ANALISIS DE SENSIBILIDAD

Erika Mishelle Arapa Condori

LINK YOUTUBE: https://youtu.be/YF4xKRYyWVA

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Tabla de Contenidos

7.1 MOTIVACION

$$\text{Maximize:} \quad P(x_1, x_2) = 60x_1 + 90x_2 \tag{7.1}$$

$$\text{Subject to:} \quad x_1 + 2x_2 = 40 \tag{7.2}$$

$$2x_1 + 3x_2 = 72 \tag{7.3}$$

$$x_1, x_2 \geq 0. \tag{7.4}$$

7.2 Ejemplo en excel

TABLE 7.1
Manufacturing Data for Lincoln Outdoors in Example 6.1.1

Labor-Hours	Cabin Model	Frontier Model	Max Hours per Day
Cutting Dept.	1	2	40
Assembly Dept.	2	3	72
Profit per Bag	$60	$90	

Cabin Model				
Frontier Model				
		Cabin	Frontier	Available
Profit	0	60	90	
Cutting	0	1	2	40
Assembly	0	2	3	72

FIGURE 7.1
The Lincoln Outdoors problem in Excel.

Cabin Model	24			
Frontier Model	8			
		Cabin	Frontier	Available
Profit	2160	60	90	
Cutting	40	1	2	40
Assembly	72	2	3	72

7.2 Ejemplo en excel

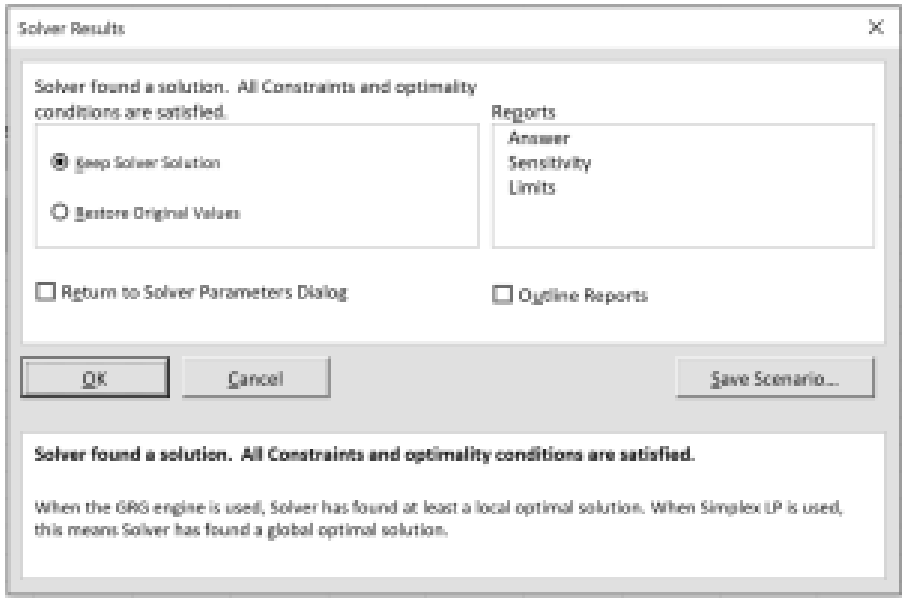


FIGURE 7.3
Options in Excel's solution for Lincoln Outdoors.

	A	B	C	D	E	F	G
1							
2		Cabin Model	0				
3		Frontier Model	0				
4				Cabin	Frontier	Available	
5		Profit	0	60	90		
6							
7		Cutting	0	1	2	40	
8		Assembly	0	2	3	72	
9							
10							

Answer Report 1 | Sensitivity Report 1 | Limits Report 1 | Sheet1

7.2 Ejemplo en excel

Objective Cell (Max)

Cell	Name	Original Value	Final Value
$C$5	Profit	0	2160

Variable Cells

Cell	Name	Original Value	Final Value	Integer
$C$2	Cabin Model	0	24	Contin
$C$3	Frontier Model	0	8	Contin

Constraints

Cell	Name	Cell Value	Formula	Status	Slack
$C$7	Cutting	40	$C$7<=$F$7	Binding	0
$C$8	Assembly	72	$C$8<=$F$8	Binding	0

7.2 Ejemplo en excel

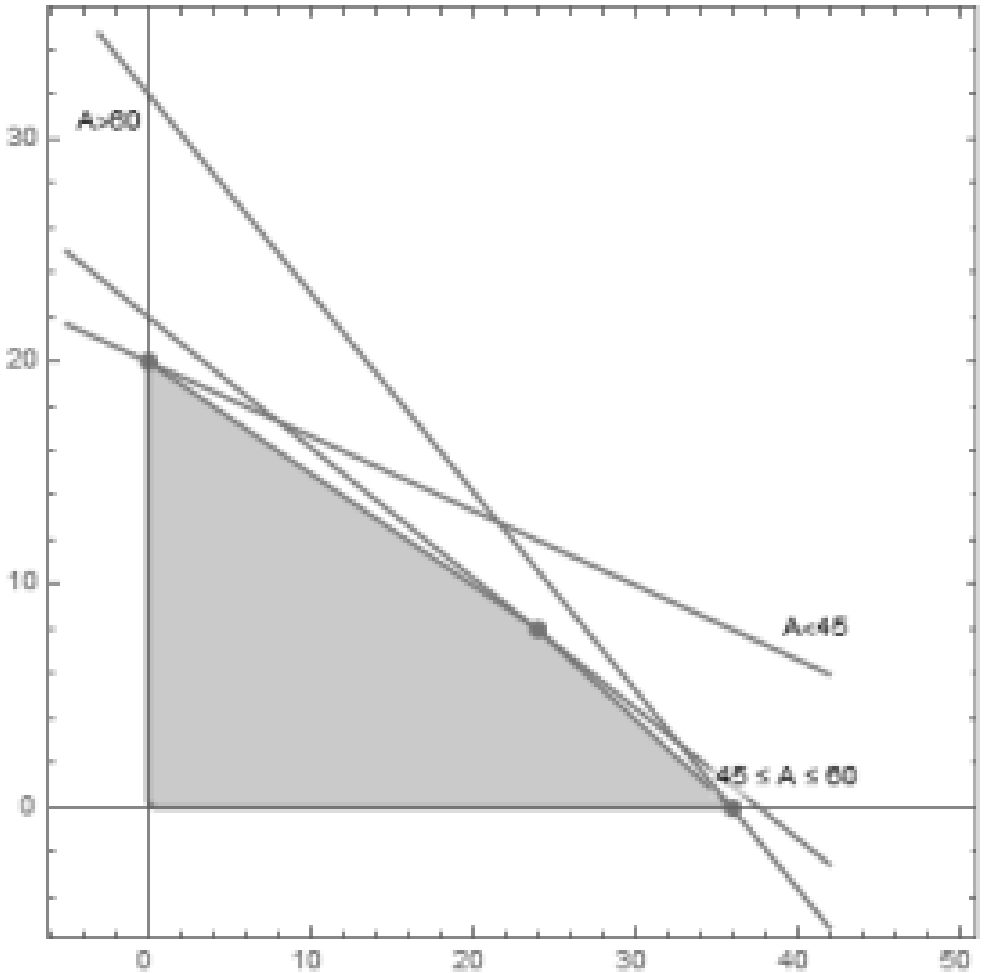
Variable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
$C$2	Cabin Model	24	0	60	0	15
$C$3	Frontier Model	8	0	90	30	0

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
$C$7	Cutting	40	0	40	8	4
$C$8	Assembly	72	30	72	8	12

7.2 Ejemplo en excel



algoritmo 2.2.1

Algorithm 7.2.1 Finding Additional Non-Degenerate LP Solutions Using Solver.

Input: Solved LP problem in Solver with decision variables $x_1, \ldots, x_n$.

1: Add a constraint to the model that holds the objective function at the optimal value.
2: **for** $i = 1$ to k **do**
3: **if** Allowable Decrease $= 0$ for x_i **then**
4: run Solver to minimize x_i
5: **end if**
6: **if** Allowable Increase $= 0$ **then**
7: run Solver to maximize x_i
8: **end if**
9: **end for**

Output: Additional non-degenerate LP solutions via Solver (if they exist).

7.2 Ejemplo en excel

Objective		
Cell	Name	Value
$C$5	Profit	2160

Variable			Lower Objective		Upper Objective	
Cell	Name	Value	Limit	Result	Limit	Result
$C$2	Cabin Model	24	0	720	24	2160
$C$3	Frontier Model	8	0	1440	8	2160

FIGURA 7.8 Reporte de límites para Lincoln Outdoors.

$$\begin{aligned}
\text{Maximize:} \quad & f(x_1, x_2) = x_1 && (7.5)\\
\text{Subject to:} \quad & 60x_1 + 90x_2 = 2160 && (7.6)\\
& x_1 + 2x_2 = 40 && (7.7)\\
& 2x_1 + 3x_2 = 72 && (7.8)\\
& x_1, x_2 \geq 0 && (7.9)
\end{aligned}$$

and

$$\begin{aligned}
\text{Minimize:} \quad & f(x_1, x_2) = x_2 && (7.10)\\
\text{Subject to:} \quad & 60x_1 + 90x_2 = 2160 && (7.11)\\
& x_1 + 2x_2 = 40 && (7.12)\\
& 2x_1 + 3x_2 = 72 && (7.13)\\
& x_1, x_2 \geq 0. && (7.14)
\end{aligned}$$

$$\begin{aligned}\text{Reduced Cost} = {} & \text{coefficient of variable in objective function} \\ & - \text{value per unit of resources used} \end{aligned} \tag{7.15}$$

where *the resources are valued at their shadow price.*

For example, the reduced cost of the Cabin Model for Lincoln Outdoors is (all values are *per unit*)

$$\begin{aligned}&\text{contribution to objective function} - \text{cutting hours} \cdot \text{shadow price} \\ &\quad - \text{assembly hours} \cdot \text{shadow price} \\ &= 60 - 1 \cdot 0 - 2 \cdot 30 = 0.\end{aligned}$$

As well, the reduced cost of the Frontier Model is

$$90 - 2 \cdot 0 - 3 \cdot 30 = 0.$$

It is not a coincidence that both of these values are 0, as the only time Reduced Cost of a decision variable is non-zero is if the variable is at either its lower or upper bound of the feasible region. For example, based on the cutting and assembly constraints we will only be able to produce between 0 and 36 Cabin Model sleeping bags. The solution $x_1 = 24$ is easily within this range.