

1. 風險趨避將可能造成拒絕正 EMV 投資計畫之結果。原因？先看個例子

2. Example 1: (PROB17.1)

An investment project will yield NT50000 or NT-25000 with equal probability. MBA Jan is an expected utility maximizer with utility function  $U(x) = 12.5859 - 7.4267e^{-0.0000211x}$ . If  $\theta$  is the percentage she retains, she then owns a gamble with equally likely prizes  $50000\theta$  and  $-25000\theta$ .

(a) If  $\theta = 1$ , does this gamble give Jan a negative CE?

(b) How does Jan's CE change as a function of  $\theta$ , the fraction she retains?

(c) What percent retained by Jan maximizes her CE?

3. Example 2:

一投資計畫將有各半的機率賺 10000 元與賠 9000 元，一投資者原

有財富為 10000 元且其效用函數為  $v(y)=\ln(y)$ 。 $(\ln(10000)=9.21, \ln(20000)=9.903, \ln(1000)=6.907)$

a. 此投資的期望貨幣價值為？

b. 此投資者會獨自執行此計畫嗎？

c. 若只佔 1/10 持份，此投資者願意參與嗎？ $(\ln(11000)=9.306, \ln(9100)=9.116)$

4. Example 3:

An investment project will yield NT10000 or NT-9000 with equal probability. An individual has a certain income of NT10000 and utility function  $v(y) = \ln y$ .

(1) Show that the individual would turn down the project.

(2) Suppose that it is possible for a syndicate of  $n$  individuals to undertake the project. How large must  $n$  be before they would be willing to accept the project?

- (3) What is the size of syndicate which maximizes the expected utility of syndicate members if the project is accepted?
  - (4) If the first individual owned the project and could not sell shares in it but could give away a proportion of the project, how much would he give away?
5. Risk Spreading:  
By taking a risk and breaking it into pieces, with the pieces shared among many individuals – in other words, by securitizing the risk – risk aversion on the part of individual risk bears is largely defeated
6. 有沒有更聰明的方式讓投資計畫執行—證券化
7. Example 4 : (見 Excel 17.2)

Suppose Jan from Problem 17.1 tries to sell an  $\alpha$  share of the gamble to a risk-averse expected utility maximizer. No risk-averse person would pay "full EMV price," or  $\$12,500\alpha$ , for an  $\alpha$  share (as long as  $\alpha > 0$ ), but if Jan sets a target of getting back 95% or 98% or some percentage less than 100% of  $\$12,500\alpha$  for an  $\alpha$  share, she might succeed, if  $\alpha$  is small enough.

Suppose Jan has an associate with (essentially) the same utility function as she,  $-e^{-0.0001x}$ . Would this associate buy a 10% share of Jan's gamble for 95% of 10% of the full EMV? (The answer is No, and the real point of this is to get started on what comes next. If you cannot see how to set up the spreadsheet to answer this part of the problem, look at sheet 1 of the spreadsheet PROB17.2.)

Jan is set on obtaining 95% of the EMV of the gamble, so rather than lowering the price to her associate in part a, she decides to decrease the share she will sell to him. What is the largest share  $\alpha$  Jan can sell to her associate at a price of 95% of  $\$12,500\alpha$ ? Assume he buys as long as his CE for the full transaction is greater or equal to 0.

Redo part b, if Jan decides to try for 98% of the EMV of the gamble. And find the shares needed to get either 98% or 95% of the EMV, if Jan sells to a second associate, whose utility function is  $e^{-0.0001x}$ . (Is this second associate more or less risk averse than the first?)

(Optional, and the last part is difficult.) A third associate of Jan has utility function  $U(x) = \sqrt{x + 50,000}$ , where  $x$  is the associate's net from the transaction with Jan. Answer the questions of part c for this associate. Then evaluate, for this utility function  $U$ , the ratio  $-U''(x)/U'(x)$  at the value  $x = 0$ . What does this tell you?

8. A General Result about Small Risks:

Picking some target percentage  $\beta$  less than 100%. *No matter how risk averse is the individual, there is a small fraction  $\alpha$  such that if we offer the individual an  $\alpha$  share of the gamble, the individual would be willing to pay  $\alpha \times \beta \times$  the EMV of the gamble.*

9. 習題 17.3

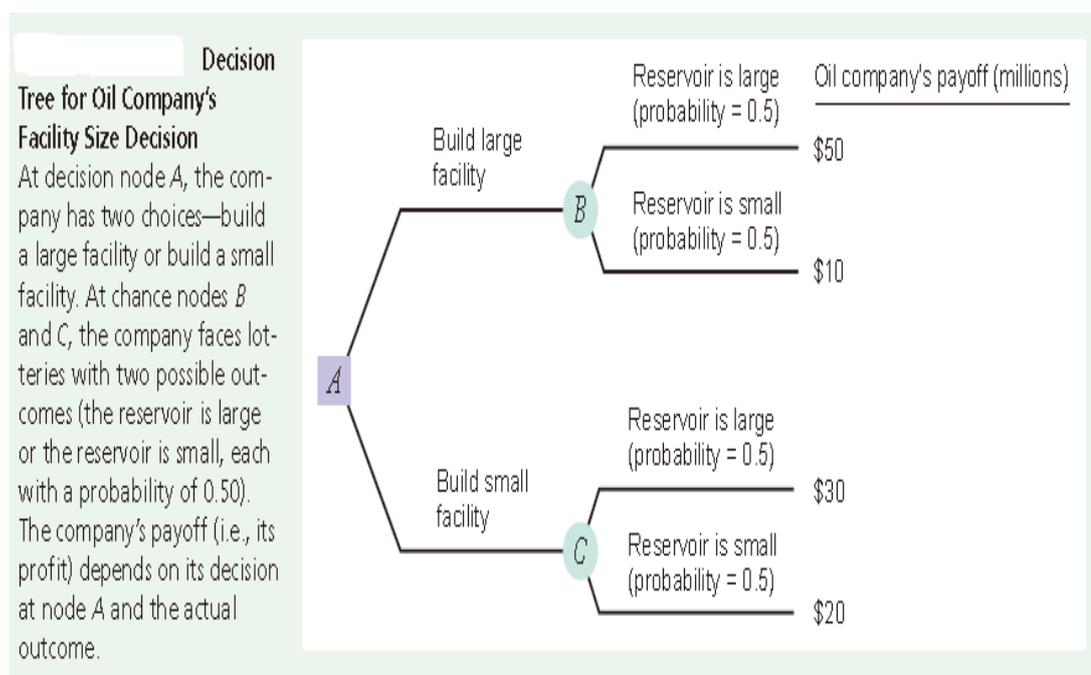
10. Why Risk is Not Always Spread Thinly?

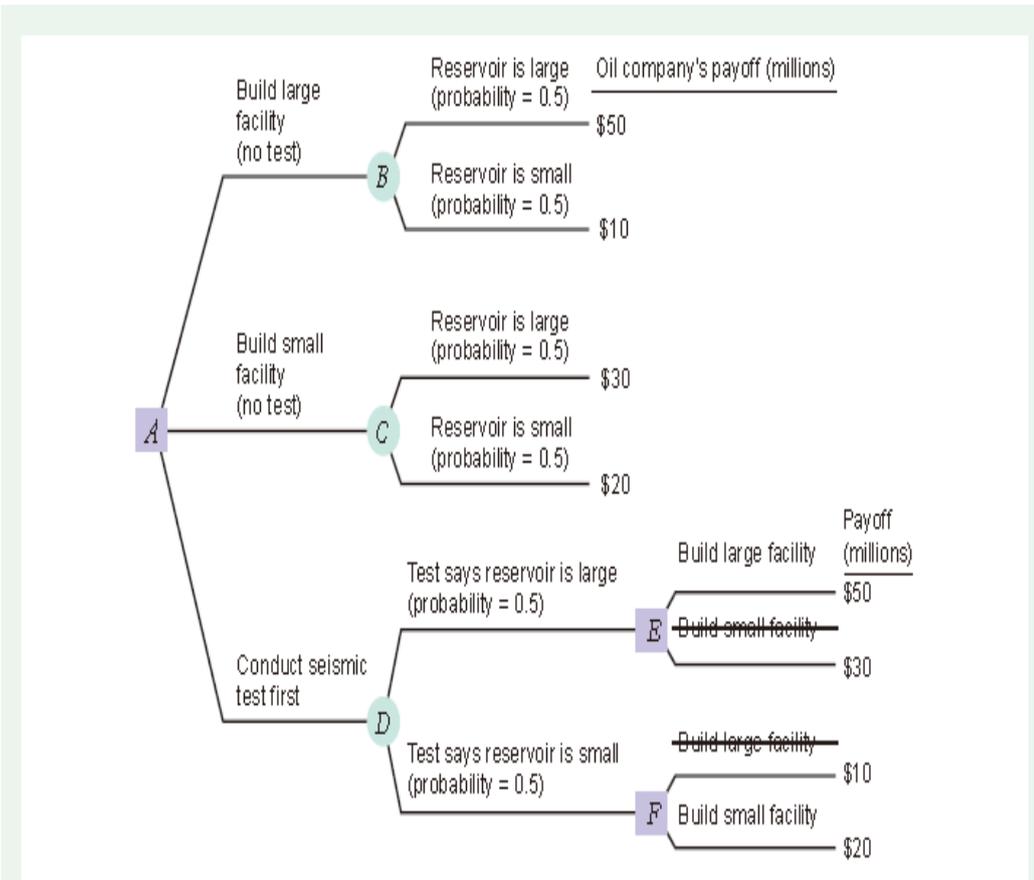
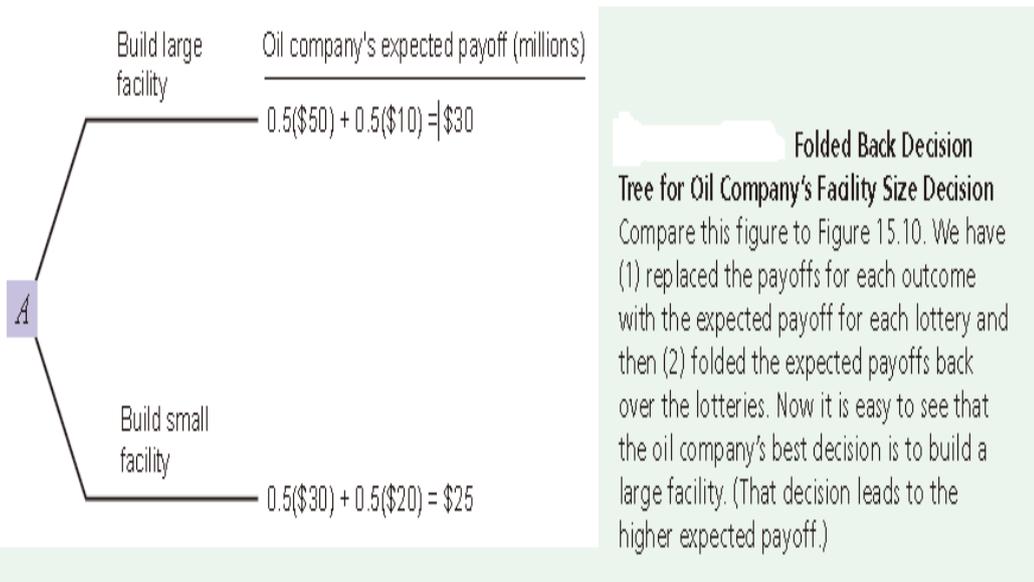
- a. 不對稱訊息與一些額外的考量
- b. 系統性風險

11. Efficient Risk Sharing :

When one of the parties is risk neutral and the others are strictly risk averse, efficient risk sharing is simple: The risk-neutral party assumes all the risk.

12. The Value of Information (見以下例子說明)





**FIGURE 15.12 Decision Tree for Oil Company's Facility Size Decision with an Option to Test**  
 Compare this figure to Figure 15.10. Now the company has an option to conduct a seismic test at no cost. This option leads to the new chance node *D*, whose outcomes lead to decision nodes *E* and *F*. If we compare the payoffs associated with the choices at these decision nodes, we can cross out the inferior choices. Then we can calculate the expected payoffs of the lotteries, fold back the tree, and find the company's optimal decision (see Figure 15.13).

## Ex 12.1:

A small biotechnology company has developed a new drug treatment that has commercial potential. The company has to decide whether to produce the new compound itself or sell the rights to the compound to a large drug company. The payoffs from each of these courses of action depend on whether the treatment is approved by the Food and Drug Administration (FDA), the regulatory body in the United States that approves all new drug treatments. (The FDA bases its decision on the outcome of tests of the drug's effectiveness on human subjects.) The company must make its decision before the FDA decides. Here are the payoffs the drug

company can expect to get under the two options it faces:

Outcome	Probability	Decision	
		Sell the Rights	Produce Yourself
FDA approves	0.20	\$10	\$50
FDA does not approve	0.80	\$2	-\$10

*(payoffs are in millions of dollars)*

- Draw a decision tree showing the decisions that the company can make and the payoffs from following those decisions. Carefully distinguish between chance nodes and decision nodes in the tree.
- Assuming that the biotechnology company acts as a risk-neutral decision maker, what action should it choose? What is the expected payoff associated with this action?
- What is the company's VPI?