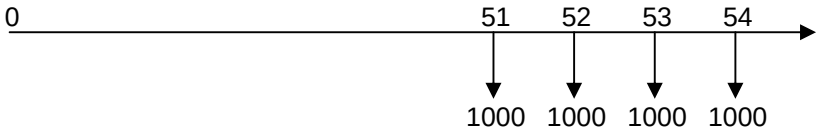
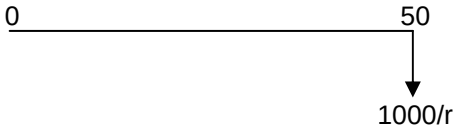
Global Warming Exercise
Notes on Solution

Present values of potential cash flows, in billions

Damage if warming occurs:

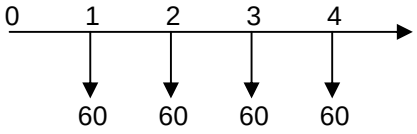



Equivalent to:



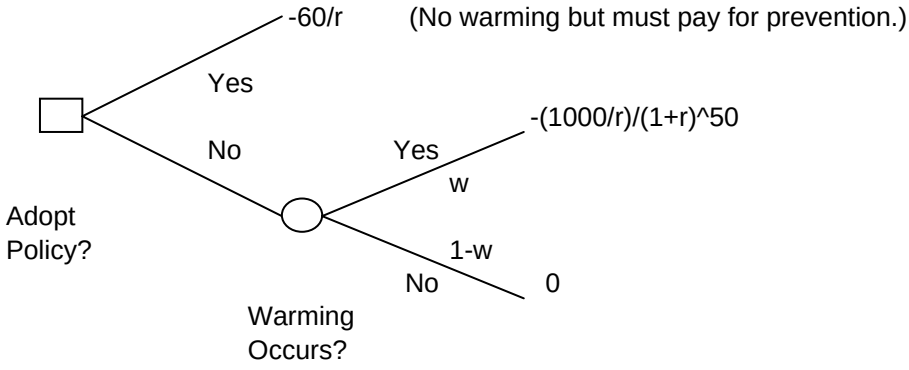

PV = (1000/r)/(1+r)^50

Cost of preventative policy:




PV = 60/r

Building the decision tree:



Expected value of uncontrolled warming (lower branch on the tree above):

EV(no policy) = -w*(1000/r)/(1+r)^50 + (1-w)*0

r 5%
w 10%

EV(no policy) = -0.10 * 20000 /( 1.05 )^ 50 = -174

Expected value of policy:

EV(policy) = -60/r
EV(policy) = -1200

1 A risk neutral agent would not adopt the preventative policy. The present value of its costs is 1.2 trillion dollars while it would be possible to compensate for the expected future damages of warming by establishing a trust fund with an initial deposit of 174 billion. It is not a close decision because the chance of warming is relatively low and the warming doesn't occur until far in the future.

2a Maximum interest rate where it would make sense to adopt the policy is the one where the two EVs are identical:

EV(no policy) = EV(policy)

w*(1000/r)/(1+r)^50 + (1-w)*0 = 60/r

w*(1000/r)/(1+r)^50 = 60/r

plugging in w=0.1 and simplifying 0.1*1000 to 100:

(100/r)/(1+r)^50 = 60/r

100/(1+r)^50 = 60

100/60 = (1+r)^50

(100/60)^(1/50) = 1+r

(100/60)^(1/50) - 1 = r

( 1.67 )^ 0.02 -1 = 1.0269%

checking:

5842.9 = 5842.9

2b Minimum value of w where it would make sense to adopt the policy when r=5%:

EV(no policy) = EV(policy)

w*(1000/r)/(1+r)^50 + (1-w)*0 = 60/r

w*(1000/r)/(1+r)^50 = 60/r

plugging in r=0.5 and making use of the fact that 1/0.05 = 20:

w*(20,000)/(1.05)^50 = 1200

w = 1200*((1.05)^50)/20,000

w = 68.80%

checking:

1200 = 1200

If the policy maker is risk neutral it only makes sense to adopt the preventative policy if either the interest rate is relatively low or the probability of warming is relatively high.