Problem 4.2

year	1	2	3	4	5	6
current s	5	5.3	5.6	5.8	6	6.1
forecast	5.60%	5.90%	6.07%	6.25%	6.32%	

Problem 4.3

year	bond 1	bond 2	Zero
1	9	7	0
2	9	7	0
3	9	7	0
4	9	7	0
5	109	107	100
Price	101	93.2	65.9

Zero-coupon bond can be constructed by selling 3.5 bond 1 and buying 4.5 bond 2. Then we have only a payment 100 at the end of the fifth year.

Problem 4.11

Period (k)	0	1	2	3	4	5	6	
CFS	-40	10	10	10	10	10	10	
Spot Rate (sk)		5.00%	5.30%	5.60%	5.80%	6.00%	6.10%	
Discount (dk)		95.24%	90.19%	84.92%	79.81%	74.73%	70.10%	
PV	-40	9.5238	9.0187	8.492	7.981	7.4726	7.0098	9.4979 (a)

	Short Rates					
Forward Rates	5.00%	5.30%	5.60%	5.80%	6.00%	6.10%
	5.60%	5.90%	6.07%	6.25%	6.32%	
	6.20%	6.30%	6.47%	6.50%		
	6.40%	6.60%	6.60%			
	6.80%	6.70%				
	6.60%					

Period	0	1	2	3	4	5	6
CFS	-40	10	10	10	10	10	10
Short Rates	5.00%	5.60%	6.20%	6.40%	6.80%	6.60%	
Discount (dk)	0.9524	0.947	0.9416	0.9398	0.9363	0.9381	
PV	9.4979	51.973	44.324	36.453	28.146	19.381	10

Problem 4.13

Data:

YEAR	1	2	3	4	5	6	7
	500	900	600	500	100	100	100

Obligations	Year	Spot		d	PV Oblig	Dobl
500	1	7.67%	1.159283	0.928764	464.3819	431.3011
900	2	8.27%	1.269183	0.853068	767.7613	1418.235
600	3	8.81%	1.401765	0.776236	465.7414	1284.095
500	4	9.31%	1.560628	0.700423	350.2115	1281.535
100	5	9.75%	1.74754	0.628026	62.80256	286.1165
100	6	10.16%	1.968645	0.559573	55.95726	304.7781
100	7	10.52%	2.226009	0.496494	49.64938	314.4641
0	8	10.85%	2.527093	0.438646	0	0
		Total		PV	2216.505	5320.525
					Duration	2.400411

P1	65.98	P1*X1+P2*X2-PV=	-0.000229 =a
P2	101.66	P1*X1*D1+P1*X2*D2-PV*D=	4.73E-05 =b
D1	7.11		
D2	3.8	Minimize	a*a+b*b 5.49E-08
X1	-14.20459049	Variable	
X2	31.02227021	Variable	

Problem 5.2

The Road

The zero-one problem is the same as in Example 5.2 with the following additional constraint:

$$(x_2 + x_4)(1 - (x_6 + x_7)) = 0$$

Transportation Alternatives

			Cost($1000)	NPV($1000)	Optimal X-values	Cost	NPV	Goals
	Road between Augen and Burger							
1		Concrete, 2 lanes	2,000	4,000	0	0.000	0.000	
2		Concrete, 4 lanes	3,000	5,000	0	0.000	0.000	
3		Asphalt, 2 lanes	1,500	3,000	0	0.000	0.000	
4		Asphalt, 4 lanes	2,200	4,300	1	2200.000	4300.000	1
	5	Repair existing	500	1,000	0	0.000	0.000	
	6	Add lane	1,500	1,500	1	1500.000	1500.000	
	7	New structure	2,500	2,500	0	0.000	0.000	1
	8	Traffic lights	100	300	0	0.000	0.000	
	9	Turn lanes	600	1,000	0	0.000	0.000	
	10	Underpass	1,000	2,000	1	1000.000	2000.000	1
						4700.000	7800.000	

Constraint Budget ($K)= 5000

		#Chosen	#Available
Road between Augen and Burger	(1-4)	1	1
Bridge at Cay Road	(5-7)	1	1
Traffic Control in Downberg	(8-10)	1	1
Concrete or Asphalt, 4 lanes		1	
Add lane or New structure		1	

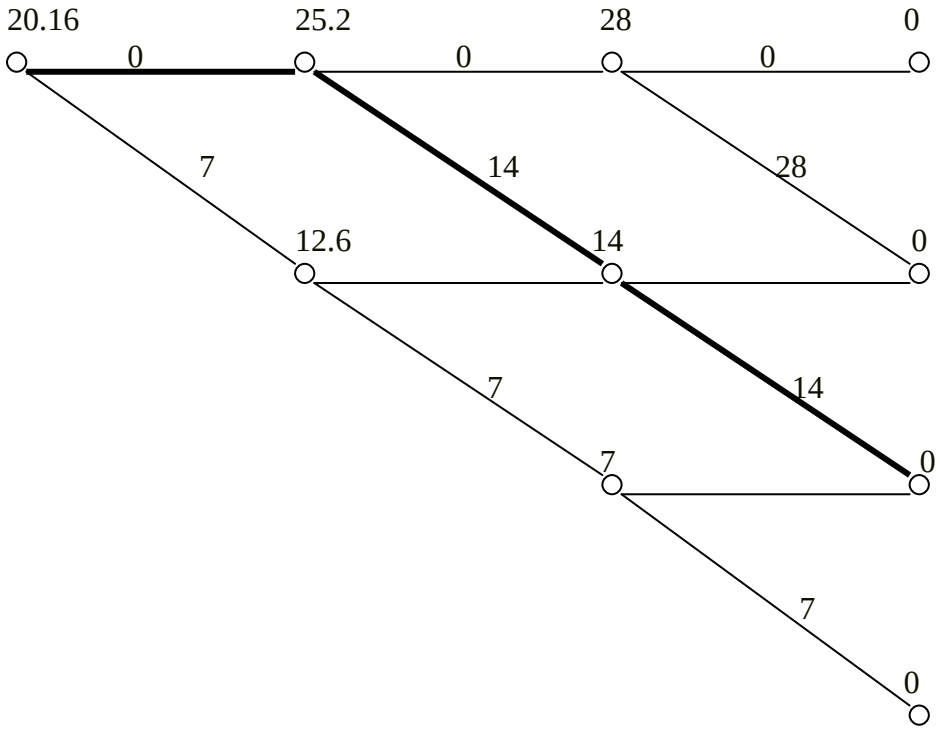
Problem 5.7

The fishing problem

Problem: Each season there is the choice to fish or not to fish; if you fish then you will catch 70% of the fish in the lake and the fish will restock to their original value by the next season; if you do not fish then the amount of fish in the lake will double by the next season; the initial fish population is 10 tons; the profit is $1 per ton; the interest rate is constant at 25%; the discount factor is .8 each year; you have three seasons to fish

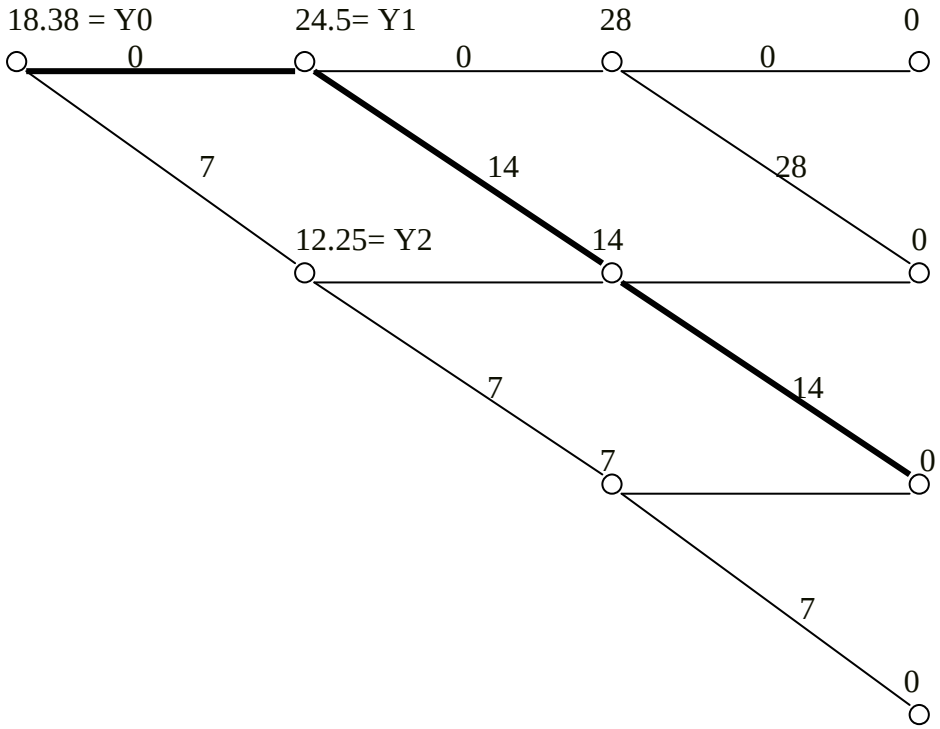
Example in book at 25% interest rate (1/1.25=0.8 discount rate)

14+0.8*14=25.2 is > 0.8*28=22.4
7+0.8*7=12.6
0.8*25.2=20.16



At 33% interest rate (1/1.33=0.75 discount rate)

14+0.75*14=24.5 is > 0.75*28=21
7+0.75*7=12.25
0.75*24.5=18.38



Therefore the solution does not change when the interest rate increases from 25% to 33%.

The critical value of the discount factor at which solution would change is found below.

Y1:No-fishing node after the initial node (chose to not fish for first season), the value of the node is:
$Y1=14+14d$

Y2: The second node (chose to fish for first season), is:
$Y2=7+7d$

The initial value is then:
$Y0=\max(14d(1+d), 7(1+d+dd))$

In order to find the critical value of the discount factor, these two comparisons are set equal and solved:
$14d(1+d)=7(1+d+d^2)$
$14d+14d^2=7+7d+7d^2$
$7d^2+7d-7=0$

using quadratic equation, $d=(-7+\sqrt{(7^2-4(-49)))}/(2*7)=0.618$

The solution of the fishing problem will change when the discount factor reaches the critical value of .618

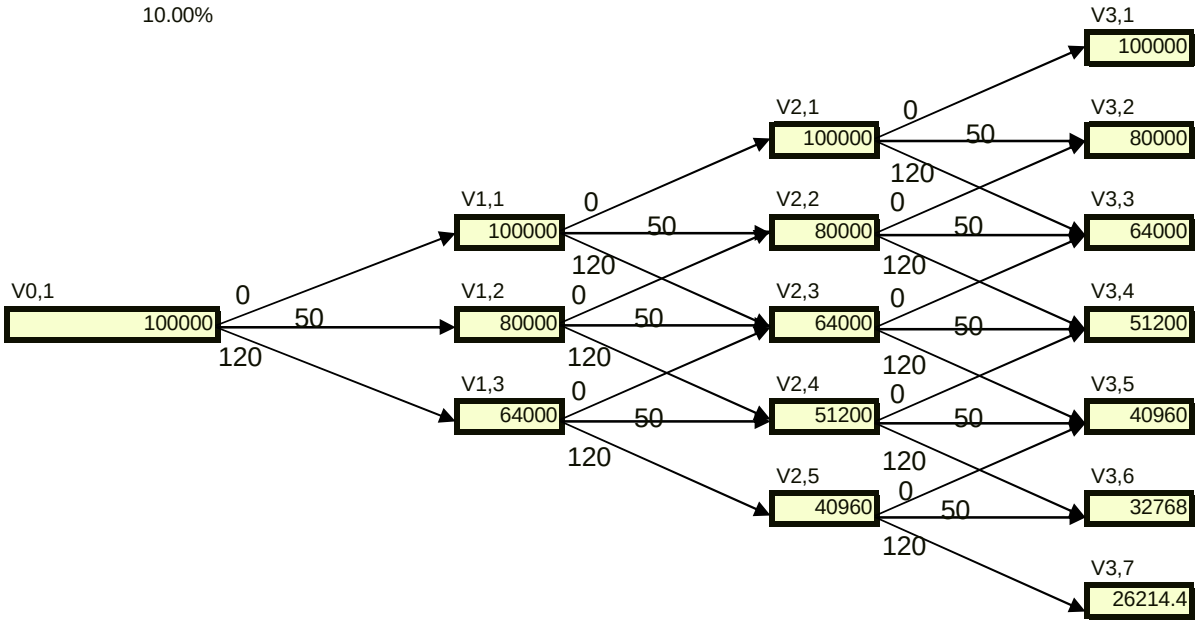
Problem 5.9

Choices	Action	Cost	Pump out
A	not pump	0	0.00%
B	normal pump	50000	20.00%
C	enhanced pump	120000	36.00%

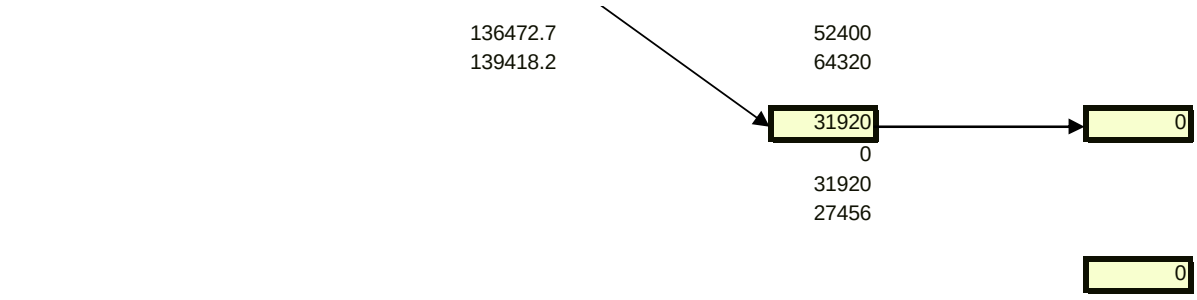
Barrel price 10

r 10.00%

a)



Periods:	0	1	2	3
				0
			240000	0
			0	
			150000	
			240000	
		340363.6	168000	0
		218181.8	0	
		302727.3	110000	
		340363.6	168000	
b)	366743.8017	226472.7	110400	0
	309421.4876	152727.3	0	
	355884.2975	210363.6	78000	
	366743.8017	226472.7	110400	
		139418.2	64320	0
		100363.6	0	



Max PV	#########

Max path = enhance pump first year then enhance pump second year then normal pump third year