



Decision trees(basics)

Ing.J.Skorkovský, CSc,
Department of Corporate Economy
FACULTY OF ECONOMICS AND ADMINISTRATION
Masaryk University Brno
Czech Republic



Description

Diagramming technique which uses :

- Decision points – points in time when decisions are made, squares called nodes (rozhodovací uzly) 
- Decision alternatives – branches of the tree off the decision nodes (alternativy řešení)
- Chance events – events that could affect a decision, branches or arrows leaving circular chance nodes- (co může rozhodnutí ovlivnit)
- Outcomes – each possible alternative sted (výstupy, výsledky, závěry,...)
- Payoff- (prospěch, výhoda výnos – využití v posledním příkladu)

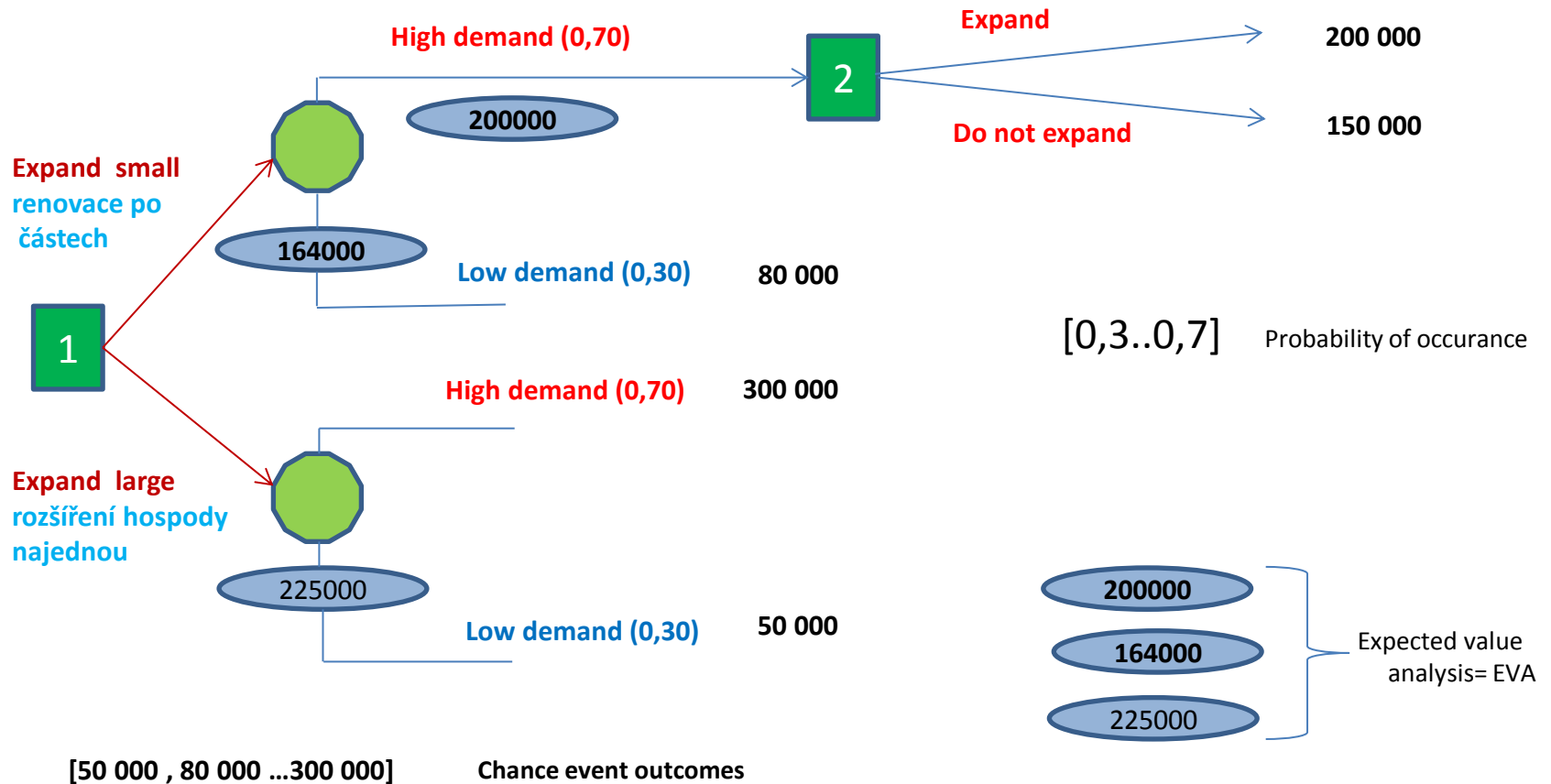
DT diagrams

Decision trees developed by

- Drawing from left to right (kreslí se zleva doprava)
- Use squares to indicate decision points 
- Use circles to indicate chance events 
- Write the probability of each chance by the chance (sum of associated chances = 100%) (součet pravděpodobností všech možností)
- Write each alternative outcome in the right margin

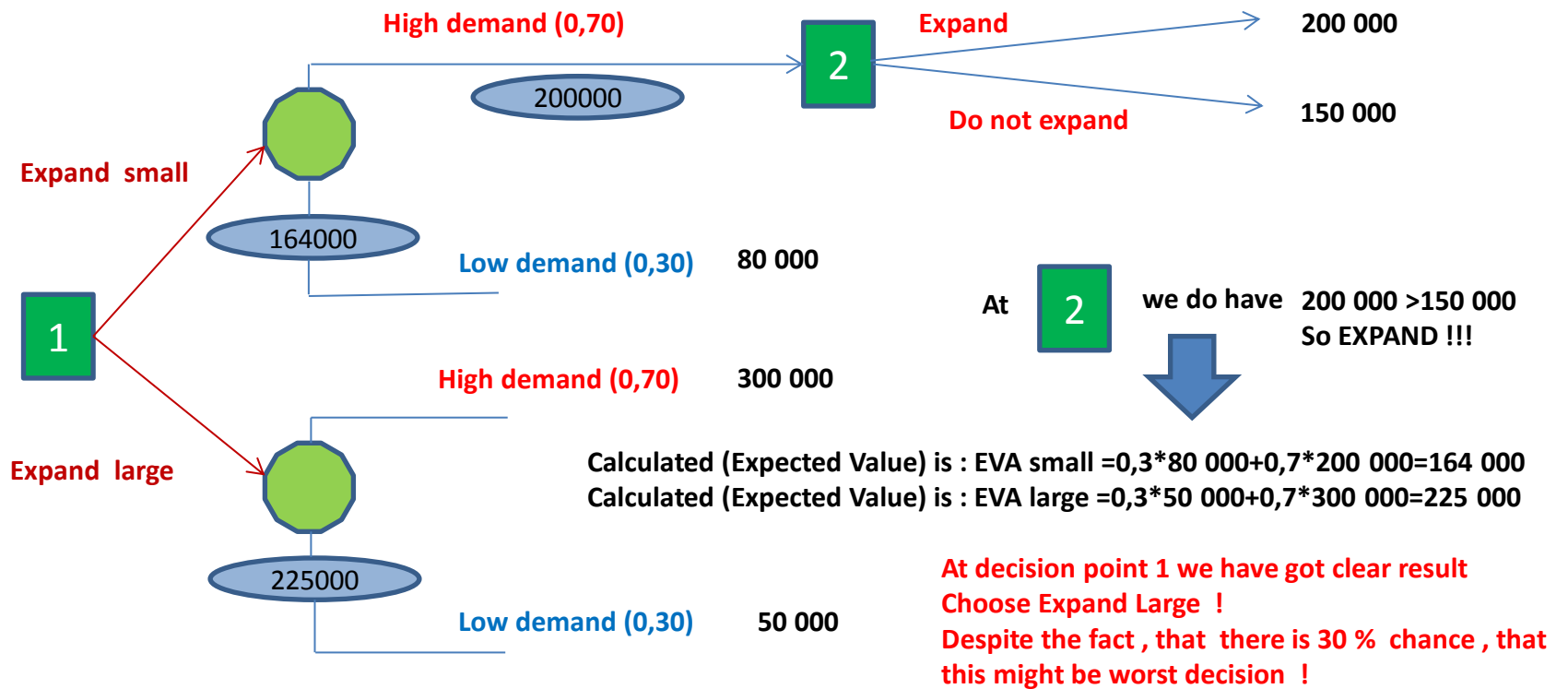
DT-Example I

- A restaurant owner has determined, that he needs to expand his facility. He has two alternatives. One is one large expand now and risk smaller demand later or the second alternative is expand on a smaller scale now knowing, that he might need to expand again in three years. Which alternative would be most attractive?



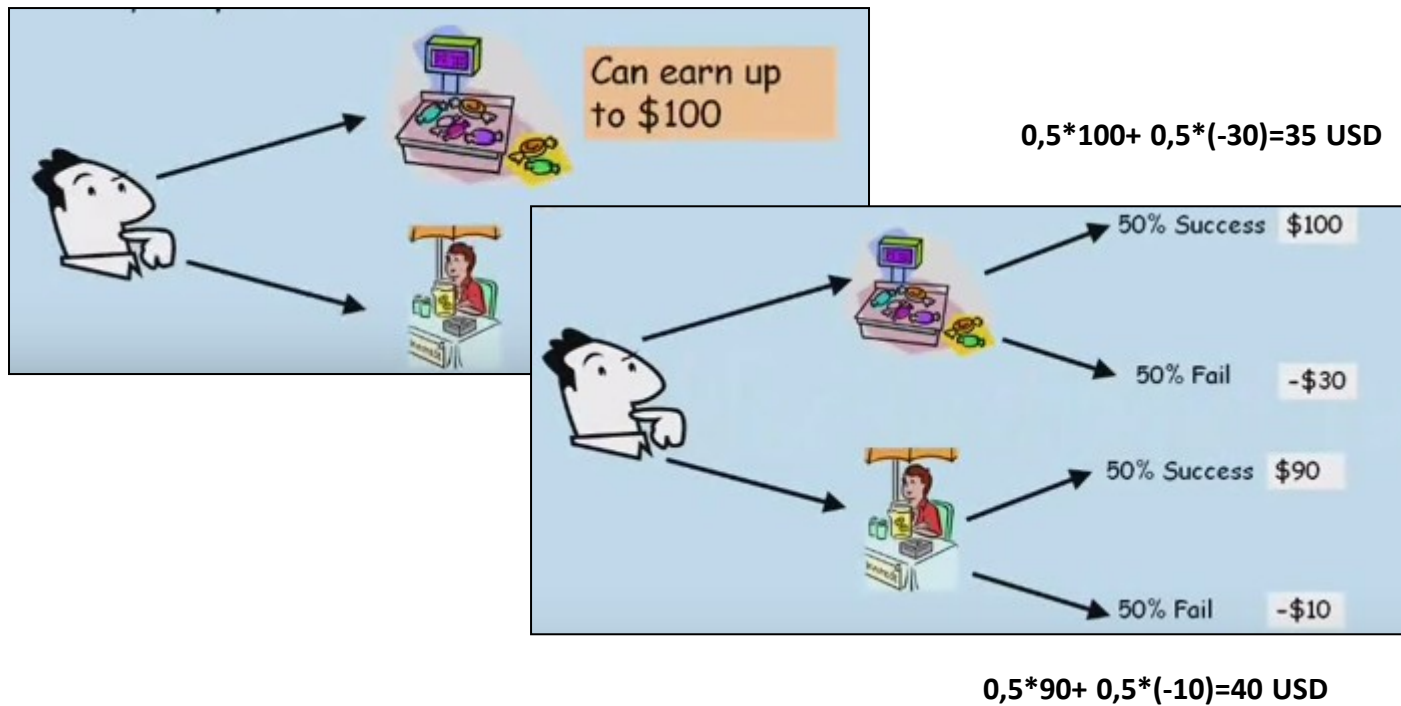
DT-Example I

- Decision tree analysis utilizes Expected Value Analysis (EVA), which is a weighted average of the chance events :
 - Probability of occurrence * chance event outcome



DT-Example II

- Project to sell candies or lemonade. At the first sight it is clear : Candy !!

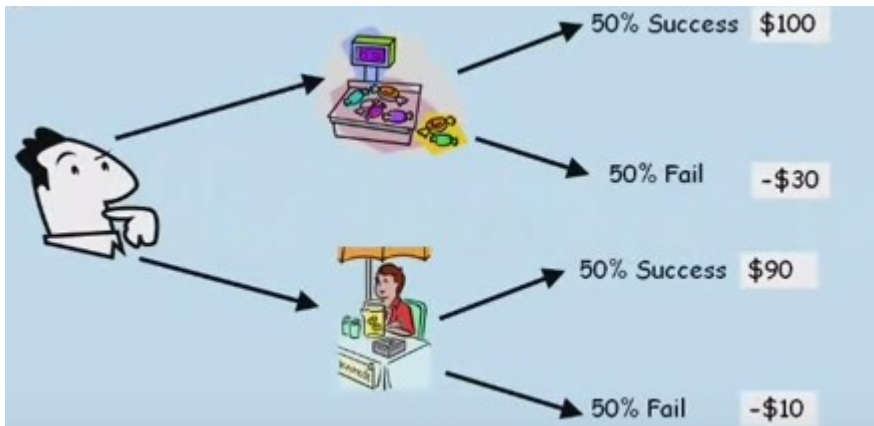


DT-Example II

- So now it would be better to choose lemonade business ! So we have chosen bigger EVA. But..

$$0,5*100+ 0,5*(-30)=35$$

$$0,5*90+ 0,5*(-10) = 40$$



Decision based on EVA? Does this mean, that if you do Lemonade project, you will earn 40? **NO !**

If you did the IDENTICAL Lemonade project **very many times** (in exactly the same situation), then your **average** earnings will be **probably** 40 per time.

This means that you will not get 40 **USD each time** !!

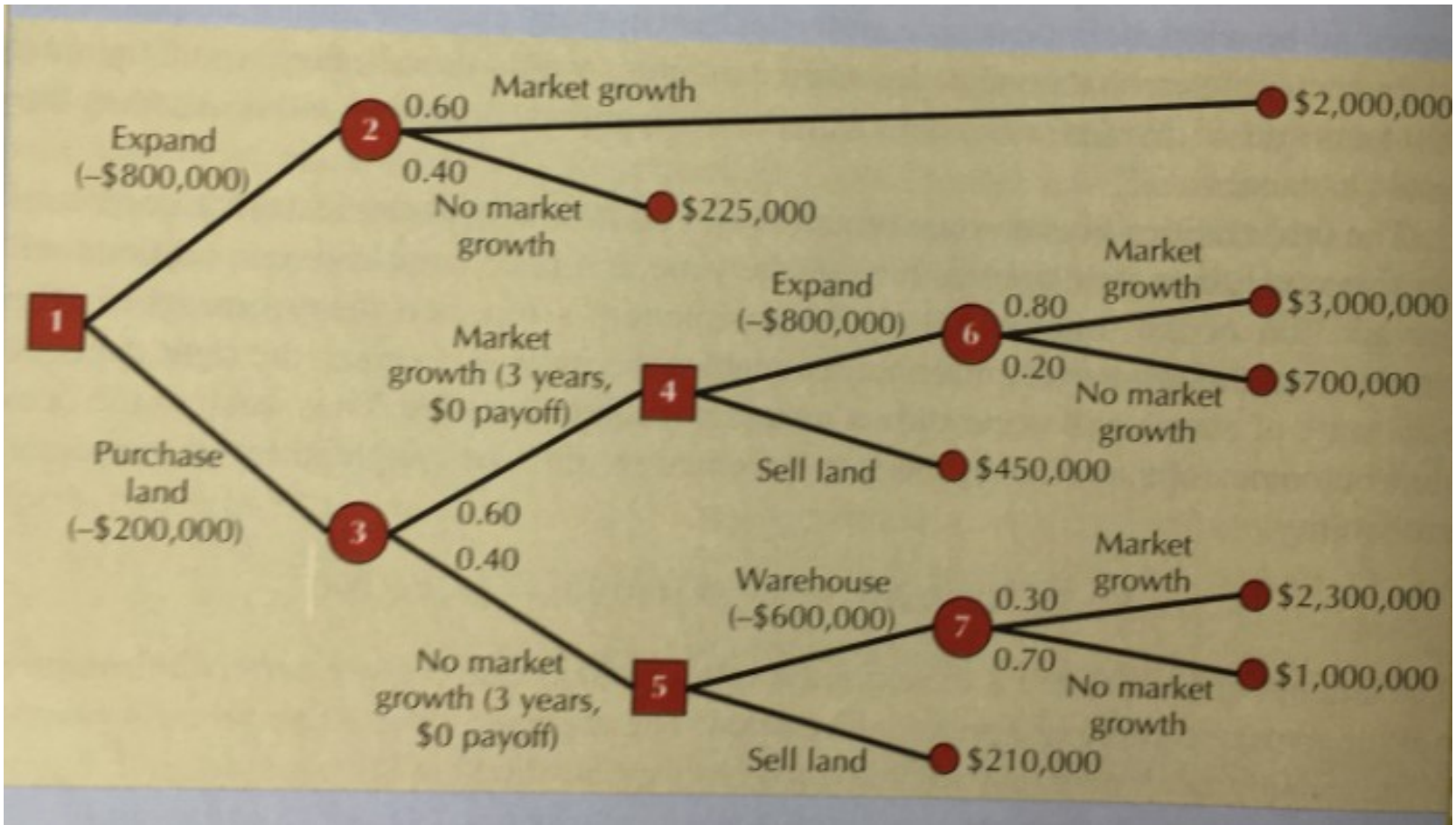
Because $EVA(x) = \sum p(x_i) * x_i$ for=1 to n,

Where X_i = outcome i and $p(x_i)$ is a probability of outcome i

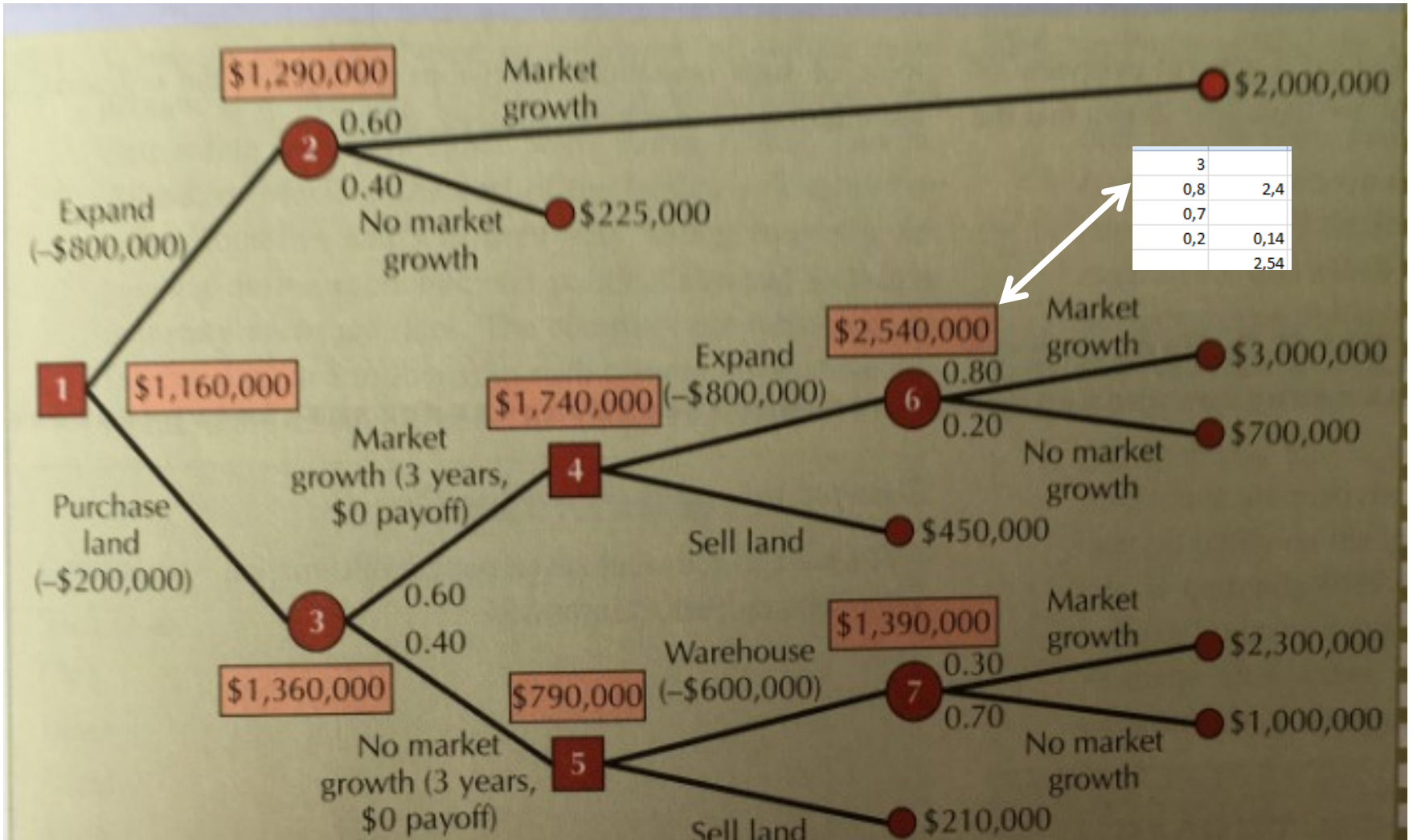
Example III

- The first decision facing the company is whether to expand or buy land. If the company expands, two states of nature is possible. Either the market will grow (probability 0,6) or it will not grow (probability 0,4).
- Either state of nature will result in a payoff. On the other hand, if company chooses to purchase land, three years in the future another decision will have to be made regarding the development of the land

DT-Example III



DT-Example III



Decision tree calculation				
Outcome	Probability	EVA	Expand	
3 000 000,00	0,80			
700 000,00	0,20	2 540 000,00		
2 540 000,00				
1 740 000,00	0,60	1 740 000,00	-800 000,00	
790 000,00	0,40	1 360 000,00		
1 360 000,00				
		1 160 000,00	-200 000,00	
1 290 000,00		490 000,00	-800 000,00	

$$3\,000\,000 * 0,8 + 700\,000 * 0,2 = 2\,540\,000$$

$$2\,540\,000 - 800\,000 = 1\,740\,000$$

$$1\,740\,000 * 0,6 + 790\,000 * 0,4 = 1\,360\,000$$

$$1\,360\,000 - 200\,000 = 1\,160\,000$$

$$1\,290\,000 - 800\,000 = 490\,000$$

Final decision

- Expand : $129\ 000 - 800\ 000 = 490\ 000$
- Land : $1\ 360\ 000 - 200\ 000 = 1\ 160\ 000$
- Payoff of purchasing land is 1,16 millions