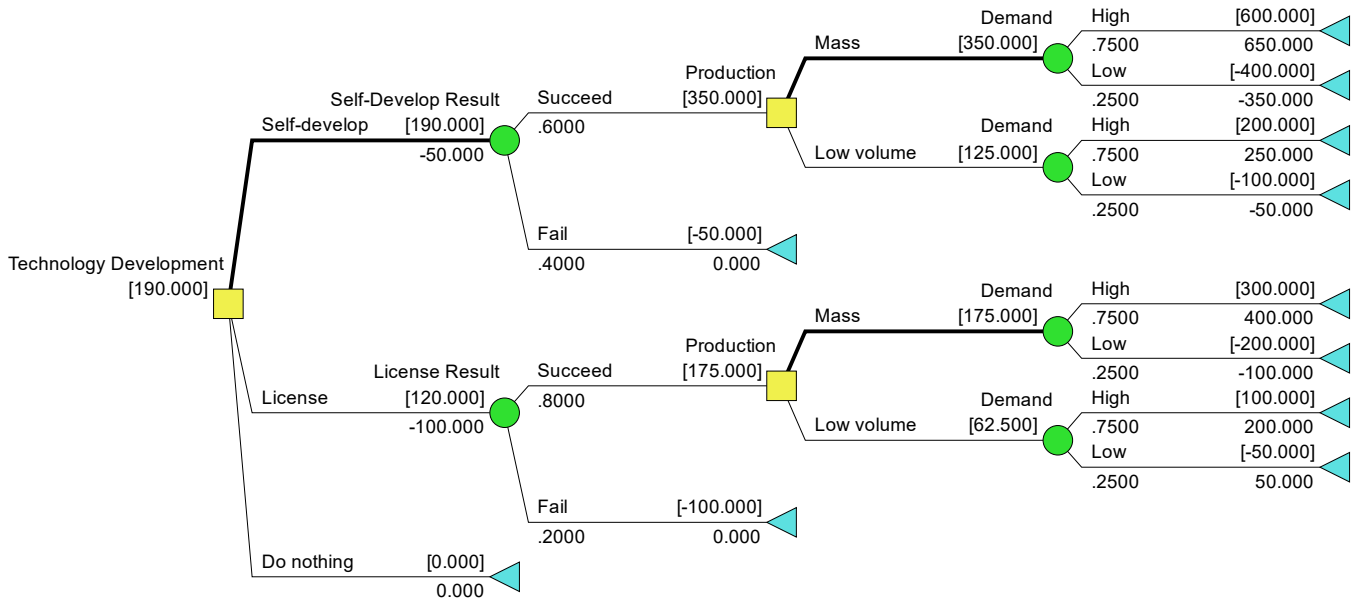


TIE4203 Decision Analysis in Industrial Operations and Management Solutions to Assignment 2

(a)

- The Decision Tree:



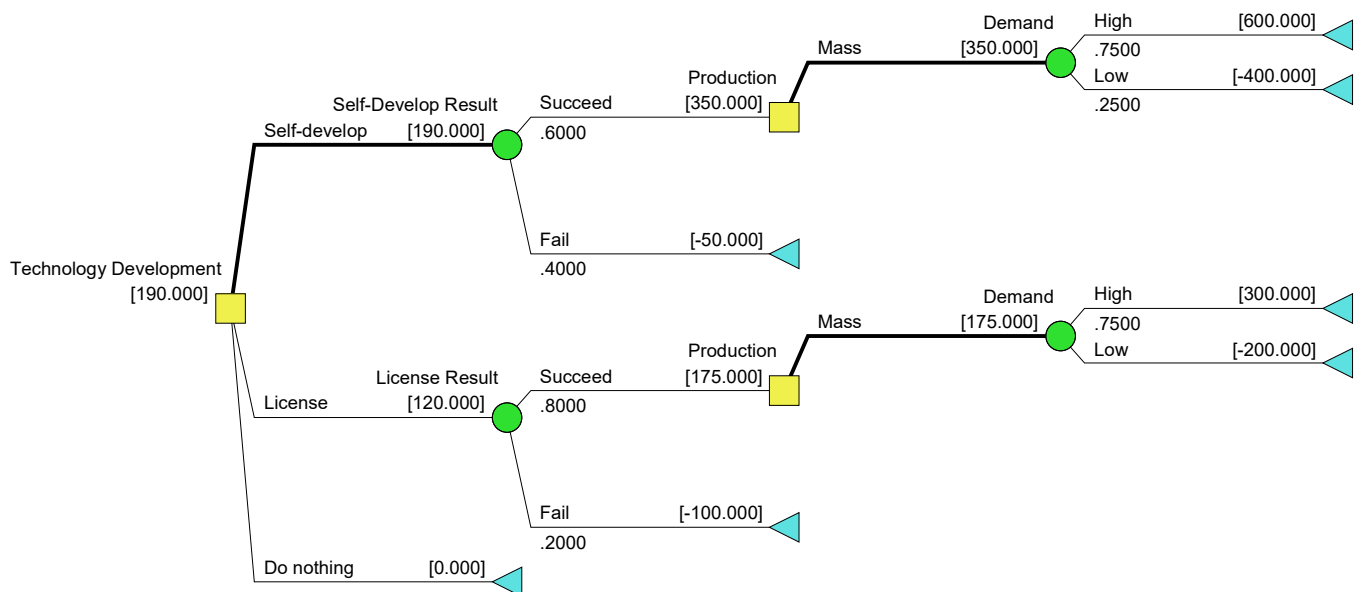
- The Optimal Decision Policy is

Self-Develop Technology
If Development is Successful then
 Do Mass production
Else
 Terminate project

- Optimal Certainty Equivalent (Expected Value) = \$ **190,000**

(b) Plotting Risk Profiles:

- Remove sub-optimal branches from decision policy tree:



- End-point values (sorted) and joint probabilities:

Alternative A: Self-Develop

End-point	Value \$K	Probability
1	-400	$0.6 \times 0.25 = 0.15$
2	-50	$= 0.40$
3	600	$0.6 \times 0.75 = 0.45$

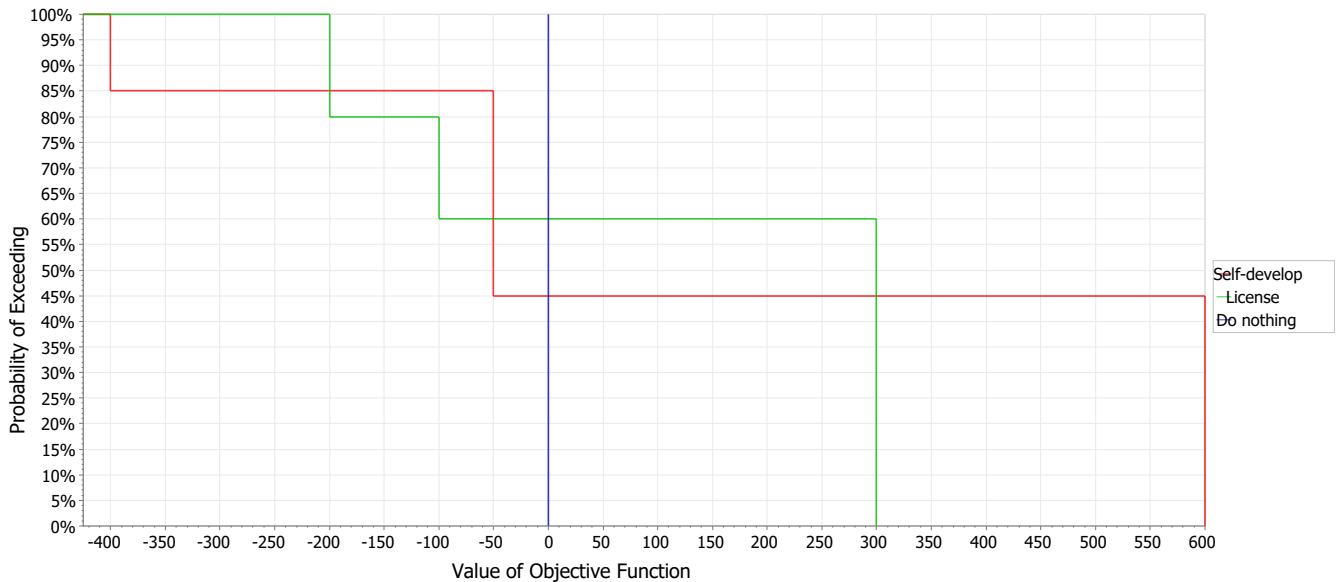
Alternative B: License and Adapt

End-point	Value \$K	Probability
1	-200	$0.8 \times 0.25 = 0.20$
2	-100	$= 0.20$
3	300	$0.8 \times 0.75 = 0.60$

Alternative C: Do nothing

End-point	Value \$K	Probability
1	0	1

- Risk Profiles in Excess Probabilities:

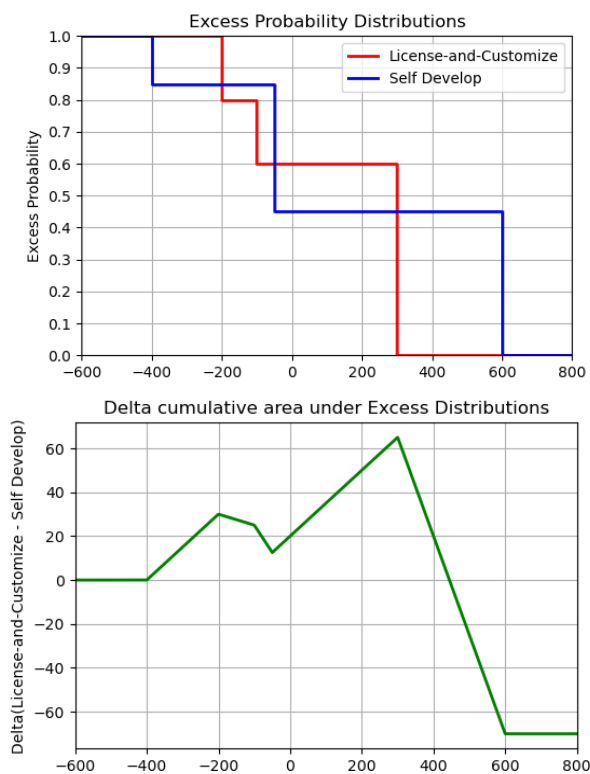


(c) First-order Stochastic Dominance Analysis

- There is no first-order stochastic dominance between the 3 alternatives as their risk profiles intersect each other.

(d) Second-order Stochastic Dominance Analysis between A and B.

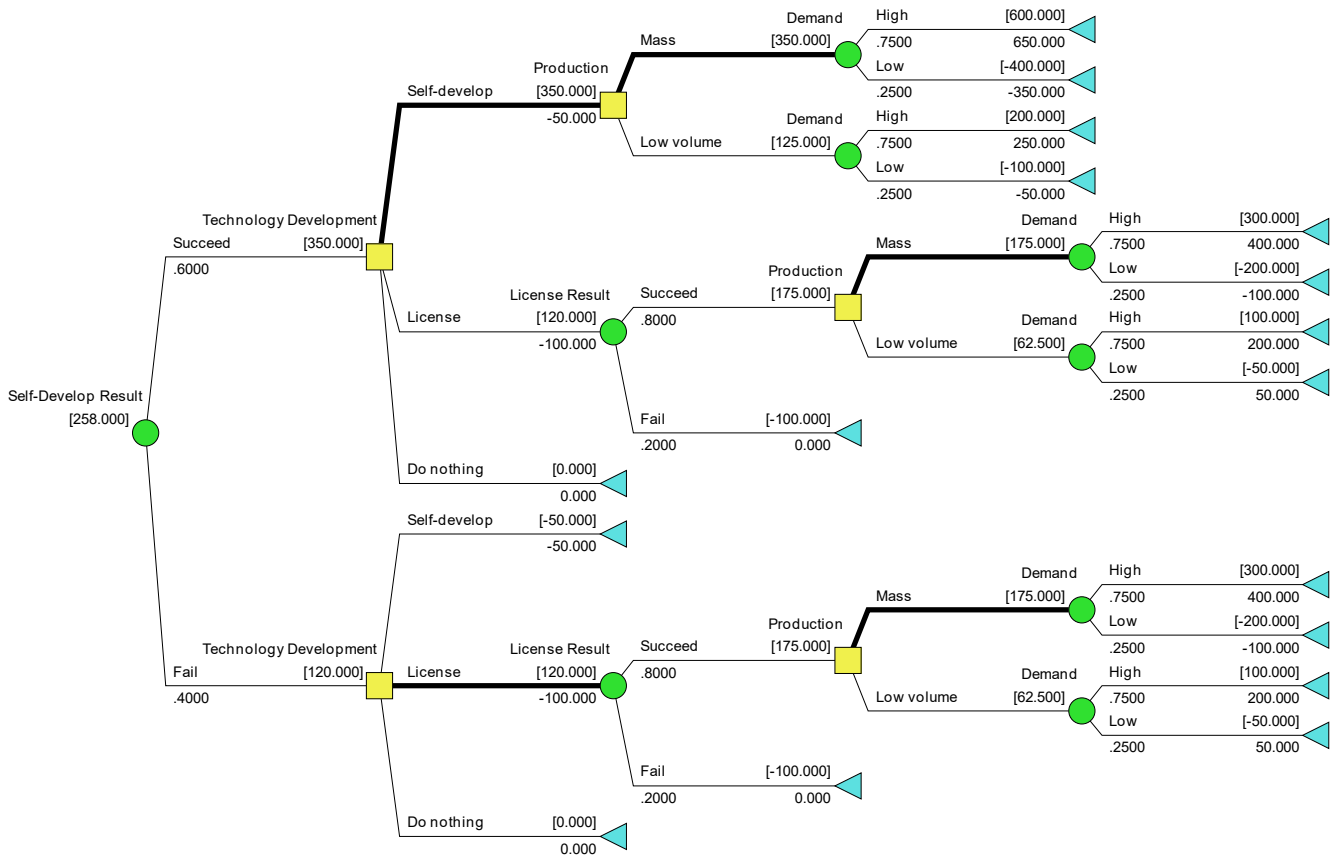
Note that B (License) might dominates A (Self-develop), but not vice versa.



- **B does not second-order dominates A** as the difference in cumulative areas under the excess distributions between B and A becomes negative after around 400+.

(e)

- Decision model with free perfect information on Self-Develop Technology result:



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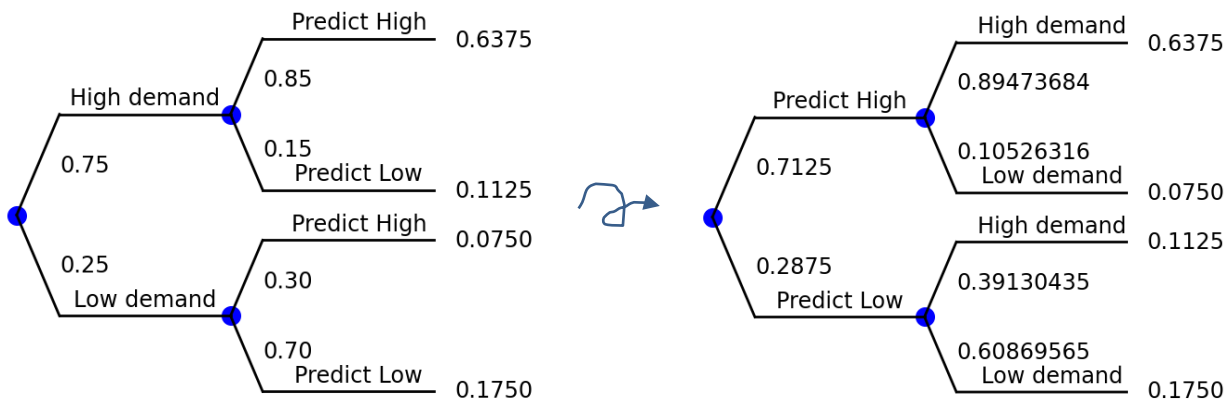
- Expected value with free perfect information on Self-Develop Technology result = \$258,000
- Expected value with no information = \$190,000
- Expected value of perfect information on whether self-developing the technology result

$$= 258,000 - 190,000$$

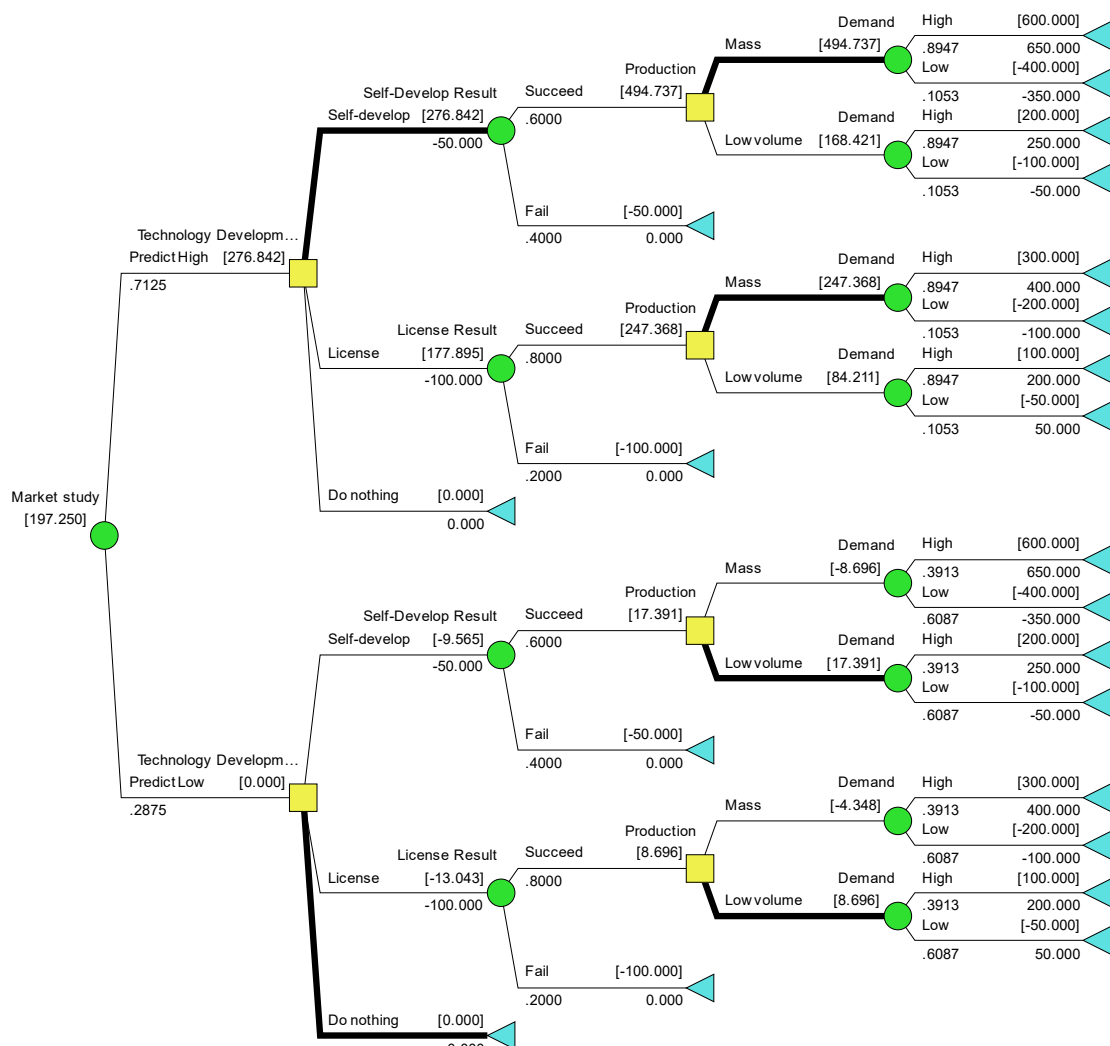
$$= \$ \underline{\underline{68,000}}$$

(f)

- Flip the market study performance tree:



- Decision model with free market study on product demand:



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- Expected value with free market study = \$197,250
- Expected value with no market study = \$190,000
- Hence expected value of imperfect market study = \$197,250 - \$190,000 = \$ **7,250**.
- Hence the company should spend only up to a maximum of \$7,250 for the market study.
- Optimal decision policy with free market study:

 If the market study predicts “High demand”:

 Self-develop technology

 If Successful:

 Mass produce the product

 Else:

 Terminate project

 Else:

 Do nothing