IE5203 Decision Analysis
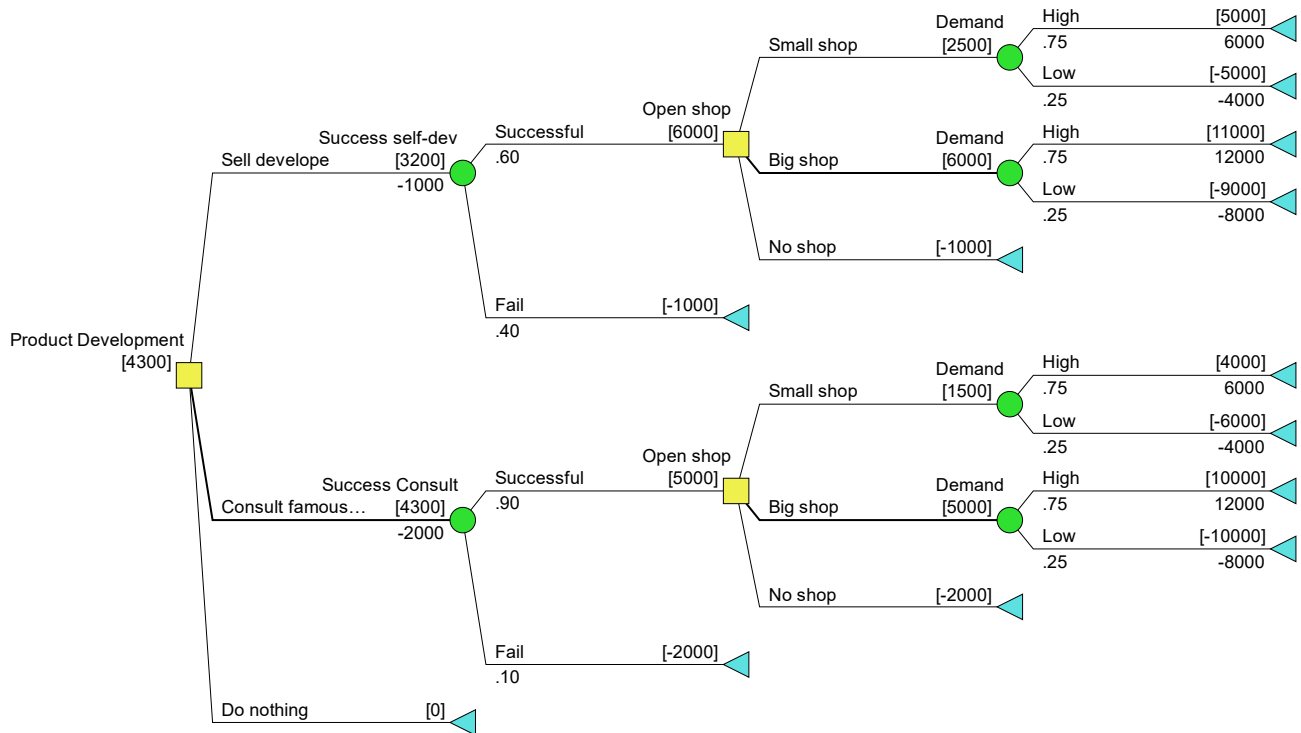## Solutions to Assignment #1

(*a*) Base Model Analysis

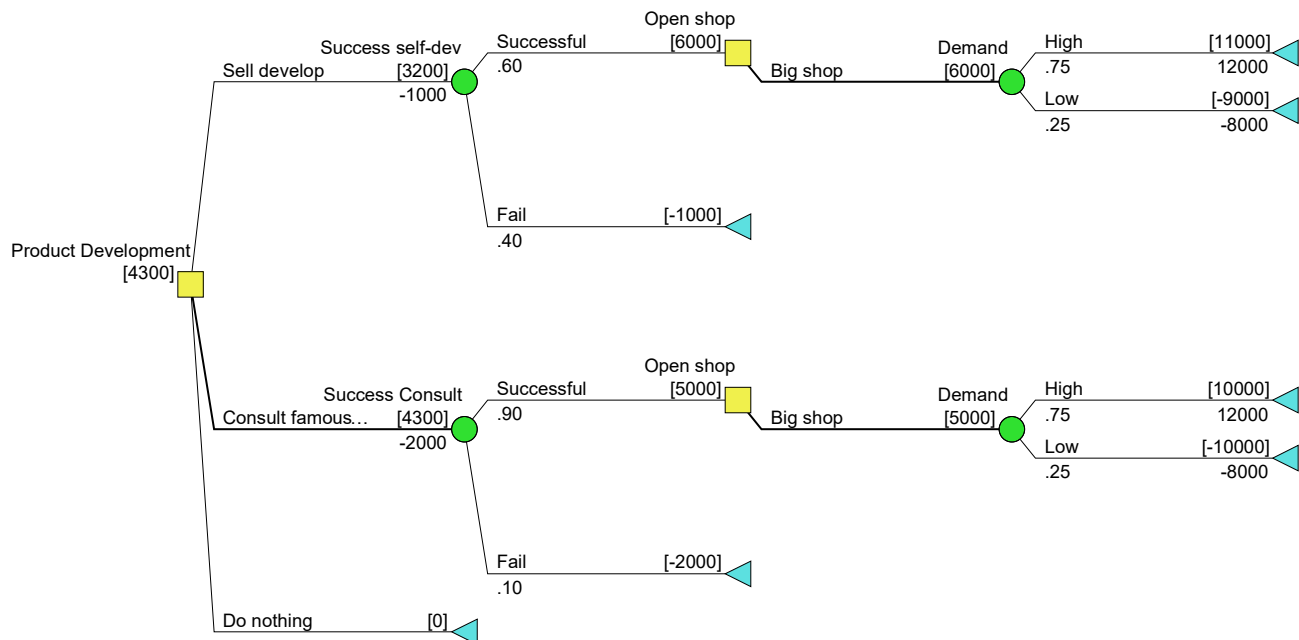- Decision tree representing Mabel's decision problem:

- Mabel's optimal decision policy is:

> Consult Famous Baker.
> If Product Development is successful:
>> Open Big Shop.
> Else
>> Terminate project.

- Optimal Certainty Equivalent = $4,300.00

(*b*) Initial Alternatives Risk Profile Plotting

• Prune the none optimal sub-decision trees:

• End-points Values and their Probabilities for the three initial alternatives:

Self-develop:

Value	Probability
11,000	0.6 × 0.75 = 0.45
-9,000	0.6 × 0.25 = 0.15
-1,000	0.4

Value	Probability
-9,000	0.15
-1,000	0.40
11,000	0.45

Consult famous baker:

Value	Probability
10,000	0.9 × 0.75 = 0.675
-10,000	0.9 × 0.25 = 0.225
-2,000	0.1

Value	Probability
-10,000	0.225
-2,000	0.100
10,000	0.675

Do Nothing:

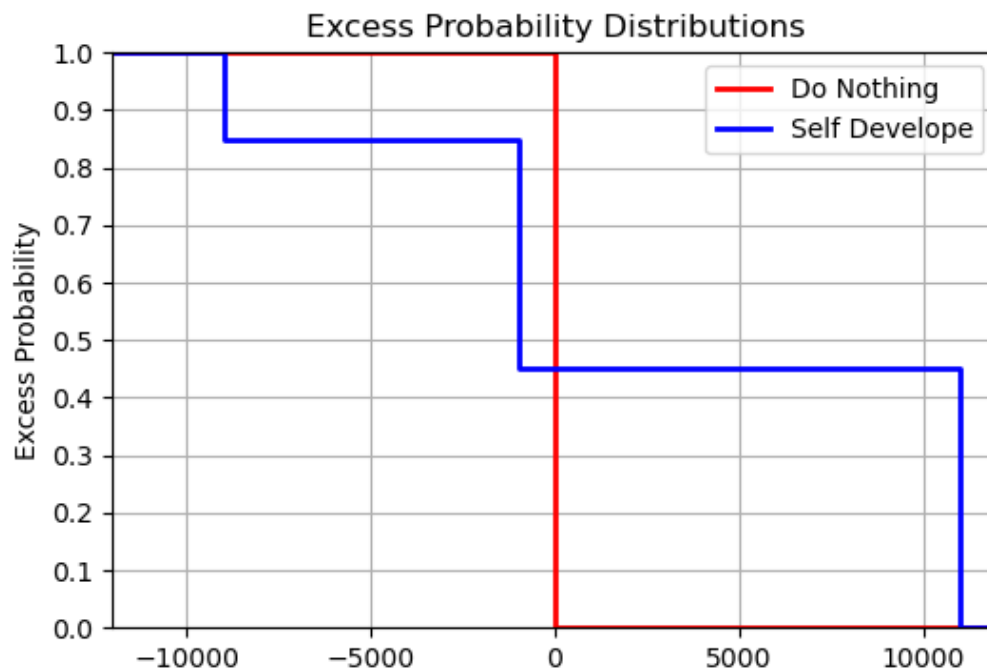| Value	Probability
0	1

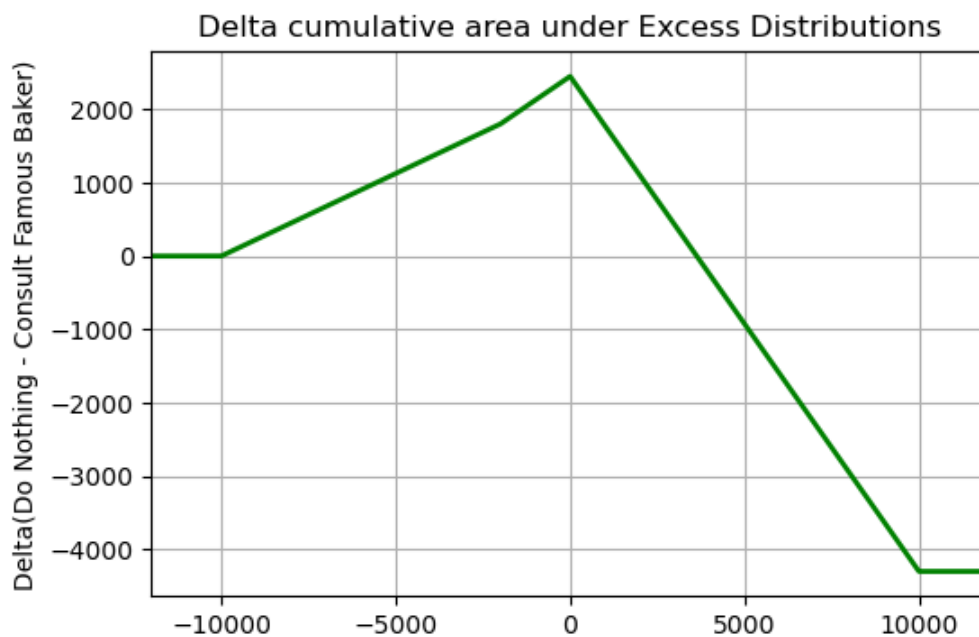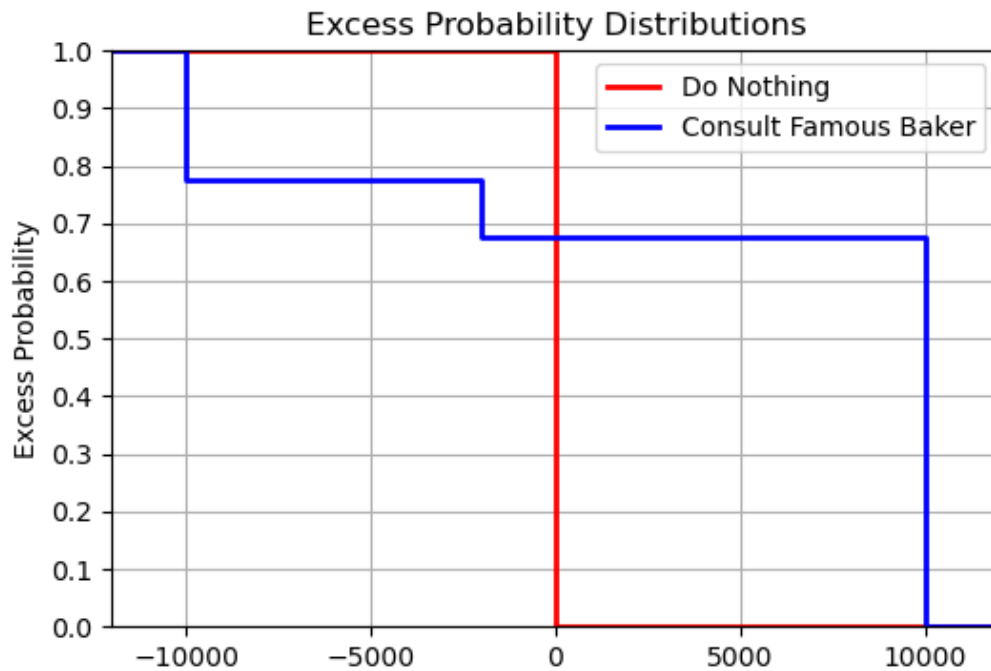- Risk Profiles for the three initial alternatives:
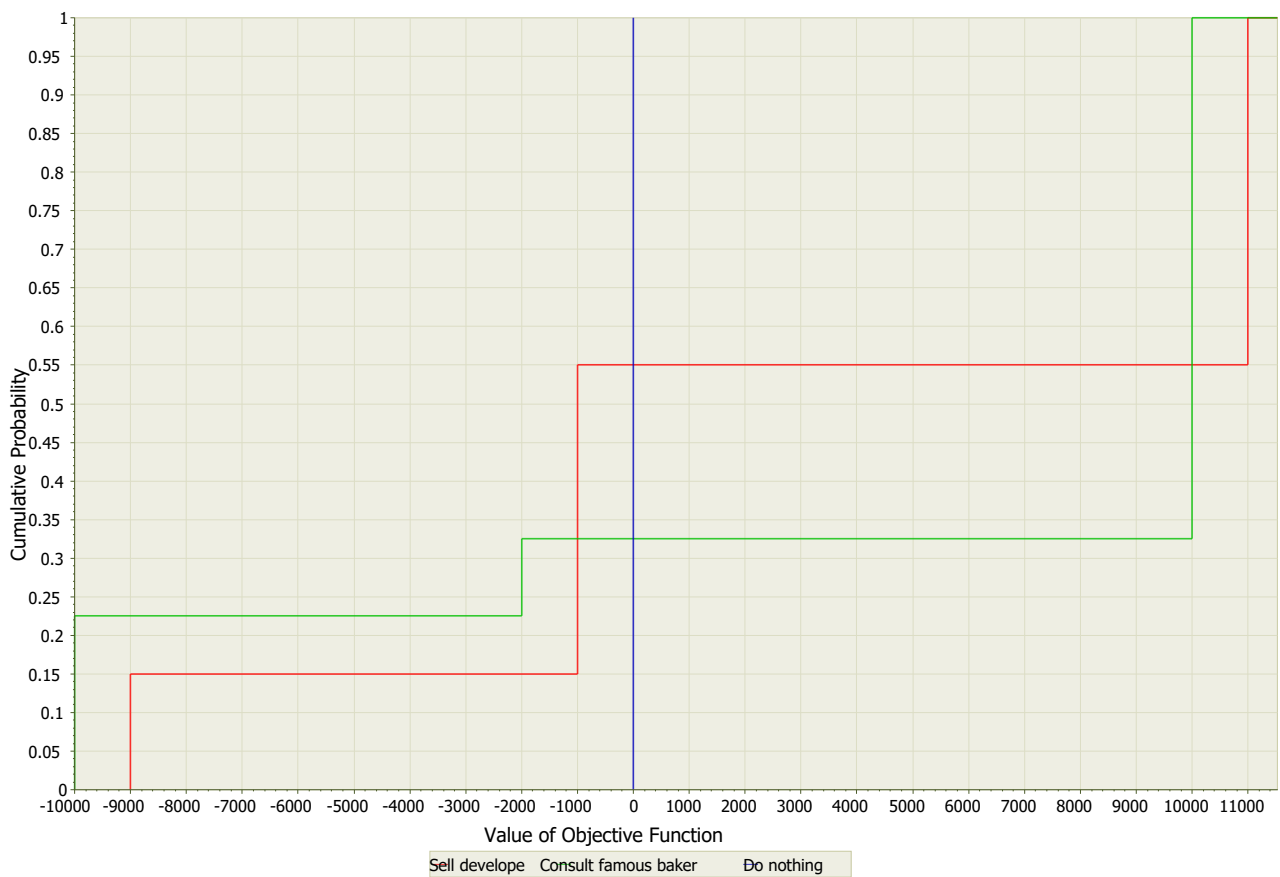
(*c*)   **Stochastic Dominance Analysis**

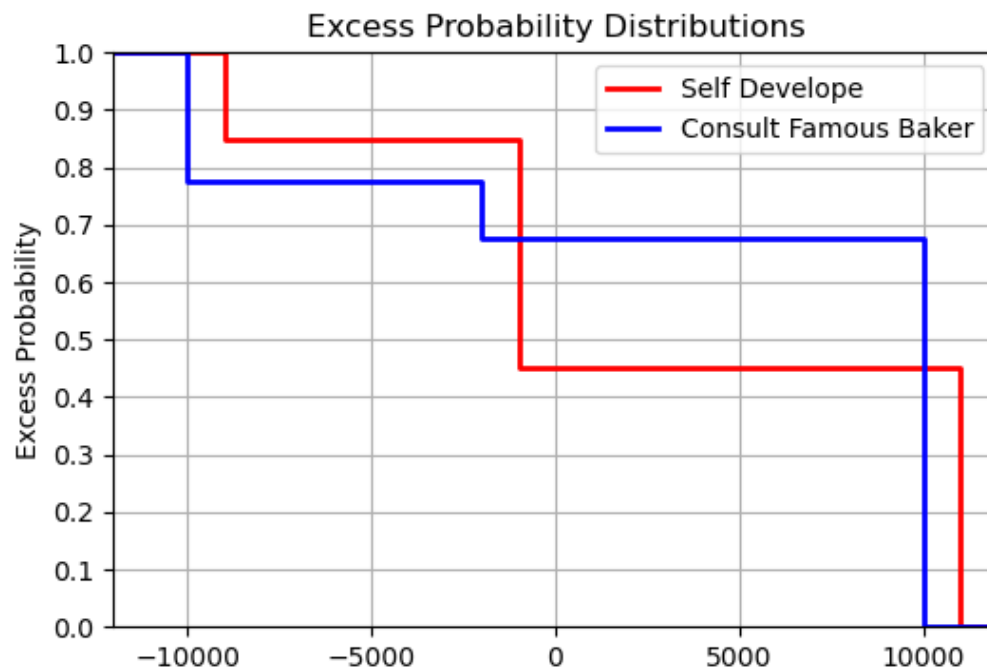- There is no first and second order stochastic dominance between Do nothing and Self-develop:

Excess Probability Distributions

Delta cumulative area under Excess Distributions
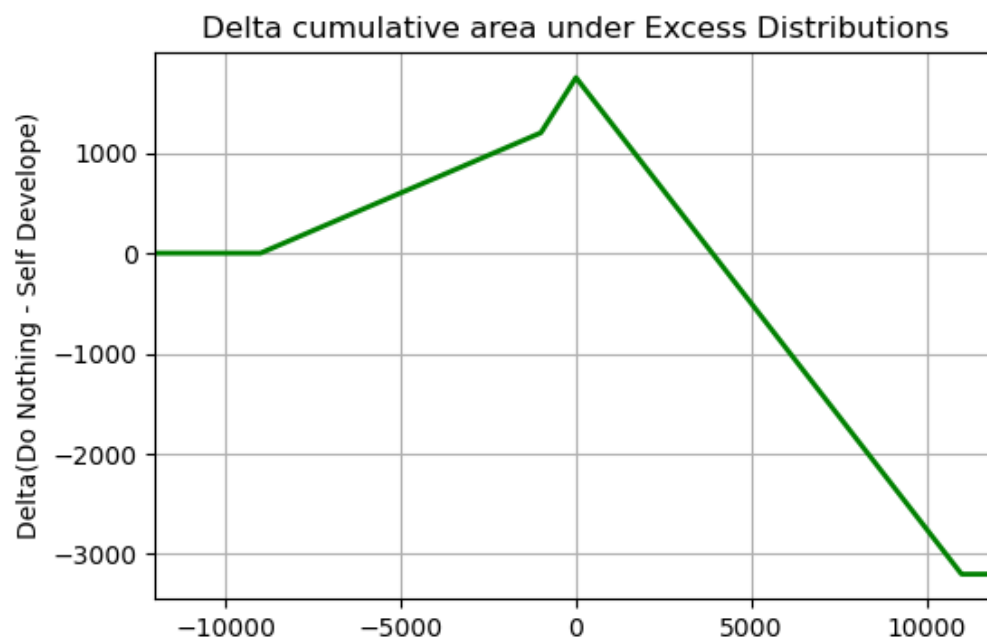
- There is no first and second order stochastic dominance between Do nothing and Consult famous baker:

### Excess Probability Distributions

Delta cumulative area under Excess Distributions

- There is no first and second order stochastic dominance between Self develope and Consult famous baker:

Excess Probability Distributions

Delta cumulative area under Excess Distributions
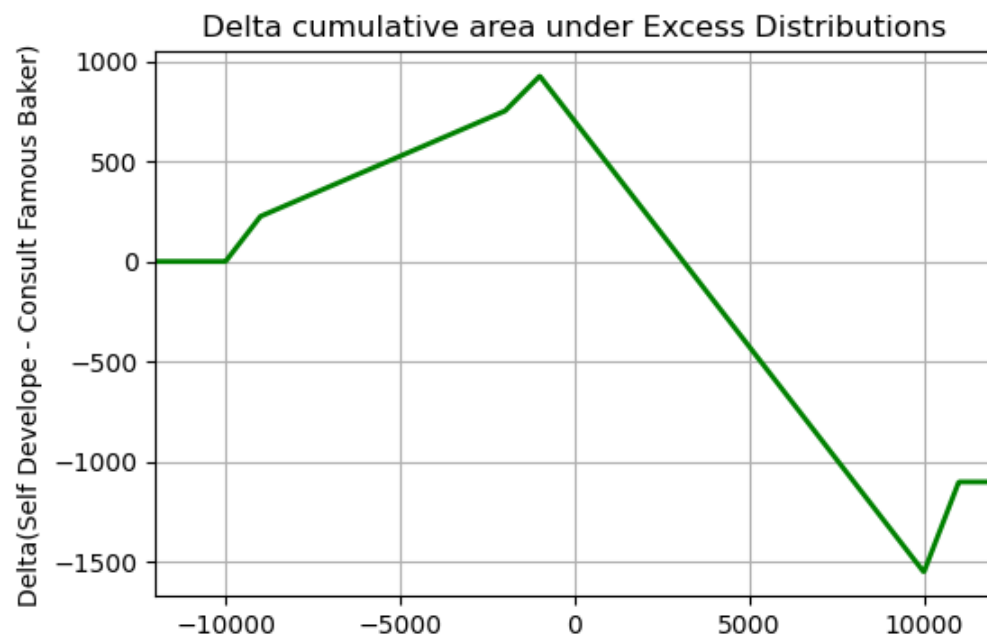
(*d*)   Expected Value of Perfect Information Analysis

- Decision model with free perfect information on product demand before Mabel's initial decision to pursue the bakery business or not.
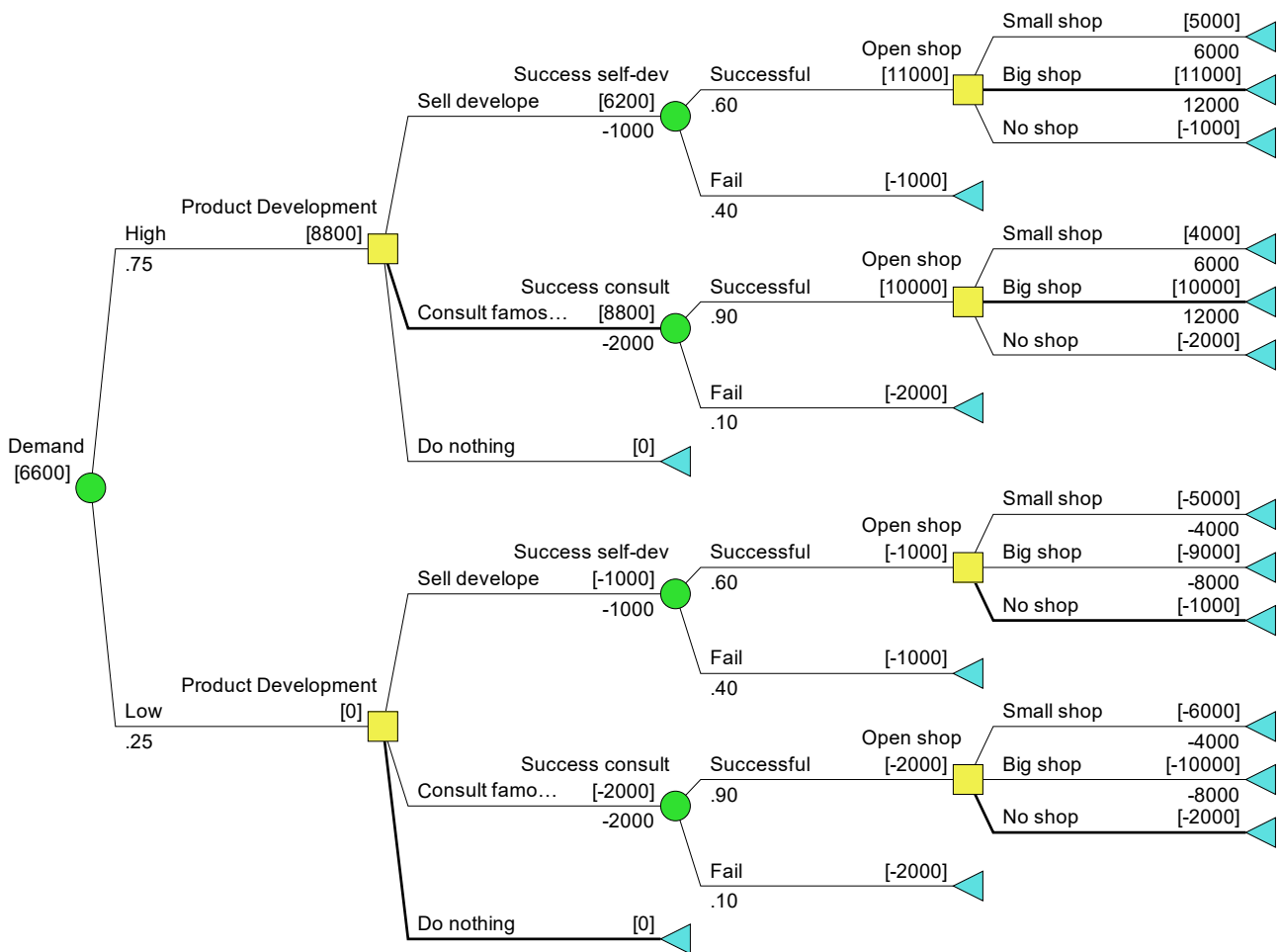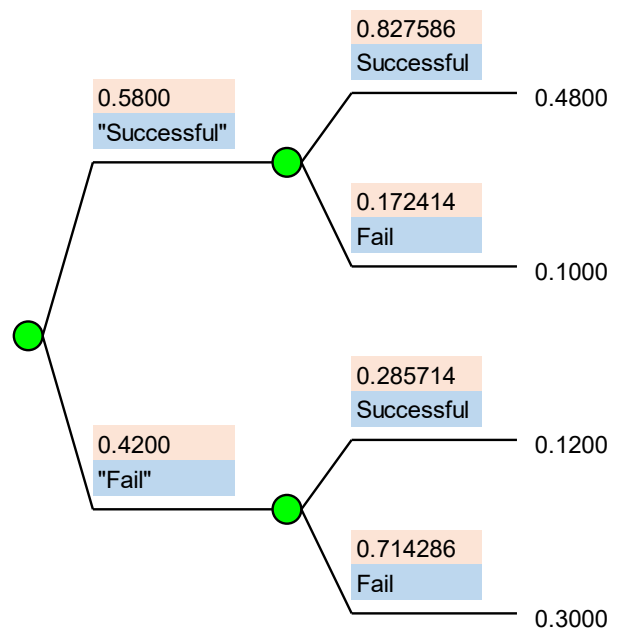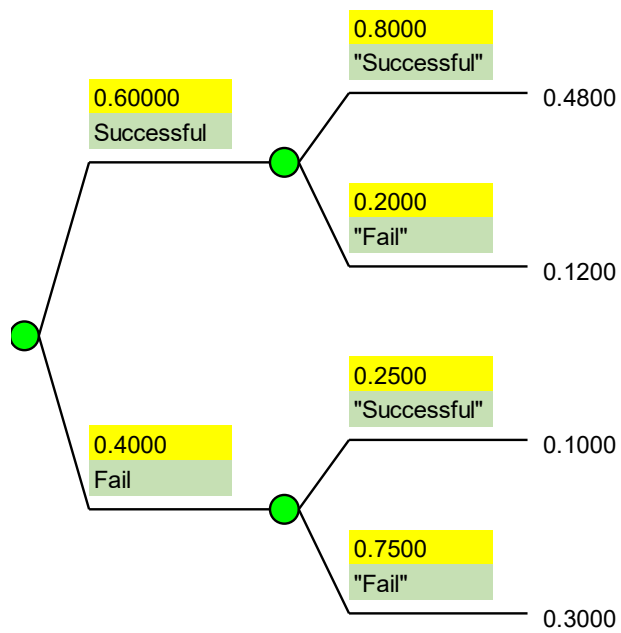

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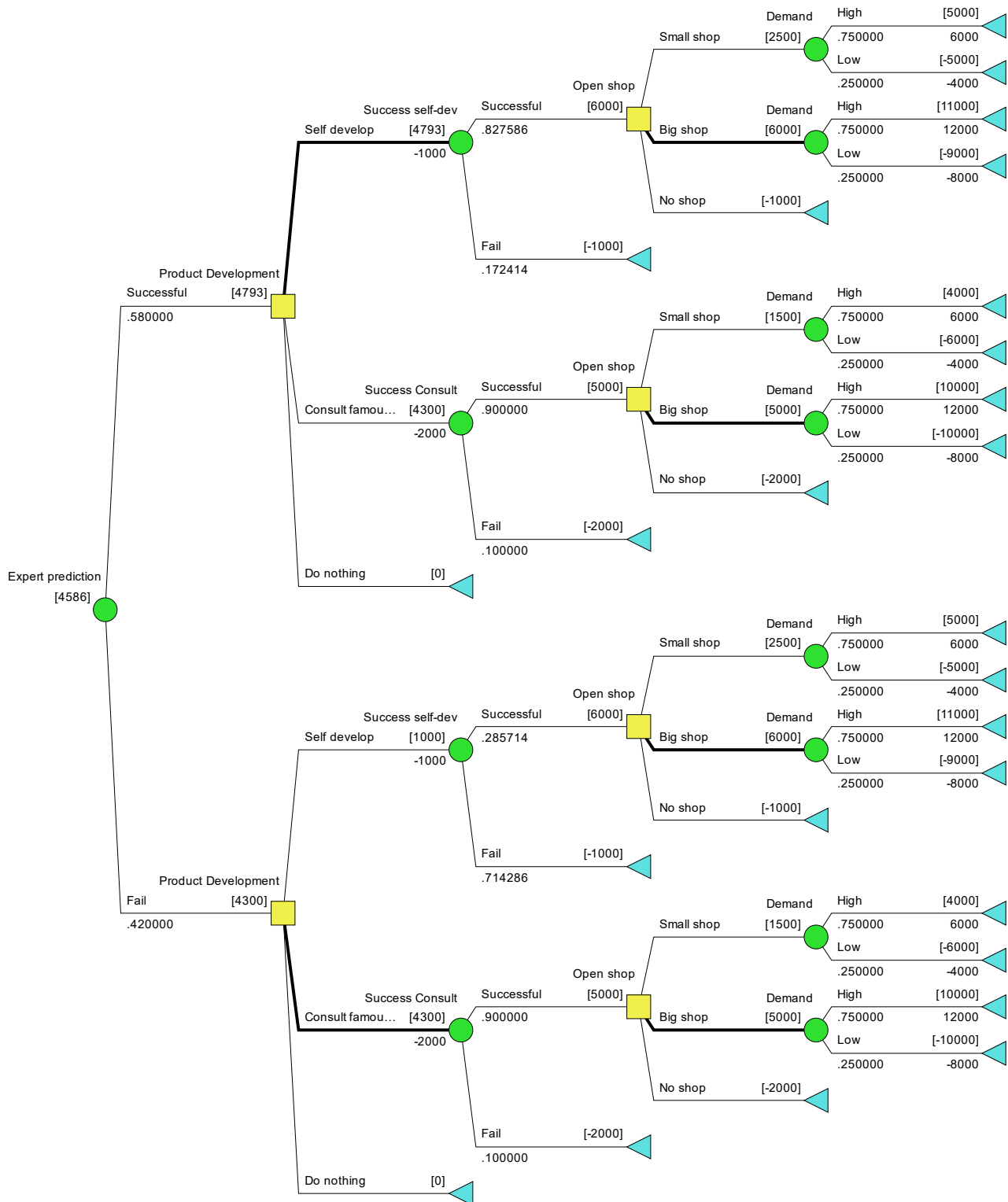
- Certainty Equivalent with free perfect information = $6,600
- Certainty Equivalent with no information = $4,300

- Hence Expected Value of Perfect Information on whether the current pipe will break or not

    = $6,600 – $4,300 = **$ 2,300**

(*e*)   Expected Value of Imperfect Perfect Information Analysis

- Flip the probability tree on the expert prediction on self-develop results:

- Decision Model with free imperfection prediction on self-develop result:

- Certainty Equivalent with Free Prediction = $4,586.00
- Certainty Equivalent with no prediction   = $4,300.00

- Expected value of imperfect prediction = $5,486.00 – $4,300.00 = **$ 1,186.00**
- Hence the maximum Mabel is willing to pay the expert = **$ 1,186.00**

Optimal Decision Policy upon prediction by the expert:

    If Prediction = "Successful":
        Self-develop product.
        If Successful:
            Open Big shop
        Else:
            Terminate
    Else if Prediction = "Fail":
        Consult famous baker.
        If Successful:
            Open Big shop
        Else:
            Terminate