EXTRA PROBLEM 7: SENSITIVITY ANALYSIS

Max Result

Accept $2 Billion

5

Texaco Accepts $5 Billion (0.17)

High (p)

10.3

Medium (q)

5

Low (1-p-q)

0

$5 Billion

Counteroffer

Texaco Refuses (0.50)

Final Court Decision

Refuse

(0.33)

Texaco Counteroffers $3 Billion

Counteroffer

Final Court Decision

Low (1-p-q)

0

Accept $3 Billion

3

Counteroffer

Texaco Refuses (0.50)

Final Court Decision

Accept $3 Billion

3

Counteroffer

Texaco Refuses (0.50)

Final Court Decision

Refuse

(0.33)

Texaco Counteroffers $3 Billion

Counteroffer

Texaco Refuses (0.50)

Final Court Decision

Accept $3 Billion

3

Counteroffer

Texaco Refuses (0.50)

Final Court Decision

Refuse

(0.33)

Texaco Counteroffers $3 Billion

Counteroffer

Texaco Refuses (0.50)

Final Court Decision

Accept $3 Billion

3

Counteroffer

Texaco Refuses (0.50)

Final Court Decision

Refuse

(0.33)

Texaco Counteroffers $3 Billion

Counteroffer

Texaco Refuses (0.50)

Final Court Decision

Accept $3 Billion

3
A. Create a two-way sensitivity graph that shows optimal strategies for Liedtke for all possible values of p and q

Strategy A = Accept $2 billion.
Strategy B = Counteroffer $5 billion, then refuse if Texaco offers $3 billion.
Strategy C = Counteroffer $5 billion, then accept if Texaco offers $3 billion.

EMV(A) = 2

EMV(B) = 0.17 (5) + 0.5 \left[p 10.3 + q 5 + (1-p - q) 0\right] + 0.33 \left[p 10.3 + q 5 + (1-p - q) 0\right]
= 0.85 + 8.549 p + 4.15 q.

EMV(C) = 0.17 (5) + 0.5 \left[p 10.3 + q 5 + (1-p - q) 0\right] + 0.33 (3)
= 1.85 + 5.15 p + 2.5 q.
NOW CONSTRUCT THREE INEQUALITIES:

• \(\text{EMV}(A) > \text{EMV}(B) \iff\)
  
  \[
  2 > 0.85 + 8.549\ p + 4.15\ q \iff \\
  0.135 - 0.485\ q > p .
  \]  
  \(1\)

• \(\text{EMV}(A) > \text{EMV}(C) \iff\)
  
  \[
  2 > 1.85 + 5.15\ p + 2.5\ q \iff \\
  0.03 - 0.485\ q > p .
  \]  
  \(2\)

• \(\text{EMV}(B) > \text{EMV}(C) \iff\)
  
  \[
  0.85 + 8.549\ p + 4.15\ q > 1.85 + 5.15\ p + 2.5\ q \iff \\
  p > 0.294 - 0.485\ q .
  \]  
  \(3\)

Plot these three inequalities as lines on a graph with \(p\) on the vertical axis and \(q\) on the horizontal axis. Note that only the region below the line \(p + q = 1\) is feasible because \(p + q\) must be less than or equal to one.
These three lines divide the graph into four separate regions, labeled I, II, III, and IV.
Inequality (3) divides regions I and II. For points above this line, \( p > 0.294 - 0.485 \, q \), and so \( \text{EMV}(B) > \text{EMV}(C) \).

Inequality (1) divides regions II and III. For points above this line, \( p > 0.135 - 0.485 \, q \), and \( \text{EMV}(B) > \text{EMV}(A) \). As a result of this, we know that B is the preferred choice in region I and that C is the preferred choice in region II [where \( \text{EMV}(C) > \text{EMV}(B) > \text{EMV}(A) \)].

Inequality (2) divides regions III and IV. For points above this line, \( p > 0.03 - 0.485 \, q \), and \( \text{EMV}(C) > \text{EMV}(A) \). Thus, we now know that C is the preferred choice in region III [where \( \text{EMV}(C) > \text{EMV}(A) \) and \( \text{EMV}(C) > \text{EMV}(B) \)], and A is preferred in region IV.

Thus, we can redraw the graph, eliminating the line between regions II and III.

B. If Liedtke thinks that \( p \) must be at least 0.15 and \( q \) must be more than 0.35 can he make the decision without further probability assessment.
The diagram shows a probability space with axes $p$ and $q$. The region $B$ is shaded, indicating the conditions $p > 0.15$ and $q > 0.35$. Regions $A$ and $C$ are also marked on the graph.
Conclusion:

The shaded area in the figure represents those points for which \( p > 0.15 \) and \( q > 0.35 \). Note that all of these points fall in the “Choose B” region. Thus, Liedtke should adopt strategy B: **Counteroffer $5 billion, then refuse if Texaco offers $3 billion.**