Comparison of County ARC and SCO

Scott Gerlt (gerlts@missouri.edu) Research Associate and
Pat Westhoff (westhoffp@missouri.edu) Director,
Food and Agricultural Policy Research Institute
University of Missouri
www.fapri.missouri.edu

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Agenda

- SCO, ARC and PLC in the new farm bill
- Methodology
- Results
No more direct, countercyclical or ACRE program payments

Reallocate base acres and update program yields
  - One time choice, for the life of the farm bill
  - Decision made by land owner

Must choose (1 time for life of farm bill) between
  - Price loss coverage (PLC, payments when prices fall below a trigger)
  - Agriculture risk coverage (ARC, payments when per-acre revenues fall below a trigger)
  - Decision made by producers

New crop insurance options
  - STAX for upland cotton producers
  - Supplemental Coverage Option (SCO) for crops not in ARC or STAX
Producers on each farm can choose
- An individual farm version of ARC (ARC-IC) for all crops with base on the farm OR
- For each crop with base on a farm, they can choose between the county version of ARC (ARC-CO) or PLC

Choice is made once for the life of the farm bill

If producers on a farm do not agree on a choice
- No ARC or PLC benefits are available in 2014
- PLC is only remaining option for 2015 and beyond
Like countercyclical payments in some respects
- Makes payments when prices fall below a trigger
- Payments tied to base acreage and program yields
- These generally do NOT depend on current production choices
  - Except for those with former cotton base or with fruits and vegetables, planting more or less of a given crop will have NO effect on payments

But different in many ways, including
- Formula changes slightly: Max (0, (Reference price-max(MYA price, loan rate)) * program yield * base acres (and allocated generic base) * 0.85
- Reference prices are far higher than old target prices
Agriculture risk coverage (ARC)

- Like ACRE in some respects
  - Makes payments when per-acre revenues fall below a trigger
  - Trigger depends on moving averages of market prices and yields

- But different in many ways, including
  - Paid on base acreage, not planted
  - Tied to county or farm yields, not state
  - Covers losses of 14-24% (ACRE was 10-35%)
  - Don’t have to give up direct payments to participate
  - No loan rate penalty
Payments if per-acre revenues fall below 86% of benchmark

Benchmark:
- County: 5-yr. Olympic avg. national price * 5-yr. Olympic avg. county yield
- Individual: Weighted average of the 5-yr Olympic average revenues for the farm
- Annual prices used are higher of farm price or reference price

Maximum payment: 10% of benchmark (covers 76-86%)

Paid on 85% (county yield option) or 65% (farm yield option) of base acres (not planted)
Supplemental coverage option (SCO)

- On top of regular individual coverage (must have individual policy)
- Area-based insurance for range between 86% and individual coverage level
- 65% subsidized
- Only available for crops not in ARC or STAX
Intended to be rated actuarially fair

Starts in 2015 (NOT available in 2014); not available in all counties for all crops

Operates like underlying individual policy

Payments are scaled to farm by county loss rate
  - Implication: farms with higher APH can get larger indemnities for a given coverage level and county loss rate
County ARC vs. SCO

- **Similarities**
  - Coverage begins at 86%
  - Operate at the county level
  - Can both be revenue based

- **Differences**
  - Producers pay 35% of SCO premium; ARC is “free”
  - SCO utilizes a planting price determined by futures markets while ARC uses Olympic avg. price with floors in determining guarantee
  - SCO uses trend yield while ARC uses Olympic avg. yield in determining guarantee
  - ARC and PLC have $125,000 payment limitation; SCO does not
  - ARC payment rate cannot exceed 10% of benchmark; SCO payment rate limit depends on underlying insurance coverage
  - SCO pays on planted acres while ARC pays on base
Each county is represented by a single farm
  - Gerlt, et al. (2014) found bias to be small at high coverage levels

Planted and base area equal

All payment yields updated

Underlying crop insurance coverage levels do not change

All crop insurance policies are Revenue Protection
  - 87% of 2013 insured corn acres were RP

SCO is assumed (counterfactually) to be available beginning in 2014
Calculating benefits

- With a targeted average loss ratio of one, the SCO premium should equal the average indemnity.

- Estimate payments and indemnities from 2014 to 2018 for corn, soybeans and wheat.

- Yields used in calculations:
  - 1980 to 2013 yields per planted acre from NASS (per harvested for corn and wheat).
  - FSA ACRE data used to augment recent years.
  - If county did not have at least 15 observations in the last 20 years, it was dropped.
Yields, continued

- Each county and state yield were regressed against a linear trend to get both forecasted yields and standard deviation of errors.

- Missing county residuals were estimated by regressing county yields against state yields.

- Using Latin hypercube, 500 normally distributed draws were obtained for each county, crop and year.
  - Normal easy to work with.
  - RMA assumes yield normality for farm yields.
Calculating benefits, cont’d

- Prices taken from FAPRI-MU stochastic baseline
  - Model consists of approximately 2,000 equations for crops, livestock, biofuels, etc.
  - Correlated draws of selected exogenous variables (both supply and demand shifters) used to generate 500 solutions for endogenous variables
  - Thus 500 farm prices for each commodity in each year

- Correlating county yields and national prices
  - Correlations derived from detrended yields and FAPRI-MU prices
  - For more information, see Gerlt and Westhoff (2013)
Calculating benefits, cont’d

- FAPRI-MU farm average price projections per bushel (March baseline), marketing year

<table>
<thead>
<tr>
<th></th>
<th>14/15</th>
<th>15/16</th>
<th>16/17</th>
<th>17/18</th>
<th>18/19</th>
<th>19/20</th>
<th>20/21</th>
<th>21/22</th>
<th>22/23</th>
<th>23/24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>4.17</td>
<td>4.09</td>
<td>4.07</td>
<td>4.06</td>
<td>4.04</td>
<td>4.02</td>
<td>3.97</td>
<td>3.93</td>
<td>3.92</td>
<td>3.87</td>
</tr>
<tr>
<td>Wheat</td>
<td>5.55</td>
<td>5.37</td>
<td>5.32</td>
<td>5.31</td>
<td>5.28</td>
<td>5.26</td>
<td>5.25</td>
<td>5.23</td>
<td>5.23</td>
<td>5.21</td>
</tr>
</tbody>
</table>

Note: More recent FAPRI-MU deterministic projections show lower 2014/15 and 2015/16 corn prices, but most stories are not very different than the March estimates.
2014/15 corn yields and prices
FAPRI-MU stochastic baseline, March 2014
2014/15 corn yields and prices
FAPRI-MU stochastic baseline, March 2014

Avg. of March estimates: 163.5 bu./a. and $4.17/bu.
2014/15 corn yields and prices
FAPRI-MU stochastic baseline, March 2014

September USDA estimates: 171.9 bu./a. and $3.50/bu.

Avg. of March estimates: 163.5 bu./a. and $4.17/bu.
U.S. farm prices for corn

Source: FAPRI-MU stochastic baseline, March 2014
U.S. farm and futures prices for corn

Source: FAPRI-MU baselines, March and Sep. 2014; CME December futures contracts, Oct. 8, 2014
A correlation matrix is built for each commodity with all county yields and national prices.

Matrix is both overspecified and combines multiple data sources, so PSD fails.

- Use Higham (2002) to find nearest “true” correlation matrix.

Use Iman and Conover’s (1982) method to rearranged prices and yields to impose correlation.

- Given that FAPRI-MU’s prices are exogenous, a reordering algorithm is more appropriate than data generating algorithms that use copulas.
Futures prices

- Harvest price obtained directly from farm price
  - Corn: harvest price = farm price + $0.103
  - Soybeans: harvest price = farm price + $0.067
  - Wheat: harvest price = farm price + $0.209

- Planting price based used random draws from log-normal distribution centered on the harvest price
  - Historical volatility calculated based upon 1980 to 2012 market outcomes
  - Volatilities: 0.1899 for corn, 0.1730 for soybeans and 0.1844 for wheat
We assumed that 2013 crop insurance participation rates would continue.

<table>
<thead>
<tr>
<th>Coverage level</th>
<th>Corn</th>
<th>Soybeans</th>
<th>Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>6.6%</td>
<td>8.5%</td>
<td>9.0%</td>
</tr>
<tr>
<td>55%</td>
<td>0.3%</td>
<td>0.4%</td>
<td>0.6%</td>
</tr>
<tr>
<td>60%</td>
<td>1.9%</td>
<td>1.8%</td>
<td>4.8%</td>
</tr>
<tr>
<td>65%</td>
<td>6.8%</td>
<td>7.0%</td>
<td>15.0%</td>
</tr>
<tr>
<td>70%</td>
<td>20.1%</td>
<td>21.2%</td>
<td>35.0%</td>
</tr>
<tr>
<td>75%</td>
<td>29.2%</td>
<td>31.3%</td>
<td>24.6%</td>
</tr>
<tr>
<td>80%</td>
<td>22.1%</td>
<td>20.5%</td>
<td>6.5%</td>
</tr>
<tr>
<td>85%</td>
<td>10.9%</td>
<td>7.6%</td>
<td>4.1%</td>
</tr>
<tr>
<td>90%</td>
<td>2.1%</td>
<td>1.7%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>
Results

- Caveats
  - Only averages reported, will not hold for
    - Particular farms in particular counties
    - With different ratios of planted to base acreage
  - Different price assumptions could significantly alter results
## Corn payments

### Corn avg. payments per base or planted acre

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC</td>
<td>$33.79</td>
<td>$35.98</td>
<td>$31.49</td>
<td>$19.94</td>
<td>$15.99</td>
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<tr>
<td>SCO</td>
<td>$17.55</td>
<td>$15.16</td>
<td>$14.27</td>
<td>$14.33</td>
<td>$14.76</td>
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<tr>
<td>PLC</td>
<td>$15.94</td>
<td>$25.12</td>
<td>$29.76</td>
<td>$30.35</td>
<td>$30.01</td>
</tr>
<tr>
<td>SCO+PLC</td>
<td>$31.09</td>
<td>$36.50</td>
<td>$39.53</td>
<td>$40.10</td>
<td>$40.25</td>
</tr>
</tbody>
</table>

### Corn frequency of payments (share of outcomes)

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
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<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC</td>
<td>61.9%</td>
<td>63.5%</td>
<td>57.5%</td>
<td>41.3%</td>
<td>35.8%</td>
</tr>
<tr>
<td>SCO</td>
<td>29.7%</td>
<td>28.2%</td>
<td>27.8%</td>
<td>26.8%</td>
<td>28.7%</td>
</tr>
<tr>
<td>PLC</td>
<td>30.6%</td>
<td>36.8%</td>
<td>39.2%</td>
<td>40.4%</td>
<td>40.8%</td>
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<tr>
<td>SCO+PLC</td>
<td>44.4%</td>
<td>50.5%</td>
<td>52.4%</td>
<td>53.2%</td>
<td>53.6%</td>
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</table>
Soybean payments

- Soybean avg. payments per base or planted acre

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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</thead>
<tbody>
<tr>
<td>ARC</td>
<td>$20.98</td>
<td>$21.93</td>
<td>$20.91</td>
<td>$17.39</td>
<td>$12.57</td>
</tr>
<tr>
<td>SCO</td>
<td>$9.09</td>
<td>$8.99</td>
<td>$8.93</td>
<td>$8.79</td>
<td>$9.25</td>
</tr>
<tr>
<td>PLC</td>
<td>$9.99</td>
<td>$12.79</td>
<td>$14.96</td>
<td>$16.10</td>
<td>$15.73</td>
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<tr>
<td>SCO+PLC</td>
<td>$17.59</td>
<td>$19.87</td>
<td>$21.65</td>
<td>$22.49</td>
<td>$22.64</td>
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- Soybean frequency of payments

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>ARC</td>
<td>58.5%</td>
<td>59.3%</td>
<td>57.1%</td>
<td>49.7%</td>
<td>39.3%</td>
</tr>
<tr>
<td>SCO</td>
<td>26.2%</td>
<td>26.1%</td>
<td>26.1%</td>
<td>25.9%</td>
<td>26.4%</td>
</tr>
<tr>
<td>PLC</td>
<td>24.6%</td>
<td>31.2%</td>
<td>30.6%</td>
<td>33.8%</td>
<td>30.4%</td>
</tr>
<tr>
<td>SCO+PLC</td>
<td>41.6%</td>
<td>46.9%</td>
<td>45.0%</td>
<td>46.9%</td>
<td>46.0%</td>
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Wheat payments

- Wheat avg. payments per base or planted acre

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ARC</td>
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<td>$12.88</td>
<td>$13.02</td>
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</tr>
<tr>
<td>SCO</td>
<td>$8.48</td>
<td>$8.19</td>
<td>$7.90</td>
<td>$7.95</td>
<td>$7.69</td>
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<tr>
<td>PLC</td>
<td>$11.46</td>
<td>$19.14</td>
<td>$19.33</td>
<td>$20.07</td>
<td>$21.03</td>
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<tr>
<td>SCO+PLC</td>
<td>$18.24</td>
<td>$24.47</td>
<td>$24.34</td>
<td>$25.02</td>
<td>$25.57</td>
</tr>
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- Wheat frequency of payments

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<td>ARC</td>
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<td>SCO+PLC</td>
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<td>65.9%</td>
<td>69.4%</td>
<td>68.1%</td>
<td>68.7%</td>
</tr>
</tbody>
</table>
Corn distributions

![Graph showing corn distributions over years with different percentiles and measures of return.](image-url)
Corn distributions with PLC

![Graph showing corn distributions with PLC](image-url)

- 10th percentile Rev
- Mean Rev
- 90th percentile Rev
- 10th percentile Rev+SCO+PLC
- Mean Rev+SCO+PLC
- 90th percentile Rev+SCO+PLC
- 10th percentile Rev+ARC
- Mean Rev+ARC
- 90th percentile Rev+ARC
Soybean distributions

![Soybean Distributions Graph](image-url)
Soybean distributions with PLC

![Graph showing soybean distributions with PLC from 2014 to 2018, with lines indicating 10th percentile, mean, and 90th percentile for various scenarios including Rev, Rev+SCO+PLC, and Rev+ARC.](image)
Wheat distributions
Wheat distributions with PLC

[Chart showing the comparison of different revenue distributions over the years, including 10th percentile, Mean, 90th percentile, and different adjustments for Rev, SCO+PLC, and ARC.]
Conclusions

- SCO and ARC both provide a safety net
- ARC benefits generally exceed SCO net indemnities for corn, soybeans and wheat
- In many cases, the sum of PLC payments and SCO net indemnities exceed ARC benefits
- Results are sensitive to
  - Price projections
  - Individual crop insurance coverage levels
  - Much more
Thanks!

- FAPRI-MU website: www.fapri.missouri.edu

- To contact us:
  - Pat Westhoff: 573-882-4647  
    westhoffp@missouri.edu
  - Scott Gerlt: 573-882-1927  
    gerlts@missouri.edu

- Rest of FAPRI-MU full-time staff
  - Julian Binfield
  - Sera Chiuciarelli
  - Deepayan Debnath
  - Lauren Jackson
  - Willi Meyers
  - Wyatt Thompson
  - Jarrett Whistance
  - Peter Zimmel