2019

Assignment_5

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Assignment – 5

Q 1: In the given problem from the network diagram, the longest path is the critical path,

Decision Variable:

Xij= 1 where any of the node were chosen else Xij =0

= x13 + x12 + x35 + x25 + x58 + x24 + x57 + x47 + x46 + x89 + x79 + x69

Objective Function,

Max, Z = 3x13 + 5x12 + 3x35 + 2x25 + 2x58 + 4x24 + 6x57 + 4x47 + 1x46 + 7x89 + 4x79 + 5 x69

35

S,T

Starting node:

$\mathbf{X_{13} + X_{12} = 1}$

Intermediate nodes:

$\mathbf{X_{12} - X_{25} - X_{24} = 0}$

$\mathbf{X_{13} - X_{35} = 0}$

$\mathbf{X_{24} - X_{46} - X_{47} = 0}$

$\mathbf{X_{35} + X_{25} - X_{58} - X_{57} = 0}$

$\mathbf{X_{46} - X_{69} = 0}$

$\mathbf{X_{57} + X_{47} - X_{79} = 0}$

$\mathbf{X_{58} - X_{89} = 0}$

Ending node:

$\mathbf{X_{89} + X_{79} + X_{69} = 1}$

Where $\mathbf{X_{IJ}}$ are binary

Q 2a: In the given problem, the objective function includes the price per share, the projected annual growth rate in the share price, and the anticipated annual dividend payment per share. The expression is as below

Profit = (**Price per share**) * (**Growth rate of share**) + (**Dividend per share**)

Hence the objective function is

Max, Z = 4 S1 + 6.5 S2 + 5.9 S3 + 5.4 H1 + 5.15 H2 + 10 H3 + 8.4 C1 + 6.25 C2

Subject to the constraints,

Investment constraint:

40 S1 + 50 S2 + 80 S3 + 60 H1 + 45 H2 + 60 H3 + 30 C1 + 25 C2 <= 2500000

The number of shares invested in any stock must be a multiple of 1000

1000 S1 >= 0; 1000 H1>= 0; 1000 C1>= 0;

1000 S2 >= 0; 1000 H2>= 0; 1000 C2>= 0;

1000 S3 >= 0; 1000 H3 >= 0;

At least $100,000 must be invested in each of the eight stocks

40 S1 >= 100000; 50 S2 >= 100000; 80 S3 >= 100000; 60 H1 >= 100000;
45 H2 >= 100000; 60 H3 >= 100000; 30 C1 >= 100000; 25 C2 >= 100000

The client has stipulated that no more than 40% of the investment be allocated to any one of the 3 Sectors

1) **40 S1 + 50 S2 + 80 S3 <= 1000000**
2) **60 H1 + 45 H2 + 60 H3 <= 1000000**
3) **30 C1 + 25 C2 <= 1000000**

Where **S1, S2, S3, H1, H2, H3, C1, C2 >= 0** are integers.

Using lpsolve with integer restriction we get the objective function, maximum returns as **487145.2** and number of stocks are	The amount invested in each stock
S1= 2500 S2= 6000 S3= 1250 H1= 1667 H2= 2223 H3= 13332 C1= 30000 C2= 4000.	S1= 100000 S2= 300000 S3= 100000 H1= 100020 H2= 100035 H3= 799920 C1= 900000 C2= 100000

Q 2b: Using lpsolve without integer restriction we get the Objective Function, maximum returns as **487152.8** and number of stocks are	The amount invested in each stock
S1= 2500.0 S2= 6000.0 S3= 1250.0 H1= 1667.667 H2= 2222.222 H3= 13333.333, C1= 30000.0, C2= 4000.0	S1= 100000 S2= 300000 S3= 100000 H1= 100000 H2= 100000 H3= 800000 C1= 900000 C2= 100000.

Percentage difference in Objective Functions with and without integer restriction is **0.00156**