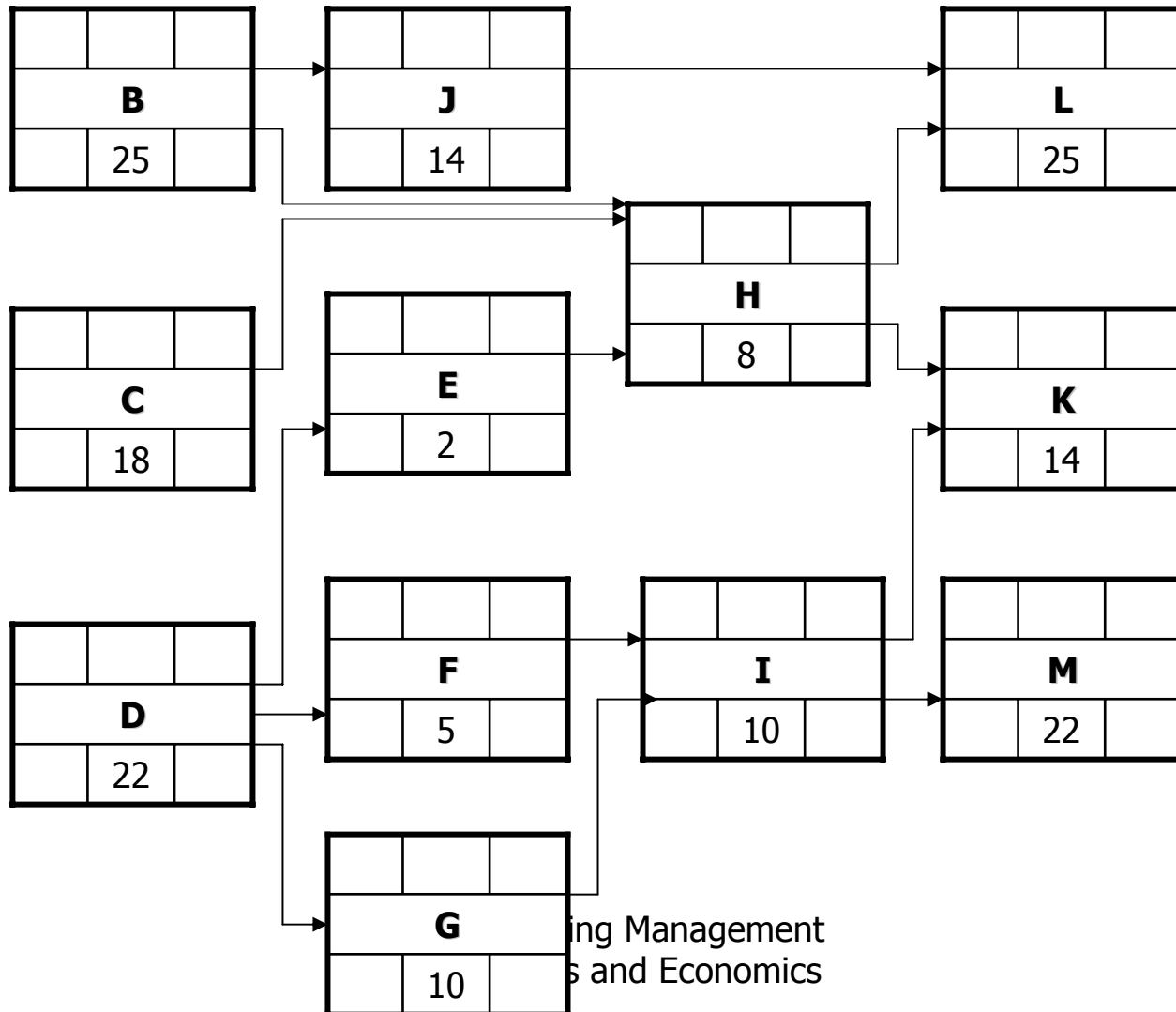
EXAMPLE # 1: PRECEDENCE (AON)



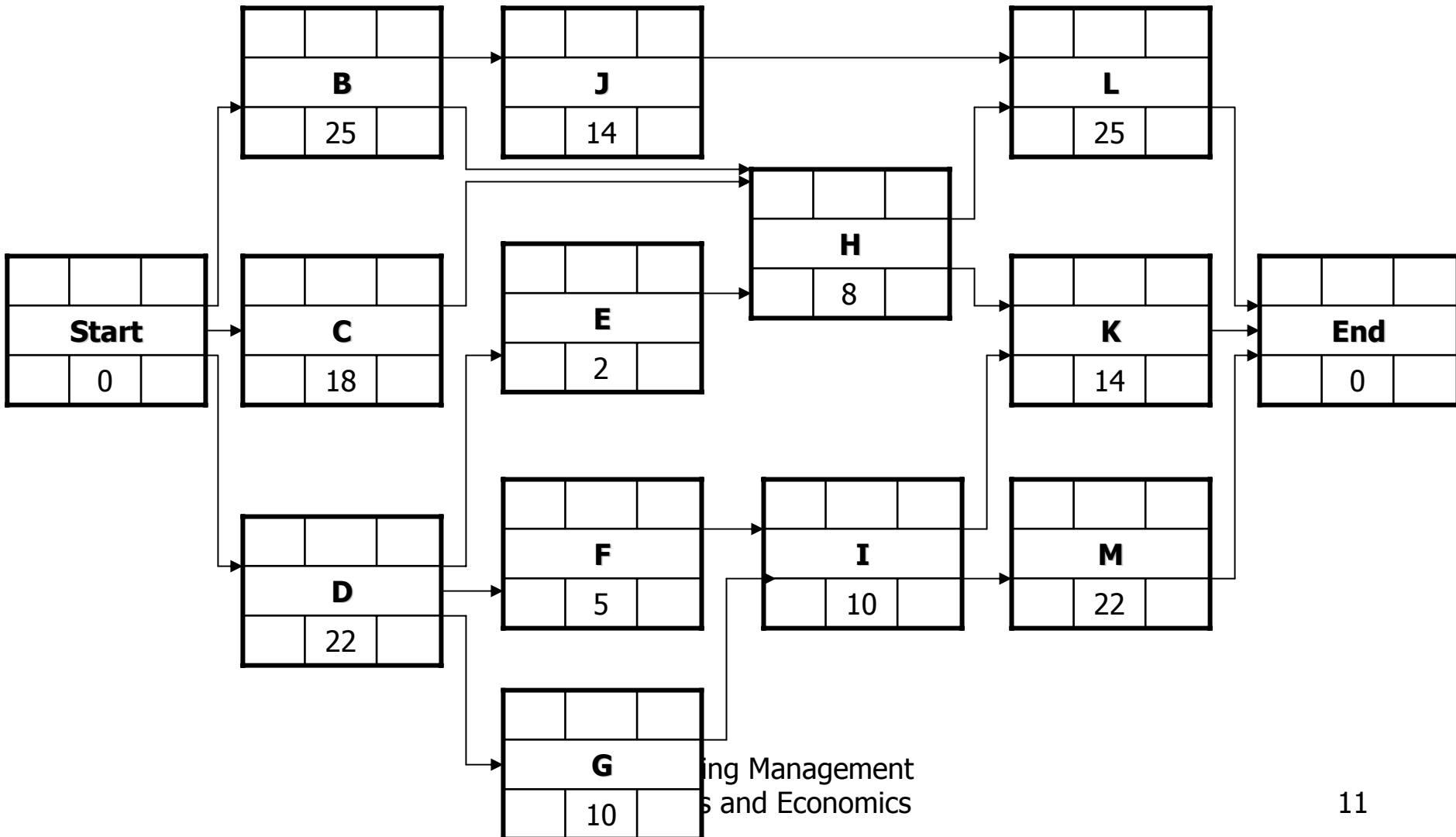
EXAMPLE # 1: PRECEDENCE (AON)



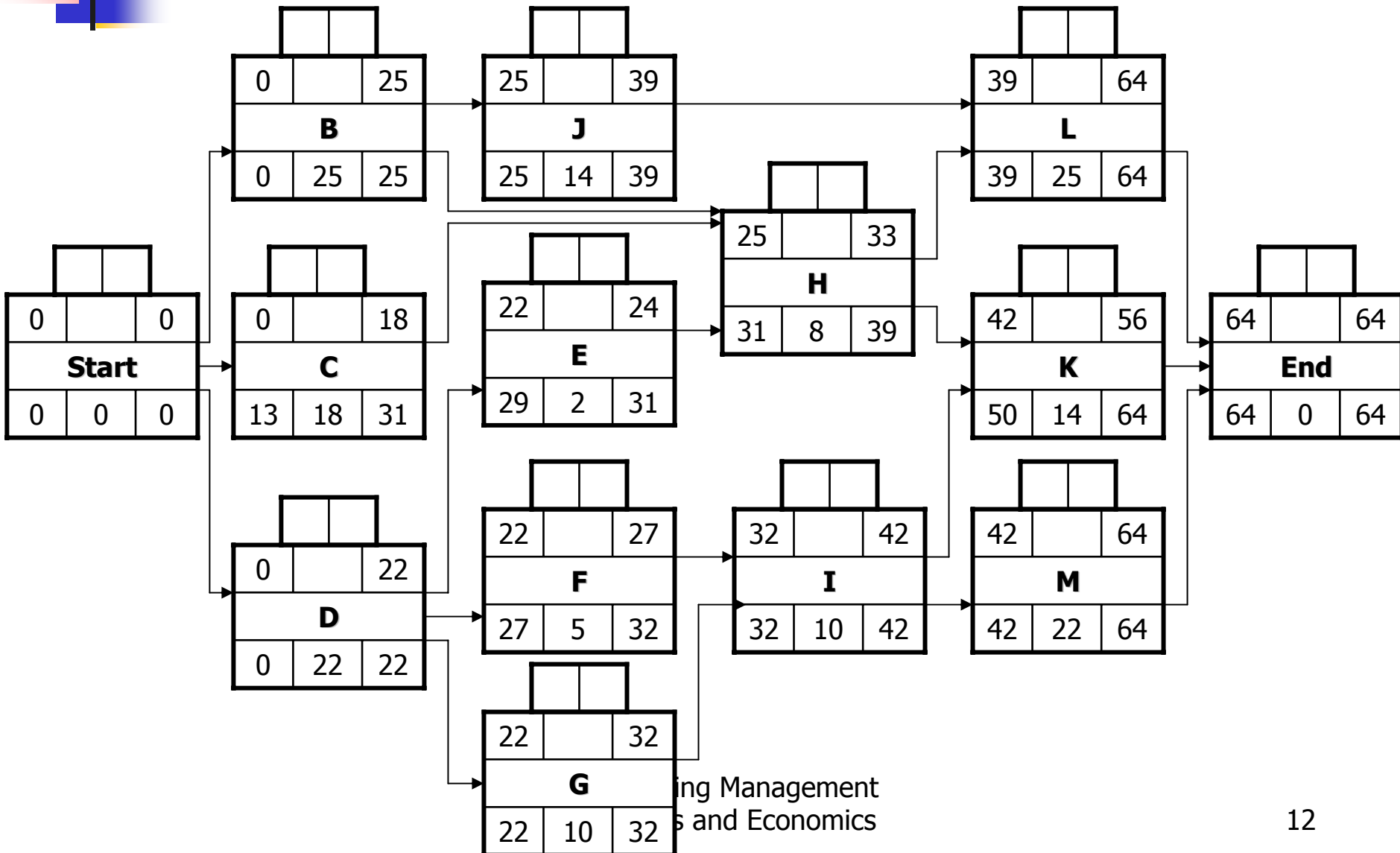
EXAMPLE # 1: PRECEDENCE (AON)



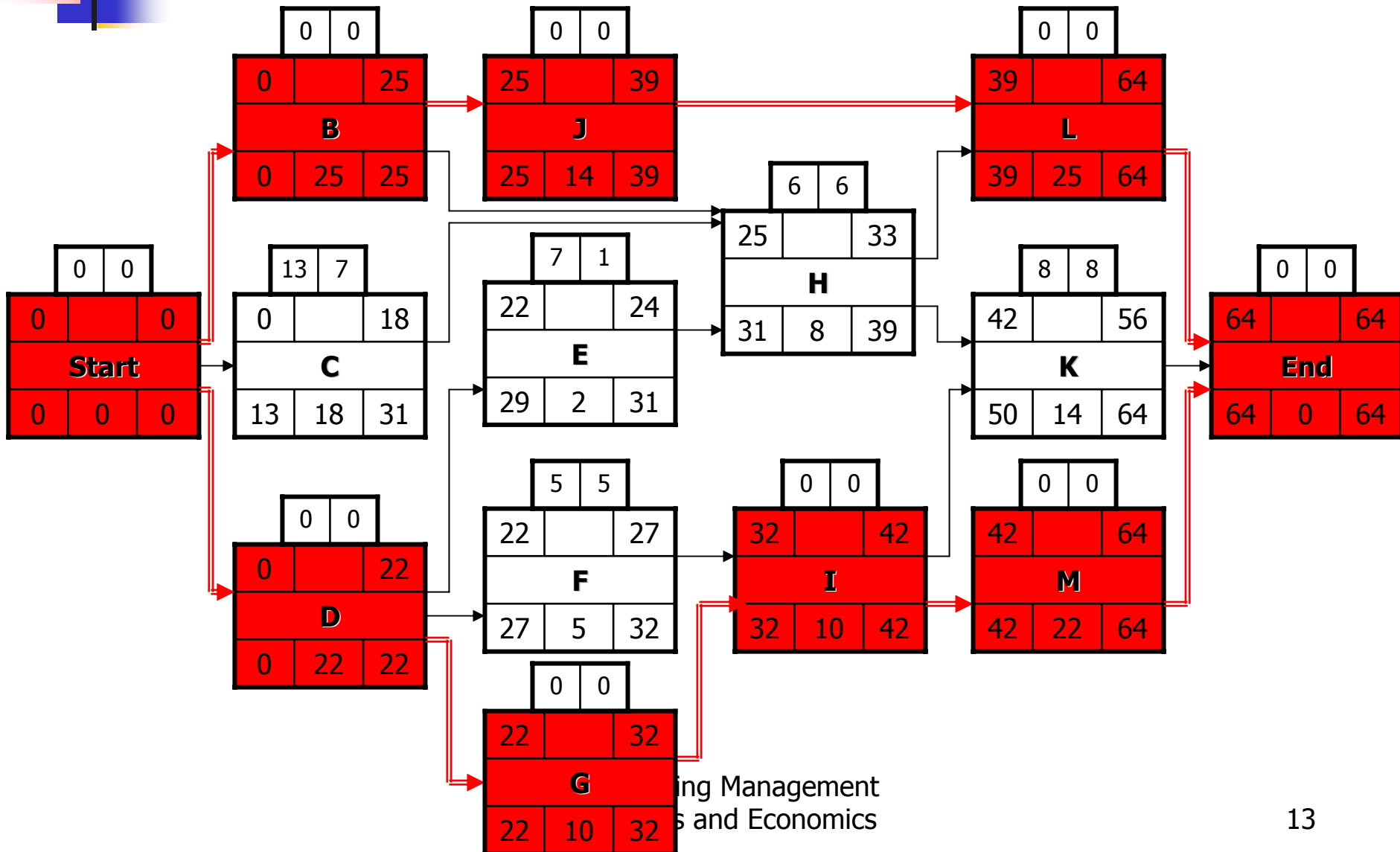
EXAMPLE # 1: PRECEDENCE (AON)



EXAMPLE # 3: PRECEDENCE (AON) "Backward Pass Calculation"



EXAMPLE # 3: PRECEDENCE (AON) "Backward Pass Calculation"





PROGRESS INDICES

ACWP = Actual Cost of Work Performed

BCWP = Budgeted Cost of Work Performed

BCWS = Budgeted Cost of Work Scheduled

SV = Schedule Variance = BCWP - BCWS

CV = Cost Variance = BCWP - ACWP



PROGRESS INDICES

Control Indices:

$$\text{Cost Index} = \frac{\text{ACWP}}{\text{BCWP}} \quad \begin{array}{l} > 1 \text{ Loss} \\ < 1 \text{ Save} \end{array}$$

$$\text{Time Index} = \frac{\text{BCWS}}{\text{BCWP}} \quad \begin{array}{l} > 1 \text{ Delay} \\ < 1 \text{ Save} \end{array}$$



PROGRESS INDICES

Control Indices:

$$\text{Project Cost Pred.} = \frac{\text{ACWP}}{\text{BCWP}} * \text{TPC}$$

$$\text{Project Time Pred.} = \frac{\text{BCWS}}{\text{BCWP}} * \text{TPT}$$

TPC = Total Project Cost

TPT = Total Project Time



EXAMPLE

- In a building construction project, the up-to-date report at the 6th month indicates that:

$$\text{BCWS} = \$54,560.00$$

$$\text{BCWP} = \$42,060.00$$

$$\text{ACWP} = \$44,130.00$$

The total project duration is 36 months and the estimated project cost is \$2,000,000.

- It is required to assess the project situation to-date and project this assessment to the end of the project from time and cost perspectives.



EXAMPLE: SOLUTION

$$\text{Cost Index} = \frac{\$44,130.00}{\$42,060.00} = 1.05 > 1 \text{ Loss}$$

$$\text{Time Index} = \frac{\$54,560.00}{\$42,060.00} = 1.30 > 1 \text{ Delay}$$

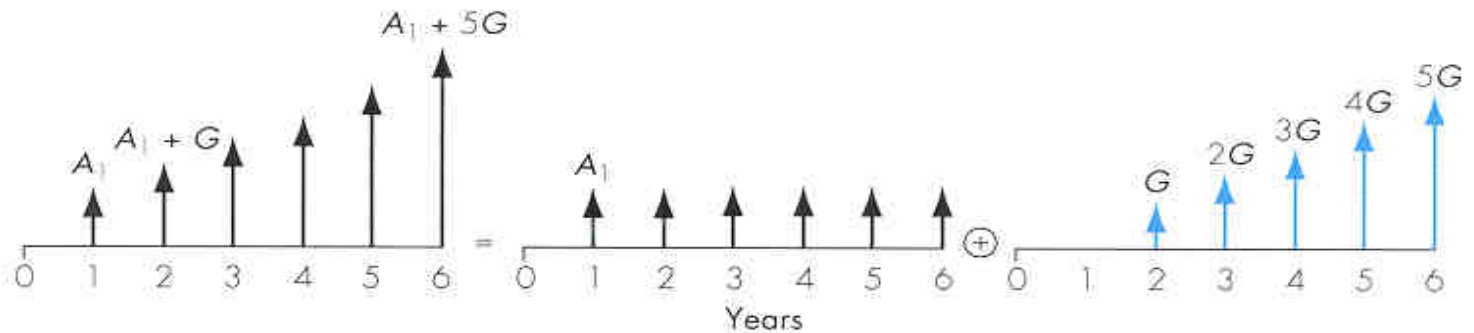


EXAMPLE: SOLUTION

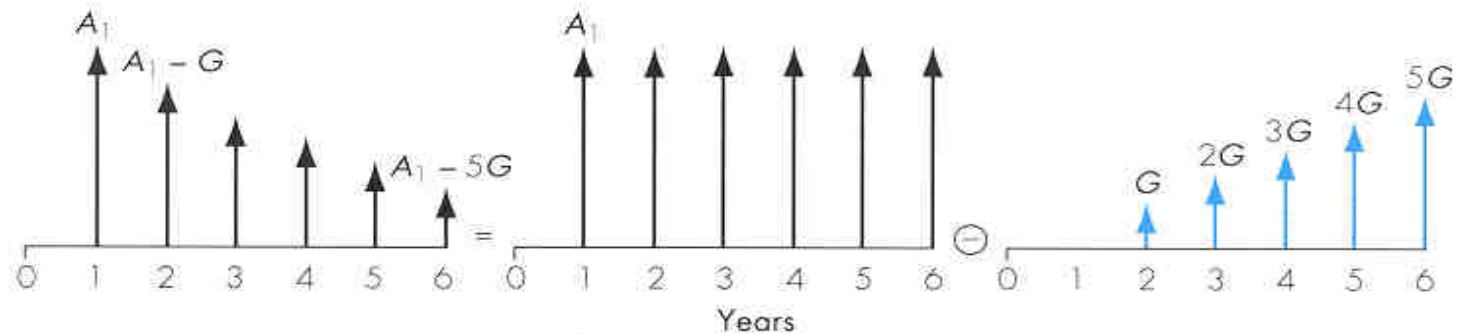
$$\begin{aligned}\text{Project Cost Pred.} &= 1.05 * \$2,000,000 \\ &= \$2,100,000\end{aligned}$$

$$\begin{aligned}\text{Project Time Pred.} &= 1.30 * 36 = \\ &= 46.80 \text{ months}\end{aligned}$$

GRADIENT SERIES AS A COMPOSITE SERIES



(a) Increasing gradient series



(b) Decreasing gradient series

Figure 4.27 Two types of linear gradient series as composites of a uniform series of N payments of A_1 and the gradient series of increments of constant amount G



METHOD 1:

Compute the present worth of the cash flows shown in the cash flow table below. Interest rate = 9%

Year	0	1	2	3	4	5
Cash Flow	-\$10,000	1,000	2,000	3,000	4,000	5,000

Solution:

$A = \$1,000/\text{yr}$ and $G = \$1,000/\text{yr}$.

$\text{NPW} = \text{PW of benefits} - \text{PW of costs}$

$$= 1,000 \times (P/A, 9\%, 5) + 1,000 \times (P/G, 9\%, 5) - 10,000$$

$$= 1,000 \times 3.890 + 1,000 \times 7.111 - 10,000 = \text{\$1001}$$

EFFECTIVE ANNUAL INTEREST RATE

- If Cash flow occurs similar to interest compounding duration: (i.e. monthly each, quarterly each, etc.)

$$i_a = \left(1 + r / M\right)^M - 1$$

r = nominal interest rate / yr

i_a = effective annual interest rate

M = number of interest periods / yr



Case I: When Payment Periods and Compounding periods coincide

Step 1: Identify the number of compounding periods (M) per year

Step 2: Compute the effective interest rate per payment period (i)

$$i = r/M$$

Step 3: Determine the total number of payment periods (N)

$$N = M \text{ (number of years)}$$

Step 4: Use the appropriate interest formula using i and N above



Example

A department store offers 24 month financing for a certain \$1,000 appliance at an "interest rate of 9% per year". The 24 equal end-of-month payments are computed as follows.

Principal		\$1,000.00
Interest at 9% per year = $0.09 \times 1,000 \times 2 =$		180.00
Credit investigation fee		18.08
Total to be repaid		\$1,198.08
Monthly payments	$\$1,198.08 / 24 =$	\$49.92

- (a) What is the effective annual interest rate a customer would actually pay for this financing
- (b) What is the nominal annual interest rate compounded monthly for this financing?



Example

Solution

(a) $49.92 = 1,018 \times (A/P, i, 24).$

Then, $(A/P, i, 24) = 0.04904.$

From interest tables, monthly interest rate (i) = 1.33%.

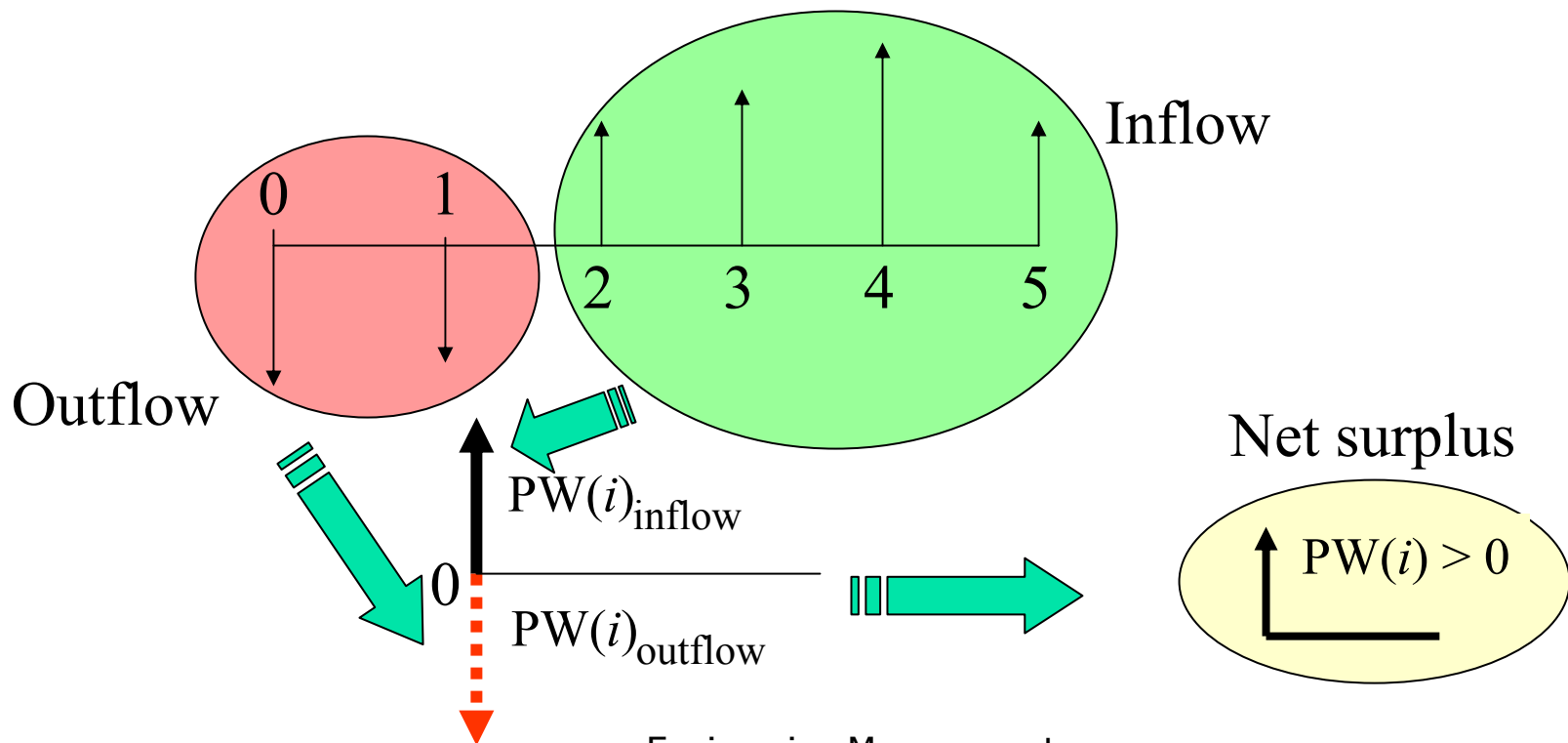
Effective annual interest rate (i_a) = $(1.013)^{12} - 1 = (F/P, 1.33\%, 12) - 1 = 16.77\%.$

(b) Nominal annual interest rate, compounded monthly,
 $r = 1.33\% \times 12 = 16\%.$

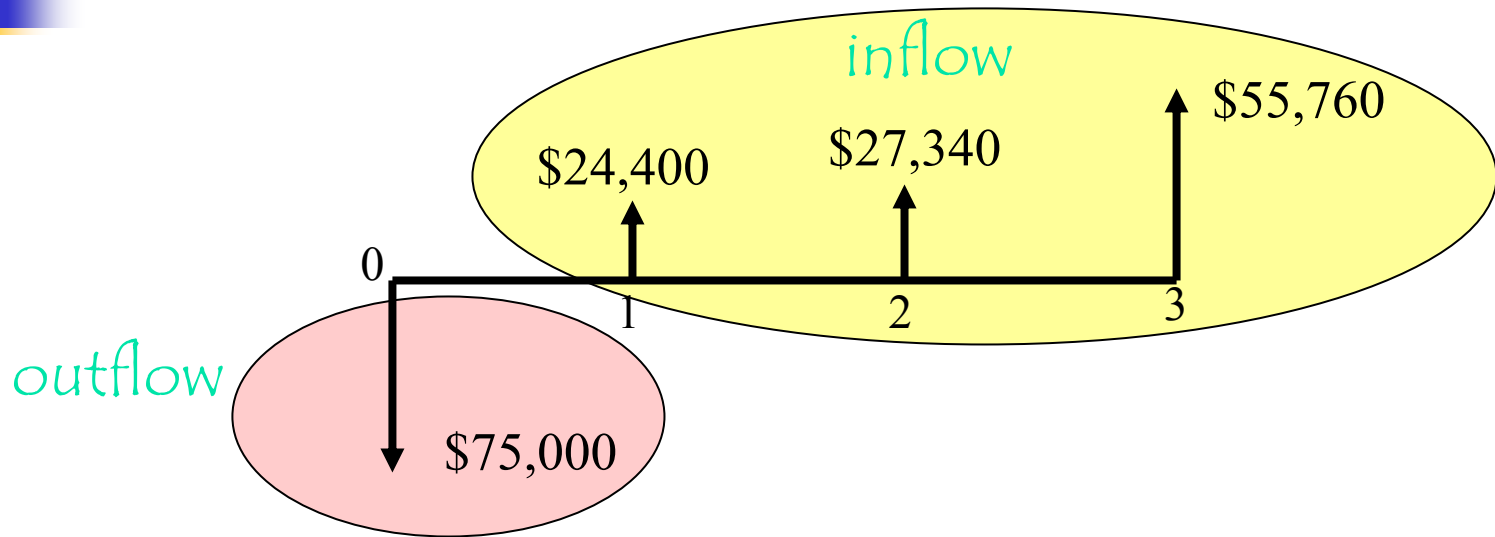
NET PRESENT WORTH MEASURE

Principle: Compute the equivalent net surplus at $n = 0$ for a given interest rate of i .

Decision Rule: Accept the project if the net surplus is positive.



EXAMPLE: TIGER MACHINE TOOL COMPANY



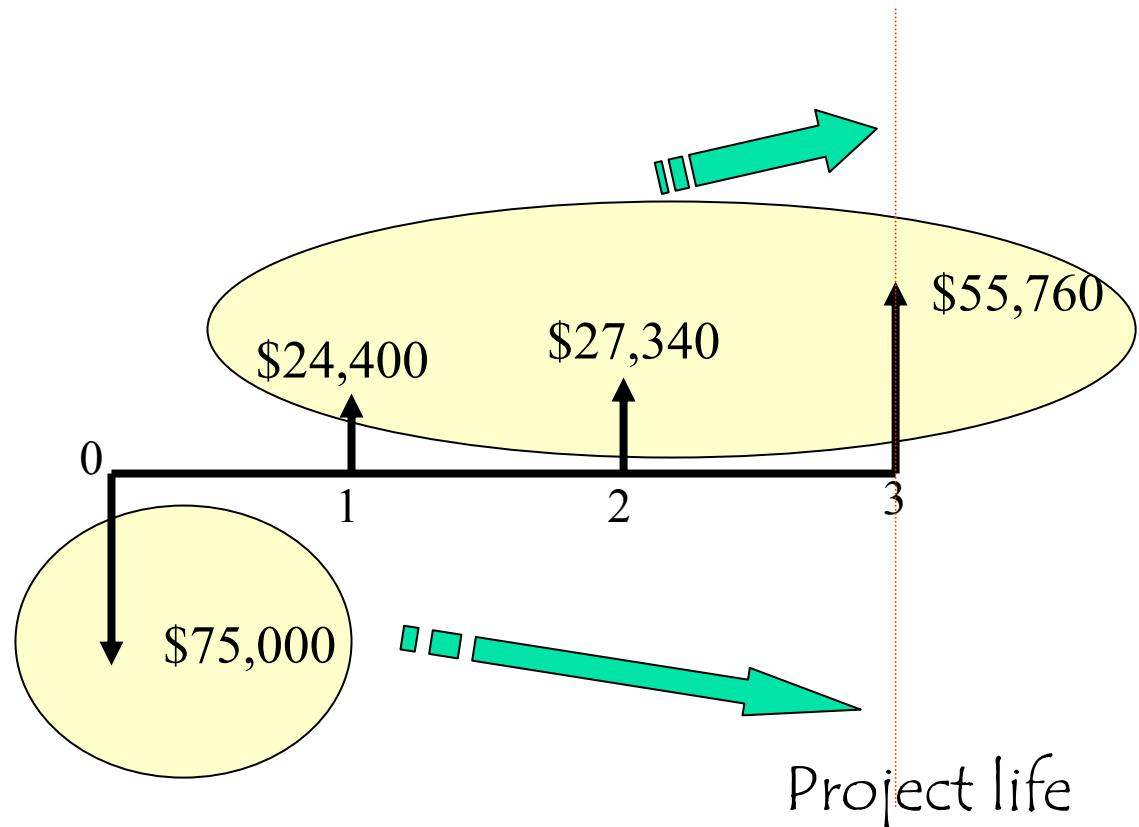
$$\begin{aligned} PW(15\%)_{\text{inflow}} &= \$24,400(P / F, 15\%, 1) + \$27,340(P / F, 15\%, 2) \\ &\quad + \$55,760(P / F, 15\%, 3) \\ &= \$78,553 \end{aligned}$$

$$PW(15\%)_{\text{outflow}} = \$75,000$$

$$\begin{aligned} PW(15\%) &= \$78,553 - \$75,000 \\ &= \$3,553 > 0, \text{ Accept} \end{aligned}$$

FUTURE WORTH CRITERION

- **Given:** Cash flows and MARR (i)
- **Find:** The net equivalent worth at the end of project life





Future Worth Criterion

$$\begin{aligned}FW(15\%)_{\text{inflow}} &= \$24,400(F / P, 15\%, 2) + \$27,340(F / P, 15\%, 1) \\ &\quad + \$55,760(F / P, 15\%, 0) \\ &= \boxed{\$119,470}\end{aligned}$$

$$\begin{aligned}FW(15\%)_{\text{outflow}} &= \$75,000(F / P, 15\%, 3) \\ &= \boxed{\$114,066}\end{aligned}$$

$$\begin{aligned}FW(15\%) &= \$119,470 - \$114,066 \\ &= \boxed{\$5,404 > 0, \text{ Accept}}\end{aligned}$$

Internal Rate of Return Lenders Viewpoint

- The interest rate paid on the unpaid balance of a loan such that the payment schedule makes the unpaid loan balance equal to zero when the final payment is made.

Year	Plan			
	A	B	C	D
0	\$(5,000.00)	\$(5,000.00)	\$(5,000.00)	\$(5,000.00)
1	\$ 1,400.00	\$ 400.00	\$ 1,252.28	\$ -
2	\$ 1,320.00	\$ 400.00	\$ 1,252.28	\$ -
3	\$ 1,240.00	\$ 400.00	\$ 1,252.28	\$ -
4	\$ 1,160.00	\$ 400.00	\$ 1,252.28	\$ -
5	\$ 1,080.00	\$ 5,400.00	\$ 1,252.28	\$ 7,346.64
IRR	8.00%	8.00%	8.00%	8.00%



Calculating IRR

- $PWB/PWC = 1$
- $1,252.28(P/A,i,5)/5,000 = 1$
- $(P/A,i,5) = 5,000/1,252.28 = 3.9927$

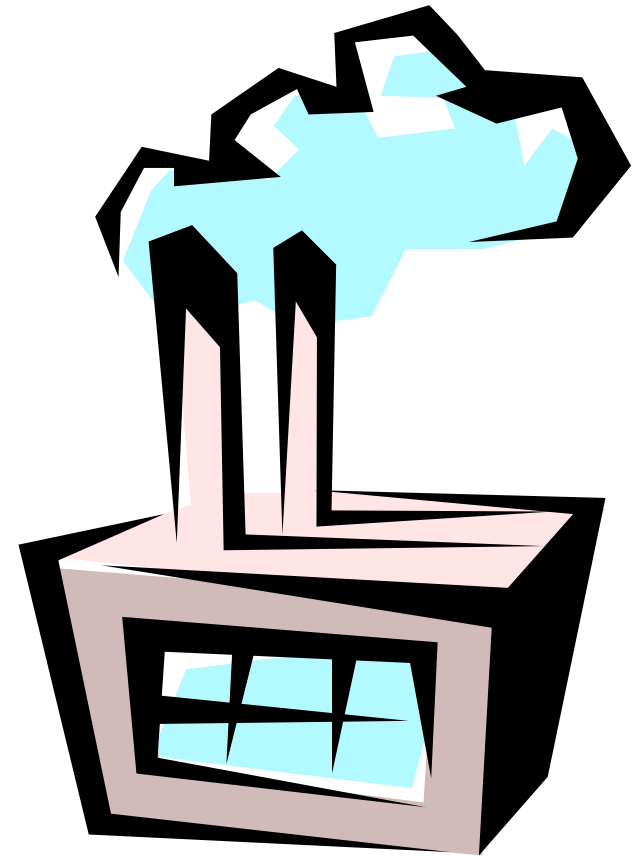
Example 7-1

From Compound Interest Tables

Interest rate	$(P/A,i,5)$
7%	4.100
8%	3.993
9%	3.890

LEARNING OBJECTIVES

- Define depreciation and book value?
- Depreciation methods:
 - (1) Straight Line (SL) method,
 - (2) Double Declining (DD) method,
 - (3) Sum of the Years digits (SOY),
 - (4) Production method,





STRAIGHT LINE METHOD

- Suppose that:

Purchase price = P

Salvage value = S

Service life = N

- Then, the depreciable amount = $P - S$
- Depreciation rate (R) = $1 / N$
- Then, depreciation amount = $(P - S) / N$
- Book value (BV) at m # of years =
 $P - m * [(P - S) / N]$

DOUBLE-DECLINING BALANCE METHOD

- If this method is applied to **new** equipment of **3 years** service life, the depreciation of this method is **approximately as twice as** Straight Line (**SL**) method. Therefore, it is called Double-Declining Balance (DDB).
- Depreciation rate (R) = $2.00/N$ (new)
R = $1.50/N$ (used)
- Depreciation amount =

$$\mathbf{R * BV} \text{ (at the previous year)}$$

SUM-OF-THE-YEARS (SOY) METHOD

- It is an accelerated method (fast write-off). It is faster in depreciation rates than straight line method.
- **SOY** = $1+2+3+4+\dots+N = \mathbf{N(N+1)/2}$
- Depreciation rate at year m is
 $R_m = (N-m+1)/SOY$
- Depreciation yearly amount is
 $D_m = R_m(P-S) = (N-m+1)(P-S)/SOY$
- **BV_m** at the end of year m =
 $= P - \{[m(N-(m/2)+0.5)](P-S)/SOY\}$



QUESTION OF THE COURSE?

I hope that you enjoyed **ENGR**
301 and get some benefits out
of it.