หาค่าที่เหมาะสมที่สุด

กำหนด

Period	Demand	Charge	Price/Unit
1	10,15,20	100,80,60	1
2	20,22,25,27	50,40,30,20	1
3	7,10,14	150,125,100	1
4	25,35	200,175	1

Holding Cost = 0.5 unit/period

Set up Cost = 100

หา Objective

$$\text{Min} Z = Q1 + Q2 + Q3 + Q4 + 0.5(I1 + I2 + I3 + I4)$$

$$+100\left(Y1 + Y2 + Y3 + Y4\right) + \text{........} Z1 + \text{........} Z2 + \text{........} Z3 + \text{........} Z4$$

.... คือ Charge ที่ขึ้นอยู่กับ Demand ที่เลือก

Subject to

$$Q1 - I1 = \text{.......Demand1}$$

$$I1 + Q2 - I2 = \text{........Demand2}$$

$$I2 + Q3 - I3 = \text{........Demand3}$$

$$I3 + Q4 - I4 = \text{........Demand4}$$

$$100 Y_i - Q_i \geq 0 \quad i = 1,2,3,4$$

$$Q_i, I_i \geq 0$$

$$Y_i = \{0,1\}$$

การหาคำตอบด้วยวิธี Benders Decomposition

ได้คำตอบที่ รอบคำนวณที่ 10 คือ

	Min Z	Demand Period				Q(การสั่งซื้อ)				I(จำนวนใน Inventory)				Y(Period ที่สั่งสินค้า)			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Model	631.0	20	27	14	35	96	0	0	0	76	49	35	0	1	0	0	0

ขั้นตอนการคำนวณ

รอบที่ 1

	Q				I				LHS	RHS
Objective	1	1	1	1	0.5	0.5	0.5	0.5		
Constraint 1	1				-1				10	10
Constraint 2		1			1	-1			20	20
Constraint 3			1			1	-1		7	7
Constraint 4				1			1	-1	25	25
Constraint 5	-1								-10	-100
Constraint 6		-1							-52	-100
Constraint 7			-1						0	0
Constraint 8				-1					0	0
Value	10	52	0	0	0	32	25	0		
									Min Z	91

Min Z	Z												Y				LHS	RHS
791																		
Value	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	0		
Constraint Z1	1	1	1														1	1
Constraint Z2				1	1	1	1										1	1
Constraint Z3								1	1	1							1	1
Constraint Z4											1	1					1	1
Constraint Y													1				1	1
Constraint T	110	95	80	70	62	55	47	161	140	121	250	245	100	100	50	0	616	791

รอบที่ 2

	Q				I				LHS	RHS
Objective	1	1	1	1	0.5	0.5	0.5	0.5		
Constraint 1	1				-1				20	20
Constraint 2		1			1	-1			20	20
Constraint 3			1			1	-1		14	14
Constraint 4				1			1	-1	35	35
Constraint 5	-1								-89	-100
Constraint 6		-1							0	0
Constraint 7			-1						0	0
Constraint 8				-1					0	0
Value	89	0	0	0	69	49	35	0		
									Min Z	165

Min Z	Z												Y				LHS	RHS
650																		
Value	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	0		
Constraint Z1	1	1	1														1	1
Constraint Z2				1	1	1	1										1	1
Constraint Z3								1	1	1							1	1
Constraint Z4											1	1					1	1
Constraint Y													1				1	1
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	-0	-50	650	650
Constraint T	110	95	80	70	62	55	47	161	140	121	250	245	100	100	50	0	616	650

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รอบที่ 3

	Q				I				LHS	RHS
Objective	1	1	1	1	0.5	0.5	0.5	0.5		
Constraint 1	1				-1				20	20
Constraint 2		1			1	-1			20	20
Constraint 3			1			1	-1		14	14
Constraint 4				1			1	-1	35	35
Constraint 5	-1								-89	-100
Constraint 6		-1							0	0
Constraint 7			-1						0	0
Constraint 8				-1					0	0
Value	89	0	0	0	69	49	35	0		
									Min Z	166

Min Z	Z												Y				LHS	RHS
651																		
Value	0	1	0	0	0	0	1	0	1	0	0	1	1	0	0	1		
Constraint Z1	1	1	1														1	1
Constraint Z2				1	1	1	1										1	1
Constraint Z3								1	1	1							1	1
Constraint Z4											1	1					1	1
Constraint Y													1				1	1
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	263	100	50	-0	-50	613	651
Constraint T	110	95	80	70	62	55	47	161	140	121	250	245	100	100	50	0	627	651
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	-0	-50	613	651

รอบที่ 4

	Q				I				LHS	RHS
Objective	1	1	1	1	0.5	0.5	0.5	0.5		
Constraint 1	1				-1				15	15
Constraint 2		1			1	-1			27	27
Constraint 3			1			1	-1		10	10
Constraint 4				1			1	-1	35	35
Constraint 5	-1								-52	-100
Constraint 6		-1							0	0
Constraint 7			-1						0	0
Constraint 8				-1					-35	-100
Value	52	0	0	35	37	10	0	0		
									Min Z	110

Min Z	Z												Y				LHS	RHS
710																		
Value	0	0	1	0	1	0	0	0	0	1	0	1	1	0	0	0		
Constraint Z1	1	1	1														1	1
Constraint Z2				1	1	1	1										1	1
Constraint Z3								1	1	1							1	1
Constraint Z4											1	1					1	1
Constraint Y													1				1	1
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	225	210	100	50	-0	100	591	710
Constraint T	110	95	80	70	62	55	47	161	140	121	250	245	100	100	50	0	608	710
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	-0	-50	643	710
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	263	100	50	-0	-50	644	710

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รอบที่ 9

	Q				I				LHS	RHS
Objective	1	1	1	1	0.5	0.5	0.5	0.5		
Constraint 1	1				-1				20	20
Constraint 2		1			1	-1			25	25
Constraint 3			1			1	-1		14	14
Constraint 4				1			1	-1	25	25
Constraint 5	-1								-84	-100
Constraint 6		-1							0	0
Constraint 7			-1						0	0
Constraint 8				-1					0	0
Value	84	0	0	0	64	39	25	0		
									Min Z	148

Min Z	Z												Y				LHS	RHS
638																		
Value	0	0	1	0	0	0	1	0	0	1	1	0	1	0	0	0		
Constraint Z1	1	1	1														1	1
Constraint Z2				1	1	1	1										1	1
Constraint Z3							1	1	1								1	1
Constraint Z4										1	1						1	1
Constraint Y													1				1	1
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	-0	-50	631	638
Constraint T	110	95	80	70	62	55	47	161	140	121	250	245	100	100	50	0	598	638
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	-0	-50	631	638
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	263	100	50	-0	-50	631	638
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	225	210	100	50	-0	100	593	638
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	4E-08	-50	631	638
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	-0	-50	631	638
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	263	100	50	-0	-50	631	638
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	263	100	50	-0	-50	631	638

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รอบที่ 10

	Q				I				LHS	RHS
Objective	1	1	1	1	0.5	0.5	0.5	0.5		
Constraint 1	1				-1				20	20
Constraint 2		1			1	-1			27	27
Constraint 3			1			1	-1		14	14
Constraint 4				1			1	-1	25	25
Constraint 5	-1								-86	-100
Constraint 6		-1							0	0
Constraint 7			-1						0	0
Constraint 8				-1					0	0
Value	86	0	0	0	66	39	25	0		
									Min Z	151

Min Z	Z												Y				LHS	RHS
631																		
Value	0	0	1	0	0	0	1	0	0	1	0	1	1	0	0	1		
Constraint Z1	1	1	1														1	1
Constraint Z2				1	1	1	1										1	1
Constraint Z3							1	1	1								1	1
Constraint Z4										1	1						1	1
Constraint Y													1				1	1
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	4E-08	-50	581	631
Constraint T	110	95	80	70	62	55	47	161	140	121	250	245	100	100	50	0	593	631
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	-0	-50	581	631
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	263	100	50	-0	-50	581	631
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	225	210	100	50	-0	100	679	631
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	4E-08	-50	581	631
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	-0	-50	581	631
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	263	100	50	-0	-50	581	631
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	263	100	50	-0	-50	581	631
Constraint T	110	95	80	80	73	67.5	60.5	164	145	128	262.5	262	100	50	-0	-50	581	631

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