Transfer efficiency analysis of margin based programs

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AgriStability

- Deficiency payment which puts a floor on farm income defined as a reference “production margin”
- Production Margin = Allowable commodity sales – Allowable expenses + Accrual Adjustment
  - Exclude expenses that are within a farmer’s control
  - Exclude expenses that are subject to moral hazard
Pulling the Trigger

- **Reference Margin**
  - “Olympic” average of the last five years’ production margins, with highest and lowest years dropped

- **Payment Trigger**: Payments are made when the program year margin falls below the reference year average

![Diagram showing government payment tiers]

<table>
<thead>
<tr>
<th>Tier</th>
<th>Production Margin / Reference Margin</th>
<th>Government Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1</td>
<td>85% / 70%</td>
<td>$\phi(1) = 70%$</td>
</tr>
<tr>
<td>Tier 2</td>
<td>70% / 60%</td>
<td>$\phi(2) = 80%$</td>
</tr>
</tbody>
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Size of government payment is inversely proportional to loss
How do you measure the impact of AgriStability?

- Judge program’s effects by how it affects producers’ incentives …specifically the incentive to access larger government payments
  - Alter outputs and inputs to access more program payments

- Prior studies:
  - Econometric estimates of risk reduction (Bakhshi 2009)
  - Stochastic simulation and capital budgeting (Schaufele, Unterschultz and Nilsson (2010))

- Measure the effects on a producer’s input choice decision rule:
Representative Producer’s Problem

\[ EU(\pi) = \int_{\omega_{\text{min}}}^{\omega_{\text{max}}} U(\pi(\omega) + 0.8 \cdot (RM - PM(\omega))) \cdot f(\omega)d\omega + \int_{\omega_{\text{min}}}^{\omega_{\text{low}}} U(\pi(\omega) + 0.7 \cdot (RM - PM(\omega))) \cdot f(\omega)d\omega + \int_{\omega_{\text{low}}}^{\omega_{\text{max}}} U(\pi(\omega) \cdot f(\omega)d\omega \]

where \[ \pi(\omega) = \sum_{i=1}^{3} \left[ R(x, \omega)_i - \sum_{j=1}^{10} V_j \cdot X_{ij} \right] \quad \text{and} \quad PM(\omega) = \sum_{i=1}^{3} \left[ R(x, \omega)_i - \sum_{j=1}^{6} V_j \cdot x_{ij}^{\text{eligible}} \right] \]

\[ EVMP = v_j \cdot \left( 1 - \sum_{i=1}^{2} (1 - \phi(i)) \cdot \frac{EMU(i)}{EMU} \cdot \frac{EVMP_j(i)}{EVMP_j} \right) \cdot \frac{EMU(i)}{EMU} \cdot \frac{EVMP_j(i)}{EVMP_j} \]

where \[ (1 - \Delta)RP = \lambda \cdot (1 - 0.7 \cdot EMU(1)/EMU - 0.8 \cdot EMU(1)/EMU) \cdot \text{cov}(\pi, VMP_j) \]

\[ \lambda = - \frac{EU''}{EU'} \]

\[ \Phi = \lambda \cdot (0.2 \cdot EMU(2)/EMU - 0.3 \cdot EMU(1)/EMU) \]

Do a stochastic simulation to get parameters for input decision rule and then employ an equilibrium displacement model.
Equilibrium Displacement Model

### Factor Supply

- Eligible Inputs
  \[ x_j^i = e_j \cdot V_j^d \]
- Non-Eligible Inputs
  \[ x_j^{f_0} = e_j \cdot V_{j_0}^d \]

\[ X_{ji}^s \equiv X_{ji}^d + X_{ji}^{d_1} + X_{ji}^{d_2} \]

### Factor Demand

- Eligible Inputs
  \[ x_{ji}^d = \sum_{j=1}^{10} c_{ji} \cdot \sigma_{ji} \cdot V_{ji}^d + q_{ji}^d \]
- Non-Eligible Inputs
  \[ x_{ji}^{d_0} = \sum_{j=1}^{10} c_{ji} \cdot \sigma_{ji} \cdot V_{ji}^{d_0} + q_{ji}^{d_0} \]

\[ Q_i^s \]

\[ P_i \cdot Q_i^s = \sum_{j=1}^2 V_{ji}^d \cdot X_{ji}^d \]

\[ Q_i^x + Q_i^c \equiv Q_i^s \]

\[ Q_i^x \equiv Q_i^{ROW d} - Q_i^{ROW s} \]

### Product Demand

\[ q_i^d = \sum_{j=1} \eta_{ij} \cdot P_j^d \]
Production Effects & Transfer Efficiency

Percentage change in production due to AgriStability

<table>
<thead>
<tr>
<th></th>
<th>MH &amp; Re-Allocation</th>
<th>Risk Reduction</th>
<th>Net Effect</th>
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</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>-5.9%</td>
<td>7.0%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Coarse Grains</td>
<td>-2.4%</td>
<td>7.7%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>-6.7%</td>
<td>6.6%</td>
<td>-0.01%</td>
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Transfer Efficiency

\[
TE = \frac{\Delta PS}{\Delta CS + \Delta GOV}
\]

Economic Impacts (Millions)

<table>
<thead>
<tr>
<th>(\Delta PS)</th>
<th>(\Delta CS)</th>
<th>(\Delta GOV)</th>
<th>(TE)</th>
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</thead>
<tbody>
<tr>
<td>352</td>
<td>11</td>
<td>823</td>
<td>42%</td>
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