Chapter 14 - AGEC 641
Risk Homework

1. Model the following situation. A farm plan is to be established for a 400 acre farm in which the only binding constraints are land and tractor time. The variables involved are the acreage of crops 1 and 2 which are grown. The data are uncertain and possess the following distributions.

Objective Function

Observation	Crop 1 Cost /Acre	Crop 1 Revenue /Acre	Crop 2 Cost /Acre	Crop 2 Revenue/ Acre	Tractor Use Per Acre Crop 1	Tractor Use Per Acre Crop 2	Tractor Hours Available
1	100	150	100	185	1.4	1.7	600
2	100	140	100	205	1.8	1.3	640
3	100	180	100	145	2.1	1.1	560
4	100	120	100	225	1.2	2.0	620
5	100	210	100	115	1.5	1.4	580
Mean	100	160	100	175	1.6	1.5	600

    a.   Set up a LP to determine how much of each crop to grow given this uncertainty.
    b.   Tell how you would find the risk aversion coefficients.

2. Given a problem involving mean and standard error of income where CX is the expected value of income; and σ_I is the standard error of income.

    a.   State reasons why you might wish to formulate the model as

        1.   Max $CX - \lambda\sigma_I$

    as opposed to

        2.   min σ_I

            $CX = \theta$

    b.   Interpret λ in the equation
        Max $CX - \lambda\sigma_1$

3. Barney Biomass produces 3 products on his farm - corn, soybeans and corn residue. Barney wishes to establish certain acreages of corn and soybeans given anticipated harvest periods. From experience, Barney has decided that his fall outcome is probabilistic. Technical data follow:

Crop	Job	Working Rate (machine time in hrs./acre)	Tractor use (hrs./machine time)	Labor use (hrs./machine time)
Corn	plow	5	1	1
	plant	10	1	1
	harvest grain	3	1	2
	harvest residue	4	1	2
Soybeans	plow	7	1	1
	plant	10	1	1
	harvest	5	1	2

Resource Availability		Spring Time Availability		Fall Time Availability		
Labor (FTE)	2.5	Period	hrs/period	Period	Event 1 (.75) hrs/period	Event 2 (.25) hrs/period
Tractor	2.0	Early spring pre-plant	85	Fall 1	110	90
		Plant 1 (P1)	130	Fall 2	115	95
		Plant 2 (P2)	135	Fall post harvest	85	60

Yields by Planting Period

	Event 1						Event 2					
	Corn		Soybeans		Corn Residue		Corn		Soybeans		Corn Residue	
	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Fall 1	130	120	32	40	4.0	3.5	130	120	32	40	4.0	3.5
Fall 2	125	135	40	39	3.5	3.2	115	120	38	34	3.0	3.0
Fall post Harvest					3.0	2.4					2.0	2.2

Prices are Corn - 2.50; Soybeans $6.10, and residue 25.00

Plowing may be done any fall or spring period as long as the land is harvested. Residue harvest must follow conventional harvest.

a)   Formulate and solve the problem.
b)   Discuss the assumed nature of risk aversion
c)   Discuss how you would place in an investment activity for specialized residue harvest equipment.
d)   Discuss how you would find the supply curve for residue.

4.   Choose a problem for which you have a GAMS formulation from an earlier homework, add objective risk to at least 2 variables, then solve it as an EV model with GAMS.

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joint product w/corn