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Impacts of CRC Price Limits on the Value of CRC Relative to RA

Crop Revenue Coverage (CRC) and Revenue Assurance (RA) are similar products insuring farm revenues. These products differ in three manners (see “product descriptions and guidelines” in the crop insurance section of *farmdoc* (www.farmdoc.uiuc.edu) for more detail):

1. CRC and RA will have different premiums.
2. CRC averages October settlement prices of the December corn futures contract traded on Chicago Board of Trade (CBOT) to determine its harvest price. RA averages November settlement prices to determine its harvest price.
3. CRC limits how much the harvest price can differ from the base price while RA does not have limits. The corn limit is \$1.50 per bushel and the soybean limit is \$3.00 per bushel. Take a corn base price of \$5.30. If settlement prices average above \$6.80 (\$5.25 base price + \$1.50 limit), the CRC harvest price is \$6.80. If settlement prices average less than \$3.80 (\$5.30 base price - \$1.50 limit), the CRC harvest price is \$3.30

In past years, price limits associated with CRC have not been a major concern. In 2008, price limits are a concern as price volatility has increased greatly, increasingly the likelihood that settlement prices will fall outside CRC price limits. This could cause RA to have higher payments than CRC.

Expected payments under CRC and RA are reported in this paper. The difference between RA and CRC payments puts a value on not having CRC limits. Before reporting expected payments, the payment mechanisms for CRC and RA are detailed. Then, the price volatility for 2008 is quantified before reporting expected payments.

CRC and RA payments

Both CRC and RA with the harvest revenue option (RA-HP) calculate a revenue guarantee as follows

$$\begin{aligned} & \text{Higher of base or harvest price} \\ & \times \text{Actual Production History (APH) yield} \\ & \times \text{Coverage level} \\ & \hline & = \text{Revenue guarantee} \end{aligned}$$

Payments under both policies will then equal:

$$\begin{aligned} & \text{Revenue guarantee} \\ & - \text{Actual yield} \times \text{harvest price} \\ & \hline & = \text{insurance payment} \end{aligned}$$

Examples of payments under CRC and RA given below assume that the settlement price in October (CRC's period) equal settlement prices in November (RA's period). This will not be the case, but there is no way to state how these prices will differ from one another before the fact.

Payments under the two products will differ when settlement prices at harvest are outside the CRC limits. In those cases, CRC payments will be lower than RA payments. Take a case where the base price is \$5.30, the APH yield is 170 bushels, and the coverage level is 75 percent. Payments will be illustrated when prices are above \$6.80 and below \$3.80.

If settlement prices average \$7.00, CRC will use \$6.80 as its harvest price and has a guarantee of \$867 (\$6.80 CRC harvest price x 170 APH yield x .75 coverage level). If the actual yield is 110 bushels, CRC payments equal \$119 per acre (\$867 - \$6.80 CRC harvest price x 110 yield). On the other hand, RA uses a \$7.00 harvest price and has a guarantee of \$893 (\$7.00 harvest price x 170 APH yield x .75 coverage level). Its payment is \$123 (\$893 guarantee - \$7.00 x 110 yield). RA has a \$4 higher payment than CRC.

If settlement prices average \$3.00, CRC uses \$3.80 as its harvest price and its guarantee of \$676 (\$5.30 base price x 170 bushel APH x .75 coverage level). If actual yield is 190 bushels, CRC will not make a payment as CRC revenue of \$722 (\$3.80 harvest price x 190 actual yield) is above the \$676 guarantee. RA will use \$3.00 as its harvest price and will have the same guarantee as CRC (\$676 revenue guarantee). RA revenue will equal \$570 (\$3 harvest price x 190 bushel actual yield) and it will make an insurance payment of \$106.

Price Volatility

In the past, there were very small chances that the harvest price would be outside the limits set by CRC. Between 1972 and 2007, the harvest prices of corn were never \$1.50 above or \$1.50 below base prices. Similarly, soybean harvest prices were never \$3.00 higher or \$3.00 lower than base prices.

In 2008, prices are much more volatile than in previous years. Options pricing model was used to calculate the probability of different harvest prices. Estimates shown in Table 1 are based on mid February CBOT futures and options contracts given a base price of \$5.30. Prices below \$3.80 and above \$6.80 would result in a different CRC price than RA price. As can be seen in Table 1, the chance of having a price below \$3.80 is 14 percent while the chance of a price of a price above \$6.75 is 17 percent. Overall, there is a 31 percent chance – or, one in three years – that CRC will have a different harvest price than RA.

Table 2 show chances for soybeans given a \$13.00 base price. In this case, a harvest price below \$10.00 and above \$16.00 result in CRC having a different harvest price than RA. There is a 18% chance of prices below \$10.00 and a 21% chance of prices above \$16.00. Overall, there is a 39 percent chance that CRC harvest price will differ from the RA harvest price.

Table 1. Chance of 2008 Corn Harvest Price in Price Ranges.

Price Range	Chance of Price in Range
	Percent
Less than \$3.80	14
\$3.80 to \$4.30	12
\$4.30 to \$4.80	14
\$4.80 to \$5.30	13
\$5.30 to \$5.80	12
\$5.80 to \$6.30	11
\$6.30 to \$6.80	7
More than \$6.80	17

Table 2. Chance of 2008 Soybean Harvest Price in Price Ranges.

Price Range	Chance of Price in Range
	Percent
Less than \$10.00	18
\$10.00 to \$11.00	11
\$11.00 to \$12.00	12
\$12.00 to \$13.00	13
\$13.00 to \$14.00	10
\$14.00 to \$15.00	8
\$15.00 to \$16.00	7
Greater than \$16.00	21

Expected Payments for CRC and RA

Expected 2008 payments associated with CRC and RA were estimated for a central Illinois situation with parameters used in the *iFARM* simulation model. This model is used to estimate payments in the crop insurance section of *farmdoc*. The farm has a 172 bushel APH yield for corn and a \$5.30 corn base price is used. The farm has a 50 bushel APH yield for soybeans and a \$13.00 soybean base price is used. Yield variability is reflective of a Logan County situation and price variability reflects volatilities estimated from mid February CBOT futures and options contracts.

If the price limits did not exist, RA and CRC would have the same expected premiums. Differences in RA and CRC payments reflect the value of not having CRC price limits. Expected payments under CRC and RA were estimated. If the RA premium is less than the CRC premium plus the difference in expected values, RA likely will be a better purchase than CRC.

For corn, the difference between the RA and CRC expected payments is \$11.37 for the 75% coverage level (see Table 3). This suggests that a farmer could pay \$11.37 more for RA and CRC due to RA not having limits. The difference between RA and CRC expected payments increase to \$19.95 at the 85 percent coverage level.

Table 3. Expected Payments for CRC and RA for Central Illinois, 2008.

Coverage Level	Corn ¹			Soybeans ²		
	Expected Payments		RA Minus CRC ³	Expected Payments		RA Minus CRC ³
	CRC	RA		CRC	RA	
	\$ per acre			\$ per acre		
65%	2.47	6.89	4.42	1.05	4.52	3.47
70%	5.23	12.68	7.45	2.48	8.31	5.83
75%	10.11	21.48	11.37	5.12	14.04	8.91
80%	18.49	34.03	15.54	9.78	22.35	12.57
85%	31.32	51.27	19.95	17.51	33.87	16.36

¹ Estimated for a farm with a 172 bushel Actual Production History yield and a \$5.30 base price

² Estimated for a farm with a 50 bushel Actual Production History yield and a \$13.00 base price

³ RA premium minus CRC premium.

For soybeans, the difference between RA and CRC expected payment is \$8.91 at the 75% coverage level. The difference increases to \$16.36 at the 85% coverage level.

Summary

In 2008, there is over a 30% chance that harvest prices will exceed CRC limits. This probability is much higher than has existed in previous years. Higher chances of exceeding CRC limits increase the value of RA relative to CRC. In corn, RA is worth about \$11 than CRC at a 75% coverage level. At an 85% coverage level, RA is worth about \$20 more than RA. For soybeans, RA is worth about \$9 more than CRC at a 75% coverage level. At an 85% coverage level, RA is worth about \$16 more than CRC.

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