Risk Management

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MAST Program

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Module: Risk Management

Session: Price and Yield Risk: Combining Marketing with Crop Insurance

Purpose

- Extend the student's understanding of how price and yield risk are related
- Provide the background for *InsuranceSim.xls*, a simulation tool for helping make crop insurance decisions

Concept of insurance

- Goal is to transfer risk to others
  - Transfer funds from "good" years to "bad" ones
  - Insurance company takes a little money from all (premiums), but pays much money (indemnities) to a few
- Does insurance change your expected long run average net income?
  - Expected indemnities are an additional "income"
  - Premiums are an additional "cost"
  - Do indemnities & premiums offset each other on average?
- Usually has a cost
  - Insurance company admin. & profit = 30% of premiums
- "Cost" of risk avoidance is NOT the premiums

Cost of Risk Reduction with Insurance: 1995-1997 Loss Ratios (cost = 100-LR)

• accident and health (1997 only)	82.6
• commercial auto	67.0
• passenger auto	66.2
• homeowners	66.5
• product liability	71.4
• medical malpractice	56.7
• workers' compensation	63.3
• private crop hail	60-70 ?
• federal crop insurance	150 to 200 ??

Risk measures

- Standard deviation
  - Statistical measure
  - A larger standard deviation means higher risk
  - Frequency and magnitude
    - But assumes normal distribution
- Worst outcome thought possible
  - Important but hard to nail down
  - Magnitude only
- In one out of X years, how badly can I expect to do?
  - Frequency and magnitude
  - Doesn't depend on normality

A word about futures markets

- **Deferred price is the best indicator of what the price will be at delivery (EFFICIENCY)**
  - **On average, deferred price = nearby price when the time comes**
- **On average, futures and/or options trading schemes cannot be devised that systematically generate a profit**
  - **Have a net cost of commissions on average**
- **You don't have to be a farmer to benefit from inefficient markets**
  - **Selective hedging is notoriously difficult**

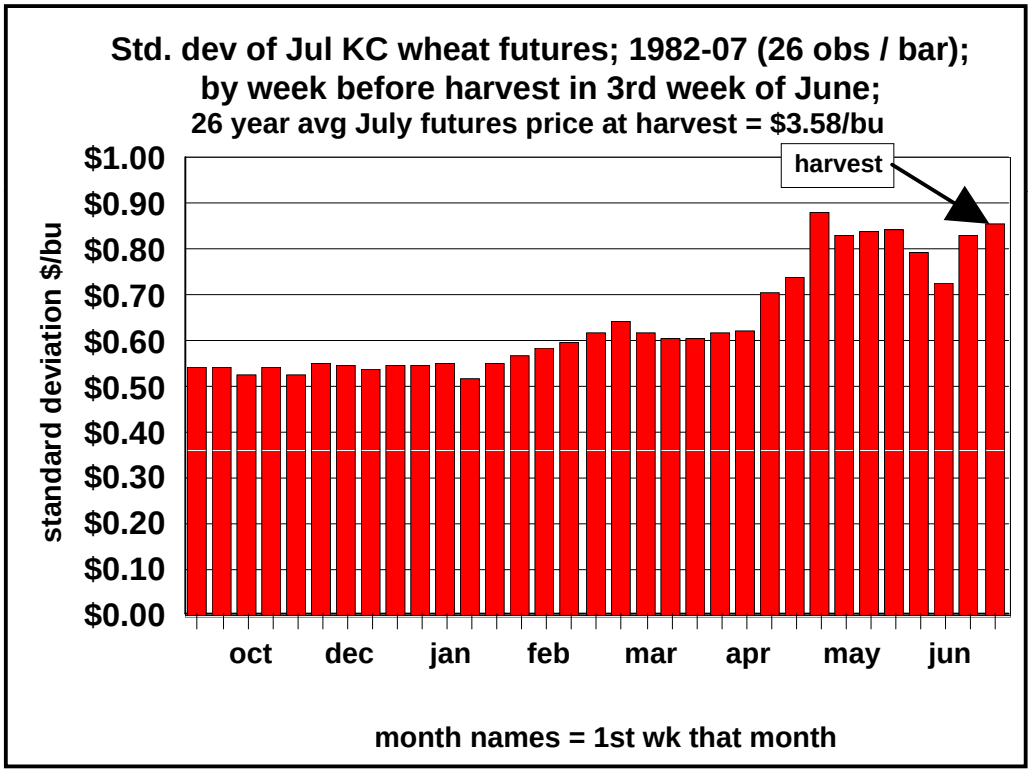
Risk reduction with short futures hedging, put options, and forward pricing

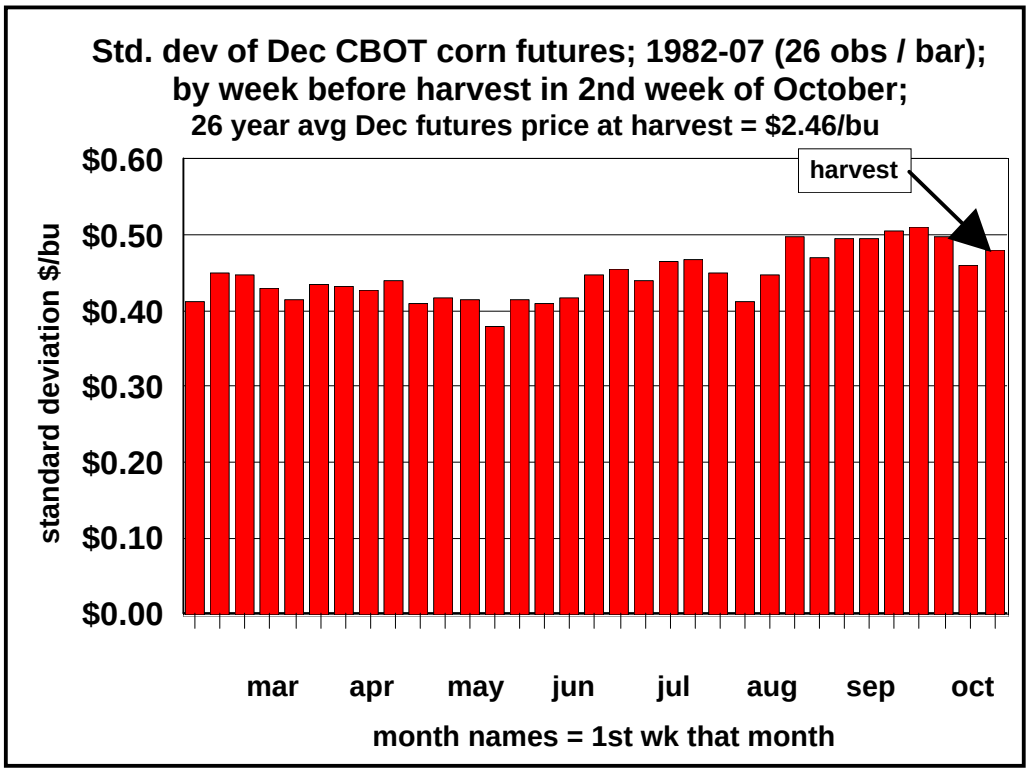
- **Futures hedging**
  - **Removes price movement risk over time period of hedge**
  - **Trades much money from good to bad years**
  - **Only true cost is commissions**
- **Put options**
  - **Removes low price movement outcomes only**
  - **Trade a few $ from every year to large $ in bad years**
  - **Only true cost is commissions**
- **Forward pricing**
  - **Removes both price and basis risk during period covered**
  - **May have a "risk premium" cost (elevator reduces basis)**
- **Problem: removes within-year price risk but not the across-years price risk**

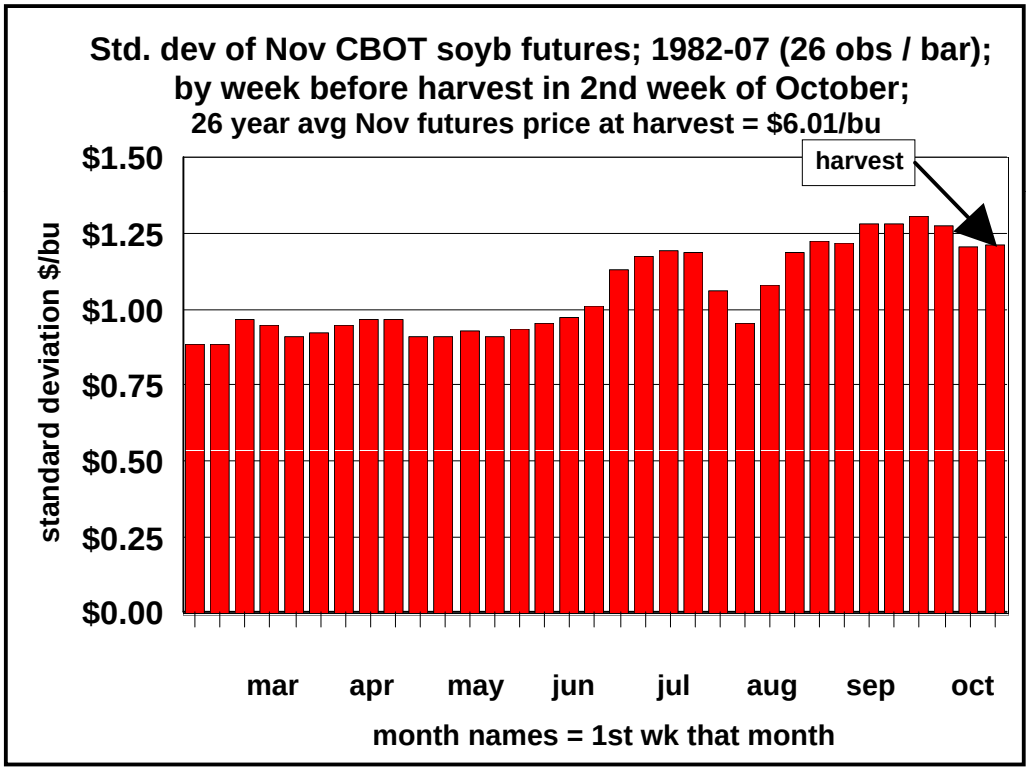
Risk reduction using futures relies on lower variability for deferred futures

What we'd like to see:

	before harvest	harvest
Yr 1	$3.00	$2.00
Yr 2	$3.36	$5.15
Yr 3	$2.92	$4.00
Yr 4	$3.42	$1.77
Yr 5	$3.50	$3.40
Yr 6	$3.60	$3.48
Average	$3.30	$3.30
Std. Dev.	$0.28	$1.26




Std. dev of Dec CBOT corn futures; 1982-07 (26 obs / bar);
by week before harvest in 2nd week of October;
26 year avg Dec futures price at harvest = $2.46/bu
standard deviation $/bu
$0.60
$0.50
$0.40
$0.30
$0.20
$0.10
$0.00
harvest
mar
apr
may
jun
jul
aug
sep
oct
month names = 1st wk that month


Std. dev of Nov CBOT soyb futures; 1982-07 (26 obs / bar);
by week before harvest in 2nd week of October;
26 year avg Nov futures price at harvest = $6.01/bu
standard deviation $/bu
$1.50
$1.25
$1.00
$0.75
$0.50
$0.25
$0.00
harvest
mar
apr
may
jun
jul
aug
sep
oct
month names = 1st wk that month

Risk Reduction . . .

- Futures hedging removes all within-year price risk but very little across-year price risk
- Yield & basis risk are each large
- With substantial yield and basis risk, hedging can actually increase revenue risk
- Revenue insurance complicates the risk story
  - Revenue insurance insures more what we want (revenue)
  - Harvest price option has the potential to remove delivery risk (replacement coverage)
  - Does revenue insurance reduce risk a lot relative to yield insurance given it doesn't remove across-years price risk?
- Might multi-year price contracts be needed?

Main Yield Insurance Products

- MPCI (multi-peril crop insurance)
  - Farmer selects amount of average yield to insure (50% to 75%, some places to 85%)
  - Pays out based on the difference between the yield guaranteed and the yield produced times the MPCI price
- CAT (catastrophic coverage)
  - 50% of average yield is covered at 55% of MPCI price
  - USDA pays premium; farmer pays a $100 administrative fee
- GRP (group risk plan)
  - Pays out when the county yield falls below some % of average, where the % is chosen by the farmer
  - Payments not based on individual farmer's losses

Main Revenue Insurance Products

- CRC (crop revenue coverage)
  - Pays out based on the higher of revenue guaranteed at planting or at harvest, less the crop salvage value (harvest price times yield)
- RA (revenue assurance)
  - Pays out based on the revenue guaranteed at planting, less the crop salvage value (harvest price times yield)
- RA-HPO (revenue assurance w/ harvest price option)
  - Like CRC
- IP (income protection)
  - Pays out based on the revenue guaranteed at planting, less the crop salvage value (harvest price times yield)
  - Payments based on farm-wide losses

Insured Units

- Enterprise Units (ent)
  - All insurable acreage of the crop in the county in which you have a crop share
- Basic Unit
  - All insurable acreage of the crop in the county in which you have 100% crop share OR which is owned by one person and operated by another in a crop share
    - Cash rented land combined with owned land (irr with non-irr)
    - Crop shared land from different landlords means different units
- Optional Units (op), if eligible
  - Splits basic units into irrigated and non-irrigated
  - Pivot corners can be separate unit if farmed separately
  - Fields in different sections or FSA serial numbers

Crop insurance is really getting complicated

- **Taxpayers subsidize:**
  - Insurance company administration costs (20+%)
  - Premiums received by insurance company (57%)
- **Makes the farmer decision one of profit expectation, not just risk management**
  - Get to have your cake and eat it to

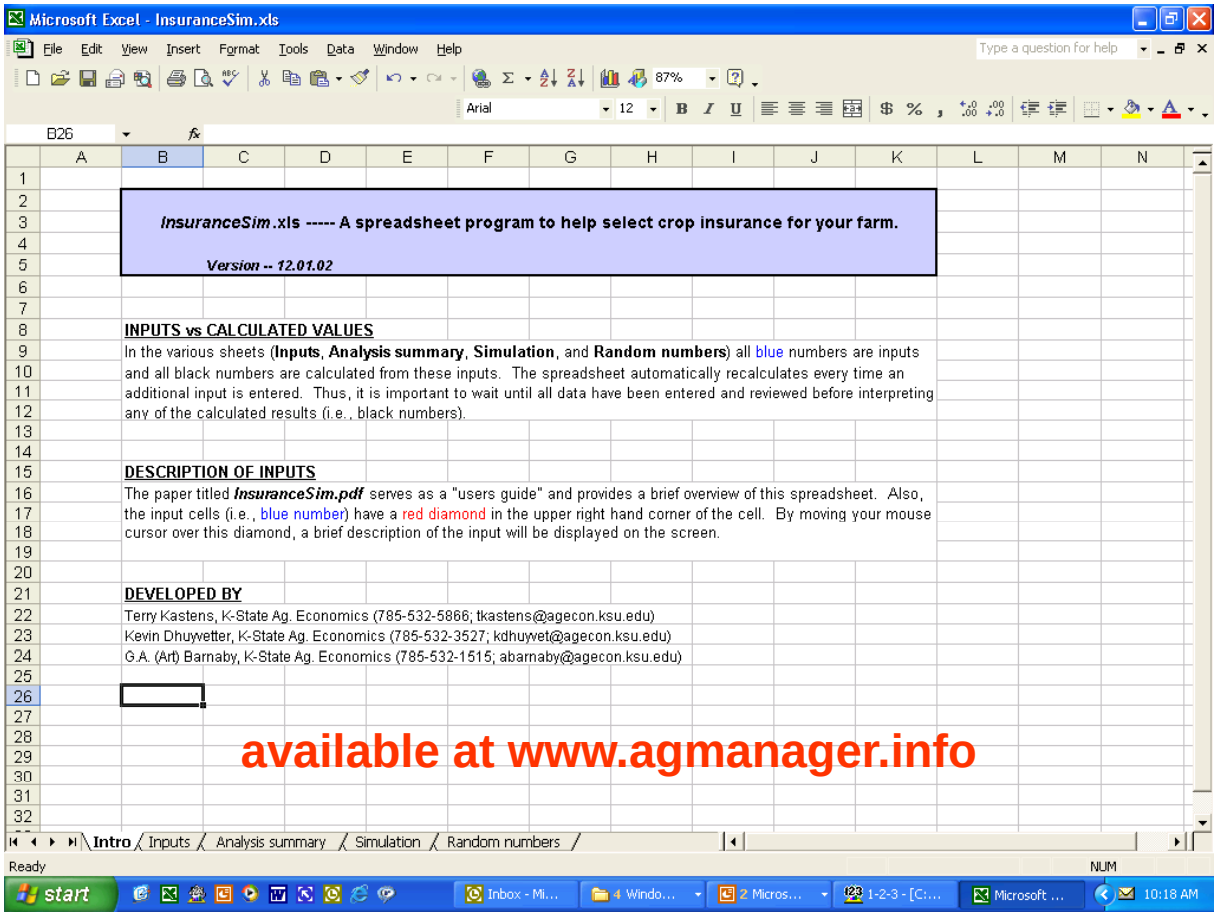
Yield and price coverages and subsidy percentages for MPCI-type yield policies

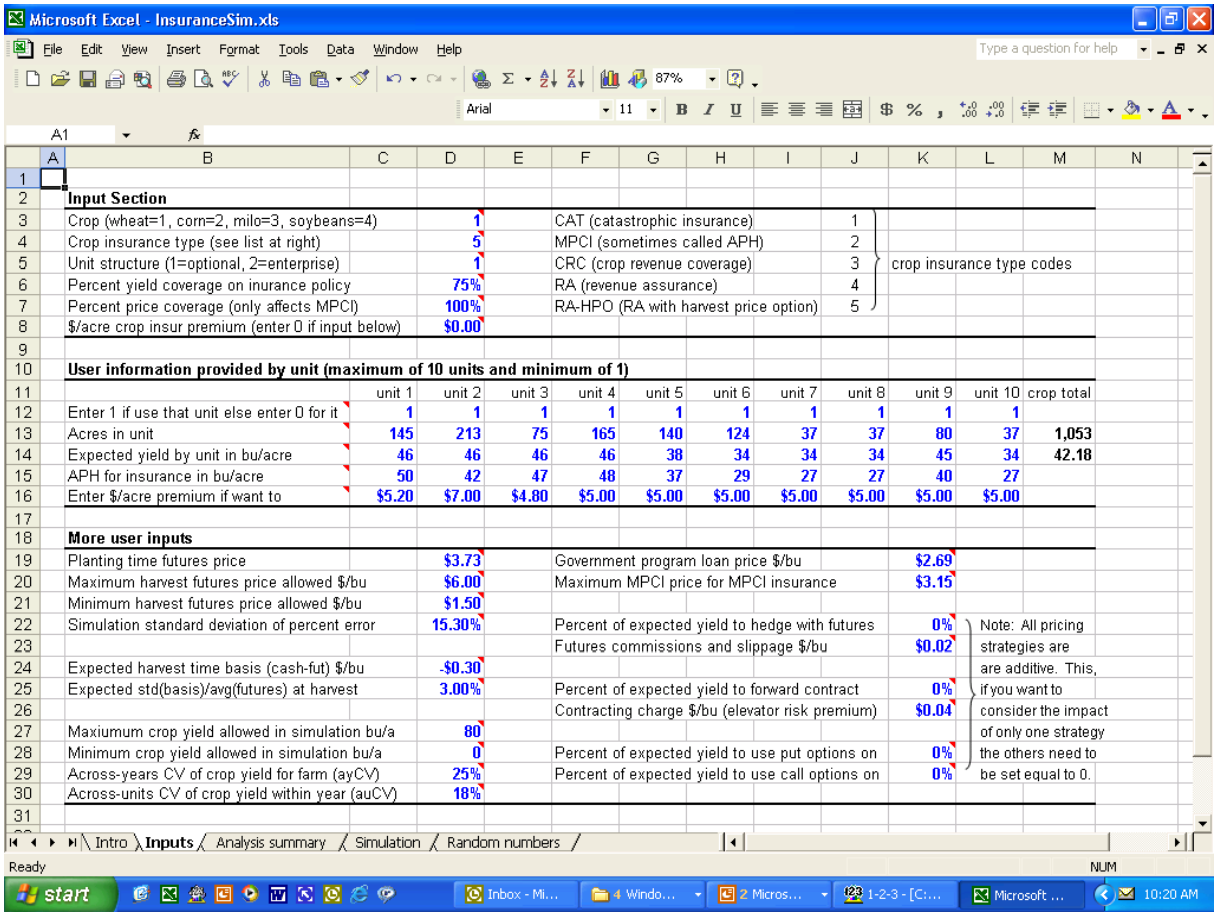
	CAT	Buy-up Coverage							
Yield Coverage %	50	50	55	60	65	70	75	80	85
Price Coverage %	55	100	91-100	84-100	77-100	72-100	67-100	63-100	59-100
Subsidy %	100	67	64	64	59	59	55	48	38

Adapted from the 2003 Crop Insurance Handbook available on the Risk Management Agency's website
Subsidy row applies also to subsidized revenue products

Declining APH

- **APH declines following several years of drought or otherwise poor-yielding years**
  - Can use 60% of T-yield as a plug but insurance is then rated on actual APH
  - Premiums on low APH's are very high
  - Expected returns to crop insurance might become negative with especially high premiums
- **May need to consider moving from revenue insurance to MPCI or GRP**


Microsoft Excel - InsuranceSim.xls
B26
InsuranceSim.xls ----- A spreadsheet program to help select crop insurance for your farm.
Version -- 12.01.02
INPUTS vs CALCULATED VALUES
In the various sheets (Inputs, Analysis summary, Simulation, and Random numbers) all blue numbers are inputs and all black numbers are calculated from these inputs. The spreadsheet automatically recalculates every time an additional input is entered. Thus, it is important to wait until all data have been entered and reviewed before interpreting any of the calculated results (i.e., black numbers).
DESCRIPTION OF INPUTS
The paper titled InsuranceSim.pdf serves as a "users guide" and provides a brief overview of this spreadsheet. Also, the input cells (i.e., blue number) have a red diamond in the upper right hand corner of the cell. By moving your mouse cursor over this diamond, a brief description of the input will be displayed on the screen.
DEVELOPED BY
Terry Kastens, K-State Ag. Economics (785-532-5866; tkastens@agecon.ksu.edu)
Kevin Dhuyvetter, K-State Ag. Economics (785-532-3527; kdhuyvet@agecon.ksu.edu)
G.A. (Art) Barnaby, K-State Ag. Economics (785-532-1515; abarnaby@agecon.ksu.edu)
available at www.agmanager.info
Intro
Inputs
Analysis summary
Simulation
Random numbers
Ready
NUM
start
10:18 AM


Microsoft Excel - InsuranceSim.xls
A1
Input Section
Crop (wheat=1, corn=2, milo=3, soybeans=4) 1
Crop insurance type (see list at right) 5
Unit structure (1=optional, 2=enterprise) 1
Percent yield coverage on inurance policy 75%
Percent price coverage (only affects MPCI) 100%
$/acre crop insur premium (enter 0 if input below) $0.00
CAT (catastrophic insurance) 1
MPCI (sometimes called APH) 2
CRC (crop revenue coverage) 3
RA (revenue assurance) 4
RA-HPO (RA with harvest price option) 5
crop insurance type codes
User information provided by unit (maximum of 10 units and minimum of 1)
unit 1 unit 2 unit 3 unit 4 unit 5 unit 6 unit 7 unit 8 unit 9 unit 10 crop total
Enter 1 if use that unit else enter 0 for it 1 1 1 1 1 1 1 1 1 1
Acres in unit 145 213 75 165 140 124 37 37 80 37 1,053
Expected yield by unit in bu/acre 46 46 46 46 38 34 34 34 45 34 42.18
APH for insurance in bu/acre 50 42 47 48 37 29 27 27 40 27
Enter $/acre premium if want to $5.20 $7.00 $4.80 $5.00 $5.00 $5.00 $5.00 $5.00 $5.00 $5.00
More user inputs
Planting time futures price $3.73
Maximum harvest futures price allowed $/bu $6.00
Minimum harvest futures price allowed $/bu $1.50
Simulation standard deviation of percent error 15.30%
Expected harvest time basis (cash-fut) $/bu -$0.30
Expected std(basis)/avg(futures) at harvest 3.00%
Maxiumum crop yield allowed in simulation bu/a 80
Minimum crop yield allowed in simulation bu/a 0
Across-years CV of crop yield for farm (ayCV) 25%
Across-units CV of crop yield within year (auCV) 18%
Government program loan price $/bu $2.69
Maximum MPCI price for MPCI insurance $3.15
Percent of expected yield to hedge with futures 0%
Futures commissions and slippage $/bu $0.02
Percent of expected yield to forward contract 0%
Contracting charge $/bu (elevator risk premium) $0.04
Percent of expected yield to use put options on 0%
Percent of expected yield to use call options on 0%
Note: All pricing strategies are additive. This, if you want to consider the impact of only one strategy the others need to be set equal to 0.
Intro
Inputs
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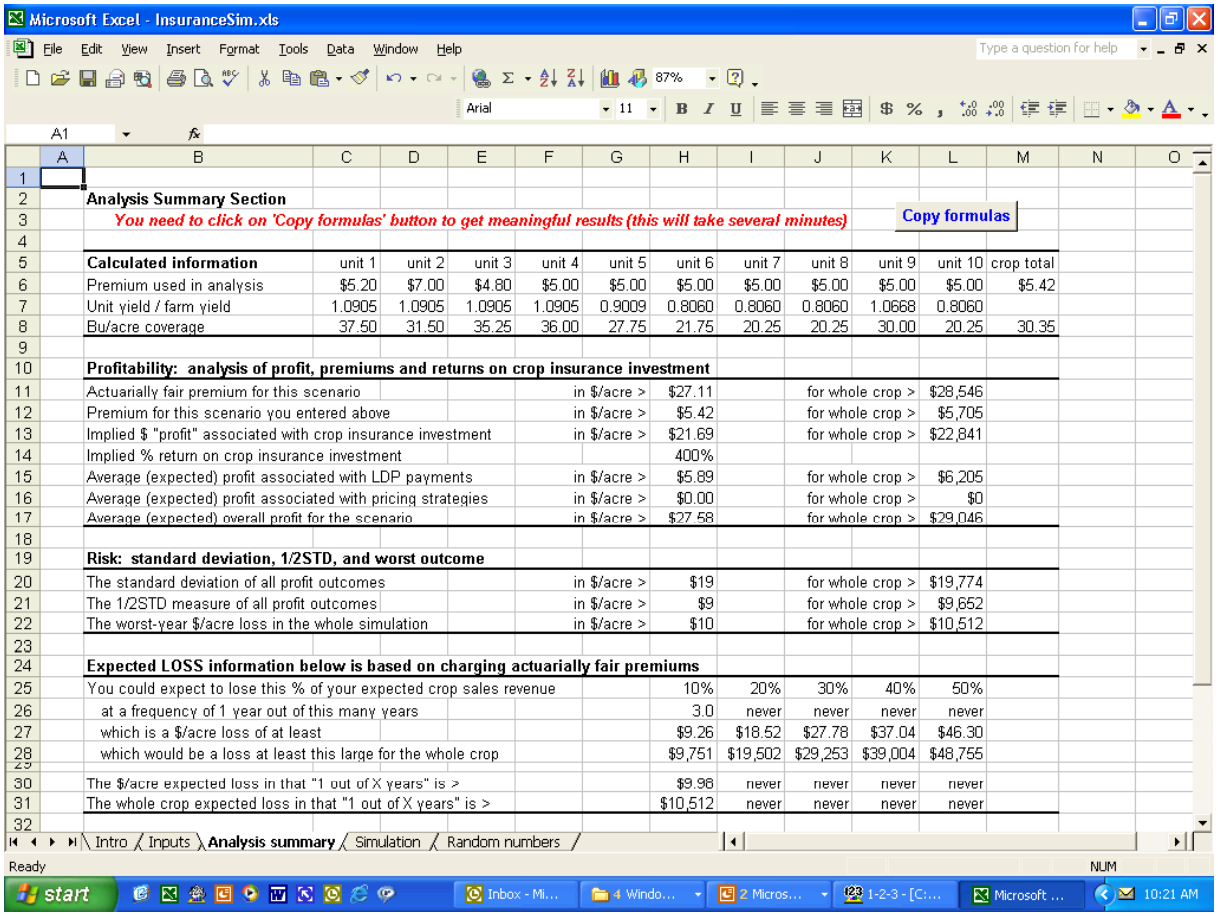
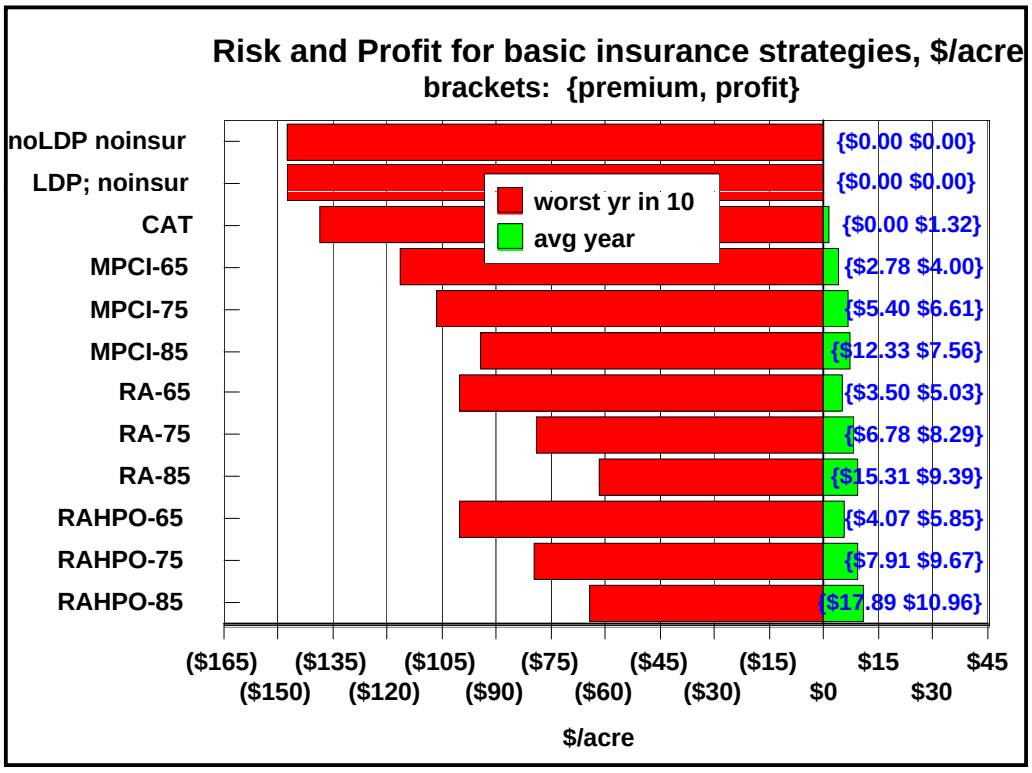
10:20 AM



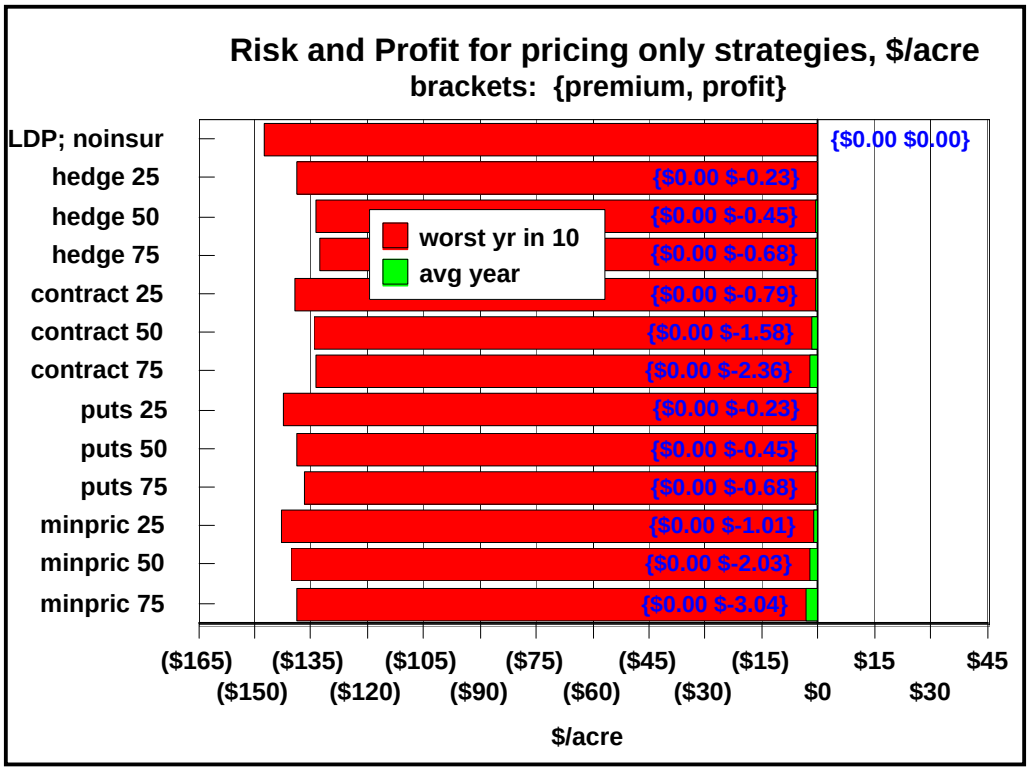
Western KS Wheat

Various *InsuranceSim* scenarios follow

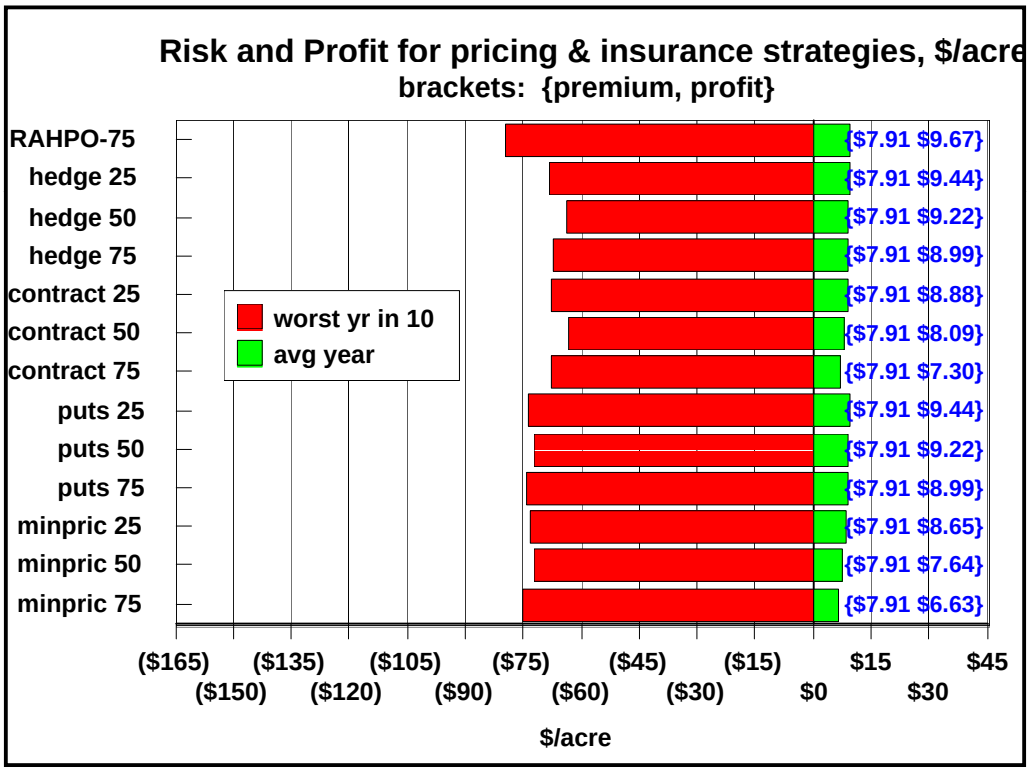
- **Common to all:**
  - Wheat; 10 units of equal size
  - Expected yield is 45 bu/acre for each unit
  - Plant futures price = $7.00/bu; basis = -$0.50/bu
  - MPCI price = $6.79/bu (97% of planting price)
  - Loan price = $2.75/bu (national)
  - 100% price election only
  - Fair premiums less percentage subsidies
  - Avg. revenue w/o LDP or insurance is $293/acre
- **Assume efficient markets**
  - Profit with hedging/options is -$0.02/bu
  - Profit with forward contracting is -$0.07/bu
  - Profit with minimum price contract is -$0.09/bu



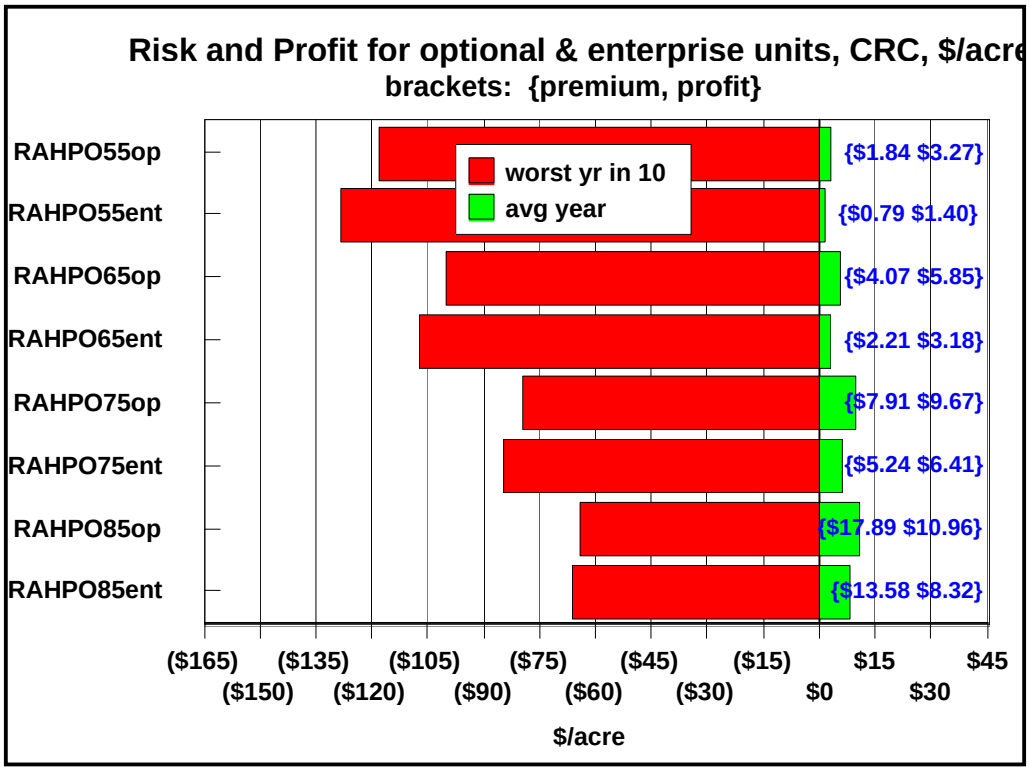
"Acceptable" risk/reward probably in the 65-75 coverage levels



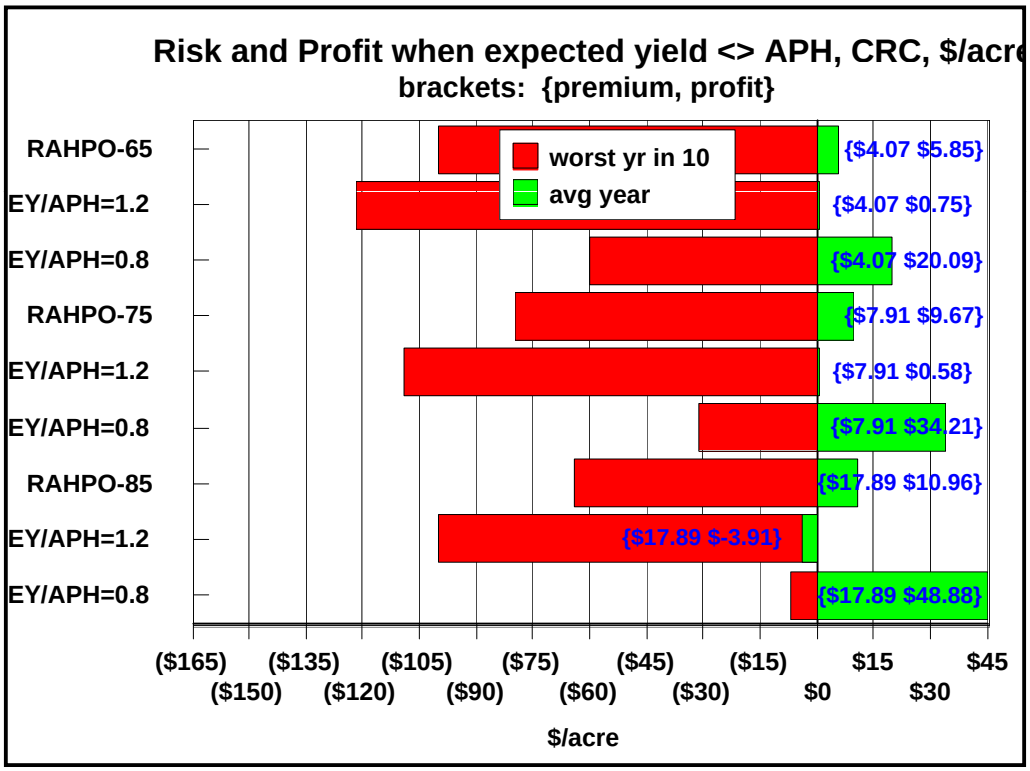
Hard to acquire acceptable risk management via routine pricing strategies



Pricing strategies in conjunction with revenue insurance doesn't help much



Some farms may want to consider enterprise units

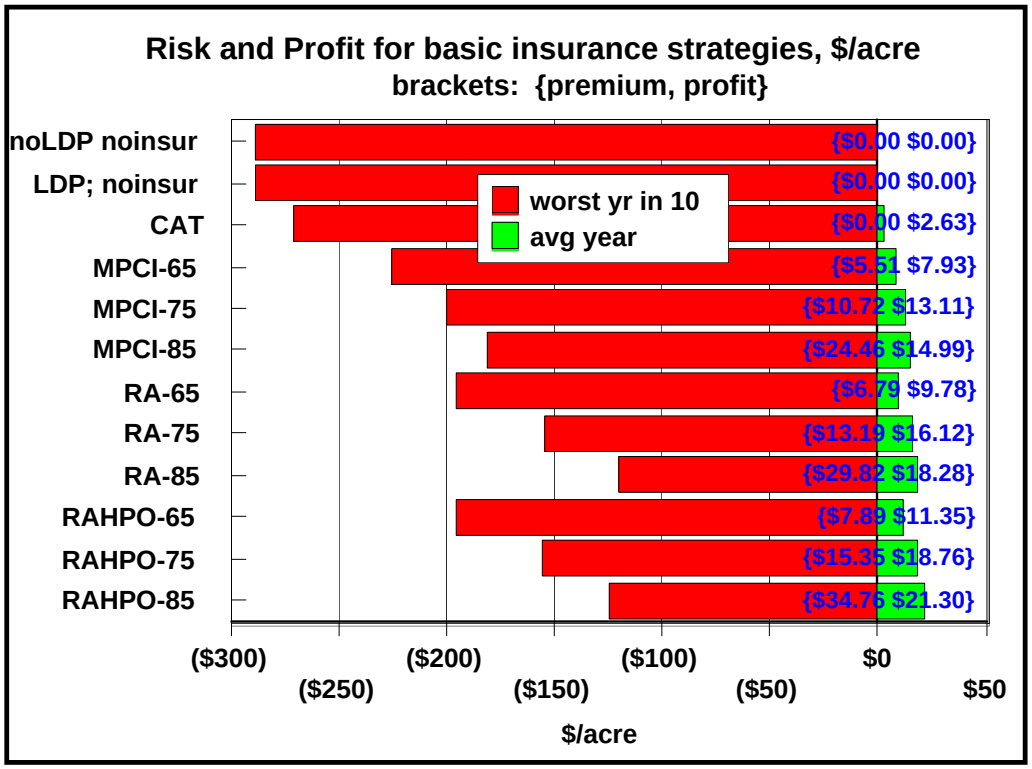


Difference in expected yield and APH often drives insurance selection

Northeast KS Corn

Various *InsuranceSim* scenarios follow

- **Common to all:**
  - Corn; 10 units of equal size
  - Expected yield is 125 bu/acre for each unit
  - Plant futures price = $5.00/bu; basis = -$0.40/bu
  - MPCI price = $4.85/bu (97% of planting price)
  - Loan price = $1.95/bu (national)
  - 100% price election only
  - Fair premiums less percentage subsidies
  - Avg. revenue w/o LDP or insurance is $576/acre
- **Assume efficient markets**
  - Profit with hedging/options is -$0.02/bu
  - Profit with forward contracting is -$0.07/bu
  - Profit with minimum price contract is -$0.09/bu



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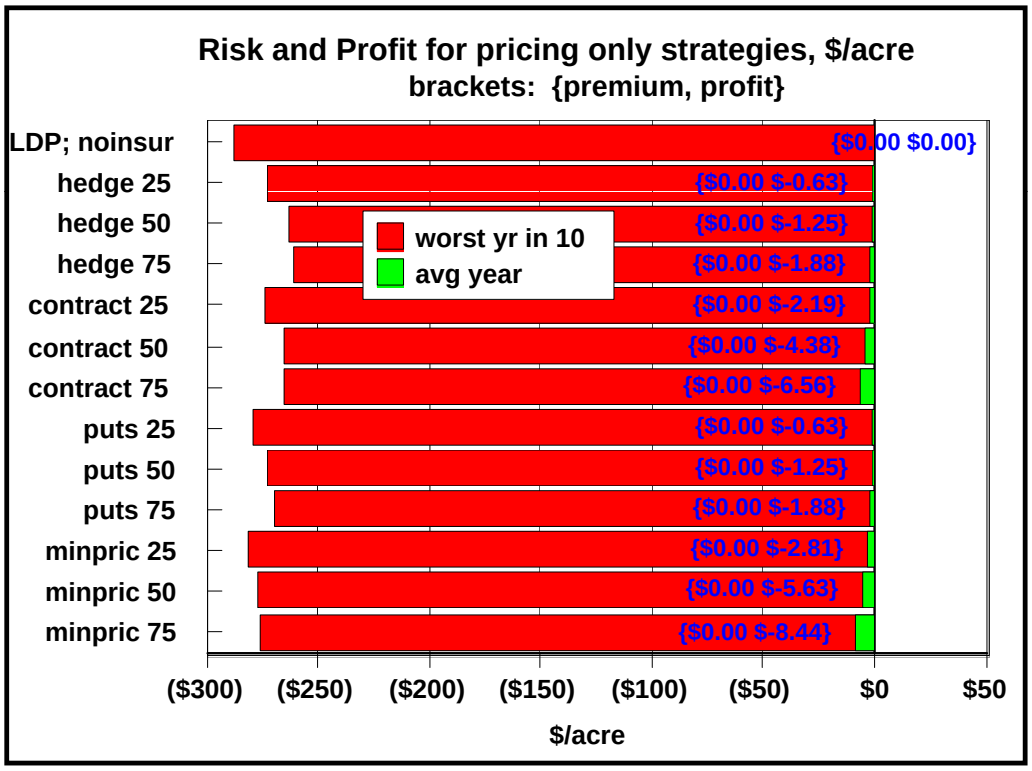

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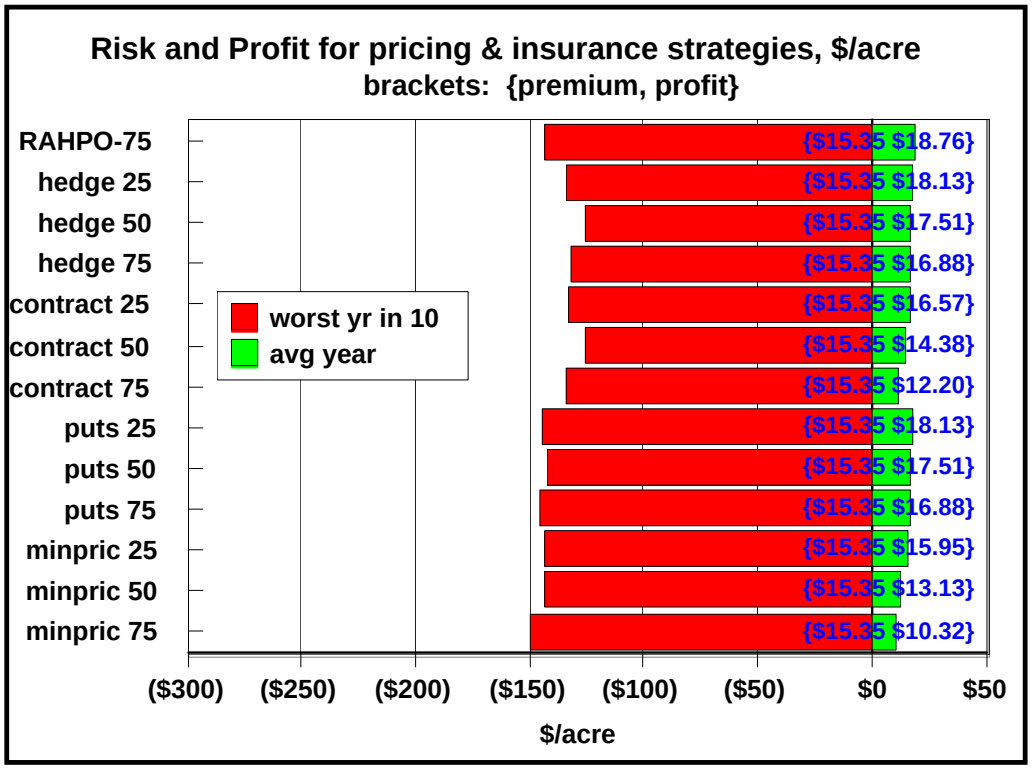

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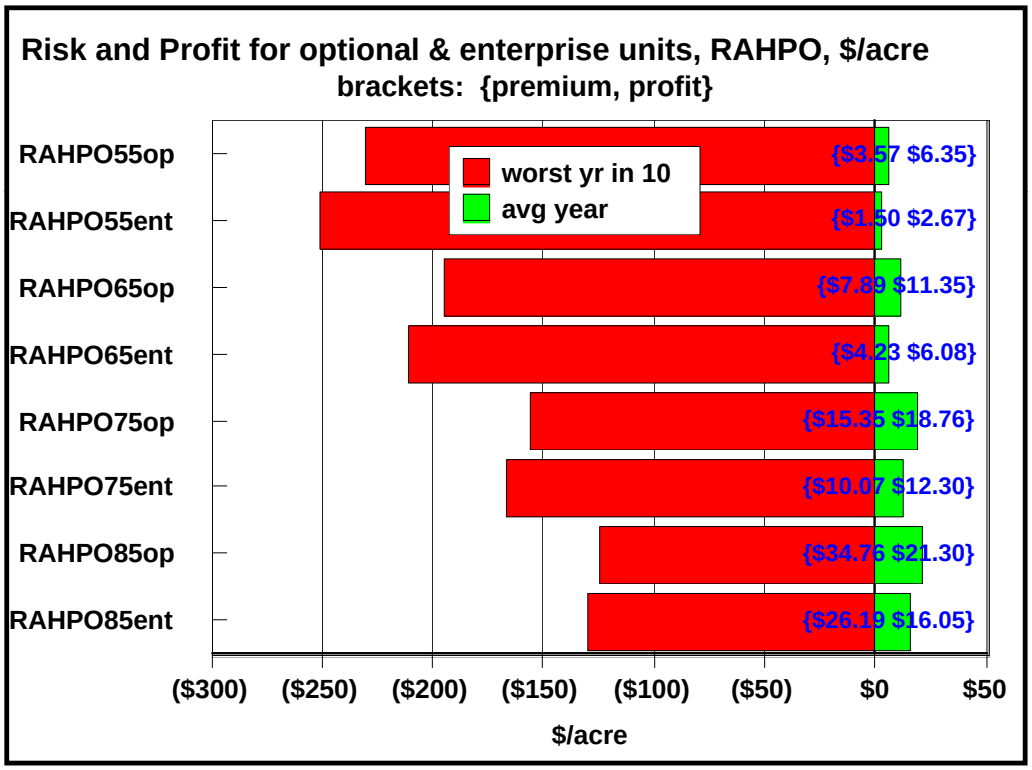

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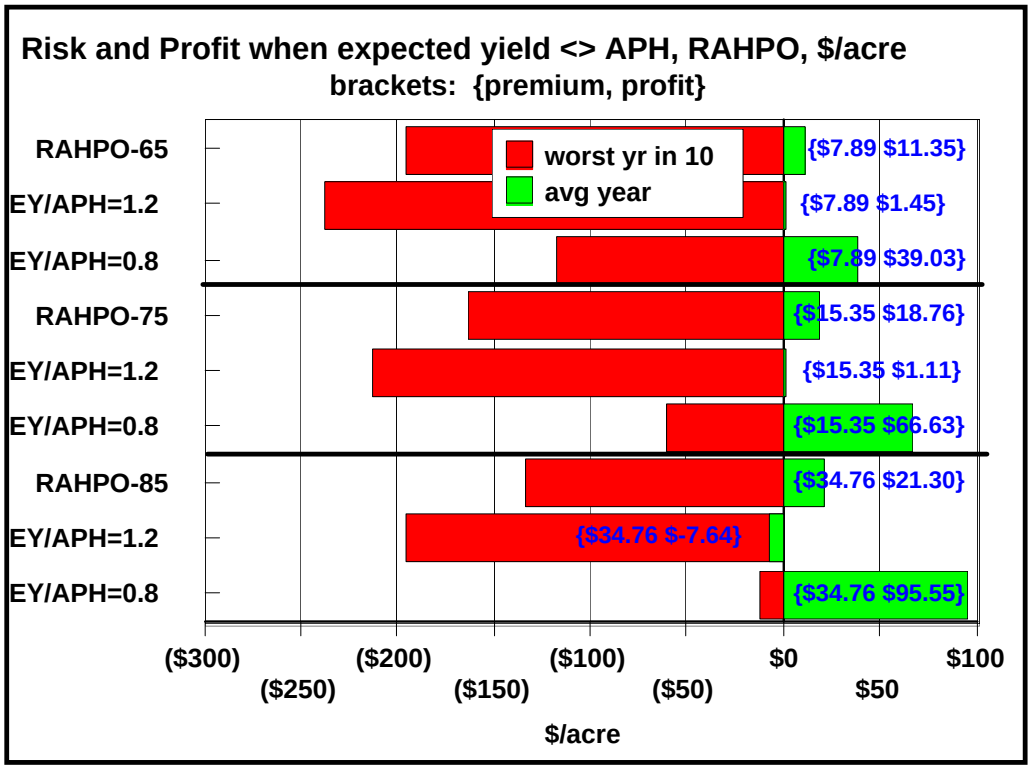
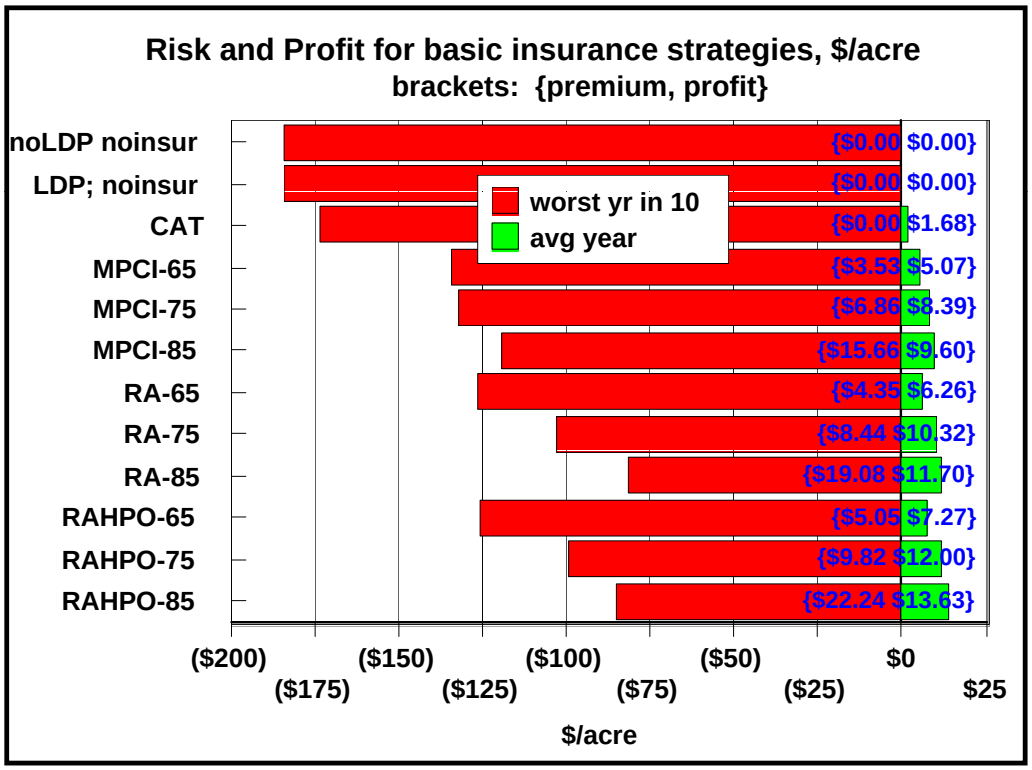


Difference in expected yield and APH often drives insurance selection

Northeast KS Soybeans

Various *InsuranceSim* scenarios follow

- **Common to all:**
  - Soybeans; 10 units of equal size
  - Expected yield is 40 bu/acre for each unit
  - Plant futures price = $10.00/bu; basis = -$0.80/bu
  - MPCI price = $9.70/bu (97% of planting price)
  - Loan price = $5.00/bu (national)
  - 100% price election only
  - Fair premiums less percentage subsidies
  - Avg. revenue w/o LDP or insurance is $369/acre
- **Assume efficient markets**
  - Profit with hedging/options is -$0.02/bu
  - Profit with forward contracting is -$0.07/bu
  - Profit with minimum price contract is -$0.09/bu



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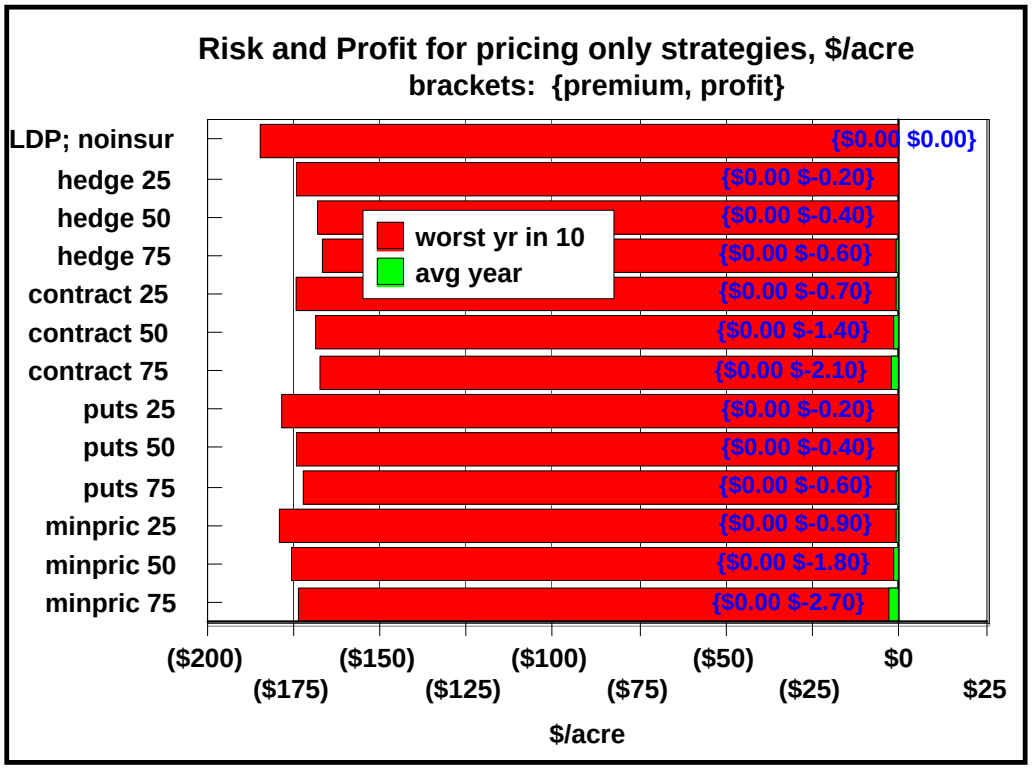

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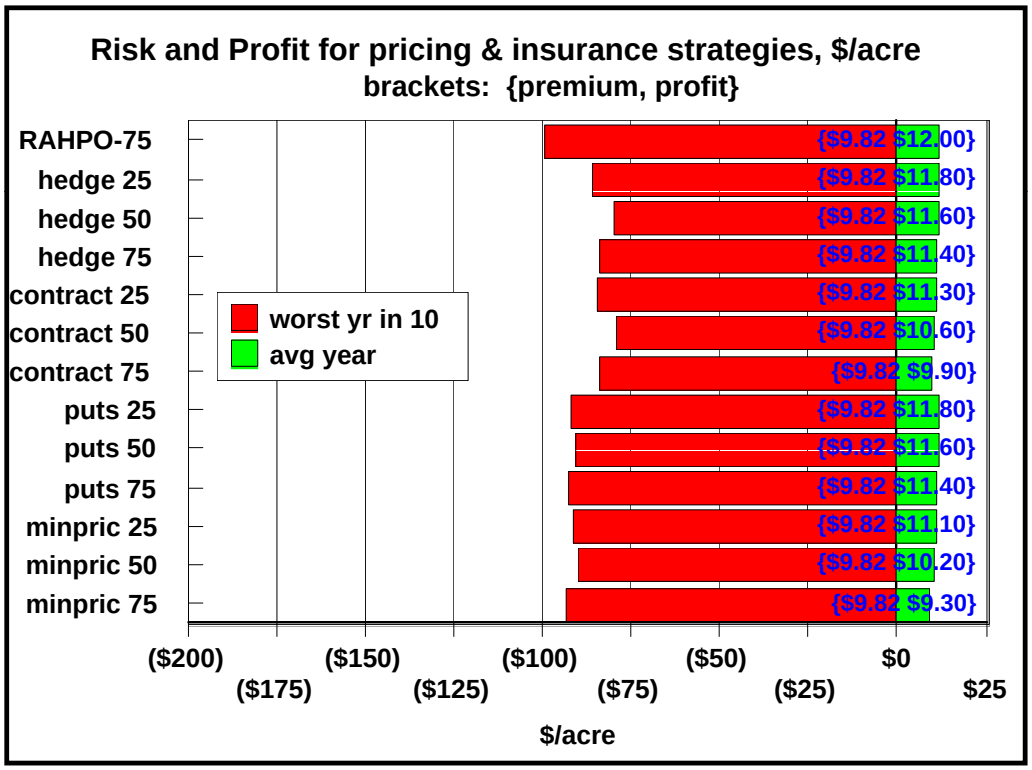

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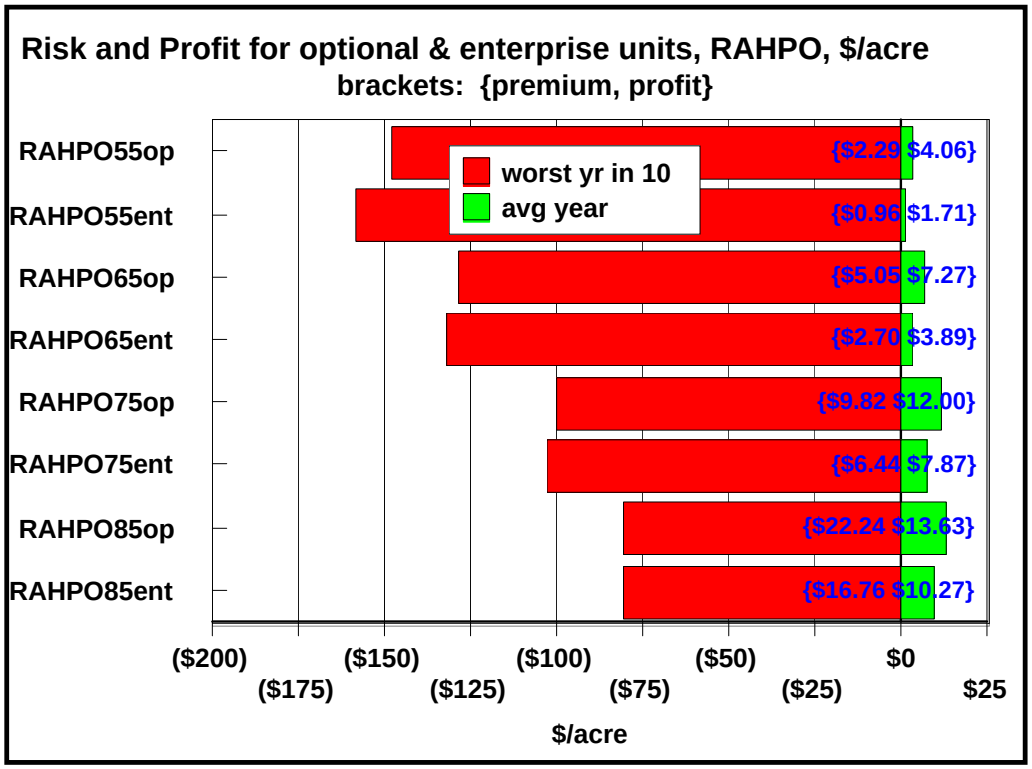

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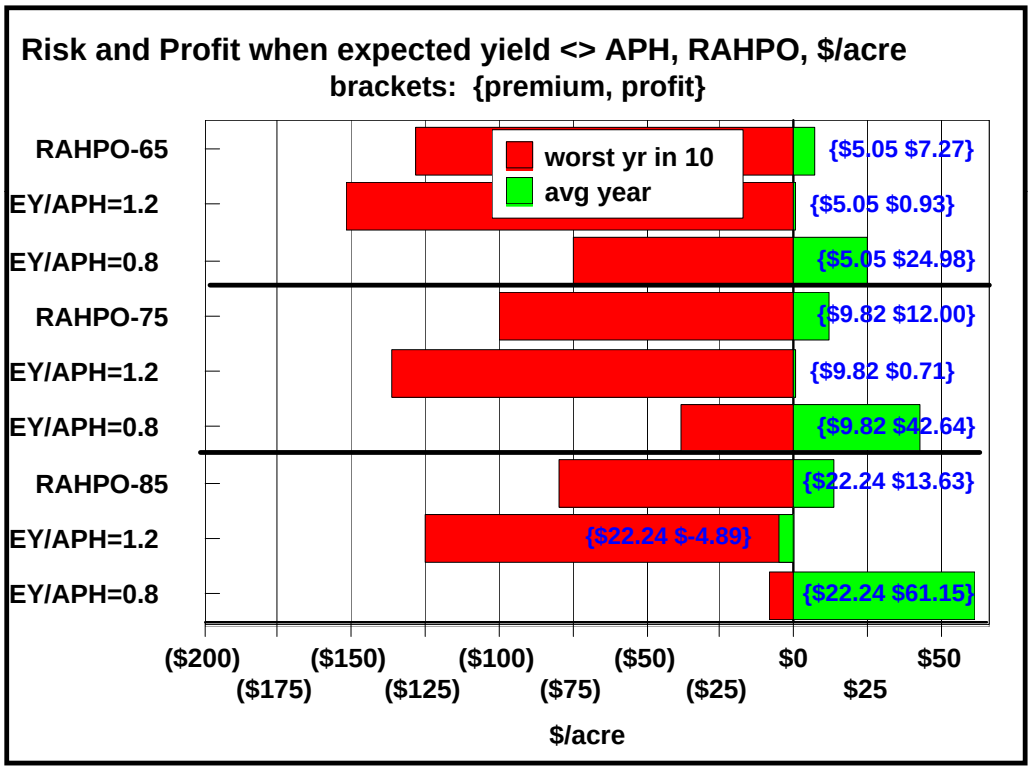

Difference in expected yield and APH often drives insurance selection

Things to consider . . .

- Crop insurance generally increases profit (because of subsidies) and reduces risk
- Choose CRC or RA-HPO based on premium cost
- RA and RA-HPO (or CRC) are similar for risk
- Routine forward pricing strategies at planting time do not reduce risk – w/ or w/o crop insurance
- You might consider enterprise units at a higher coverage to compare with an optional units policy
- Insurance really great when expected yields < APH
- Using your own numbers will improve decisions

End of Session:

Price and Yield Risk:
Combining Marketing with Crop Insurance