

### **The effect of increased risk on option values: The value of waiting**

Consider a tech company that has developed a new technology. It can develop the technology and bring it to market for a capital outlay of \$8 billion. It will take one year for the investment to begin producing. The company expects that the technology would generate a (net) annuity for 30 years of \$1.1 billion (per year). The company has no debt and its cost of equity is 9%. Because the technology is new, the company expects to learn a lot about consumer demand after 1 year.

1. What is the NPV of this project?
2. Suppose that in Case 1, after one year, there is a 50% probability that the annuity would be \$1.2 billion and a 50% probability that the annuity would be \$1 billion. In this case, what is the project's NPV? What is the value of the option to wait to see which state of nature prevails? Should the company invest now, wait before investing, or not undertake the project in this case?
3. Suppose that in Case 2, after one year, there is a 50% probability that the annuity would be \$1.5 billion and a 50% probability that the annuity would be \$0.7 billion. In this case, what is the project's NPV? What is the value of the option to wait to see which state of nature prevails? Should the company invest now, wait before investing, or not undertake the project in this case?
4. Suppose that in Case 3, after one year, there is a 50% probability that the annuity would be \$2.1 billion and a 50% probability that the annuity would be \$0.1 billion. In this case, what is the project's NPV? What is the value of the option to wait to see which state of nature prevails? Should the company invest now, wait before investing, or not undertake the project in this case?
5. Discuss the effect of increased uncertainty on the value of the option to wait.