

Chapter 7, Problem 6

HiWiFi: Option to Expand

(Effect of Option Life)

Input Data

Present value of future cash flows	\$100	million
Volatility	40%	annual
Risk-free rate of return	5%	annual
Time to expiration	5	years
Expansion factor	5	
Time step	1	year(s)
Cost of expansion	\$500	million

Results

NPV	\$0
ROV	\$243
Value added	\$243

Calculated Parameters

Up factor (u)	1.492
Down factor (d)	0.670
Risk-neutral probability (p)	0.464

Asset Valuation Lattice

Time period	0	1	2	3	4	5
Valuation of underlying asset	\$100	\$149	\$223	\$332	\$495	\$739
		\$67	\$100	\$149	\$223	\$332
			\$45	\$67	\$100	\$149
				\$30	\$45	\$67
					\$20	\$30
						\$14

Option Valuation Lattice*

Time period	0	1	2	3	4	5
Valuation of expansion option	\$243	\$417	\$713	\$1,208	\$2,001	\$3,195
		\$115	\$200	\$354	\$637	\$1,160
			\$53	\$86	\$143	\$246
				\$30	\$45	\$67
					\$20	\$30
						\$14

*Expand if green



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HiWiFi: Option to Expand (Effect of Option Life)

Input Data

Present value of future cash flows	\$100	million
Volatility	40%	annual
Risk-free rate of return	5%	annual
Time to expiration	4	years
Expansion factor	5	
Time Step	1	year(s)
Cost of expansion	\$500	million

Results

NPV	\$0
ROV	\$224
Value added	\$224

Calculated Parameters

Up factor (u)	1.492
Down factor (d)	0.670
Risk-neutral probability (p)	0.464

Asset Valuation Lattice

Time period	0	1	2	3	4
Valuation of underlying asset	\$100	\$149	\$223	\$332	\$495
		\$67	\$100	\$149	\$223
			\$45	\$67	\$100
				\$30	\$45
					\$20

Option Valuation Lattice*

Time period	0	1	2	3	4
Valuation of expansion option	\$224	\$393	\$686	\$1,184	\$1,977
		\$101	\$176	\$321	\$613
			\$45	\$67	\$100
				\$30	\$45
					\$20

*Expand if green



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HiWiFi: Option to Expand

(Effect of Option Life)

Input Data

Present value of future cash flows	\$100	million
Volatility	40%	annual
Risk-free rate of return	5%	annual
Time to expiration	2	years
Expansion factor	5	
Time step	1	year(s)
Cost of expansion	\$500	million

Results

NPV	\$0
ROV	\$176
Value added	\$176

Calculated Parameters

Up factor (u)	1.492
Down factor (d)	0.670
Risk-neutral probability (p)	0.464

Asset Valuation Lattice

Time period	0	1	2
Valuation of underlying asset	\$100	\$149	\$223
		\$67	\$100
			\$45

Option Valuation Lattice*

Time period	0	1	2
Valuation of expansion option	\$176	\$321	\$613
		\$67	\$100
			\$45

*Expand if green

