

ECON 612: MONEY AND BANKING
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EXAMPLE 7.1*
SOLUTIONS AND EXPLANATIONS

COLOR LEGEND

- ⌘ HEADINGS
- ⌘ GIVEN/PREVIOUSLY FOUND INFORMATION
- ⌘ CONCEPTS YOU SHOULD ALREADY KNOW
- ⌘ ANSWER
- ⌘ ANNOTATIONS AND EXTRA EXPLANATIONS

* A COPY OF THE PROBLEMS IS ATTACHED AT THE END OF THIS DOCUMENT. THERE MAY BE SOME DIFFERENCES BETWEEN THIS VERSION AND THE ONE AVAILABLE ON CANVAS.

GIVEN INFORMATION

$$L = \$1.05 \text{ MILLION}$$

$$E = \$1 \text{ MILLION}$$

$$D = \$2 \text{ MILLION}$$

$$S(AS) = \$3 \text{ MILLION}$$

$$P(S|AS) = 0.8$$

$$S(A) = \$2 \text{ MILLION}$$

$$P(S|A) = 0.8$$

$$F(A) = \$1 \text{ MILLION}$$

$$P(F|A) = 0.2$$

$$S(B) = \$7 \text{ MILLION}$$

$$P(S|B) = 0.2$$

$$F(B) = \$0$$

$$P(F|B) = 0.8$$

$$d = 0$$

PREVIOUS DEBT IS SENIOR

$$ETT = 0$$

I FINDING $ER(A)$

$$\begin{aligned} ER(A) &= P(S|A)S(A) + P(F|A)F(A) \\ &= 0.8(2) + 0.2(1) \end{aligned}$$

$$ER(A) = \$1.6 \text{ MILLION}$$

FINDING $ER(B)$

$$\begin{aligned} ER(B) &= P(S|B)S(B) + P(F|B)F(B) \\ &= 0.2(7) + 0.8(0) \end{aligned}$$

$$ER(B) = \$1.4 \text{ MILLION}$$

CONCLUSION

BECAUSE $ER(A) > ER(B)$, PROJECT A IS SAFER AND PROJECT B IS RISKIER.

2 a i FINDING $P(i)$

$$\begin{aligned} P(i) &= P(S|AS)P(S|A) \\ &= (0.8)(0.8) \end{aligned}$$

$$P(i) = 0.64$$

ii FINDING $P(ii)$

$$\begin{aligned} P(ii) &= P(S|AS)P(F|A) \\ &= (0.8)(0.2) \end{aligned}$$

$$P(ii) = 0.16$$

iii FINDING $P(iii)$

$$P(\text{W}) = P(F \mid AS)P(S \mid A)$$

$$= (0.2)(0.8)$$

$$P(\text{W}) = 0.16$$

(iv) FINDING $P(\text{N})$

$$P(\text{N}) = P(F \mid AS)P(F \mid A)$$

$$= (0.2)(0.2)$$

$$P(\text{N}) = 0.04$$

(b) i) FINDING $OU(i)$

$$OU(i) = S(AS) + S(A)$$

$$= 3 + 2$$

$$OU(i) = \$5 \text{ MILLION}$$

(ii) FINDING $OU(ii)$

$$OU(ii) = S(AS) + F(A)$$

$$= 3 + 1$$

$$OU(ii) = \$4 \text{ MILLION}$$

(iii) FINDING $OU(iii)$

$$OU(iii) = F(AS) + S(A)$$

$$= 0 + 2$$

$$OU(iii) = \$2 \text{ MILLION}$$

(iv) FINDING $OU(N)$

$$OU(N) = F(AS) + F(A)$$

$$= 0 + 1$$

$$OU(N) = \$1 \text{ MILLION}$$

(c) i) FINDING $Eq(i)$

$$Eq(i) = OU(i) + E$$

$$= 5 + 1$$

$$Eq(i) = \$6 \text{ MILLION}$$

(ii) FINDING $Eq(ii)$

$$Eq(ii) = OU(ii) + E$$

$$= 4 + 1$$

$$Eq(ii) = \$5 \text{ MILLION}$$

(iii) FINDING $Eq(iii)$

$$Eq(iii) = OU(iii) + E$$

$$= 2 + 1$$

$$Eq(iii) = \$3 \text{ MILLION}$$

(iv) FINDING $Eq(N)$

$$Eq(N) = OU(N) + E$$

$$= 1 + 1$$

$$Eq(N) = \$2 \text{ MILLION}$$

d i FINDING CF(i)

$$CF(i) = Eq(i) - D$$
$$= 6 - 2$$

$$CF(i) = \$4 \text{ MILLION}$$

ii FINDING CF(ii)

$$CF(ii) = Eq(ii) - D$$
$$= 5 - 2$$

$$CF(ii) = \$3 \text{ MILLION}$$

iii FINDING CF(III)

$$CF(III) = Eq(III) - D$$
$$= 3 - 2$$

$$CF(III) = \$1 \text{ MILLION}$$

iv FINDING CF(N)

$$CF(N) = Eq(N) - D$$
$$= 2 - 2$$

$$CF(N) = \$0$$

e FINDING ER(2)

$$ER(2) = P(i)CF(i)^* + P(ii)CF(ii)^* + P(III)CF(III)^*$$
$$+ P(N)CF(N)^*$$

* IF $CF \geq L$, THEN JUST PUT "R".
IF $CF < L$, PUT CF FROM PART d.

$$= 0.64R + 0.16R + 0.16(1) + 0.04(0)$$

$$ER(2) = 0.80R + 0.16$$

THE FIRM IS COVERED BY LIMITED LIABILITY. SO, IF $CF > L$, THEN THE MOST THEY COULD REPAY IS CF .

f FINDING R(2)

$$0\pi: L = ER(2)$$

$$1.05 = 0.80R + 0.16$$

$$R(2) = \$1.1125 \text{ MILLION}$$

g FINDING i(2)

$$i(2) = \frac{R(2)}{L} - 1$$
$$= \frac{1.1125}{1.05} - 1$$

$$i(2) = 5.95\%$$

h FINDING E(2)

$$E(2) = P(i)[CF(i) - R(2)]^* + P(ii)[CF(ii) - R(2)]^*$$
$$+ P(III)[CF(III) - R(2)]^* + P(N)[CF(N) - R(2)]^*$$

* IF $CF \geq L$, COMPUTE AS WRITTEN ABOVE. IF $CF < L$, REPLACE $CF - R$ WITH 0 AS THE FIRM IS COVERED BY LIMITED LIABILITY.

$$= 0.64(4 - 1.1125) + 0.16(3 - 1.1125) + 0.16(0) + 0.04(0)$$

SINCE $CF < L$, THERE IS NO EXPECTED VALUE TO SHAREHOLDERS.

$$E(2) = \$2.15 \text{ MILLION}$$

3 a i FINDING $P(i)$

$$P(i) = P(S|AS)P(S|B)$$
$$= (0.8)(0.2)$$

$$P(i) = 0.16$$

ii FINDING $P(ii)$

$$P(ii) = P(S|AS)P(F|B)$$
$$= (0.8)(0.8)$$

$$P(ii) = 0.64$$

iii FINDING $P(iii)$

$$P(iii) = P(F|AS)P(S|B)$$
$$= (0.2)(0.2)$$

$$P(iii) = 0.04$$

iv FINDING $P(iv)$

$$P(iv) = P(F|AS)P(F|B)$$
$$= (0.2)(0.8)$$

$$P(iv) = 0.16$$

b i FINDING $DU(i)$

$$DU(i) = S(AS) + S(B)$$
$$= 3 + 7$$

$$DU(i) = \$10 \text{ MILLION}$$

ii FINDING $DU(ii)$

$$DU(ii) = S(AS) + F(B)$$
$$= 3 + 0$$

$$DU(ii) = \$3 \text{ MILLION}$$

iii FINDING $DU(iii)$

$$DU(iii) = F(AS) + S(B)$$
$$= 0 + 7$$

$$DU(iii) = \$7 \text{ MILLION}$$

iv FINDING $DU(iv)$

$$DU(iv) = F(AS) + F(B)$$
$$= 0 + 0$$

$$DU(iv) = \$0$$

c i FINDING $Eq(i)$

$$Eq(i) = DU(i) + E$$
$$= 10 + 1$$

$$Eq(i) = \$11 \text{ MILLION}$$

i FINDING Eq(i)

$$Eq_i = DU(i) + E$$
$$= 3 + 1$$

$$Eq_i = \$4 \text{ MILLION}$$

ii FINDING Eq(ii)

$$Eq_{ii} = DU(ii) + E$$
$$= 7 + 1$$

$$Eq_{ii} = \$8 \text{ MILLION}$$

iii FINDING Eq(iii)

$$Eq_{iii} = DU(iii) + E$$
$$= 0 + 1$$

$$Eq_{iii} = \$1 \text{ MILLION}$$

d i FINDING CF(i)

$$CF(i) = Eq(i) - D$$
$$= 11 - 2$$

$$CF(i) = \$9 \text{ MILLION}$$

ii FINDING CF(ii)

$$CF(ii) = Eq(ii) - D$$
$$= 4 - 2$$

$$CF(ii) = \$2 \text{ MILLION}$$

iii FINDING CF(iii)

$$CF(iii) = Eq(iii) - D$$
$$= 8 - 2$$

$$CF(iii) = \$6 \text{ MILLION}$$

iv FINDING CF(iv)

$$CF(iv) = Eq(iv) - D$$
$$= 1 - 2$$

$$CF(iv) = -\$1 \text{ MILLION}$$

e GIVEN INFORMATION

$$R(3) = R(2)$$

FINDING R(3)

$$R(3) = R(2)$$

$$= 1.1125$$

$$R(3) = \$1.1125 \text{ MILLION}$$

f FINDING E(3)

$$E(3) = P(i)[CF(i) - R(3)]^* + P(ii)[CF(ii) - R(3)]^*$$

$$+ P(\text{III})[CF(\text{III}) - R(3)]^* + P(\text{IV})[CF(\text{IV}) - R(3)]^*$$

* IF CF \geq L, COMPUTE AS WRITTEN ABOVE. IF CF $<$ L, REPLACE CF - R WITH 0 AS THE FIRM IS COVERED BY LIMITED LIABILITY.

$$= 0.16(9 - 1.1125) + 0.64(2 - 1.1125) + 0.04(6 - 1.1125)$$

$$+ 0.16(0) \quad \begin{matrix} \text{SINCE } CF < L, \text{ THERE IS NO EXPECTED} \\ \text{VALUE TO SHAREHOLDERS.} \end{matrix}$$

$$E(3) = \$2.025 \text{ MILLION}$$

4 A; B; A IN THIS CASE, R(2) IS AN INCENTIVE COMPATIBILITY.

5 GIVEN INFORMATION

$$E = 0$$

a i FINDING P(i)

$$P(i) = P(S|AS)P(S|A)$$
$$= (0.8)(0.8)$$

$$P(i) = 0.64$$

i ii FINDING P(ii)

$$P(ii) = P(S|AS)P(F|A)$$
$$= (0.8)(0.2)$$

$$P(ii) = 0.16$$

ii iii FINDING P(III)

$$P(III) = P(F|AS)P(S|A)$$
$$= (0.2)(0.8)$$

$$P(III) = 0.16$$

iv FINDING P(iv)

$$P(iv) = P(F|AS)P(F|A)$$
$$= (0.2)(0.2)$$

$$P(iv) = 0.04$$

b i FINDING DU(i)

$$DU(i) = S(AS) + S(A)$$
$$= 3 + 2$$

$$DU(i) = \$5 \text{ MILLION}$$

ii FINDING DU(ii)

$$DU(ii) = S(AS) + F(A)$$
$$= 3 + 1$$

$$DU(ii) = \$4 \text{ MILLION}$$

iii FINDING DU(III)

$$DU(III) = F(AS) + S(A)$$
$$= 0 + 2$$

$$DU(III) = \$2 \text{ MILLION}$$

iv FINDING DU(iv)

$$OU(w) = F(AS) + F(A)$$

$$= 0 + 1$$

$$OU(w) = \$1 \text{ MILLION}$$

c i FINDING Eq(i)

$$Eq_b(i) = OU(i) + E$$

$$= 5 + 0$$

$$Eq_b(i) = \$5 \text{ MILLION}$$

i ii FINDING Eq(ii)

$$Eq_b(ii) = OU(ii) + E$$

$$= 4 + 0$$

$$Eq_b(ii) = \$4 \text{ MILLION}$$

iii iii FINDING Eq(iii)

$$Eq_b(iii) = OU(iii) + E$$

$$= 2 + 0$$

$$Eq_b(iii) = \$2 \text{ MILLION}$$

w iv FINDING Eq(w)

$$Eq_b(w) = OU(w) + E$$

$$= 1 + 0$$

$$Eq_b(w) = \$1 \text{ MILLION}$$

d i FINDING CF(i)

$$CF(i) = Eq_b(i) - D$$

$$= 5 - 2$$

$$CF(i) = \$3 \text{ MILLION}$$

ii ii FINDING CF(ii)

$$CF(ii) = Eq_b(ii) - D$$

$$= 4 - 2$$

$$CF(ii) = \$2 \text{ MILLION}$$

iii iii FINDING CF(iii)

$$CF(iii) = Eq_b(iii) - D$$

$$= 2 - 2$$

$$CF(iii) = \$0$$

w iv FINDING CF(w)

$$CF(w) = Eq_b(w) - D$$

$$= 1 - 2$$

$$CF(w) = -\$1 \text{ MILLION}$$

e FINDING ER(S)

$$ER(S) = P(i)CF(i)^* + P(ii)CF(ii)^* + P(iii)CF(iii)^*$$

$$+ P(\text{W})CF(\text{W})$$

*IF CF ≥ L, THEN JUST PUT "R".
IF CF < L, PUT CF FROM PART d.

$$= 0.64R + 0.16R + 0.16(D) + 0.04(D)$$

$$ER(S) = 0.80R$$

THE FIRM IS COVERED BY LIMITED LIABILITY. SO, IF CF > L, THEN THE MOST THEY COULD REPAY IS CF.

f FINDING R(S)

$$\text{DT}: L = ER(S)$$

$$1.05 = 0.80R$$

$$R(S) = \$1.3125 \text{ MILLION}$$

g FINDING L(S)

$$L(S) = \frac{R(S)}{L} - 1$$

$$= \frac{1.3125}{1.05} - 1$$

$$L(S) = 25\%$$

h FINDING E(S)

$$E(S) = P(i)[CF(i) - R(S)]^* + P(ii)[CF(ii) - R(S)]^* + P(III)[CF(III) - R(S)]^* + P(W)[CF(W) - R(S)]^*$$

* IF CF ≥ L, COMPUTE AS WRITTEN ABOVE. IF CF < L, REPLACE CF - R WITH 0 AS THE FIRM IS COVERED BY LIMITED LIABILITY.

$$= 0.64(3 - 1.3125) + 0.16(2 - 1.3125) + 0.16(D) + 0.04(D)$$

$$E(S) = \$1.19 \text{ MILLION}$$

SINCE CF < L, THERE IS NO EXPECTED VALUE TO SHAREHOLDERS.

b a i FINDING P(i)

$$P(i) = P(S|AS)P(S|B)$$

$$= (0.8)(0.2)$$

$$P(i) = 0.16$$

ii FINDING P(ii)

$$P(ii) = P(S|AS)P(F|B)$$

$$= (0.8)(0.8)$$

$$P(ii) = 0.64$$

iii FINDING P(III)

$$P(III) = P(F|AS)P(S|B)$$

$$= (0.2)(0.2)$$

$$P(III) = 0.04$$

iv FINDING P(W)

$$P(W) = P(F|AS)P(F|B)$$

$$= (0.2)(0.8)$$

$$P(W) = 0.16$$

b i FINDING DU(i)

$$DU(i) = S(AS) + S(B)$$

$$= 3 + 7$$

$$OU(i) = \$10 \text{ MILLION}$$

i FINDING OU(ii)

$$OU(ii) = S(AS) + F(B)$$

$$= 3 + 0$$

$$OU(ii) = \$3 \text{ MILLION}$$

ii FINDING OU(iii)

$$OU(iii) = F(AS) + S(B)$$

$$= 0 + 7$$

$$OU(iii) = \$7 \text{ MILLION}$$

iii FINDING OU(iv)

$$OU(iv) = F(AS) + F(B)$$

$$= 0 + 0$$

$$OU(iv) = \$0$$

c i FINDING Eq(i)

$$Eq_f(i) = OU(i) + E$$

$$= 10 + 0$$

$$Eq_f(i) = \$10 \text{ MILLION}$$

ii FINDING Eq(ii)

$$Eq_f(ii) = OU(ii) + E$$

$$= 3 + 0$$

$$Eq_f(ii) = \$3 \text{ MILLION}$$

iii FINDING Eq(iii)

$$Eq_f(iii) = OU(iii) + E$$

$$= 7 + 0$$

$$Eq_f(iii) = \$7 \text{ MILLION}$$

iv FINDING Eq(iv)

$$Eq_f(iv) = OU(iv) + E$$

$$= 0 + 0$$

$$Eq_f(iv) = \$0$$

d i FINDING CF(i)

$$CF(i) = Eq_f(i) - D$$

$$= 10 - 2$$

$$CF(i) = \$8 \text{ MILLION}$$

ii FINDING CF(ii)

$$CF(ii) = Eq_f(ii) - D$$

$$= 3 - 2$$

$$CF(i) = \$1 \text{ MILLION}$$

iii FINDING $CF(w)$

$$CF(w) = Eq(w) - D$$
$$= 7 - 2$$

$$CF(w) = \$5 \text{ MILLION}$$

w FINDING $CF(n)$

$$CF(n) = Eq(n) - D$$
$$= 0 - 2$$

$$CF(n) = -\$2 \text{ MILLION}$$

e GIVEN INFORMATION

$$R(b) = R(s)$$

FINDING $R(b)$

$$R(b) = R(s)$$
$$= 1.3125$$

$$R(b) = \$1.3125 \text{ MILLION}$$

f FINDING $E(b)$

$$E(b) = P(i)[CF(i) - R(b)]^* + P(ii)[CF(ii) - R(b)]^*$$
$$+ P(iii)[CF(iii) - R(b)]^* + P(iv)[CF(iv) - R(b)]^*$$

* IF $CF \geq L$, COMPUTE AS WRITTEN ABOVE. IF $CF < L$, REPLACE $CF - R$ WITH 0 AS THE FIRM IS COVERED BY LIMITED LIABILITY.

$$= 0.16(8 - 1.3125) + 0.64(1) + 0.04(5 - 1.3125) + 0.16(0)$$

$$E(b) = \$1.2175 \text{ MILLION}$$

SINCE $CF \geq L$, THERE IS NO EXPECTED VALUE TO SHAREHOLDERS.

7 B; A; B

8 THE FIRM WOULD CHOOSE THE SAFER PROJECT (PROJECT A) AND ITS OWN EQUITY. CAPITAL HELPS RESOLVE MORAL HAZARD BY IMPOSING A GREATER LOSS ON THE FIRM FOR POOR PROJECT OUTCOMES. THIS IS BECAUSE CAPITAL ACTS AS THE "FIRST LINE OF DEFENSE" AGAINST PROJECT LOSSES AND PROVIDES A CUSHION OF PROTECTION FOR THE LENDER. WITHOUT EQUITY CAPITAL, THE FIRM KNOWS THAT IT HAS A VALUABLE CALL OPTION—IF THE PROJECT DOES POORLY, THE LENDER SUSTAINS THE LOSS (THE WORST THE FIRM CAN DO IS GET NOTHING), WHEREAS IF THE PROJECT DOES WELL, THE LENDER GETS ONLY ITS CONTRACTUAL PAYMENT AND THE FIRM EARNS A PROFIT. WITH CAPITAL, THE FIRM'S COST OF PURSUING RISK IS INCREASED AND THE VALUE OF ITS CALL OPTION IS REDUCED. WITH SUFFICIENT EQUITY CAPITAL, THE LENDER CAN ALIGN THE FIRM'S INTEREST PERFECTLY WITH ITS OWN.interestingly, this means that the firm is better off.

Self-Investment Incentives

Example 7.1

A firm requests a \$1.05 million loan from the bank. It currently has \$1 million in equity (retained earnings) and has \$2 million in debt. It also has assets worth \$3 million with a successful probability of 0.8. The firm has two projects: A and B. Their probabilities of success and failure are below:

Project A = \$2 million with $p = 0.8$

Project A = \$1 million with $p = 0.2$

Project B = \$7 million with $p = 0.2$

Project B = \$0 with $p = 0.8$

In this problem, we're making a few assumptions. First, the discount rate is 0. Second, the firm's previous debt is senior to the bank loan. Third, the banking sector is competitive so expected profits are 0.

In this problem, you will calculate the firm's profits under Project A and B with and without equity. Given these values, you will show the firm will choose Project A with its equity in the project and would choose Project B without its equity in the project. You will also show that projects under Project A are greater than the profits under Project B for the firm.

(1) Which project seems riskier?

(2) Using values for Project A with equity, fill out the table below using the following prompts:

Project A with Equity

	Probability (a)	Outcome (b)	With Equity (c)	Cash Flow (d)
(i)	<u>0.64</u>	<u>5</u>	<u>6</u>	<u>4</u>
(ii)	<u>0.16</u>	<u>4</u>	<u>5</u>	<u>3</u>
(iii)	<u>0.16</u>	<u>2</u>	<u>3</u>	<u>1</u>
(iv)	<u>0.04</u>	<u>1</u>	<u>2</u>	<u>0</u>

THESE ARE LESS THAN $L=1.05$, SO THEY'RE COVERED BY LIMITED LIABILITY.

(a) In the first column, labeled "(a)", calculate the probability of each of the following situations and fill in the corresponding rows:

- (i) Successful outcome for firm's assets; Successful outcome for Project A
- (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project A
- (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project A
- (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project A

(b) In the second column, labeled "(b)", calculate the sum of the outcomes in each of the following situations and fill in the corresponding rows:

- (i) Successful outcome for firm's assets; Successful outcome for Project A
- (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project A
- (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project A
- (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project A

(c) In the third column, labeled "(c)", add the firm's retained earnings to the value from the previous column for each of the following situations and fill in the corresponding rows:

- (i) Successful outcome for firm's assets; Successful outcome for Project A
- (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project A
- (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project A

- (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project A
- (d) In the fourth column, labeled "(d)", calculate the value of the firm's cash flow for each of the following situations and fill in the corresponding rows:
- (i) Successful outcome for firm's assets; Successful outcome for Project A
 - (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project A
 - (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project A
 - (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project A
- (e) Using the zero-profit condition, find the firm's level of expected repayments in terms of repayments (R).
- (f) Using the zero-profit condition and the level of expected repayments, find the level of repayments.
- (g) Find the interest rate the firm faces.
- (h) Find the expected value to shareholders after repayments.

(3) Using values for Project B with equity, fill out the table below using the following prompts:

Project B with Equity

	Probability (a)	Outcome (b)	With Equity (c)	Cash Flow (d)
(i)	0.16	10	11	9
(ii)	0.64	3	4	2
(iii)	0.04	7	8	6
(iv)	0.16	0	1	-1*

*THIS WILL BE WITH LIMITED LIABILITY

- (a) In the first column, labeled "(a)", calculate the probability of each of the following situations and fill in the corresponding rows:
- (i) Successful outcome for firm's assets; Successful outcome for Project B
 - (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project B
 - (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project B
 - (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project B
- (b) In the second column, labeled "(b)", calculate the sum of the outcomes in each of the following situations and fill in the corresponding rows:
- (i) Successful outcome for firm's assets; Successful outcome for Project B
 - (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project B
 - (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project B
 - (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project B
- (c) In the third column, labeled "(c)", add the firm's retained earnings to the value from the previous column for each of the following situations and fill in the corresponding rows:
- (i) Successful outcome for firm's assets; Successful outcome for Project B
 - (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project B
 - (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project B
 - (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project B
- (d) In the fourth column, labeled "(d)", calculate the value of the firm's cash flow for each of the following situations and fill in the corresponding rows:
- (i) Successful outcome for firm's assets; Successful outcome for Project B

- (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project B
 - (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project B
 - (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project B
 - (e) Find the level of repayments supposing that the firm takes out the contact meant for Project A and diverts it towards Project B (i.e., the levels of repayment are the same).
 - (f) Find the expected value to shareholders after repayments.
- (4) Given the values from Questions (2) and (3), fill in the blanks: Since the expected value to shareholders for Project ____ is greater than the expected value to shareholders for Project ____, the firm will choose project _____. This is contingent upon the firm spending its own equity.
- (5) Using values for Project A without equity, fill out the table below using the following prompts:

Project A without Equity

	Probability (a)	Outcome (b)	Without Equity (c)	Cash Flow (d)
(i)	<u>0.64</u>	<u>5</u>	<u>5</u>	<u>3</u>
(ii)	<u>0.16</u>	<u>4</u>	<u>4</u>	<u>2</u>
(iii)	<u>0.16</u>	<u>2</u>	<u>2</u>	<u>0</u>
(iv)	<u>0.04</u>	<u>1</u>	<u>1</u>	<u>-1</u>

THESE ARE LESS THAN $L=1.05$, SO THEY'RE COVERED BY LIMITED LIABILITY.

- (a) In the first column, labeled "(a)", calculate the probability of each of the following situations and fill in the corresponding rows:
- (i) Successful outcome for firm's assets; Successful outcome for Project A
 - (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project A
 - (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project A
 - (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project A
- (b) In the second column, labeled "(b)", calculate the sum of the outcomes in each of the following situations and fill in the corresponding rows:
- (i) Successful outcome for firm's assets; Successful outcome for Project A
 - (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project A
 - (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project A
 - (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project A
- (c) In the third column, labeled "(c)", add the firm's retained earnings to the value from the previous column for each of the following situations and fill in the corresponding rows:
- (i) Successful outcome for firm's assets; Successful outcome for Project A
 - (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project A
 - (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project A
 - (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project A
- (d) In the fourth column, labeled "(d)", calculate the value of the firm's cash flow for each of the following situations and fill in the corresponding rows:
- (i) Successful outcome for firm's assets; Successful outcome for Project A
 - (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project A
 - (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project A
 - (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project A

- (e) Using the zero-profit condition, find the firm's level of expected repayments in terms of repayments (R).
- (f) Using the zero-profit condition and the level of expected repayments, find the level of repayments.
- (g) Find the interest rate the firm faces.
- (h) Find the expected value to shareholders after repayments.

(6) Using values for Project B without equity, fill out the table below using the following prompts:

Project B without Equity

	Probability (a)	Outcome (b)	With Equity (c)	Cash Flow (d)
(i)	0.16	10	10	8
(ii)	0.64	3	3	1
(iii)	0.04	7	7	5
(iv)	0.16	0	0	-2*

*THIS WILL BE 0 WITH LIMITED LIABILITY

(a) In the first column, labeled "(a)", calculate the probability of each of the following situations and fill in the corresponding rows:

- (i) Successful outcome for firm's assets; Successful outcome for Project B
- (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project B
- (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project B
- (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project B

(b) In the second column, labeled "(b)", calculate the sum of the outcomes in each of the following situations and fill in the corresponding rows:

- (i) Successful outcome for firm's assets; Successful outcome for Project B
- (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project B
- (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project B
- (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project B

(c) In the third column, labeled "(c)", add the firm's retained earnings to the value from the previous column for each of the following situations and fill in the corresponding rows:

- (i) Successful outcome for firm's assets; Successful outcome for Project B
- (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project B
- (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project B
- (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project B

(d) In the fourth column, labeled "(d)", calculate the value of the firm's cash flow for each of the following situations and fill in the corresponding rows:

- (i) Successful outcome for firm's assets; Successful outcome for Project B
- (ii) Successful outcome for firm's assets; Unsuccessful outcome for Project B
- (iii) Unsuccessful outcome for firm's assets; Successful outcome for Project B
- (iv) Unsuccessful outcome for firm's assets; Unsuccessful outcome for Project B

(e) Find the level of repayments supposing that the firm takes out the contact meant for Project A and diverts it towards Project B (i.e., the levels of repayment are the same).

(f) Find the expected value to shareholders after repayments.

- (7) Given the values from Questions (5) and (6), fill in the blanks: Since the expected value to shareholders for Project ____ is greater than the expected value to shareholders for Project ____, the firm will choose project _____. This is contingent upon the firm *not* spending its own equity.
- (8) In conclusion, what project will the firm choose and why?