Investment under Uncertainty

Demand curve: P = A - B*Q
Fixed cost: 20 million
Marginal cost: 0
Probability a hit: 15%
Interest rate: 5%

If product is a hit:

	A	300
	B	0.002

Q	P	TR	MR	MC	MR-MC
74995	150.01	11,250,000		0.00	
74996	150.01	11,250,000	0.02	0.00	0.02
74997	150.01	11,250,000	0.01	0.00	0.01
74998	150.00	11,250,000	0.01	0.00	0.01
74999	150.00	11,250,000	0.01	0.00	0.01
75000	150.00	11,250,000	0.00	0.00	0.00
75001	150.00	11,250,000	0.00	0.00	0.00
75002	150.00	11,250,000	-0.01	0.00	-0.01
75003	149.99	11,250,000	-0.01	0.00	-0.01
75004	149.99	11,250,000	-0.01	0.00	-0.01
75005	149.99	11,250,000	-0.02	0.00	-0.02

Would charge $150 and sell 75,000 copies for a total profit of
11.25 million dollars (not counting the initial investment).

Cash flow of profits:
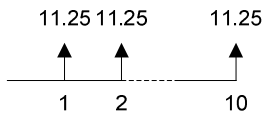
PV of payments forever = 11.25/r =   225.00 million
PV of payments after 10 = 225/(1+r)^10 =   138.13 million
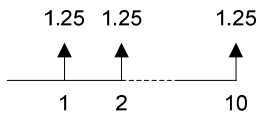PV of payments 1-10 is the difference: 86.87 million

If product is a flop:

A		100			
B		0.002			

| Q	P	TR	MR	MC	MR-MC
24995	50.01	1,250,000		0.00	
24996	50.01	1,250,000	0.02	0.00	0.02
24997	50.01	1,250,000	0.01	0.00	0.01
24998	50.00	1,250,000	0.01	0.00	0.01
24999	50.00	1,250,000	0.01	0.00	0.01
25000	50.00	1,250,000	0.00	0.00	0.00
25001	50.00	1,250,000	0.00	0.00	0.00
25002	50.00	1,250,000	-0.01	0.00	-0.01
25003	49.99	1,250,000	-0.01	0.00	-0.01
25004	49.99	1,250,000	-0.01	0.00	-0.01
25005	49.99	1,250,000	-0.02	0.00	-0.02

Would charge $50 and sell 25,000 copies for a total profit of
1.25 million dollars (not counting the initial investment).

Cash flow of profits:

1.25	1.25	1.25
1	2	10

PV of payments forever = 1.25/r =   25.00 million
PV of payments after 10 = 25/(1+r)^10 =   15.35 million
PV of payments 1-10 is the difference: 9.65 million

Decision tree:

86.87 − 20 = 66.86

Yes
15%

Hit?

Write
Program?

Yes

No
85%

9.65 − 20 = -10.35

No
0
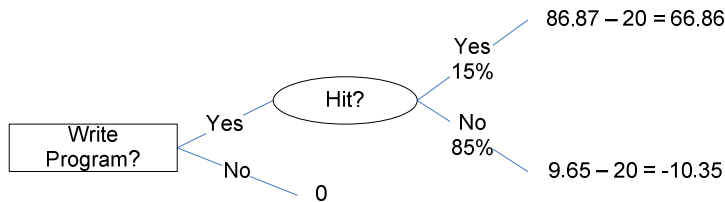
Expected value of writing the program:

EV = 0.15*(66.86) + 0.85*(-10.35)
EV =   10.03   +   -8.80
EV =   1.23 million

Yes, the firm should go ahead with the project. It has an expected value that
is greater than zero (although the project is VERY risky).