Value of Perfect Information *(cont.)*

$$EPPI = \sum_{i} CP^{*}(State_i)\, P(State_i)$$

EVPI Expected Value of Perfect Information

$$EVPI = EPPI - EMV^{*}$$

Value of Perfect Information *(cont.)*

EVPI Expected Value of Perfect Information

EVPI = $ 18,600 - 16,500= $ 2,100

Do you recognize this number???

It is the same as EOL*

EVPI = EOL* (always)

WHY???

Decision Trees and Sequential Decision Making

Decision Tree:

- Organizes all elements of complex decision into a meaningful arrangement
- Useful when set of possible states is different for each possible decision
- Useful when survey or experiment is possible for decision maker to use

Decision Trees and Sequential Decision Making

Components:

Branches- represent event or decision →

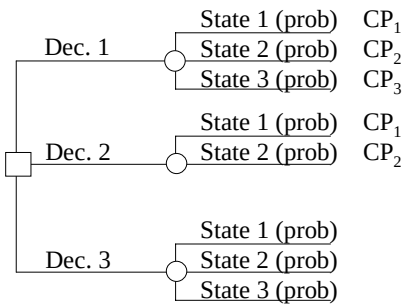
Decision node- point at which decision is made □

Event (state) node- point at which state occurs ○

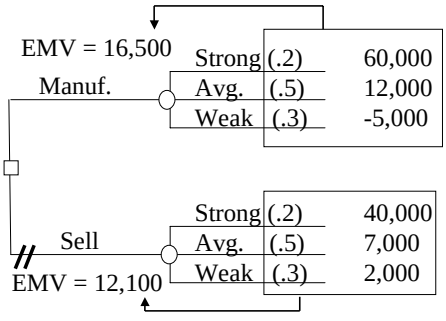
Outcome (payoff)- result of following path of decisions and states

CP

Decision Trees

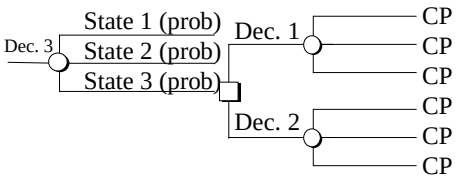


Decision Tree



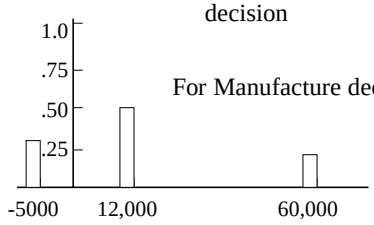
Decision Trees and Sequential Decision Making

Sequential decision: There is more than one decision to be made, and earlier decisions have an effect on later decisions.



Risk Profiles

Show individual and cumulative probs. associated with all payoffs for a given decision

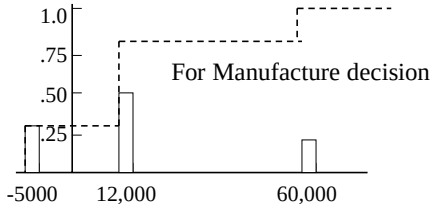


Payoff Table

Act / Event	Prob.	*Act 1* Manuf.	*Act 2* Sell
Strong Sales	.2	$60,000	$40,000
Average Sales	.5	12,000	7,000
Weak Sales	.3	-5,000	2,000

Risk Profiles

Cumulative risk profile



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Strong Sales	.2	$60,000	$40,000
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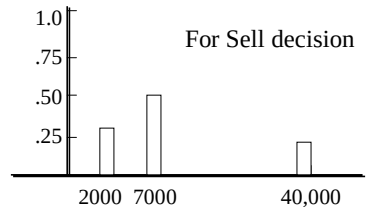
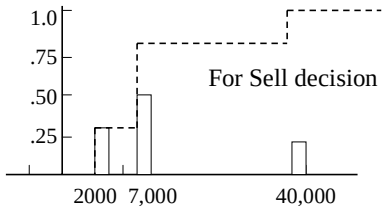
Risk Profiles

Individual risk profile

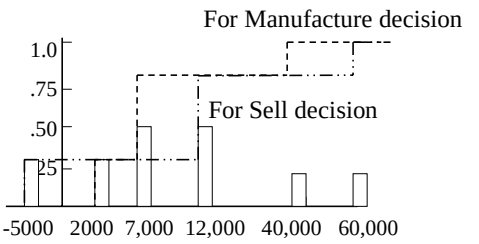


Risk Profiles

Cumulative risk profile

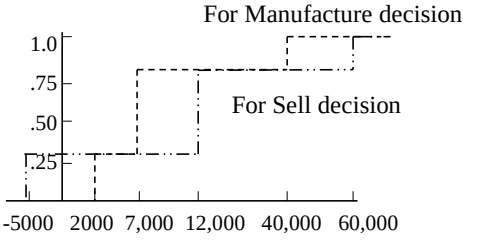


Risk Profiles



Risk Profiles

Neither decision is dominant



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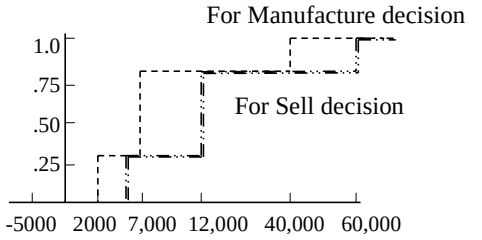
Manufacture is dominant because for every state, payoff is higher than for Sell

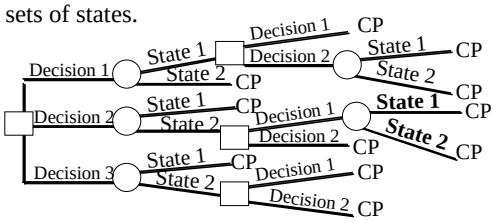
Risk Profiles

Now Manufacture is dominant decision
(all of line is under and/or to right)



Sequential Decision Making

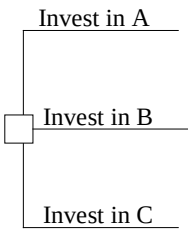
Decision trees are very useful when there are multiple decisions to be made and they follow a sequence in time. There are also usually multiple sets of states.



Sequential Decision Tree Problem

Suppose that you are trying to decide which of three companies to invest in, Company A, B, or C. If you choose A, there is a 50/50 chance of going broke or earning $50,000. If you go broke with A, you then have three choices: accept a debt of $2,000; embezzle $35,000 of company money [disclaimer: this problem is for illustration purposes only!] and leave the country; or file for personal bankruptcy at the hands of a court-appointed trustee.

Sequential Decision Tree



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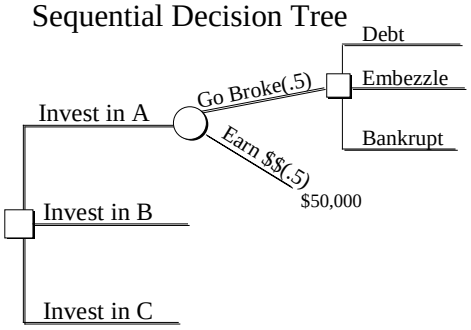
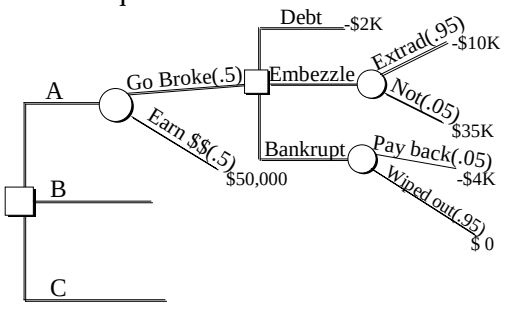
Sequential Decision Tree



Sequential Decision Tree Problem

If you embezzle money and leave the country, there is a 95% chance of being extradited and fined $10,000. If you file for personal bankruptcy, there is a 95% chance that your debts will be wiped out and a 5% chance that you will have to pay back $4,000.

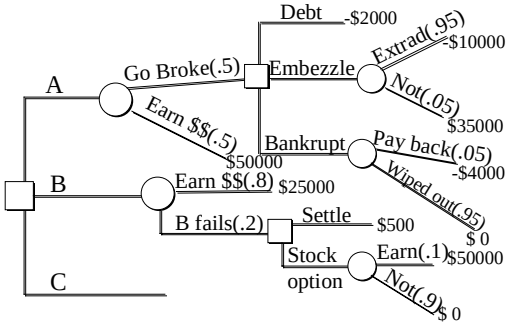
Sequential Decision Tree



Sequential Decision Tree Problem

If you choose Company B, there is an 80 percent chance of earning $25,000. If Business B fails, you still have the option of either settling for $500 or taking a stock option in the company that will be worth $50,000 with probability 0.1 or zero with probability 0.9.

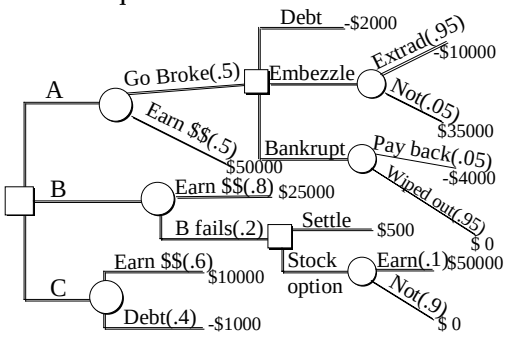
Sequential Decision Tree



Sequential Decision Tree Problem

Finally if you choose Company C, you will either earn $10,000 with probability 0.6, or be in debt for $1,000 with probability 0.4.

Sequential Decision Tree



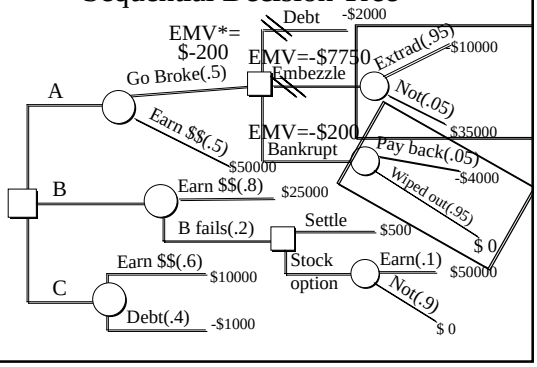
Sequential Decision Tree Problem - Solving by Folding Back the tree

For each set of state branches, find the EMV for the connected decision.

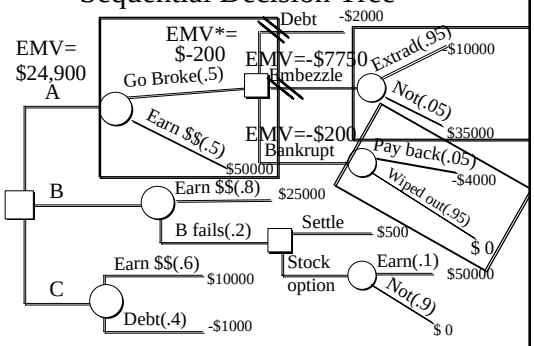
For each set of decisions, select the one with the highest EMV and carry the EMV* forward (to the left)

Trees are drawn from left to right; they are folded back from right to left.

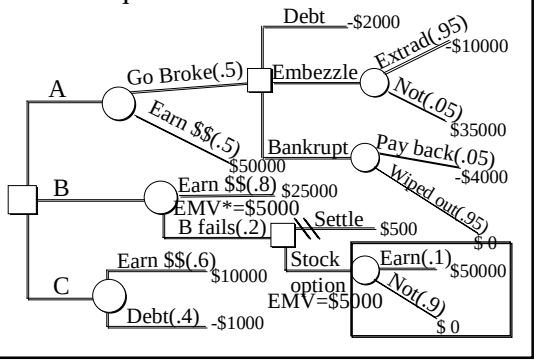
Sequential Decision Tree



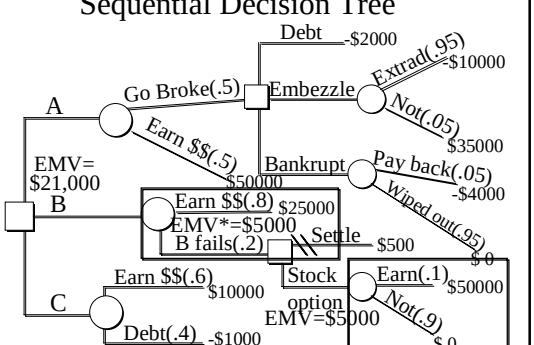
Sequential Decision Tree



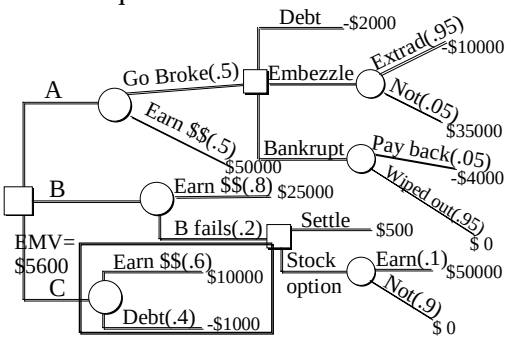
Sequential Decision Tree



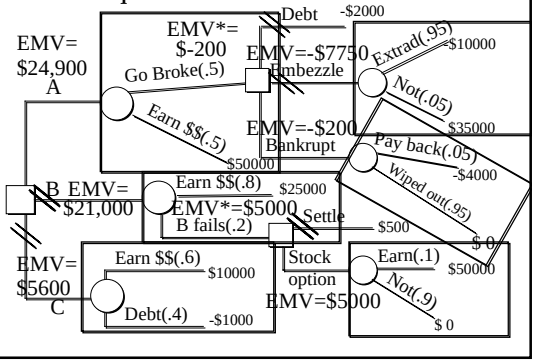
Sequential Decision Tree



Sequential Decision Tree



Sequential Decision Tree

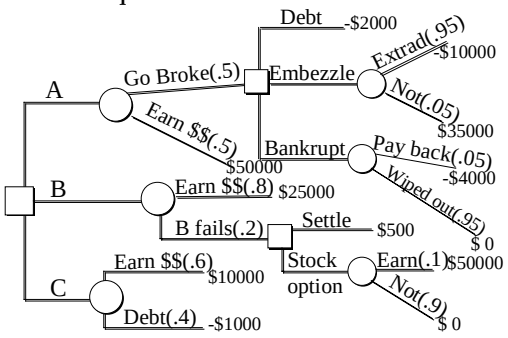


Decision Tree Solution

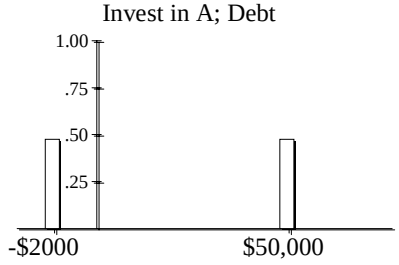
After you fold back the tree and determine the best initial decision, then state the complete optimal sequence of decisions:

Invest in Company A. If you go broke, then file for bankruptcy. Otherwise enjoy the $50,000!!

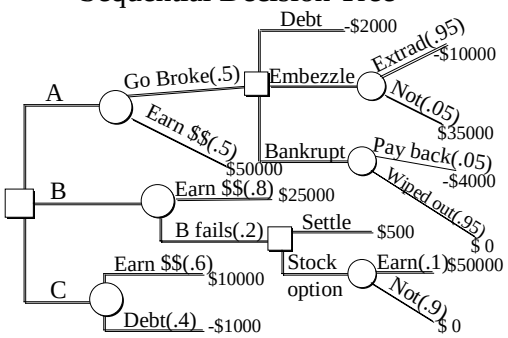
Sequential Decision Tree



Risk Profiles for ABC Investment problem

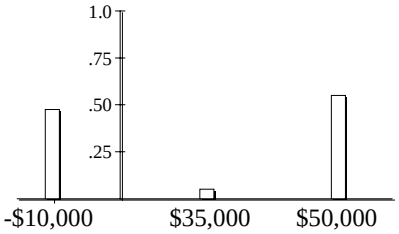


Sequential Decision Tree

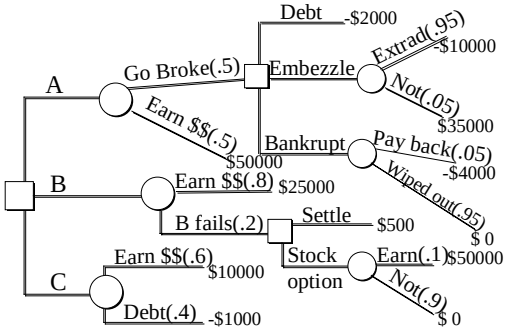


Risk Profiles for ABC Investment problem

Invest in A; Embezzle



Sequential Decision Tree



Risk Profiles for ABC Investment problem

Invest in A; Bankrupt