Chapter 14 - AGEC 641
Risk Homework

1. Elmer the weaver makes 5 types of baskets: Big Round, Small Round, Big Octagonal, Small Octagonal, and Huge. In his 5 years of business Elmer has recorded the basket industry price situation. The price data is in Table 1. The input requirements are given in Table 2, and the prices Elmer expects for this year are in Table 3.

Table 1. Historical Price Data

	Basket Prices					Input Prices	
Year	BR	SR	BO	SO	HU	Wicker	Labor
1	10	8	18	7	20	2.0	4.0
2	12	7	15	8	10	2.3	4.5
3	11	8	14	3	31	3.0	5.0
4	14	9	13	5	13	2.0	5.5
5	16	7	15	7	19	2.5	6.0

Table 2. Input Requirements

Basket Type	Requirements	
	Wicker	Labor
BR	2.0	0.50
SR	1.2	0.35
BO	3.0	0.75
SO	1.2	0.30
HU	6.0	1.00

Elmer is limited to 10,000 baskets as total production.

a. Formulate this as a QP to tell, given varying degrees of risk aversion, what Elmer should make.
b. Discuss how you would use either of the models above to help Elmer and how you would explain the results.
c. Some of the data above has trends; discuss how you would handle this.

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 = θ

   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 Residue1		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.

[1] joint product w/corn