THE EFFECT OF CHANGING GOVERNMENT SUBSIDY PROGRAMS:
AN ANALYSIS OF REVENUE AT THE FARM LEVEL

By
Sarah Elizabeth Thomas

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The expiration of the 2002 Farm Bill has presented an opportunity to renovate current farm policy into a program that better meets the demands faced by producers and other interested parties. During the farm bill debates on what to do with subsidy payments, the idea of structuring new programs that better fit a farmer’s needs is gaining momentum. These programs are often revenue based, adding to a more efficient program by combining yield and price risk. The intention of this thesis was to offer an overview of the potential effects of changes in farm programs on both the level and variability of farm revenue. The first step in accomplishing this objective was to create a model that accurately simulates farms from every producing county for which data were available. The proposals modeled include the National Corn Growers Association (NCGA), the USDA proposal, and a revenue subsidy wrapped-around an insurance program.
DEDICATION

To my parents
ACKNOWLEDGEMENTS

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CHAPTER I
INTRODUCTION

The nature of farming presents producers with management challenges that include endemic risks. These risks include both price and yield uncertainty, either of which can lead to revenue variability. The Farm Security and Rural Investment Act of 2002, commonly known as the 2002 farm bill, is the legislation responsible for the current Federal support programs in place that are designed to help farmers manage risk. The 2002 farm bill is scheduled to expire in 2007, and several proposals have already been suggested by various groups such as the National Corn Growers Association, American Farm Bureau, and the American Farmland Trust to supplant the current legislation.

The American Farmland Trust, in part, is proposing a safety net that combines a government revenue-based program with private individual revenue insurance. Presently, the U.S. Department of Agriculture (USDA) uses price-triggered subsidy programs to buffer the price risk faced by farmers. These programs include counter-cyclical payments and loan deficiency payments. Direct payments are based on historical production, but are not price triggered. Additionally, crop insurance programs provide another layer of protection that has traditionally mitigated yield risk, but in the last decade also began covering revenue risk. The decision to retain, modify, or completely
change current policies will be made in the context of tight budgets, relatively high commodity prices, and World Trade Organization (WTO) constraints.

During the debate over competing farm policy alternatives, economists are called upon to provide analysis of proposed plans. The commodity programs in place today are often assessed through the use of stochastic modeling. A well-known and widely used simulation is the Farm Level Income and Policy Simulation Model, or FLIPSIM developed by Richardson. According to the Agricultural and Food Policy Center, FLIPSIM uses accounting equations, identities and probability distributions to simulate the annual economic activities of a representative or actual farm over a multiple-year planning horizon. Similarly, Miller, Barnett, and Coble and Lence and Hayes designed models that analyze policy by simulating farm revenue and aggregate prices.

Another set of models widely used in policy simulations include aggregate price models such as the multi-equation econometric models of the Food and Agricultural Policy Research Institute (FAPRI) and USDA models such as those used by Westcott, Young, and Price. Westcott, Young, and Price used the USDA-ERS Food and Agricultural Policy Simulator (FAPSIM) to show the impact of implementing the 2002 farm bill. Aggregate price models, such as FAPRI and FAPSIM, have been quite effective at modeling national prices for programs such as the season average price-triggered counter-cyclical payment program because prices are highly correlated across regions.

However, recent debates reflect the rising popularity of the idea of a revenue-based subsidy program. The first such plan was released by Babcock and Hart of Iowa State University, with a more recent discussion found in a paper from Paulson and
Babcock. Paulson and Babcock evaluate the cost and effectiveness of implementing Group Revenue Income Protection (GRIP) as a standing disaster program apart from the federal crop insurance program. Similarly, the National Corn Growers Association released a proposal incorporating area revenue components. Proposals of this nature present a number of challenges. First, benefits are driven by a mix of farm and county revenue variability, so both must be modeled. Because revenue risk is dependent on yield risk the results can be quite heterogeneous across locations, making the assessment of how many representative farms are sufficient to judge the welfare implications of these proposals difficult. Further, aggregate cost is always a key issue for policy makers. With diffuse benefits, entities such as the Congressional Budget Office will likely have great difficulty assessing such programs.

This thesis reports the development of and results from models that simulate representative crop revenue from each of hundreds of counties in the U.S. The models incorporate important characteristics like price and yield risk and include county and other aggregate stochastic variables. Importantly, the system is designed to maintain spatial correlations across locations to maintain consistent aggregation of the results.

Objectives

The general objective of this research is to create a model that simulates several representative farms revenue distributions. The specific objectives for this study are:

1. Accurately model hundreds of representative farms at one time, while maintaining price, yield, and spatial correlations.
2. Evaluate alternative farm subsidy programs being suggested for the 2007 Farm Bill.

3. Investigate what the aggregate costs under various proposals are both at a regional level and the national level.

Potential Users of Results

This thesis will primarily be useful to federal policymakers who would like to know how to evaluate changes to current agricultural policy. The knowledge of costs associated with proposed changes will benefit them in making fiscally responsible decisions, while still taking into account the impact on farmer’s revenue. In addition to policymakers, producer groups that play an active role in creating policy can have a better understanding of where to focus their attention. Finally, researchers will be able to apply the methods used within this paper to accurately map new programs and associated costs for future farm bill debates.
CHAPTER II
LITERATURE REVIEW

The literature reviewed in this study is divided into three categories.

1. Studies reviewing current farm subsidy programs and the motivation for change.
2. Studies examining various programs proposed for the 2007 farm bill.
3. Studies evaluating the methods used in previous simulation programs.

Current Subsidy Programs

The passage of the Farm Security and Rural Investment Act (FSRIA) in 2002 allowed for the continuation of marketing assistance loans and direct payments from the 1996 farm bill. However, some changes were made to loan rates and payment rates (Anderson).

A new program offered by FSRIA is the counter-cyclical payment program, designed to provide payments when the national season average price is equal to or above the loan rate but less than the target price minus the direct payment rate. Thus, counter-cyclical payments are maximized once the season average price falls to the loan rate. Further, these payments are paid on the product of a producer’s program yields and 85 percent of a farm’s base acres, both of which are decoupled from current plantings.
Miller, Barnett, and Coble study producer preferences for counter-cyclical payments and conclude that the assumption that producers prefer counter-cyclical payments to fixed payments is often overstated. Their method for analyzing farm policy is different from other programs in that it includes producer risk aversion and yield-price correlations. Including the correlations, results indicate that policy can affect different regions in different ways, which will play a role in discussions about a revenue-based farm program.

Although not directly covered in the Farm Bill, a policy that will be discussed and analyzed in this paper is the federal crop insurance program. Currently, several programs that are subsidized and reinsured by the federal government are available to assist farmers against yield losses and revenue uncertainty. These programs are offered through the Risk Management Agency (RMA) of the United States Department of Agriculture. The programs that are of most interest to this study are the Group Risk Plan (GRP) and Group Risk Income Protection (GRIP).

GRP is a yield-based insurance coverage plan. This means that it is based off of an area’s Actual Production History (APH). According to RMA, these policies use a county index as the basis for determining a loss. When the county yield for the insured crop, as determined by the National Agricultural Statistics Service (NASS), falls below the trigger level chosen by the farmer, an indemnity is paid. On the other hand, GRIP pays an indemnity when the county-level revenue drops below the revenue level chosen by the farmer. The producer can only choose one program.

The question on the minds of producers and legislators is that of whether or not to change current policy and the impact such changes would have on farmers. The National
Corn Growers Association (NCGA) lists several reasons for their support of an overhaul of current programs. Their primary motivation is to improve the efficiency of farm programs. They feel that programs focus on price risk and do not protect farmers when yield is low. Along this vein of thinking, they would prefer a system that stabilizes revenue. The NCGA final reason for change is to be able to defend cases against outside criticism. This is in reference to the World Trade Organization (WTO) Cotton Case.

In 2005, the WTO released its rulings in the case that Brazil brought against the United States cotton program. Brazil effectively argued that programs, like direct payments, which were previously considered Green Box (non-trade distorting), are actually Amber Box. Amber Box payments are subsidies that are considered to distort production and trade. Another important finding of the WTO was that the marketing loan and counter-cyclical payments caused significant price suppression and serious prejudice to Brazil over the 1999-2002 period, (Hudson et al. 2005) but not during the 2003-2007 period. Therefore, during farm bill debates legislators will consider how much importance they will place on WTO compliance regulations. The breakdown of trade talks during the Doha Development Round of WTO negotiations raises the question of importance in the eyes of US agricultural policy legislators of WTO compliance.

**Proposed Plans for 2007 Farm Bill Programs**

A revenue-based farm program idea has been mentioned during recent farm bill debates, which indicate this policy option is gaining more attention than in previous years. The first of these new plans to gain significant attention was released by Babcock and Hart. They call for a complete redesign of U.S. farm policy. Although this plan will
not be analyzed in this paper, it forms the basis of several other plans that are being proposed. Therefore, it is important to have a working knowledge of this proposal.

Babcock and Hart claim a revenue target - not a price target - triggering support would reduce the number of years that farm revenue falls to an unacceptable level. According to Babcock and Hart a revenue-based program would meet the proposed U.S. limits on trade-distorting subsidies with a high degree of probability. Their plan is comprised of 3 components. The first component assures that an individual farmer’s revenue will not fall below 70 percent of a five year average. The second component uses an area revenue plan that is triggered when revenue is 85 percent below the effective revenue target. The area revenue is calculated by taking the product of the national season average price and the county yield. The payment has a cap of 15 percent of the area revenue trigger. The final component of the plan says that when the area revenue, as defined previously, falls below 95 percent of the product of the expected county yield and the trigger price then the individual farmer will receive a payment based on their base acres. There is a 10 percent cap, based on the product of the expected county yield and trigger price, placed on the payment received by farmers. Babcock and Hart then examine how combining these proposals with current policy will have to be changed to make US Policy WTO compliant. They created a proposal based on revenue triggers that would fall under Amber Box and Blue Box payment guidelines.

Coble and Miller look at several implications of a revenue-based subsidy plan. They point out that since the way a revenue-based policy would be implemented is unknown, then how the program would fit into WTO boxes is also unknown. Another issue is that the primary advocates of revenue-based programs are generally located in the
Corn Belt. Producers of traditional crops in the South such as rice and cotton tend to prefer price-based programs, much like the current programs. They claim this dichotomy occurs because areas where prices and yields are not negatively correlated respond better to programs that separate price risk from yield risk. However, Coble and Miller also note that revenue-based programs would affect the distribution of program benefits as revenue risk is greatest in regions and crops where yield risk is the greatest.

The National Corn Growers Association recently released their proposal for new farm programs entitled “Forging a New Direction for Farm Policy.” The group proposes several courses of action from updating and modifying current programs to creating a new program. The first step to their plan offers their continued support of direct payments. They feel that the direct payment offers a base level of support and that there is no reason to change the program. The next step is changing the non-recourse loan program to a recourse loan program. According to the NCGA, this was done to help farmers increase their market orientation, both domestically and abroad. A recourse loan will also benefit in that it will prevent excess government stocks from affecting the market.

The most dramatic change is the third component of the NCGA plan, which introduces a new program referred to as the Base Revenue Protection (BRP). BRP is based on net farm revenue and would be triggered when per-acre net revenue falls more than 30 percent below the previous five-year average. They calculate the per-acre net revenue by multiplying farm-level actual yield per planted acre by a national market price, then subtracting per-acre average variable costs of production. The way BRP is structured is in response to WTO compliance regulations for making a program fall in the
green box. According to NCGA, unlike current revenue insurance methods, BRP is based upon an Olympic average of the past five years and begins compensation when revenue drops below 30 percent of the calculated revenue, which fits with green-box requirements. However, the most compelling difference between BRP and previous proposals is the decision to cover net revenue rather than gross revenue. This is observed in the method of calculating revenue which includes subtracting the cost of production.

The final part of their proposal changes the counter-cyclical payment to form the Revenue Counter-cyclical Program (RCCP). RCCP closely resembles the GRIP insurance product. These programs are similar in that they both are triggered when county prices are low, but unlike GRIP, RCCP is based on a fixed trigger price and not expected futures prices.

American Farmland Trust (ATF) released their farm policy agenda in May 2006, titled, "Agenda 2007: A New Framework and Direction for U.S. Farm Policy." Their program is based on a three pillar approach to farm policy. The pillars are as follows: safety net, environmental stewardship, and new markets. The focus for this paper will be on the safety net pillar. Their plan is to replace existing counter-cyclical and loan-deficiency payments with programs that would be less distorting and cost significantly less while providing a true yield/price protection. According to ATF the safety net will have both green payment programs and risk management programs that mitigate revenue volatility. Green payments are used to reward environmental stewardship and will replace current fixed direct payments. The risk management practices would replace current programs that are crop specific or price triggered. Instead, they will be more market oriented and revenue based. They would combine government revenue programs
with private individual revenue insurance. The government's role would be to protect
against uninsurable risks, such as weather. On the other hand, private insurance and the
producer would protect against all other risks. The program is structured so that farmers
and ranchers are responsible for the first 5 percent of a decline in revenue; the
government would be responsible for a 10 to 15 percent decline in revenue; and the rest
would be available on the private market. This would create a national revenue
deficiency program.

The ATF presents two alternative plans for farm policy. One of these plans is to
transition out of commodity specific payments and allow for private insurers to offer a
suite of revenue insurance programs. Essentially, the government would be slowly
detached from the agricultural industry. Another less drastic approach would be to offer
supplemental programs, such as Farmer IRAs or a Recourse Loan.

Secretary of Agriculture, Mike Johanns, on January 31, 2007 released the
USDA's proposal for the 2007 farm bill. The section of interest for this thesis is Title 1:
Commodity Programs. The administration has fourteen recommendations. The
highlighted recommendations of interest for this paper are: establish a market-based loan
rate, replace current daily posted county prices used for determining LDPs with a
monthly posted county price, increase direct payments, and create a revenue-based
counter-cyclical payment. Their revenue based counter-cyclical program uses a national
level yield variable to calculate revenue.

The American Farm Bureau Federation (AFBF) released their proposal of
recommendations for the 2007 farm bill. AFBF proposes keeping a “three-legged stool”
of support programs for the major commodities. The “three-legged stool” refers to
continuing the current method of using marketing loans, direct payments, and counter-
cyclical payments to protect farmers during low prices.

The Farm Bureau proposal closely follows the recommendations outlined by the
USDA—the major exception being that the USDA proposed an increase in direct
payment rates. AFBF accepts the current level of coverage provided for by the 2002
farm bill direct payments. Another example of the difference between AFBF and USDA
recommendations is the AFBF’s decision to use a state level, instead of national level,
yield variable when calculating the revenue-based counter-cyclical program. This means
that payments would be made when a state’s crop revenue is less than the crop’s trigger
revenue. This was done to protect farmers that are in need of assistance and to avoid
unnecessary payouts. For example, areas that have a high inverse correlation relationship
between yield and prices might have low prices and high yields and under the current
CCP the farmer would still be eligible for a subsidy payment.

A key point for the Farm Bureau’s proposal is the creation of a county-based
catastrophic assistance program. They point out that they do not want to replace current
crop insurance programs, but work in conjunction with the program. Their proposal
offers a standing policy against yield losses of over 50 percent of normal production
within a county.

The increasing interest in expanding the crop insurance programs has not escaped
the notice of economists working on agricultural policy. Paulson and Babcock released a
paper looking at whether GRIP should be made part of the Farm Bill or remain offered as
an insurance program. They looked at the cost to taxpayers on a per-acre basis in
Indiana, Illinois, and Iowa for corn and soybeans for GRIP being offered as area revenue
insurance or as a program in the Farm Bill, replacing market loans and counter-cyclical programs. Their results show that the primary difference is in who pays the cost and who receives the majority of the benefits. They claim that the current method in which GRIP is being offered is highly inefficient and that offering the program through the Farm Bill will provide a better safety net for farmers.

**Studies Using Simulation Methods**

Several widely-cited simulation models, such as FLIPSIM, were mentioned in Chapter I. FLIPSIM was developed in 1981 by James Richardson and uses a panel farm process. In this process, producers give actual farm information in a three- to four-hour session, and that information is used to create a representative farm for their area. After the model is run, an income statement, cash flow, balance sheet, and federal and state income tax summaries are given. The program is able to summarize more than 200 risks faced by the business. Although this model is able to model farm risks, it is not designed to aggregate up to the national level and provide aggregate costs.

On the other hand, models released by FAPRI can not look at the farm level but are able to evaluate different scenarios involving macroeconomic, policy, weather and technology variables. FAPRI simulation models create a baseline projection and add assumptions about current conditions affecting the variables mentioned above. FAPRI has two research centers: the Center for Agricultural and Rural Development (CARD) and the Center for National Food and Agricultural Policy (CNFAP). However, it is unable to look at a farm-level impact and only gives a broad picture of the effect of policy changes.
Another model that looked at farm revenue was Lence and Hayes' program assessing the impact on commodity prices of the Federal Agricultural Improvement and Reform (FAIR) Act of 1996. Their model simulates a corn, wheat, and third "non-program crop" equilibrium. They used the program to look at pre-FAIR conditions and the impact of FAIR policies on the market equilibrium. The end results provided a rational-expectations model that allowed for storage and output substitution and showed that the passage of FAIR had little impact on the volatility of prices.

There are several programs available that simulate farm revenue. Miller, Barnett, and Coble use a nonparametric bootstrapping approach to simulate farm revenue. According to Miller, Barnett, and Coble this approach has both positive and negative attributes. The downside is that it is less efficient if the distribution patterns are known, but on the upside the model does not make assumptions about what the distribution is. Therefore such a model does not make biased or inconsistent estimates. Their analysis examines two representative farms at two separate locations, but could be changed for application to a larger geographic region.
CHAPTER III
CONCEPTUAL FRAMEWORK

In the past, simulation models have evaluated policy with a number of criteria. FLIPSIM uses the probability of bankruptcy. FAPRI models have largely estimated dollars of government program outlays, which may also be interpreted as producer benefits. Others such as Miller, Barnett, and Coble that look at policy implications have focused their attention on expected utility frameworks. This has worked well in the past because of the small number of farms that are analyzed with the simulation. However, this model is conceptually different due to the large number of representative farms that it encompasses. This model creates one representative farm for every county with available historical data. For example, the soybean data allow for 831 counties to each have one soybean producing representative farm. Corn and cotton representative farms are created in the same manner. The simulation will also include the effects on farmer revenue when modeling current government programs.

Although conceptually an expected utility model could be used to present a clear picture of how government programs will affect farmers, the number of farms modeled makes the expected utility model unwieldy to report. However, expected utility has often been approximated by the mean-variance approach. The mean-variance approach is more suitable for the primary intended audience of this paper, for whom the priority will be to
see the average government payout for each subsidy program and the associated cost to taxpayers. Therefore, a mean-variance approach, despite its limitations, will be the primary method of comparing alternatives in this study.

This chapter contains a brief overview of the expected utility model, including an in depth discussion of the positive and negative features of this approach. This chapter also examines the benefits and limitations of applying a mean-variance approach to making decisions

**Expected Utility Model**

The expected utility (EU) model came about in an effort to explain an individual’s selection behavior. The EU model looks at a decision maker’s ability to cope with uncertainty, otherwise called risk. Hardaker, Huirne, and Anderson described how it originated out of von Neumann and Morgenstern’s 1940s subjected expected utility hypothesis. However, the authors claim that its concepts have been alluded to since the 1700’s and Daniel Bernoulli’s writings on risk aversion.

According to Robison and Barry, the two main components of decision theory are the decision maker’s risk attitude and the expectation or perceptions of the amount of risk. The model will manifest these components by forming an equation to represent decision-maker utility. This is accomplished by taking the sum of varying monetary outcomes times a probabilistic weight to represent the likelihood of each occurrence. The utility function formed by these components will be unique to each individual. Individuals can be grouped into three classes depending upon the shape of their utility function. These three groups contain people that are considered to be risk loving, risk
Figure 3.1

Graphical representation of utility functions under risk neutral, risk adverse and risk loving individuals
neutral, and risk averse. Figure 3.1 shows a graphical representation of the three possible utility shapes. The top graph in figure 3.1 shows a risk neutral individual’s utility. In this case, utility is represented by a linear function. A risk neutral individual, faced with two outcomes both having an equal chance of occurring, will accept a certainty equivalent of one half the sum of the options. According to Newbery and Stiglitz, a certainty equivalent is the price which would cause the same decision to be made with or without the presence of risk. Due to the risk neutral utility function this individual will neither pay to avoid or actively pay for the risk.

On the other hand, a risk loving individual has a utility function that is convex. This utility function is represented in the lower graph of Figure 3.1. This is the most unusual case and will rarely factor in to discussions explaining risk behavior. A risk loving individual has a certainty equivalent that is above the expected wealth of the gamble. This means that a person would be willing to pay to take on the risk or must be compensated to not take the risk.

In contrast, the most common and thoroughly discussed form of risk behavior is the risk averse individual. This person has a concave utility function. A risk averse utility function is represented by the middle graph in Figure 3.1. This is the most common behavior exhibited by individuals. Looking at this graph more in depth shows that there are two possible outcomes: one with an expected outcome with a low expected wealth and one with a high expected wealth. The certainty equivalent (CE) is lower than the expected wealth ($W^*$) received from the gamble. Therefore the individual is willing to pay any amount between the CE and $W^*$ in order to avoid the gamble. This difference is referred to as a risk premium.
Mathematically, levels of risk aversion can be expressed with a relationship between wealth and utility. According to Hardaker, Huirne, and Anderson when more money is preferred to less, the following equations explain risk preferences:

\[ U'(W) > 0 \]  
\[ (3-1) \]

Where:

\[ U(W) \] is the utility function for wealth. Equation 3-1 shows that the first derivative of the utility function for wealth is positive. Although it can be shown that the utility function is increasing, the curvature of the utility function is determined by the second derivative.

Where:

\[ U''(W) > 0 \]  
\[ (3-2) \]

\[ U''(W) = 0 \]  
\[ (3-3) \]

\[ U''(W) < 0 \]  
\[ (3-4) \]

Equation 3-2 describes a risk loving individual’s utility function. Equation 3-3 represents a risk neutral individual. Finally, equation 3-4 shows the shape of a risk averse individual’s utility function for wealth. The concave structure of a risk averse individual’s utility function exhibits diminishing marginal returns to wealth.

Hardaker, Huirne, and Anderson then show that through the use of the coefficient of absolute risk aversion, often called the Pratt coefficient, an individual’s level of risk aversion can be established. The Pratt coefficient is:

\[ r_a(W) = \frac{U''(W)}{U'(W)} \]  
\[ (3-5) \]
As mentioned before this forms the backbone of the mean–variance analysis discussed in the next section and used in this paper.

**Mean–Variance Analysis**

The Mean–Variance Analysis, often referred to as the Expected Value–Variance (EV) Analysis, according to Robison and Barry, was first introduced by Markowitz as a portfolio selection tool. The EV model orders choices into efficient and inefficient sets. The efficient set contains the most favorable returns that have the least variance. These sets are considered the preferable choice, whereas the inefficient sets contain those choices that are not preferred.

Hardaker, Huirne, and Anderson discuss this form of analysis at the simplest level. They say when given two choices, if the expected value of choice A is larger or equal to the expected value of choice B, and the variance of A is less than or equal to the variance of B, then a risk averse decision maker will prefer A to B. However, for this to be true the decision maker must meet certain conditions. According to Robison and Barry there are four conditions or assumptions in which the EV approach is defensible: (1) quadratic utility, (2) normality, (3) choices involving a single random variable, and (4) choices involving linear combinations of the random variable.

The simplicity of explaining expected utility in terms of their means and their variances has caused the EV model to become a very popular tool. On the other hand, as Robison and Barry discuss, the conditions imposed by the model make it better suited to being used as an empirical tool rather than a deductive tool.
CHAPTER IV
METHODS AND PROCEDURES

The model in this thesis uses historical farm yields and prices to simulate gross revenue per acre. Although these two components are the only variables necessary to calculate farm revenue, several other variables are needed to simulate government payments. The method of simulations created for corn, cotton, and soybeans is based on Coble et al. (1999).

The first component in the simulation is farm level yield. The ideal method is to include farm-level historical data for each county producing the selected crop. However, such data are rarely available for a sufficient time period needed for a credible simulation of yield variability. For this reason county-level yields and farm-level deviations are used to calculate farm level yields.

County yields were retrieved from the National Agricultural Statistics Service (NASS) of the United States Department of Agriculture (USDA). The yield history from 1976 to 2005 was collected and these data sets were regressed using a quadratic function of time to predict the 2006 county-level yield. The regression analysis incorporates changes in technology that vary between regions and crops. The regression equation is:

\[ c_{it} = \alpha_i + \beta_1 t + \beta_2 t^2 \cdot \nu_s, \]  

(4-1)
where $c_i^t$ is the county-level yield for crop $i$ in time $t$. A matrix containing the detrended county yields is created by adjusting historic deviations to the current expected yield level. These data are contained in matrix $[c_i^y]$ with $T_i$ rows for each year and $N$ county columns. The variable $\hat{c}_i^y$ is defined as the 2006 predicted county-level yield.

From the county yield data, the next step calculates the farm-level yield using computed farm yield variability for representative farms for each county. The mean yield of each representative farm is assumed equal to the expected county yield and yield variability is consistent with the average riskiness of farms insured by RMA’s yield crop insurance. Given the average premium rate for 65 percent coverage yield insurance for each crop in each county, a grid search is performed to find a multiplier, $k$. The multiplier expands county yield variability to a level that generates the RMA premium rate:

$$d_f = d_c \quad \Box \quad k$$

(4-2)

where $d_f$ is farm yield deviation from expectation and $d_c$ is the deviation in county yield from expectation and $k$ is an expansion factor. The expansion factor accounts for the disaggregation effect—that is, the increase in variability between the county yield and average farm yield. Given the unsubsidized crop insurance premium rate, a grid search from 1.0 to 5.0 by intervals of 0.2 finds the level of farm yield variability that simulates a 65 percent yield insurance expected indemnity that most closely approximates the average MPCI crop insurance premium rate for the county in 2005. For example, cotton in Bolivar County, Mississippi, has an expansion factor of 2.8 while cotton in Coahoma County...
County, Mississippi, has an expansion factor of 2.4. After establishing this equation, the model creates the matrix \( df_{i,y} \) containing farm yield deviations of \( T_i \) rows for each year and \( N \) county columns. To calculate farm-level yields \( f_{i,y} \), the matrix \( df_{i,y} \) is multiplied by the corresponding \( k \) value to form matrix \( f_{i,y} \).

The simulation of prices consists of two steps. The first step creates ratios that represent state-wide deviations from the national average price. The national average price and state-level harvest time price are obtained from NASS for 1974 through 2005. The next step is the creation of matrix \( P_{sit} \), which is composed of price ratios at the state level with \( T_i \) rows for years and \( M \) state columns. Since the \( T_i \) row of price changes corresponds to the historical year of yield data given for the counties, the correlations between price and yield are implicitly maintained. Although in an ideal environment, county-level price deviations would be used, the data are not available to support the use of county-level prices.

The final step in calculating revenue begins by taking a random draw; yield and price deviations for every location are drawn simultaneously to maintain the empirical correlation between prices and yields. Starting prices are determined from December 2006 futures market prices for 2007 delivery months; see Table 4.1. The starting price is then multiplied by the price deviation randomly drawn. The simulation then models a five-year time path of random prices (and yields in each year) such that the expected price in year \( t \) is the MYA price for year \( t-1 \). This process is used for the remaining random draws. The use of five hundred iterations results in 2,500 random draws for each
location (five years multiplied by 500 iterations). Farm revenue for each of these iterations is calculated as

\[ R_i^f = \cdot MYA_i \cdot f_i^Y \]  

(4-3)

Although the basic revenue simulations, without government programs, can be made by having the draw take a price and farm yield from the same year, government programs require the introduction of other variables. Figure 4.1 shows a representation of the variables required for each random draw to contain the proper spatial correlations across regions. Each draw is taken from one row across the matrix. Figure 4.1 includes state and national level yield de-trended values for each of the 30 years of historical data. These de-trended yields were calculated in the same manner as the county level yields. The original national and state yields were retrieved from NASS. The cost variable also included in figure 4.1 will be thoroughly discussed when introduced in the calculating of the National Corn Growers proposal.

\[
\begin{bmatrix}
Y_{r1} & Y_{r1+1} \\
Y_{r1+1} & Y_{r29} \\
Y_{r29} & Y_{r+29} \\
\end{bmatrix}
\begin{bmatrix}
Y_{c1} & Y_{c1+1} \\
Y_{c1+1} & Y_{c+29} \\
Y_{c+29} & Y_{c+1} \\
\end{bmatrix}
\begin{bmatrix}
Y_{s1} & Y_{s1+1} \\
Y_{s1+1} & Y_{s+29} \\
Y_{s+29} & Y_{s+1} \\
\end{bmatrix}
\begin{bmatrix}
Y_{n1} & Y_{n1+1} \\
Y_{n1+1} & Y_{n+29} \\
Y_{n+29} & Y_{n+1} \\
\end{bmatrix}
\begin{bmatrix}
P_{r1} & P_{r1+1} \\
P_{r1+1} & P_{r+29} \\
P_{r+29} & C_{r+1} \\
\end{bmatrix}
\begin{bmatrix}
P_{c1} & P_{c1+1} \\
P_{c1+1} & C_{c+29} \\
C_{c+29} & C_{c+1} \\
\end{bmatrix}
\]

Figure 4.1

Matrix containing variables needed for each random draw

**Current Government Programs**

The model incorporates and simulates government payments made under each random draw. In the simulation current farm programs consist of loan deficiency
payments (LDPs), direct payments (DP), and counter-cyclical payments. Crop insurance (APH) indemnity payments are modeled using the parameters outlined by the Farm Security and Rural Investment Act of 2002 as seen in Table 4.1.

The first payment simulated is the loan deficiency payment.

\[
LDP_i = \max(0, LR_i \cdot MYA_i) 
\]  

(4-4)

where:

- \(LDP_i\) = farm-level loan deficiency payment for crop \(i\)
- \(LR_i\) = loan rate for crop \(i\)
- \(MYA_i\) = market year average price for crop \(i\)

This simulation model is not a continuous-time model that allows a producer to “lock in” LDP payments during a window of his or her choosing. Rather the model assumes that the LDP value is determined at the harvest-time price. A wider exercise window exists under efficient markets, but price dynamics also suggest harvest prices tend to be the lowest cash price for the year (Hofstrand). Ultimately, continuous-time modeling would add significant complexity to the model.

The model next simulates direct payments, which, along with other programs, require the creation of a base acres data set. This information was retrieved from USDA’s Economic Research Services (ERS). These records provide the updated 2002 base acres enrolled in government payment programs.

Farm-level planted acres records are not available; therefore a county payment is the only available information for direct payments. The formula used to calculate the county-level direct payment \(DP_i\) for crop \(i\) is:
Table 4.1

Simulation parameters for NCGA, USDA, and Revenue Wrap proposals

<table>
<thead>
<tr>
<th></th>
<th>Corn</th>
<th>Cotton</th>
<th>Soybeans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Expected Price</td>
<td>2.40</td>
<td>0.58</td>
<td>6.25</td>
</tr>
<tr>
<td>APH Coverage Level</td>
<td>0.65</td>
<td>0.65</td>
<td>0.70</td>
</tr>
<tr>
<td>MPCI Subsidy Factor</td>
<td>0.59</td>
<td>0.59</td>
<td>0.59</td>
</tr>
<tr>
<td>Loan Rate</td>
<td>1.95</td>
<td>0.52</td>
<td>5.00</td>
</tr>
<tr>
<td>Target Price</td>
<td>2.63</td>
<td>0.724</td>
<td>5.80</td>
</tr>
<tr>
<td>Direct Payment Yield Ratio</td>
<td>0.76</td>
<td>0.88</td>
<td>0.76</td>
</tr>
<tr>
<td>Direct Payment Rate</td>
<td>0.28</td>
<td>0.0667</td>
<td>0.44</td>
</tr>
<tr>
<td>Direct Payment Percentage</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>CCP Percentage</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>CCP Yield Ratio</td>
<td>0.85</td>
<td>0.90</td>
<td>0.84</td>
</tr>
<tr>
<td>BRP Coverage Level</td>
<td>0.70</td>
<td>0.70</td>
<td>0.70</td>
</tr>
<tr>
<td>RCCP Coverage Level</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>USDA Loan Rate</td>
<td>1.89</td>
<td>0.457</td>
<td>4.92</td>
</tr>
<tr>
<td>USDA Direct Payment Rate</td>
<td>0.28</td>
<td>0.1108</td>
<td>0.47</td>
</tr>
<tr>
<td>CCP Base Acres yield</td>
<td>114.3</td>
<td>638.9</td>
<td>34.1</td>
</tr>
<tr>
<td>GRP Subsidy Factor</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>GRP Coverage Level</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
<tr>
<td>GRP Floor Level</td>
<td>0.70</td>
<td>0.70</td>
<td>0.70</td>
</tr>
<tr>
<td>CRC Wrap Tier 1</td>
<td>0.65</td>
<td>0.65</td>
<td>0.65</td>
</tr>
<tr>
<td>CRC Wrap Tier 2</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
</tbody>
</table>
\[ D_P^i \cdot D_P^y \cdot D_P^R \cdot D_P^p \cdot BA_i \] (4-5)

where:

- \( D_P^y \) = direct payment yield for crop \( i \)
- \( D_P^R \) = direct payment rate for crop \( i \)
- \( D_P^p \) = direct payment percentage for crop \( i \)
- \( BA_i \) = base acres for crop \( i \)

Actual \( D_P^y \) is not available for all farms represented. To compensate for the lack of data availability, the following formula was used:

\[ D_P^y \cdot \hat{f}_i^{y06} \cdot D_P^{RT} \] (4-6)

where:

- \( \hat{f}_i^{y06} \) = simulated farm yield for 2006 for crop \( i \)
- \( D_P^{RT} \) = direct payment ratio for crop \( i \)

The direct payment ratio was calculated by taking the USDA-Farm Service Agency (FSA) national average program yield divided by the expected 2006 crop yield. The results are presented in Table 4.1. The counter-cyclical payment is calculated as

\[ CCP_i \cdot (CCP^p \times (TP_i \cdot D_P^R)) \cdot \max(LR_i, MYA_i) \cdot BA_i \times CCP^p \] (4-7)

where:

- \( CCP_i \) = counter-cyclical county-level payment for crop \( i \)
- \( CCP^p \) = counter-cyclical payment ratio for crop \( i \)
- \( TP_i \) = CCP target price for crop \( i \)
\[ CCP^p_i = \text{CCP payment percentage for crop } i \]

The method used for calculating \( DP^y_i \) was also used for calculating \( CCP^y_i \). The CCP uses an effective target price. The effective target price is calculated by taking the TP defined in the 2002 Farm Bill, values can be seen in Table 4.1, and subtracting the direct payment rate that was previously defined. The Actual Production History (APH) insurance indemnity payment is calculated using the formula

\[ APH_i \cdot EP_i \cdot \max(0, APH^{CL}_i \times (f^y_i \cdot f^y_i)) \cdot MPCI_i^{SUB_p} \]  

(4-8)

where:

\[ APH_i \] = APH payment for crop \( i \)

\[ EP_i \] = the expected price for crop \( i \)

\[ APH^{CL}_i \] = APH coverage level for crop \( i \)

\[ MPCI_i^{SUB_p} \] = MPCI subsidy premium factor for crop \( i \)

The APH indemnity payment is a basic farm yield insurance program. The parameters, as defined in Table 4.1, show that the producers are insured up to 65% of farm yields for corn and cotton and farm yields are covered up to 70% for soybeans. Unlike for farm bill programs, the producer must pay a premium for this program which is accounted for under the MPCI subsidy premium factor. Total current payments add direct payments, LDPs, counter-cyclical payments, and APH indemnity payments. Comparing programs, however, requires adding farm revenue to total current payments, which provides a base for comparison in the results section.
NCGA Proposal

The following section discusses the simulation of the NCGA proposal payments. As mentioned before, these payments are based on a shortfall in the net revenue of a farm. However, the equations used in this simulation represent a construct of the NCGA proposal, as the actual formulas intended by the NCGA have not been published and therefore are open to interpretation.

Farm-level net revenue is calculated as

\[
NR_i = (MYAi \cdot f_i') \cdot C_i
\]

where:

\[
NR_i = \text{farm-level net revenue received for crop } i
\]

\[
C_i = \text{production cost of crop } i \text{ on a regional basis}
\]

The NCGA bases cost of production on the regional estimates published by ERS. Historical cost data were retrieved from ERS for 1975-2005. The cost of production regions were linearly regressed against time in order to account for changes in technology. ERS redefined the regions in 1996; therefore, the model incorporates a dummy variable to act as an intercept shifter at the series break. Using the regression equation the value for the predicted cost of 2006 \( \hat{C}_i^{06} \) was calculated for use in future equations.

According to the NCGA proposal the net revenue guarantee is triggered when net revenue drops below the Olympic five-year average. The method for calculating the Olympic five-year average will be referred to as expected net revenue. The farm-level expected net revenue (\( NR_i^E \)) for crop \( i \) is calculated as:
The parameters used in this equation are those set forth by the NCGA proposal, which can be found in Table 4.1. Equation 4-8 finds the level of revenue that triggers a payment and is used within the calculation of the BRP payment. The two payments of the NCGA proposal, BRP and RCCP, are calculated as:

\[
BRP_i = \max(0, (NR_i^E - (1 - BRP_{CL}) \times NR_i^E)) \times NR_i^E
\]

(4-11)

and

\[
RCCP_i = \min(RCCP_{CL} \times TP_i \times \hat{\epsilon}_i^p, \max(0, RCCP_{CL} \times (TP_i \times \hat{DP}_i^E \times \hat{\epsilon}_i^p \times MYA_i \times \hat{\gamma}_i))
\]

(4-12)

where:

\[
BRP_{CL} = \text{NCGA BRP coverage level for crop } i
\]

\[
RCCP_{CL} = \text{NCGA RCCP coverage level for crop } i
\]

The BRP payment takes a revenue guarantee which is calculated by taking the expected net revenue minus the coverage level times the absolute value for the expected net revenue. The absolute value for the expected net revenue is used because there is a possibility that there can be negative expected revenue. This happens when cost is greater than revenue. The RCCP payment is triggered by a county yield trigger and uses an expected price instead of a target price. According to the NCGA, since BRP and RCCP work together, the county trigger revenue should approximately equal 100 percent of the product for the effective target price and expected county yield.
USDA Proposal

Payments simulated under the USDA proposal fall into one of two categories. Some payments, like LDPs, are found according to the same methods used for the 2002 farm bill but use different parameters. Other payments like RCCPs are new programs and the calculations are described in the USDA proposal. USDA loan deficiency payments are simulated as

\[ LDP_{i}^{p} \cdot f_{i}^{*} \cdot \max(0, LR_{i}^{p} \cdot MYA_{i}) \cdot PA_{i} \]  (4-13)

where:

- \( LDP_{i}^{p} \) = farm-level LDPs under USDA proposal for crop \( i \)
- \( LR_{i}^{p} \) = USDA loan rate for crop \( i \)

The new loan rate and other parameters used in this simulation are located in Table 4.1. The direct payment constitutes one of the payments calculated the same as before but with an updated payment rate. Direct payments under the USDA proposal are simulated as

\[ DP_{i}^{p} \cdot DP_{i}^{p} \cdot DP_{i}^{pR} \cdot DP_{i}^{p} \cdot BA_{i} \]  (4-14)

where:

- \( DP_{i}^{p} \) = Direct payment for crop \( i \)
- \( DP_{i}^{pR} \) = direct payment rate for crop \( i \)

Equations 4-13, 4-14, and 4-15 use three different ways to implement the proposed revenue-based CCP program. USDA proposed using a national average yield trigger. The yield trigger aspect of a revenue-based program requires the creation of several additional data matrices. The first matrix contains the de-trended national level
yields. These data sets were obtained from NASS for 1975-2005. A regression analysis like that for county level yields is performed to create a matrix containing de-trended state yields for the same time period. The state-level yields are used in equations that simulate different methods of implementing a revenue-triggered counter-cyclical payment. The final dataset created contains updated base acre yields based on 2005 yields. USDA revenue counter-cyclical payments are found as

\[ RCCP_i^N \cdot \cdot CCP_i^P \cdot CCP_i^R \cdot \max((0, TP_i \cdot DP_i^R)) \cdot \hat{y}_i^{N06} - \max(LR_i, MYA_i) \cdot (y_i^N \cdot 1.01) / CCP_i^y \]  

(4-15)

where:

\[ RCCP_i^N = \text{USDA national yield triggered RCCP payment for crop } i \]
\[ \hat{y}_i^{N06} = \text{Predicted average national yield for 2006 for crop } i \]
\[ y_i^N = \text{Average national yield for crop } i \]
\[ CCP_i^{By} = \text{CCP base acres yield for crop } i \]

Equation 4-14 contains the term \((\hat{y}_i^N \cdot 1.01)\); this term is used to reflect increases in expected yields over the five-year simulation period while the proposed revenue guarantee remains constant. The two different versions of the USDA RCCP proposals use a state or county yield trigger, respectively. The base acre yields are the Olympic national average yields as defined in the USDA proposal, and these parameters are listed in Table 4.1. The state and county triggers are calculated as:

\[ RCCP_i^S \cdot \cdot CCP_i^P \cdot CCP_i^R \cdot \max((0, TP_i \cdot DP_i^R)) \cdot \hat{y}_i^{S06} \cdot \cdot \cdot \]

\[ (LR_i, MYA_i) \cdot (y_i^S \cdot 1.01)) / ((\hat{y}_i^{S06} \cdot DP_i^R) \]  

(4-16)
where:

\[ RCCP_i^S = \text{USDA state yield-triggered RCCP payment for crop } i \]

\[ \hat{y}_{i}^{s06} = \text{predicted average state yield for 2006 for crop } i \]

\[ y_i^S = \text{average state yield for crop } i \]

and

\[
RCCP_i^C = \text{USDA county yield-triggered RCCP payment for crop } i
\]

The GRP layer of insurance as described under the USDA proposal is calculated as

\[
GRP_i \cdot \text{GRP}_i^{\text{SUB}} \cdot \text{EP}_i \cdot \max(0, GRP_i^{\text{CL}} \cdot \tilde{y}_i^{06} \cdot \max(0, GRP_i^{\text{FL}} \cdot \tilde{y}_i^{06}, c_i^y)) \quad (4-18)
\]

\[ GRP_i = \text{GRP indemnity payment for crop } i \]

\[ \text{GRP}_i^{\text{SUB}} = \text{GRP subsidy factor for crop } i \]

\[ GRP_i^{\text{CL}} = \text{GRP coverage level for crop } i \]

\[ GRP_i^{\text{FL}} = \text{GRP floor for crop } i \]

This type of insurance closely resembles the current GRP program but provides a layer of insurance rather than compensating for losses below a set level. The difference arises from a change in the parameters as listed in Table 4.1.

**Insurance Wrap-around Proposal**

As previously mentioned, public discourse is increasingly focusing on subsidy programs based on modified revenue insurance programs, although the mechanics of
such programs have not been formally presented. The following two equations represent an interpretation of this type of program. A GRIP with harvest option payment is calculated as

\[ \text{Tier}_i^1 \cdot \max(0, \text{Tier}_i^{1\text{CL}} \cdot \mathcal{E}_i \cdot \hat{c}_i \cdot \hat{y}_i \cdot MYA_i \cdot \hat{c}_i) \]  

\[ \text{Tier}_i^2 \cdot \text{MPCl}_{i\text{SUB}} \cdot \max(0, \text{Tier}_i^{2\text{CL}} \cdot \max(\mathcal{E}_i, MYA_i) \cdot \hat{f}_i \cdot \hat{y}_i \cdot MYA_i \cdot \hat{f}_i \cdot \hat{y}_i \cdot \text{Tier}_i^1) \]

The payments are divided into two tiers in order to accomplish two things. The first tier, under parameters assigned in Table 4.1, offers crop revenue coverage (CRC) of 65%. This means that if the county level revenue drops below the base revenue protection level, then an indemnity payment will be made. Tier 2 offers CRC at the farm level. According to Table 4.1, this protects up to 95% of the expected revenue. This covers farm level losses greater than 65% at the county level. This program is referred to as a revenue insurance wrap program because it takes a county level insurance program and wraps it around farm level revenue insurance.
CHAPTER V
RESULTS

This chapter expounds upon the results of the representative farm revenue simulation model. This chapter begins with a look at the revenue distribution for the average farm producing one of three crops: corn, cotton or soybeans. The results of the simulated revenue, when three proposed government subsidy programs are applied, are compared. The NCGA, the USDA, and a crop insurance wrap around program are compared to simulated current program payment levels. In addition, results comparing how each program affects different crops and regions are discussed. Results are primarily presented in map form to make comparisons straightforward. However, to begin, the results from simulating farm revenue without any government payments are scrutinized.

Revenue Distribution

As mentioned in previous chapters, alternative proposed revenue-based programs are based on one of two different measures of revenue: net revenue and gross revenue. The two revenues both require yield and price information; however net revenue also needs the cost of production. The statistics summarized in Table 5.1 look at the county average for all three crops analyzed.
Looking first at the expected county yield, the large standard deviation can be explained by the different spatial aspects associated with producing the crop in varying conditions. For example, this is particularly obvious when looking at cotton yield, which has a standard deviation of almost 300. According to data retrieved from NASS, in 2002, California produced an average per acre yield of 1,469 pounds while North Carolina’s average yield was only 421 pounds. Therefore, a large standard deviation when looking at average values across the entire nation is expected. Building off of the county level yield is the farm level yield. Basic statistical theory suggests that a farm yield should have a higher standard deviation than the county yield due to the smoothing that results from aggregation. This is confirmed by the results retrieved from the simulation. The mean expected farm yield closely resembles that of the expected county yield, but the standard deviation increases. There is an increase of approximately 65% for each crop.

The next variables presented in Table 5.1 deal with the price aspect of calculating farm revenue. The mean and standard deviation of the expected price are a reflection in part of the initial price chosen. In this case, as mentioned in the methods section, the starting prices are from the December 2006 futures market prices for 2007 delivery months. This will play an important role in the calculation of government payments. For example, corn’s expected price of $3.73 is high relative to price levels that will trigger support payments, and even with a standard deviation of $1.07 the price will rarely drop low enough to trigger LDPs. Once yields and prices are obtained, calculating revenue is the next step. Table 5.1 also summarizes the mean and standard deviations of area cost, net revenue, and gross revenue for the entire country.
Table 5.2 looks at how closely the simulated model represents actual production levels. The actual and estimated production levels for 2006 and 2007 were retrieved from NASS publications. These numbers were compared to the sum of the 2006 acres modeled by the simulation. In the case of cotton, 70.1% of the acres producing cotton in 2006 are represented by the model. Simulated corn acres account for 93.1% of actual production acres for 2006. In turn, soybeans estimate 91.5% of production acres for 2006.

**Simulated Results**

This section contains a detailed analysis of current and proposed payment levels. Although to begin with, an overview of the effects at the national level are analyzed. Table 5.3 shows the breakdown of payment levels and associated costs. The first grouping of variables shows the mean payment made as summarized across the country. It is important to note that the results are broken down into the mean payment per planted acre per year. This is including payments, such as the CCP, which are usually paid on a per base acre arrangement. The next grouping of variables looks at the average total revenue per year generated by each program. The revenue is calculated on a per planted acre basis. The highest level of revenue always occurs under the NCGA proposal. The next highest level of revenue received varies between crops. Corn and soybeans both have higher revenues under the revenue insurance wrap program. However, corn receives $14 more per acre in comparison to the USDA proposal. Whereas, soybeans receives less than a $1 more under the wrap program in comparison to the USDA proposal, making it less clear which one would truly be preferred by soybean producers.
Table 5.1

Selected statistics for the simulated farm revenue under the three crops

<table>
<thead>
<tr>
<th></th>
<th>County Yield</th>
<th>Farm Yield</th>
<th>Expected Price</th>
<th>Market Year Avg. Price</th>
<th>Area Cost</th>
<th>Net Revenue</th>
<th>Gross Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (Std. Dev.)</td>
<td>Mean (Std. Dev.)</td>
<td>Mean (Std. Dev.)</td>
<td>Mean (Std. Dev.)</td>
<td>Mean (Std. Dev.)</td>
<td>Mean (Std. Dev.)</td>
<td>Mean (Std. Dev.)</td>
</tr>
<tr>
<td>Corn</td>
<td>124.94 (18.69)</td>
<td>126.07 (44.49)</td>
<td>3.50 (0.67)</td>
<td>185.63 (24.25)</td>
<td>290.38 (267.45)</td>
<td>470.79 (265.59)</td>
<td></td>
</tr>
<tr>
<td>Cotton</td>
<td>647.10 (328.5)</td>
<td>652.71 (328.5)</td>
<td>0.58 (0.07)</td>
<td>311.99 (90.80)</td>
<td>73.81 (233.88)</td>
<td>385.76 (265.73)</td>
<td></td>
</tr>
<tr>
<td>Soybean</td>
<td>39.44 (5.46)</td>
<td>39.56 (14.55)</td>
<td>6.25 (1.44)</td>
<td>87.98 (8.32)</td>
<td>124.74 (62.74)</td>
<td>264.95 (139.61)</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.2

Acre comparison between actual and simulated results for corn, cotton and soybeans

<table>
<thead>
<tr>
<th></th>
<th>Cotton</th>
<th>Corn</th>
<th>Soybeans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual 2006 Acres</td>
<td>15,274,000</td>
<td>78,327,000</td>
<td>75,552,000</td>
</tr>
<tr>
<td>Estimated 2007 Acres</td>
<td>12,147,000</td>
<td>90,454,000</td>
<td>67,147,000</td>
</tr>
<tr>
<td>Total 2006 acres in</td>
<td>10,715,500</td>
<td>73,000,000</td>
<td>61,447,000</td>
</tr>
<tr>
<td>simulated counties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulated acres as a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>percent of 2006 planted</td>
<td>70.1%</td>
<td>93.1%</td>
<td>91.5%</td>
</tr>
</tbody>
</table>
Table 5.3

Average per planted acre payment under current conditions, NCGA proposal, USDA proposal, and a CRC Wrap Revenue Insurance program

<table>
<thead>
<tr>
<th></th>
<th>Corn</th>
<th>Cotton</th>
<th>Soybeans</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP</td>
<td>$22.50</td>
<td>$32.30</td>
<td>$11.21</td>
</tr>
<tr>
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<td>CRC WRAP tier 2 - 95% Coverage</td>
<td>$25.09</td>
<td>$26.53</td>
<td>$12.15</td>
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Revenue with current programs $511.30 $474.69 $291.77
Revenue with NCGA $541.89 $536.31 $303.29
Revenue with USDA $516.56 $494.08 $294.40
Revenue with Wrap Insurance $530.22 $452.01 $294.70

NCGA - Current $30.59 $61.62 $11.52
USDA - Current $5.26 $19.39 $2.63
WRAP - Current $18.92 -22.68 $2.93

NCGA - Baseline cost/year $2,766,987,860 $748,498,140 $773,533,440
USDA - Baseline cost/year $475,788,040 $235,530,330 $176,596,610
WRAP - Baseline cost/year $1,711,389,680 $275,493,960 $196,740,710
The coefficient of variation for soybeans under both the USDA proposal and a revenue insurance wrap program is 0.43, making the programs’ attractiveness indistinguishable from one another. Cotton farms clearly receive a better payment under the USDA proposal than under a revenue wrap program. In fact, the cotton revenue wrap insurance plan would receive approximately $23 less than what cotton producers currently receive.

The next two sets of variables explore the cost of the proposed programs in respect to current costs. The baseline cost takes the difference between the mean payment under the proposed plan and the mean payment under the current plan. The number generated is then multiplied by the corresponding crop estimated 2007 acres from Table 5.2. These numbers show how expensive the NCGA proposal would be. In the case of corn, average yearly cost would increase by almost $3 billion. Corn shows that the wrap program is 350% more expensive than the USDA proposed plan. Under cotton, the USDA proposal would cost a quarter of a billion more each year. On the other hand, the revenue wrap insurance the program would save more than a quarter of a billion each year. The costs of the two programs under soybean are approximately the same. This is to be expected due to how closely the total payments reflect each other.

Figures 5.1, 5.2, and 5.3 show a county breakdown of payments under current farm bill subsidy payment levels. The payments represented include LDPs, counter-cyclical payments, direct payments, and crop insurance payments. These payments are average payments made on a per acre basis within that county.

Figure 5.1 looks at these payment levels for corn. The average payments within the heart of the Corn Belt range from $40 to $60, but the payments for counties on the outskirts of the Corn Belt tend to become lower. The area in south-east Texas
Figure 5.1

Corn total subsidy payments per acre under current Farm Bill
Figure 5.2

Cotton total subsidy payments per acre under current Farm Bill
Figure 5.3

Soybean total subsidy payments per acre under current Farm Bill
tends to have payment levels that are lower than those in the Corn Belt. The Corn Belt exhibits a high negative price-yield correlation, whereas in south-east Texas there is not as much correlation between the price and the yield. The highest level of government payments are gathered along the Mississippi River and in the Oklahoma panhandle area. This is to be expected due to these areas—high yield but relatively low price-yield correlation.

Figure 5.2 graphs the average cotton per acre payment under current farm policy. Unlike corn, cotton exhibits more payment volatility depending upon the location of the producing region. The western producing states, such as California, have extremely high yields in comparison to the rest of the US, but they do not produce enough to have a huge impact on the price of cotton. This explains their high subsidy payments, due to current payments being based primarily on prices. On the other hand, West Texas has low yields and little impact on prices, thus resulting in low payment levels.

The final graph of current payments, figure 5.3, contains soybean payment levels on a per acre basis. This graph exhibits the least variability in payment levels compared to Figure 5.1 and 5.2. This is attributed to the rather stable yields. The Midwest and along the Mississippi River have marginally higher yields, but not enough to affect prices, which allows for slightly higher payment levels, $24 - $36. The farther away from the heart of the Midwest the average yield levels drop slightly accounting for a smaller payment, around $12 - $24.

The consistent theme that runs through figures 5.1, 5.2, and 5.3 is that the price-yield relationship is the primary driving force between the average levels of payment that the area will receive. In the following section these results will be compared to the
proposals discussed in previous sections. The impact of moving away from a price triggered farm subsidy program to a revenue based payment plan will be discussed.

The next section of figures provides an overview of the National Corn Growers recommended payments, the total payment levels provided under their proposal, and how the NCGA plan risk reduction compares to current risk reduction techniques. The first of these payments is the BRP payment. As mentioned previously the BRP payment is a net revenue protection plan. Figure 5.4 looks at corn BRP payment levels. The average predominant payment is less than $30 per acre. This payment plan is driven by the cost of production which can explain why there is little variation in payment levels in the Corn Belt. As mentioned in the methods section, due to data constraints the cost variable is held constant for several of the Midwest states.

Figure 5.5 shows the BRP average payment with respect to cotton producing acres. There is a large variation in payment levels depending on the region producing cotton. West Texas still has the lowest payments offered, less than $25 per acre. California also is receiving less than $25 an acre, which shows how a revenue based program operates differently than the current yield based trigger. As mentioned before, when payments are based on prices, California has high yields and little impact on the price. Therefore, they receive a large payment when prices are low despite having high yields. However, when the cost of production is factored in, the revenue variability in producing California cotton is relatively small. Therefore, the payment offered to California under a revenue trigger is smaller than when payments are offered off of price triggers.
Figure 5.4

Corn average BRP payment per acre under the proposed NCGA plan.
Cotton average BRP payment per acre under the proposed NCGA plan

Figure 5.5
Figure 5.6

Cotton average BRP payment per acre under the proposed NCGA plan
Figure 5.6 shows that the average payment offered to soybean producers is approximately the same in all areas, less than $20. Since yield is reasonably consistent in all regions, this means that the cost of producing soybeans also remains consistent across regions. Unlike cotton, in soybeans a revenue trigger has the same effect that a price trigger would have. The reason for this is that the yield and the cost of production are consistent among producing regions.

Figures 5.7, 5.8, and 5.9 show the mean payment offered on a per acre basis under the fixed county level counter-cyclical trigger payment proposed by the NCGA. This payment as discussed in previous chapters is referred to as an RCCP. Figure 5.7 shows that the mean payment offered to a corn producer per acre is less than $25. In some areas, such as those in lower Iowa, that have higher payments, the higher payment can be attributed to the fact that those counties have less production. Therefore, the county average is more volatile because it is more affected by farm level yields.

Figure 5.8 represents cotton RCCP payments. The unsystematic appearance of payment levels reflects the low price-yield correlation that is unique to cotton. The final figure that looks at RCCP payments is Figure 5.9 which looks at soybean payments. Central Iowa has the most drastic variability under this form of payments.

Figures 5.10, 5.11, and 5.12 show the total average per acre payment for the entire crop subsidy payment under the NCGA. Figure 5.10, corn payments, show that the Corn Belt pays on average $40 - $60. The payment levels increase for counties further away from the Corn Belt. This is a marked difference from what currently occurs. As mentioned before, in the Corn Belt, average payments have also increased from $20 - $40 to $40 - $60. Under current farm bill programs the counties on the outskirts of the Corn
Figure 5.7

Corn average RCCP payment per acre under the proposed NCGA plan
Figure 5.8

Cotton average RCCP payment per acre under the proposed NCGA plan
Figure 5.9

Soybean average RCCP payment per acre under the proposed NCGA plan
Figure 5.10

Corn average total payment per acre under the proposed NCGA plan
Figure 5.11

Cotton average total payment per acre under the proposed NCGA plan
Figure 5.12

Soybean average total payment per acre under the proposed NCGA plan
Belt receive less payment than those within the Corn Belt, which is opposite from what would occur under the NCGA proposal. This shows that a revenue triggered program is more likely to pay higher payments when the county has a lower price—yield correlation. Looking at cotton, figure 5.11 in comparison to figure 5.2, the average payment is slightly higher under NCGA, the difference being in the delta region of Mississippi. However, this figures into the conclusion that a price—yield correlation affects whether payments will be higher under NCGA or current programs. Figure 5.12 explores what the total average payment for soybeans would be under NCGA. The average payment runs between $20 - $40. Although figure 5.3 shows a similar average payment level of $24 - $36, the question of how the NCGA plan copes with risk in comparison to the current subsidy program will have to be analyzed to decide under which plan soybean farmers would truly be better off.

Although knowing the average payment a program will provide is helpful, often the amount of risk protection provides a better understanding of what that proposal has to offer. This can be observed from the following three figures, figures 5.13, 5.14, and 5.15 for the NCGA versus the current farm program. Figure 5.13 and 5.14 show that the variation in payment levels is consistently higher under the NCGA plan. This is to be expected from the magnitude of payments offered by the NCGA to payments. However, figure 5.15 shows that despite the seemingly close payments offered to soybeans, the risk reduction is clearly better under the NCGA plan. This means that although the average payments are similar under both plans the standard deviation is significantly smaller under the NCGA plan.
Figure 5.13

NCGA versus Current risk reduction levels for Corn.
NCGA versus Current risk reduction levels for Cotton.
Figure 5.15

NCGA versus Current risk reduction levels for Soybeans
The next set of figures looks at the USDA proposal results. Figures 5.16, 5.17, and 5.18 show the average payment results for the USDA GRP payment. This payment is when farm yield drops below 30% of the historical county yield average. Figure 5.16 shows that for corn the average payment will be $4-$8 per acre. The next most common payment is to have less than $4; often no payment is triggered. Figure 5.17 shows cotton payments to be $3-$6 in west Texas and other areas to be greater than $9. Figure 5.18 indicates a relatively low payment to soybean producers, ranging from $2-$4 in the Midwest and along the Mississippi River. However, Kansas and western Missouri producers receive more than $6 on average.

The USDA's RCCP proposal is based on a national level trigger. The next few figures will look at the magnitude of payments received if this were the case as well as examining what would happen if this national trigger was changed to a state or county level trigger. A nation wide trigger price for corn, as represented by figure 5.19, shows that the average payment for the Corn Belt region is $1-$2. The average payment in counties on the outskirts of the Corn Belt is only one dollar more than in the main producing regions within the Corn Belt. The maximum payment offered is between $2 and $3 and is offered to the northern part of Texas and surrounding areas.

When compared to the state corn price triggered payment, the average payment offered will increase under the nationally triggered plan. For example, under a state trigger, the average subsidy payment offered in north Texas doubles, and in West Virginia and along the coast, the payment triples. The less correlated a region's yield is to the price of that crop, the greater the impact a region-specific price trigger will have on
Figure 5.16

Corn average GRP payment per acre under proposed USDA plan
Figure 5.17

Cotton average GRP payment per acre under proposed USDA plan
Figure 5.18

Soybean average GRP payment per acre under proposed USDA plan
Figure 5.19

Corn average RCCP payment per acre under proposed USDA plan using a national level trigger price
Figure 5.20

Corn average RCCP payment per acre under proposed USDA plan using a state level trigger price
Figure 5.21
Corn average RCCP payment per acre under proposed USDA plan using a county level trigger price
payments received in that area. An even more specific targeted price, a county level trigger, is modeled in figure 5.21. These results show that compared to the national level trigger, the subsidy in the Corn Belt is allowed to fluctuate.

Cotton RCCP national, state, and county level trigger effects are analyzed in figures 5.22, 5.23, and 5.24 respectively. Figure 5.22 shows that the highest payments are paid to those areas that have the highest yield, because these areas have little impact on price. Areas with lower yields receive lower payments. Figure 5.23, the state level per acre payments, shows an increase to most areas and a dramatic change to certain states. For example, Arizona previously received a payment of less than $10. The state payment trigger would increase the average payment to between $45 - $60. A county level trigger, as represented by figure 5.24, has little impact on payment levels. The payments on average do increase slightly, but the yield in the states varies only slightly thus resulting in only a minor shift in payment levels.

The final crop simulated, soybeans, shows the impact of a more localized payment trigger on payments to a crop that has little yield variability from location to location and low correlation between price and yield within a region. Figure 5.25 shows the average soybean USDA national triggered price payment to by between $2 - $3 throughout the production areas, with few exceptions. The main area of distinction is along the Mississippi River, which has a lower payment than the rest of the nation.

The state level triggered payment map, figure 5.26, shows increased variability in subsidy payments. This is evident in parts of Illinois where farm predicted yield levels are slightly higher than the state or national level. This means that revenue will also be
Figure 5.22

Cotton average RCCP payment per acre under proposed USDA plan using a national level trigger price
Figure 5.23

Cotton average RCCP payment per acre under proposed USDA plan using a state level trigger price.
Figure 5.24

Cotton average RCCP payment per acre under proposed USDA plan using a county level trigger price
Figure 5.25

Soybean average RCCP payment per acre under proposed USDA plan using a national level trigger price
Figure 5.26

Soybean average RCCP payment per acre under proposed USDA plan using a state level trigger price
Figure 5.27

Soybean average RCCP payment per acre under proposed USDA plan using a county level trigger price
slightly higher than the state average, thus triggering a lower payment in those areas than they would receive under a national trigger plan. The opposite phenomenon occurs along the Mississippi River. This area’s state yield is lower than the national yield; therefore, a higher payment will be paid under a state triggered payment.

The final soybean RCCP payment figure is the county trigger payment, figure 5.27. This map shows that when a county level yield trigger is used payment levels tend to increase.

Although the results of a GRP layer of protection and the USDA RCCP payment using different triggers are discussed in this section, the USDA proposal also includes raising the direct rate for the direct payment calculations and lowering the loan rate for LDPs. Figures 5.28, 5.30, and 5.32 will show graphically the average payment per acre a county will receive if the USDA proposal was enacted with all changes as it was originally proposed (i.e., a national trigger price). Figures 5.29, 5.31, and 5.33 will show how these average payments compare to the levels of risk protection currently offered.

Figure 5.28 looks at the breakdown of corn subsidy payments. In comparison to the current farm programs the average payment per acre increases to $40 - $60 from $20 - $40. Although some areas in the Corn Belt consistently receive more than $40 per acre, the USDA plan makes higher payments more consistently. This is shown in Figure 5.29 when the variability of the USDA proposal in comparison to current payment levels is revealed. The sheer magnitude of the increase in payments offered by the USDA insures that the current payment will always offer less protection than the USDA proposal.

There is a 2% margin of error in all programs having the same level of risk coverage.
Figure 5.28

Corn average total payment per acre under proposed USDA plan
Figure 5.29

USDA versus Current risk reduction levels for Corn.
Figure 5.30

Cotton average total payment per acre under proposed USDA plan
The next crop analyzed is cotton, under figures 5.30 and 5.31. At first glance, when the payment levels are compared to those payments currently being offered, there appears to be little if any change in amounts being received. However, figure 5.31 shows that the level of risk protection for cotton is clearly better under the USDA proposal. The one exception to this is Arizona. This means that Arizona’s coefficient of variation is lower under current programs compared to no programs, then the coefficient of variation under the USDA compared to no programs. The final crop comparison is done for soybeans. Figure 5.32 shows the average payments for almost all areas to fall under the $24 - $36 range; roughly the same range offered by the current farm subsidy program. Therefore the level of risk reduction map, figure 5.33, must be consulted to see which plan soybean farmers would truly prefer. The results are clear; the level of risk reduction is far superior under the USDA plan. This means that farmers consistently receive payments that are closer to the mean. This means there is less variability in the payment paid.

The next section of results analyzes the idea mentioned in previous sections of a wrap around insurance payment based on county revenue. The first layer of payments offers a 65% coverage level on county revenue. Figures 5.34, 5.35, and 5.36 show payments on a per acre basis for corn, cotton, and soybeans, respectively. The heart of the Corn Belt has areas receiving from $0 to $9 an acre. In counties further from the Corn Belt, payments appear to increase. This can be explained by the stabilizing effect a high negative correlation between price and yield has on county revenue. Figure 5.35, which shows the effect on cotton, includes low payments in west Texas and the higher
payments being along the east and west coast. However the variability offered by county does not
Figure 5.32

Soybean average total payment per acre under proposed USDA plan
Soybean Risk Reduction of Current Program vs. USDA

Figure 5.33

USDA versus Current risk reduction levels for Soybean.
Figure 5.34

Corn average per acre payment with a 65% crop revenue wrap around insurance.
Figure 5.35

Cotton average per acre payment with a 65% crop revenue wrap around insurance
Figure 5.36

Soybean average per acre payment with a 65% crop revenue wrap around insurance
appear to have any set pattern or explanation as to why neighboring counties can go from not receiving a payment to having a payment greater than $9 an acre. Soybeans, figure 5.36, show larger payments going to areas around the Mississippi River and smaller payments being received in the Corn Belt.

The next payment level mapped includes a 95% coverage level wrap around design. Starting with corn, figure 5.37, the majority of corn producing acres will receive between $20 and $30 an acre. There is a small section within the Corn Belt and southeast Texas that receives a higher payment. Looking at cotton, the random pattern exhibited in figure 5.38 is only slightly smoothed out under a 95% guarantee. However, the magnitude of payments greatly increases, up to four times the 65% payment. Finally, soybean payments at the 95% guarantee average between $10 - $15 for the majority of producing counties.

The two previously mentioned types of payments can be layered together to form a program of payments. These programs along with current direct payment levels are mapped in figures 5.40, 5.42, and 5.44. After each average payment map, the risk reduction in comparison to the current farm program is presented. The first set of graphs looks at the effect on corn. The average wrap payment made per acre for corn is around $40 - $80. This is double the payments a producer would expect under current farm programs. For this reason, the variance of the wrap program is vastly greater than that of the current program, which explains figure 5.41.

The next group of graphs looks at the total per acre payment by county of the wrap design for cotton. The average payment is between $40 and $80. Higher payments are made in California, but this has been true for all types of payment programs. All
Figure 5.37

Corn average per acre payment with a 95% crop revenue county guaranteed.
Figure 5.38

Cotton average per acre payment with a 95% crop revenue county guaranteed.
Figure 5.39

Soybean average per acre payment with a 95% crop revenue county guaranteed.
Figure 5.40

Corn average total per acre payment with a wrap around design
Figure 5.41

Wrap versus Current risk reduction levels for Corn.
Figure 5.42

Cotton average total per acre payment with a wrap around design
Figure 5.43

Wrap versus Current risk reduction levels for Cotton.
programs that model cotton also show that payments will be their lowest in west Texas. The comparison between variances of current programs versus the wrap program show that Texas and the Carolinas would prefer the current programs to a county revenue wrap around program. Meanwhile, California and parts of the Mississippi River would prefer a wrap around program rather than the current method. This split opinion to the random pattern seen in both layers of revenue insurance.

The final crop, soybeans, is represented by figure 5.44 and 5.45. The average soybean payment is between $20 and $30. This closely resembles the payment offered under current farm programs. Analyzing figure 5.45, which looks at the variance of wrap payments in respect to current variance levels, shows that most areas would prefer current programs instead of a wrap program. The middle of the Cotton Belt is the only area that would benefit by changing to a wrap program.
Figure 5.44

Soybean average total per acre payment with a wrap around design
Figure 5.45

Wrap versus Current risk reduction levels for Soybean.
CHAPTER VI
SUMMARY AND CONCLUSIONS

The expiration of the 2002 Farm Bill has presented an opportunity to renovate current farm policy into a program that better meets the demands faced by producers and other interested parties. Farmers face both yield and price risk; either of which can lead to revenue risk. One of the purposes of a farm subsidy program is to help alleviate a degree of this uncertainty and provide more revenue stability in farm income. Current commodity support programs include loan deficiency payments, direct payments and counter-cyclical payments. Current programs are price triggered. Insurance programs are yield triggered support payments. These programs are supposed to work in harmony with insurance programs to help stabilize producer revenue. However, this is not always the case and this dichotomy has led to inefficiency in the program. Therefore, during the farm bill debates on what to do with subsidy payments, the idea of structuring new programs that better fit a farmer’s needs is gaining momentum. These programs are often revenue based, adding to a more efficient program by combining yield and price risk. This approach appears logical due to the negative correlation found between price and yield. During these debates, legislators must look at the effect of any changes made to a program, which includes taking into account tight budgets, relatively high commodity prices, and World Trade Organization (WTO) constraints.
The intention of this thesis was to offer an overview of the potential effects of changes in farm programs on both the level and variability of farm revenue. The first step in accomplishing this objective was to create a model that accurately simulates farms from every producing county for which data were available.

Modeling commodity program proposals was the next step. Proposals modeled included the National Corn Growers Association (NCGA), the USDA proposal, and the idea of a revenue wrap-around program. The NCGA proposal introduced the idea of a net revenue approach to subsidy payments. They devised two levels of payments: Base Revenue Protection (BRP) and Revenue Counter-Cyclical Program (RCCP). The BRP payment is triggered when net revenue falls more than 30 percent below the previous five-year Olympic average of per-acre net corn revenue. The RCCP program was designed to take the place of current LDPs and CCP. It is structured so that when actual revenue falls below the trigger revenue, a payment would make up the difference. The trigger revenue is based on a county revenue trigger, not a farm revenue trigger.

The next proposal analyzed is the USDA’s. This program increased direct payment rates, lowered loan rates, and created a revenue counter-cyclical program (RCCP). RCCP as it was introduced by the USDA proposal uses a national yield trigger to calculate payment levels. After the release of this proposal, there was debate on the benefit of changing this to a state or county level trigger. The effects of all three forms of RCCP were calculated.

The final version of farm programs modeled looks at the idea of a revenue support program that adds a layer of insurance that wraps-around revenue. This insurance was
offered at a 65% coverage level and a 95% coverage level. This program operates essentially in the same way that GRIP with a Harvest Revenue Option operates.

The simulated results from all three programs were then compared against one another. Observations about how each crop is affected in comparison to other crops using the same program, along with the spatial effects of the program, were judged. The overall costs were then compared to present an overall picture of the proposals costs and effects.

Conclusions

The idea of modeling farm revenue is not a new concept. It has been used extensively in predicting how certain areas will be affected by government payments. However, it has never been attempted on the scale that this thesis encompassed. The goal behind this research was to examine the concept of modeling farm level revenue in a way that can show hundreds of counties across the US while maintaining the necessary correlations among random variables, so that estimates of total program cost can be estimated. This type of modeling is unique in that it encompasses hundreds of counties while maintaining all correlations. The program is computationally intensive (several hours of computation time per crop), but the model is conceptually simple and has produced results comparable to those obtained from Congressional Budget Office models; however, it has the added benefit of allowing the reporting of county-specific results which allows comparison of results across regions.

This thesis also looks at the cost of implementing net revenue programs. While gross revenue has been widely studied, a net revenue design that subsumes cost
variability is novel, although it has been suggested previously in a crop insurance context. Interestingly, the findings of this study are that net revenue protection is costly primarily because a percentage guarantee is inherently more costly when the coefficient of variation is increased significantly by reducing the mean. Although implicitly the costs associated with a net farm revenue protection have been believed to be expensive, this is one of the first times the empirical costs were calculated. The shear magnitude of costs associated with such a proposal is striking. For example, a cotton program based on the NCGA design would be five times the cost of current commodity programs. The NCGA, who proposed the plan, have since adjusted their support to less costly proposals.

The idea of a revenue insurance based subsidy program is most often heralded by farmers in the Mid-West. The reason for this is the strong negative correlation between price and yield. This means that in years where crop yields are low, prices tend to be high, which implies that price triggered subsidies will have low payments and the producer will have to rely on crop insurance programs to stabilize their revenue. The opposite is also true. In years where crop yields are high, prices will be low. This means that farmers will not be receiving insurance payments, but will be receiving subsidy payment. These regions with high negative correlations would prefer to have more efficiency in stabilizing revenue.

On the other hand, this does not explain what happens in regions where the prices and yields are not as correlated. For example, no cotton producing region has a significant price-yield correlation. This being said, theoretically, a cotton producer should not be made worse off by using a revenue stabilizing insurance program because cotton revenue variability is relatively high compared to Midwestern corn or soybeans.
However, cotton producers do have lower revenues under a CRC wrap insurance program. The reason for this is that the cotton producers are able to capitalize on the inefficiency of current programs. The inefficiency occurs when producers are essentially allowed to receive both high levels of insurance payments and high subsidy payments. For example, when cotton prices are low, subsidy payments are triggered. At the same time, areas where yields are low are also receiving large insurance payments. This double payment increases revenue greatly.

The corn and soybean revenue programs do not show the effect of double payments, because they currently have a higher price which means that DP, CCP, and LDPs are not as large. The program is largely driven by the starting prices. Crops that have high starting prices are going to prefer revenue driven subsidy programs, whereas crops with a low starting price will prefer keeping price and yield triggered programs separate.

The simulation looks at a five year time span. The simulating power of a model decreases in accuracy over time. The longer a time span is simulated the greater the chance for unknown shocks to affect the results. For example, the current increase in demand for grain based ethanol will affect prices and the amount of land producing these crops. This model is based on historical data and therefore cannot account for these forms of market shocks. These limitations are not unique to this model; it is a common limitation of all models based on time and historical data. However, the overall concept and results of implementing a revenue based subsidy program will hold.

The big picture shows that there is a regional aspect involved in designing policy. The type of policy that will be best suited depends largely on the type of price yield...
correlation present. An interesting aspect of the programs being recommended by Mid-West farmers is the fact that they are willing to give up program money to West Texas in order to have better risk protection for their crops.

Future research with this model will develop as new proposals are made. After a proposal is made, there is little effort involved in adding the code necessary to model the new programs. The effects and cost of these proposals can then be compared to either the current programs or previous proposals. This program is also designed so that it can be updated with new parameters to current proposals. As policy proposals concerning the upcoming farm bill arise, this program will be able to adapt to the needs presented and show the aggregate costs of new ideas.


Paulson, Nicholas and Bruce A. Babcock. “Get a GRIP: Should Area Revenue Coverage Be Offered through the Farm Bill or as a Crop Insurance Program” Center for Agricultural and Rural Development Working Paper 07-WP 440, January 2007.


APPENDIX

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dm output clear output;

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LIBNAME sd2 u:\research project;

options nocenter;

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keep locstate loccnty cyield scaler fyield crpyr fpred06;
proc sort; by locstate crpyr;
proc means; title cyield and fyield data;
*proc print;
run;

/*******************************************************************************/
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if locstate < 99;
stpred06 = pred06;
keep locstate crpyr styield stpred06;
proc sort; by locstate crpyr;
proc means; title Merged Farm County State Yield Data;
run;

data yldscf; merge styield1 yieldcf;
by locstate crpyr;

/*******************************************************************************/
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/************ to keep just corn **************/
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cstpred06 = pred06;
proc sort; by locstate crpyr;
proc print; title cost data;
run;

data yldcfest; merge cost1 yldscf;
by locstate crpyr;
proc sort; by locstate loccnty crpyr;
run;
DATA yield1; set yldcfcst;
cpred06 = fpred06;
proc sort; by locstate loccnty;
proc means; title 'yield data';
proc print;
run;

DATA baseac;
Proc import datafile = L:\Sarah\BaseAcres2002.xls dbms=excel out=baseac replace;
data baseac; set baseac;
locstate = floor(fips/1000);
loccnty = fips - (locstate*1000);
crbase = corn;
cr_direct_rat = 0.76;
cr_ccp_rat = 0.85;
keep locstate loccnty crbase cr_direct_rat cr_ccp_rat;
proc sort; by locstate loccnty;
*proc print; title 'base acres data';

DATA pltac;
Proc import datafile = u:\research project\corn.2005.Acres.xls dbms=excel out=pltac replace;
/*Proc import datafile = g:\Research Project\corn.2005.Acres.xls dbms=excel out=pltac replace;*/
data pltac; set pltac;
locstate = StFips;
loccnty = Cofips;
cr_plt_ac=planted;
if loccnty < 888;
keep locstate loccnty cr_plt_ac;
proc sort; by locstate loccnty;
proc print; title 'pltac acres data';

data acres2; merge baseac pltac; by locstate loccnty;
proc means; title 'base and planted acres';
run;

DATA yield1; merge yield1 acres2;
by locstate loccnty;
proc sort; by locstate crpyr;
proc means; title 'yield data';
*proc print;
run;

DATA price1; set sd2.crpricept;
if 2005 > year > 1974;
crpyr=year;
drop year luscrprice;
proc sort; by crpyr;
proc means; title 'price data';
*proc print;
run;

DATA usprice1; set sd2.crpricept;
if 2005 > year > 1974;
if locstate = 99;
crpyr=year;
usrat =crrat;
usrat= usrat- 0.11;
*keep usrat loccnty crpyr;
proc sort; by crpyr;
proc means; title 'us price data';
proc print;
run;
/****************** national yield ********************/
data usyield1; set sd2.cr_styld1pt;
if locstate = 99;
nyield = styield;
keep crpyr nyield;
proc sort; by crpyr;
proc means; title 'us yield data';
proc print;
run;
/****************** national yield ********************/

DATA price2; merge price1 usprice1 usyield1;
by crpyr;
proc sort; by locstate crpyr;
proc means; title 'price and national yield data';
*proc print;
run;
data comb1; merge yield1 price2;
by locstate crpyr;
if locstate < 99;

proc sort; by locstate loccnty crpyr;
run;

data comb2; set comb1;
drop crprice;
proc sort; by crpyr;
proc means; title comb2 data;
*proc print;
run;

data big;
locstate=0; loccnty=0; crpyr=0; fyield=0; crrat=0; draw =0;
i = 0; eprice = 0; myaprc=0; crrev=0; cyield = 0;

%macro analysis;
%do randrw1 = 1 %to 500 %by 1;

data drw1;
   retain Seed_1 0;
   do i=1 to 5;
      call ranuni(Seed_1,X1);
      crpyr=round(29*x1+1975);
      output;
   end;
run;

data drw2; set drw1;
drop seed_1;
proc sort; by crpyr;
*proc print; title drw2;
run;

data drw3; merge drw2 usprice1; by crpyr;
if i ne .

proc sort; by i;
*proc print; title 'drw3';
run;

data drw4; set drw3;
if i = 1 then eprice = 3.50;
if i = 1 then myaprc = eprice*usrat;
*proc print; title 'drw4';
run;

data drw5; set drw4;
eprice2 = lag(myaprc);
if i = 2 then eprice = eprice2;
if i = 2 then myaprc = eprice*usrat;
*proc print; title 'drw5';
run;

data drw6; set drw5;
eprice2 = lag(myaprc);
if i = 3 then eprice = eprice2;
if i = 3 then myaprc = eprice*usrat;

data drw7; set drw6;
eprice2 = lag(myaprc);
if i = 4 then eprice = eprice2;
if i = 4 then myaprc = eprice*usrat;

data drw8; set drw7;
eprice2 = lag(myaprc);
if i = 5 then eprice = eprice2;
if i = 5 then myaprc = eprice*usrat;
drop eprice2;
*proc print; title 'drw8';
run;

data drw9; set drw8;
/******************** sets the initial price ********************/
*if i = 1 then leprice = 0.52;
drop locstate x1 usrat;
proc sort; by crpyr;

data comb3; merge comb2 drw9; by crpyr;
if i ne 0;
draw = &randrw1;
crrev = myaprc * fyield;
/*************** program parms ***************************/

aphcl= 0.65; rtier1cl = 0.65; rtier2cl = 0.95; rtier2_cap= 1.00; rtier3cl=0.95; rtier3_cap= 0.1;

/*************** program parms ***************************/

// revenue variation

tier1 = individual revenue 65% HRO insurance wrapped around county; ;*/

/code/
cr_uld_pac = fyield*max(0, cr_uloan-myaprc);
cr_udirect_pmt_pac = (fpred06*cr_direct_rat)*cr_direct_per*cr_udirect_rate;
cr_rccp_pac = cr_ccp_per*(fpred06*cr_ccp_rat)
    *(max(0, (cr_target-cr_direct_rate)*npred06-(max(cr_loan,myaprc)*(nyield*1.01**i)))
    /cr_ccp_base_yield);
cr_rccps_pac = cr_ccp_per*(stpred06*cr_ccp_rat)
    *(max(0, (cr_target-cr_direct_rate)*stpred06-
        (max(cr_loan,myaprc)*(styield*1.01**i)))
        /(stpred06*cr_direct_rat));
cr_rccpc_pac = cr_ccp_per*(cpred06*cr_ccp_rat)
    *(max(0, (cr_target-cr_direct_rate)*cpred06-
        (max(cr_loan,myaprc)*(cyield*1.01**i)))
        /(cpred06*cr_direct_rat));
cr_grp_indem_pac = grp_sub*eprice*max(0,cr_grp_cl,cpred06-
    max(cr_grp_fl,cpred06, cyield));
run;

data big; set big comb3;
if i ne '.'
drop seed_1 x1;
proc means; title big
%end;
%mend analysis;
%analysis; run;
data pricesim; set big;
if locstate ne '.'
   if i ne 0;
   if I ne .
   proc sort; by i;
*proc print; title price sim
proc means ; by i;
var eprice myaprc;
run;
data big2; set big;
/*********************** state with no cost data *******************/
if locstate = 12 or locstate = 35 or locstate = 51 then delete;
/*********************** state with no cost data *******************/
if locstate ne .
if i ne 0;
if I ne .
proc sort; by locstate loccnty;
proc means; title 'big2';
run;

data big3; set big2;
   proc sort; by locstate loccnty;
run;

data big4; merge big3 acres2; by locstate loccnty;
*if fyieldm ne '.
   cr_rev_tot  =crrev* cr_plt_ac ;
cr_aph_indem_tot =cr_aph_indem_pac* cr_plt_ac;
cr_tier1_indem_tot =cr_tier1_indem_pac*cr_plt_ac;
cr_tier2_indem_tot =cr_tier2_indem_pac*cr_plt_ac;
*ct_tier3_indem_tot =ct_tier3_indem_pacm*ctbase;
cr_rtier1_indem_tot =cr_rtier1_indem_pac*cr_plt_ac;
cr_rtier2_indem_tot =cr_rtier2_indem_pac*cr_plt_ac;
*ct_rtier3_indem_tot =ct_rtier3_indem_pacm*ctbase;
cr_direct_pmt_tot =cr_direct_pmt_pac*crbase;
cr_ldp_tot =cr_ldp_pac * cr_plt_ac;
cr_udirect_pmt_tot =cr_udirect_pmt_pac*crbase;
cr_uld_p_tot =cr_uld_pac * cr_plt_ac;
cr_ccp_tot =cr_ccp_pac*crbase;
cr_rcc_p_tot =cr_rcc_pac*crbase;
cr_rccps_tot =cr_rccps_pac*crbase;
cr_grp_indem_tot =cr_grp_indem_pac* cr_plt_ac  ;
cr_current_ppac =cr_current_ppac =cr_direct_pmt_tot + cr_ldp_tot + cr_ccp_tot + cr_aph_indem_tot +
cr_rev_tot)/cr_plt_ac;
cr_nega_ppac =cr_nega_ppac =cr_direct_pmt_tot + cr_tier1_indem_tot + cr_tier2_indem_tot +
cr_rev_tot)/cr_plt_ac;
cr_wrap_ppac =cr_wrap_ppac =cr_direct_pmt_tot + cr_rtier1_indem_tot + cr_rtier2_indem_tot +
cr_rev_tot)/cr_plt_ac;
cr_usda_ppac =cr_usda_ppac =cr_direct_pmt_tot + cr_uld_p_tot + cr_rcc_p_tot +
cr_aph_indem_tot + cr_grp_indem_tot + cr_rev_tot)/cr_plt_ac;
CURRENT_PAC =cr_current_ppac + cr_ldp_tot + cr_ccp_tot + cr_aph_indem_pac +
ct_wrap_PAC =ct_wrap_PAC =cr_wrap_PAC + cr_tier1_indem_pac + cr_tier2_indem_pac;
NCGA_PAC =cr_current_ppac + cr_tier1_indem_pac + cr_tier2_indem_pac;
USDA_PAC =cr_current_ppac + cr_uld_pac + cr_wrap_PAC + cr_rcc_pac +
cr_grp_indem_pac + cr_aph_indem_pac;
proc means n mean std min max sum; title 'aggregates';
run;

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%macro data;   %let big5; %let big4;
   proc means; title big4;
   run;

DATA big5; set big4;
   proc means n mean std; title big5;
   proc means noprint; by locstate loccnty;
   var crrev cr_current_ppac cr_wrap_ppac cr_ncga_ppac cr_plt_ac cr_usda_ppac
       cr_rtier1_indem_pac cr_rtier2_indem_pac CURRENT_PAC USDA_PAC wrap_pac
   NCGA_PAC cr_rccp_pac
       cr_rccpc_pac cr_rccps_pac cr_grp_indem_pac cr_tier1_indem_pac
   cr_tier2_indem_pac;
   output out= big5
       mean= cr_rev_totm cr_current_ppacm cr_wrap_ppacm cr_ncga_ppacm cr_plt_acm
             cr_usda_ppacm
       cr_rtier1_indem_pacm cr_rtier2_indem_pacm CURRENT_PACm USDA_PACm
       wrap_pacm NCGA_PACm cr_rccp_pacm
       cr_rccpc_pacm cr_rccps_pacm cr_grp_indem_pacm cr_tier1_indem_pacm
   cr_tier2_indem_pacm
       std = cr_rev_totstd cr_current_ppacstd cr_wrap_ppacstd cr_ncga_ppacstd cr_plt_acstd
             cr_usda_ppacstd
       cr_rtier1_indem_pacstd cr_rtier2_indem_pacstd CURRENT_PACstd USDA_PACstd
       wrap_pacstd NCGA_PACstd cr_rccp_pacstd
       cr_rccpc_pacstd cr_rccps_pacstd cr_grp_indem_pacstd cr_tier1_indem_pacstd
   cr_tier2_indem_pacstd;
   %mend data;

proc sort; by locstate loccnty;

data xxx; set big5; proc means; title xxxx;
run;

data big6; set big5;
   state=locstate; county = loccnty;
   cr_rev_cv = cr_rev_totstd / cr_rev_totm;
   cr_ncga_cv = cr_ncga_ppacstd / cr_ncga_ppacm;
   cr_wrap_cv = cr_wrap_ppacstd / cr_wrap_ppacm;
   cr_current_cv = cr_current_ppacstd / cr_current_ppacm;
   cr_usda_cv = cr_usda_ppacstd / cr_usda_ppacm;
   Risk_Reduction_wrap = (cr_rev_cv - cr_wrap_cv)/cr_rev_cv;
   Risk_Reduction_ncga = (cr_rev_cv - cr_ncga_cv)/cr_rev_cv;

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\[
\text{Risk\_Reduction\_Current} = \frac{\text{cr\_rev\_cv} - \text{cr\_current\_cv}}{\text{cr\_rev\_cv}};
\]
\[
\text{Risk\_Reduction\_usda} = \frac{\text{cr\_rev\_cv} - \text{cr\_usda\_cv}}{\text{cr\_rev\_cv}};
\]

if \(\text{Risk\_Reduction\_usda} = \cdot\) then delete;
if \(\text{Risk\_Reduction\_Current} = \cdot\) then delete;

\[
\text{Risk} = \frac{\text{Risk\_Reduction\_usda}}{\text{Risk\_Reduction\_Current}};
\]

if Risk < 0.95 then Difference1 = \(\text{Current Risk Red. > USDA}\); else if Risk < 1.05 then Difference1 = \(\text{Current Risk Red. = USDA}\); else Difference1 = \(\text{Current Risk Red. < USDA}\);

\[
\text{proc means mean min max sum; title 'risk red.xxxxxx';}
\]

\[
\text{goptions reset=global gunit=pct border cback=white}
\]

\[
\text{/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */}
\]

\[
\text{colors=(red orange green yellow cyan)}
\]

\[
\text{ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation htext=6;}
\]

\[
\text{proc gmap map=maps.uscounty data=big6 all;}
\]

\[
\text{id state county ;}
\]

\[
\text{choro Difference1 / coutline=black levels=3 midpoints=old}
\]

\[
\text{cempty=black missing ;}
\]

\[
\text{title 'Corn Risk Reduction of Current Program vs. USDA - National';}
\]

\[
\text{run;}
\]

\[
\text{quit;}
\]

\[
\text{data big8; set big5;}
\]

\[
\text{state=locstate; county = loccnty;}
\]

\[
\text{if cr\_rtier1\_indem\_pacing ne \'\cdot\'}
\]

\[
\text{if cr\_rtier1\_indem\_pacing < 3 then RA\_Wrap = \'$0-3\';}
\]

\[
\text{else if cr\_rtier1\_indem\_pacing < 6 then RA\_Wrap = \'$3-6\';}
\]

\[
\text{else if cr\_rtier1\_indem\_pacing < 9 then RA\_Wrap = \'$6-9\';}
\]

\[
\text{else RA\_Wrap = \'$9\';}
\]

\[
\text{goptions reset=global gunit=pct border cback=white}
\]

\[
\text{/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */}
\]

\[
\text{colors=(red orange green yellow cyan)}
\]

\[
\text{ctext=black ftext=swiss htitle=4 htext=1 fontres=presentation htext=6;}
\]

\[
\text{proc gmap map=maps.uscounty data=big8 all;}
\]

\[
\text{id state county ;}
\]

\[
\text{choro RA\_WRAP / coutline=black levels=3 midpoints=old}
\]

\[
\text{cempty=black missing ;}
\]

\[
\text{title 'Corn 65% RA-HPO Wrap around County Revenue Design';}
\]

\[
\text{run;}
\]
data big9; set big5;
state=locstate; county = loccnty;
if cr_tier2_indem_pacm ne ' . '
  if cr.rtier2.indem_pacm < 10 then rtier2 = '$ 0-10 '
  else if cr.rtier2.indem_pacm < 20 then rtier2 = '$10-20';
  else if cr.rtier2.indem_pacm < 30 then rtier2 = '$20-30';
  else rtier2 = '> $30';
goptions reset=global gunit=pct border cback=white
  colors=(Red orange yellow green cyan )
  ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
  htext=3;
proc gmap map=maps.uscounty data=big9 all;
id state county 
choro rtier2
/ coutline=black levels=4 midpoints=old
cempty=black missing ;
title Corn 95% County Revenue Guarantee 
run;

data big10; set big5;
state=locstate; county = loccnty;
if CURRENT_PACm ne ' . '
  if CURRENT_PACm < 20 then Current = '$ 0-20'
  else if CURRENT_PACm < 40 then Current = '$20-40';
  else if CURRENT_PACm < 60 then Current = '$40-60';
  else Current = '> $60';
goptions reset=global gunit=pct border cback=white 
  colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
  colors=(Red orange yellow green cyan )
  ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
  htext=3;
proc gmap map=maps.uscounty data=big10 all;
id state county 
choro current
/ coutline=black levels=4 midpoints=old
cempty=black missing ;
title Corn Combined LDP, Counter-Cyclical, Direct, and Crop Insurance Payments 
run;
data big11; set big5;
    state=locstate; county = loccnty;
    if USDA_PACm ne .
      if USDA_PACm < 20 then USDA = '$ 0-20';
      else if USDA_PACm < 40 then USDA = '$20-40';
      else if USDA_PACm < 60 then USDA = '$40-60';
      else USDA = '> $75';
    goptions reset=global gunit=pct border cback=white
      /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
    colors=(Red  orange yellow green cyan  )
    ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
    htext=3;
    proc gmap map=maps.uscounty data=big11 all;
      id state county ;
      choro usda
        / coutline=black levels=4 midpoints=old
          cempty=black missing ;
      title 'Corn USDA Proposal';
    run;

data big12; set big5;
    state=locstate; county = loccnty;
    if cr_rccp_pacm ne .
      if cr_rccp_pacm < 1 then RCCP = '$ 0-1  ';
      else if cr_rccp_pacm < 2 then RCCP = '$1-2';
      else if cr_rccp_pacm < 3 then RCCP = '$3-4 ';
      else RCCP = '> $4';
    goptions reset=global gunit=pct border cback=white
      /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
    colors=(Red  orange yellow green cyan  )
    ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
    htext=3;
    proc gmap map=maps.uscounty data=big12 all;
      id state county ;
      choro rccp
        / coutline=black levels=4 midpoints=old
          cempty=black missing ;
      title 'Corn USDA RCCP Payments';
    run;

data big13; set big5;
data big13; set big13;   
  state=locstate; county = loccnty;   
  if cr_grp_indem_pacm ne '.' then   
    if cr_grp_indem_pacm < 4 then GRP = '$0-4$'   
    else if cr_grp_indem_pacm < 8 then GRP = '$4-8$'   
    else if cr_grp_indem_pacm < 12 then GRP = '$8-12$'   
    else GRP = '> $12$';   

goptions reset=global gunit=pct border cback=white   
  /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */   
  colors=(Red orange yellow green cyan)   
  ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation htext=3;   
proc gmap map=maps.uscounty data=big13 all;   
   id state county;   
   choro GRP / coutline=black levels=4 midpoints=old   
  cempty=black missing;   
  title 'Corn USDA GRP Layer Payments';   
run;   
   
data big14; set big14;   
  state=locstate; county = loccnty;   
  if cr_rccpc_pacm ne '.' then   
    if cr_rccpc_pacm < 1 then RCCPC = '$0-1$'   
    else if cr_rccpc_pacm < 2 then RCCPC = '$1-2$'   
    else if cr_rccpc_pacm < 3 then RCCPC = '$2-3$'   
    else RCCPC = '> $3$';   

goptions reset=global gunit=pct border cback=white   
  /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */   
  colors=(Red orange yellow green cyan)   
  ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation htext=3;   
proc gmap map=maps.uscounty data=big14 all;   
   id state county;   
   choro RCCPC / coutline=black levels=4 midpoints=old   
  cempty=black missing;   
  title 'Corn USDA RCCP County-Triggered Payments';   
run;   
   
data big15; set big15;   
  state=locstate; county = loccnty;   

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if cr_rccps_pacm ne ".
if cr_rccps_pacm < 3 then RCCPS = "$0-3";
else if cr_rccps_pacm < 6 then RCCPS = "$3-6";
else if cr_rccps_pacm < 9 then RCCPS = "$6-9";
else RCCPS = "$9+

goptions reset=global gunit=pct border cback=white
    /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00)*/
colors=(Red orange yellow green cyan)
    ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation htext=3;

proc gmap map=maps.uscounty data=big15 all;
id state county;
choro rccps
    / coutline=black levels=4 midpoints=old
cempty=black missing;
title 'Corn USDA RCCP State-Triggered Payments';
run;

DATA big15x; set big4;
proc means n mean std; title 'risk';
proc means noprint; by locstate loccnty;
var crrev cr_current_ppac cr_wrap_ppac;
output out= big5x mean= cr_rev_totm cr_current_ppacm cr_wrap_ppacm
    std = cr_rev_totstd cr_current_ppacstd cr_wrap_ppacstd;
proc sort; by locstate loccnty;

data big16; set big5;
state=locstate; county = loccnty;
cr_rev_cv = cr_rev_totstd / cr_rev_totm;
cr_wrap_cv = cr_wrap_ppacstd / cr_wrap_ppacm;
cr_current_cv = cr_current_ppacstd / cr_current_ppacm;
Risk_Reduction_wrap = (cr_rev_cv - cr_wrap_cv)/cr_rev_cv;
Risk_Reduction_Current = (cr_rev_cv - cr_current_cv)/cr_rev_cv;
if Risk_Reduction_wrap = '.' then delete;
if Risk_Reduction_Current = '.' then delete;
Risk = Risk_Reduction_wrap/Risk_Reduction_Current;
if Risk < 0.95 then Difference = 'Current Risk Red. > Wrap Risk Red.';
else if risk < 1.05 then Difference = 'Current Risk Red. = Wrap Risk Red.';
else Difference = 'Current Risk Red. < Wrap Risk Red.';
proc means; title 'risk red.';
goptions reset=global gunit=pct border cback=white
    /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00)*/
colors=(red orange green yellow cyan)
proc gmap map=maps.uscounty data=big16 all;
id state county ;
choro Difference / coutline=black levels=3 midpoints=old
empty=black missing ;
title 'Corn Risk Reduction of Current Program vs. WRAP';run;

data big30; set big5;
state=locstate; county = loccnty;
cr_rev_cv = cr_rev_totstd / cr_rev_totm;
cr_ncga_cv = cr_ncga_ppacstd / cr_ncga_ppacm;
cr_current_cv = cr_current_ppacstd / cr_current_ppacm;
Risk_Reduction_ncga = (cr_rev_cv - cr_ncga_cv)/cr_rev_cv;
Risk_Reduction_Current = (cr_rev_cv - cr_current_cv)/cr_rev_cv;
if Risk_Reduction_ncga = '.' then delete;
if Risk_Reduction_Current = '.' then delete;
Risk = Risk_Reduction_ncga/Risk_Reduction_Current;
if Risk < 0.95 then Difference = 'Current Risk Red. > NCGA Risk Red.';
else if risk < 1.05 then Difference = 'Current Risk Red. = NCGA Risk Red.';
else Difference = 'Current Risk Red. < NCGA Risk Red.';
proc means; title 'risk red.';
goptions reset=global gunit=pct border cback=white
   colors=(red orange green yellow cyan)
cf=black ftext=swiss htitle=4 htext=2 fontres=presentation htext=6;
proc gmap map=maps.uscounty data=big30 all;
id state county ;
choro Difference / coutline=black levels=3 midpoints=old
empty=black missing ;
title 'Corn Risk Reduction of Current Program vs. NCGA';run;

data big17; set big5x;
state=locstate; county = loccnty;
Payment_difference = cr_current_ppacm - cr_ncga_ppacm;
if payment_difference = '.' then delete;
if payment_difference < 0 then Difference = 'Current < NCGA Revenue';
*else if payment_difference < 5 then diffdum = 2;
else Difference = 'Current > NCGA Revenue';;
goptions reset=global gunit=pct border cback=white

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/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red green orange yellow cyan  )
ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=6;

proc gmap map=maps.uscounty data=big17 all;
id state county ;
choro Difference / coutline=black levels=2 midpoints=old
empty=black missing ;
title Corn Average Current Program Payments - NCGA Revenue Proposal;
run;
data big18; set big4;
state=locstate; county = loccnty;
if cr_tier1_indem_pac ne '.'
  if cr_tier1_indem_pac < 30 then BRP = '$ 0-30/ac';
  else if cr_tier1_indem_pac < 60 then BRP = '$30-60/ac';
  else BRP = '> $60/ac';
goptions reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan  )
ctext=black ftext=swiss htitle=4 htext=1 fontres=presentation
htext=6;
proc gmap map=maps.uscounty data=big18 all;
id state county ;
choro BRP / coutline=black levels=3 midpoints=old
empty=black missing ;
title Corn Average NCGA BRP Payment;
run;
data big19; set big4;
state=locstate; county = loccnty;
if cr_tier2_indem_pac ne '.'
  if cr_tier2_indem_pac < 10 then RCCP = '$ 0-10/ac';
  else if cr_tier2_indem_pac < 20 then RCCP = '$10-20/ac';
  else if cr_tier2_indem_pac < 30 then RCCP= '$20-30/ac';
  else RCCP = '> $30/ac';
goptions reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan  )
ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=5;

proc gmap map=maps.uscounty data=big19 all;
   id state county ;
   choro rccp
      / coutline=black levels=4 midpoints=old
          cempty=black missing ;
   title 'Corn Average NCGA RCCP Payment';
run;

data big21; set big5;
      state=locstate; county = loccnty;
      if NCGA_PACm ne '.
          if NCGA_PACm < 40 then NCGA = '$ 0-40/ac '
          else if NCGA_PACm < 60 then NCGA = '$40-60/ac'
          else if NCGA_PACm < 80 then NCGA = '$60-80/ac'
          else NCGA = '> $80/ac'
      goptions reset=global gunit=pct border cback=white
         /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
         colors=(Red orange yellow green cyan)
            ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
            htext=3;

proc gmap map=maps.uscounty data=big21 all;
   id state county ;
   choro NCGA
      / coutline=black levels=4 midpoints=old
          cempty=black missing ;
   title 'National Corn Growers Association Average Payments';
run;

data big22; set big5;
      state=locstate; county = loccnty;
      if wrap_PACm ne '.
          if wrap_PACm < 40 then Wrap = '$ 0-40 '
          else if wrap_PACm < 80 then Wrap = '$40-80'
          else if wrap_PACm < 120 then Wrap = '$80-120'
          else Wrap = '> $120'
      goptions reset=global gunit=pct border cback=white
         /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
         colors=(Red orange yellow green cyan)
            ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
            htext=3;

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/* data yieldf takes the yield history for each county and organizes it into one data set keeping certain variables. Used to sort a data set. This will be used to get a farm yield per county*/

DATA yieldcf; set sd2.ct_scaler;
fpred06 = cpred06;
*keep locstate loccounty cyield scaler fyield crpyr fpred06;
*keep the state name, county name, fyield, year, and predicted value for 06;
proc sort; by locstate crpyr;
proc means; title ‘cyield and fyield data’;
run;

/********************/ 
data styield1; set sd2.ct_styld1pt;
if locstate < 99;
stpred06 = pred06;
keep locstate crpyr styield stpred06;
proc sort; by locstate crpyr;
proc means; title ‘Merged Farm County State Yield Data’;
run;

data yldscf; merge styield1 yieldcf;
by locstate crpyr;

/******************** cost data ********************/ 
data cost1; set sd2.cost7505;
/******************** to keep just cotton ********************/
if crop_reg eq 'ct_d' or crop_reg eq 'ct_se' or crop_reg eq 'ct_sw' or crop_reg eq 'ct_sp';
cstpred06 = pred06;
proc sort; by locstate crpyr;
proc print; title 'cost data';
run;

/****** Combine yield with cost data******/
data yldcfest; merge cost1 yldscf;
by locstate crpyr;
proc sort; by locstate loccnty crpyr;
run;

/*This will combine the simulated county yield with the simulated farm yield*/
DATA yield1; set yldcfest ;
cpred06 = fpred06;
proc sort; by locstate loccnty;
proc means; title 'yield data';
proc print;
run;

DATA baseac;
proc import datafile = 'L:\Sarah\BaseAcres2002.xls' dbms=excel out=baseac replace;
data baseac; set baseac;
/*The next two equations are making the variable names of the new data set to match the names used in the other data sets.*/
locstate = floor(fips/1000); /*floor returns the lgst. integer that is less than or equal to the argument.*/
loccnty = fips - (locstate*1000);
cbase = 'cotton';
ct_direct_rat = 0.88; /*amount of land dedicated to cotton in direct payment;*/
ct_cctp_rat = 0.90; /*amount of land dedicated to cotton in counter cyclical payments;*/
keep locstate loccnty ctbase ct_direct_rat ct_cctp_rat ;
proc sort; by locstate loccnty;
*proc print; title 'Base Acres Data';
run;

DATA pltac;
/*Proc import datafile = u:\research project\upland_cotton.2005.Acres.xls dbms=excel out=pltac replace;*/
proc import datafile = 'C:\Documents and Settings\admin\Desktop\F Drive\research project\upland_cotton.2005.Acres.xls' dbms=excel out=pltac replace;
data pltac; set pltac;
locstate = StFips;
loccnty = Cofips;
ct_plt_ac=planted;
if loccnty < 888;
keep locstate loccnty ct_plt_ac ;
proc sort; by locstate loccnty;
proc print; title 'Planted Acres Data';
run;

data acres2; merge baseac pltac; by locstate loccnty;
proc means; title 'Base and Planted Acres';
run;

DATA yield1; merge yield1 acres2;
by locstate loccnty ;
proc sort; by locstate crpyr;
proc means; title 'Yield Data';
*proc print;
run;

/******** State Price **********/
DATA price1; set sd2.ctpricept;
if 2005 > year > 1974;
if locstate < 99;
crpyr=year;
drop year luscrprice;
proc sort; by crpyr;
proc means; title 'Price Data';
*proc print;
run;

/********** US Price **********/
DATA usprice1; set sd2.ctpricept;
if 2005 > year > 1974;
if locstate = 99;
crpyr=year;
usrat =crrat;
*keep usrat loccnty crpyr;
proc sort; by crpyr;
proc means; title 'US Price Data';
proc print;
run;
data usyield1; set sd2.ct_styld1pt;
  if locstate = 99;
  nyield = styield;
  keep crpyr nyield;
  proc sort; by crpyr;
  proc means; title 'US Yield Data';
  proc print;
  run;

DATA price2; merge price1 usprice1 usyield1;
  by crpyr;
  proc sort; by locstate crpyr;
  proc means; title 'Price and National Yield Data';
  proc print;
  run;

data comb1; merge yield1 price2;
  by locstate crpyr;
  if locstate < 99;
  proc sort; by locstate loccnty crpyr;
  run;

data comb2; set comb1;
  drop ctprice;
  proc sort; by crpyr;
  proc means; title 'Comb2 Data';
  run;

data big;
  locstate=0; loccnty=0; crpyr=0; fyield=0; ctrat=0; draw =0;
  i = 0; eprice = 0; myaprc=0; ctrev=0; cyield = 0;
  %macro analysis;
  %do randrw1 = 1 %to 10 %by 1;
    data drw1;
      retain Seed_1 0;
      do i=1 to 5;
        call ranuni(Seed_1,X1);
        crpyr=round(29*x1+1975);
        output;
      end;
  %end;
  %end analysis;

run;

data drw2; set drw1;
drop seed_1 ;
proc sort; by crpyr;
*proc print; title 'drw2'
run;

data drw3; merge drw2 usprice1; by crpyr;
if i ne .
proc sort; by i;
*proc print; title 'drw3'
run;

data drw4; set drw3;
if i = 1 then eprice = 0.58;
if i = 1 then myaprc = min(1.00, eprice*(1+ 0.5*(usrat-1)));
*proc print; title 'drw4'
run;

data drw5; set drw4;
eprice2 = lag(myaprc);
if i = 2 then eprice = eprice2;
if i = 2 then myaprc = min(1.00, eprice*(1+ 0.5*(usrat-1)));
*proc print; title 'drw5'
run;

data drw6; set drw5;
eprice2 = lag(myaprc);
if i = 3 then eprice = eprice2;
if i = 3 then myaprc = min(1.00, eprice*(1+ 0.5*(usrat-1)));

data drw7; set drw6;
eprice2 = lag(myaprc);
if i = 4 then eprice = eprice2;
if i = 4 then myaprc = min(1.00, eprice*(1+ 0.5*(usrat-1)));

data drw8; set drw7;
eprice2 = lag(myaprc);
if i = 5 then eprice = eprice2;
if i = 5 then myaprc = min(1.00, eprice*(1+ 0.5*(usrat-1)));
drop eprice2;
*proc print; title 'drw8'
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run;

data drw9; set drw8;
/***************** sets the initial price **********************/
*if i = 1 then leprice = 0.52;
drop locstate x1 usrat;
proc sort; by crpyr;

data comb3; merge comb2 drw9; by crpyr;
if i ne 0;
draw = &randrw1;
ctrev = myaprc * fyield;

/******************* program parms *******************
aphcl= 0.65; rtier1cl = 0.65; rtier2cl = 0.95; rtier2_cap= 1.0; rtier3cl=0.95; rtier3_cap= 0.1;
ct_loan = 0.52; ct_target = 0.724; ct_direct_rate=0.0667; ct_direct_per=0.85;
ct_ccp_per=0.85;
ct_etarget = ct_target -ct_direct_rate; mpci_sub = 0.59;
npred06 = 676.25; tier1cl = 0.70; tier2cl = 1.00; tier2_cap= 0.30; tier3cl=0.95; tier3_cap= 0.1;
/******************* program parms *******************
ct_aph_indem_pac =mpci_sub*eprice*max(0,aphcl*fpred06-fyield);
enet = eprice*fpred06-cstpred06;
rnetguar= enet-(1-rtier1cl)*abs(enet);
netguar= enet-(1-tier1cl)*abs(enet);
net = myaprc*fyield-scost;

ct_tier1_indem_pac =max(0,netguar-(myaprc*fyield-scost));
ct_tier2_indem_pac =min(tier2_cap*ct_etarget*cpred06, max(0,tier2cl*ct_etarget*cpred06-myaprc*cyield));
*ct_tier3_indem_pac=min(tier3_cap*ct_etarget*cpred06,max(0,tier3cl*ct_etarget*cpred 06-myaprc*cyield));

ct_rtier1_indem_pac =0;
/* revenue variation*/
/*rtier1 is individual revenue 65% HRO insurance wrapped around county*/
ct_rtier2_indem_pac = max(0,rtier2cl*eprice*cpred06-myaprc*cyield);
ct_rtier1_indem_pac =
mpci_sub*max(0,rtier1cl*max(eprice,myaprc)*fpred06-
((myaprc*fyield)+ct_rtier2_indem_pac ));
*ct_rtier3_indem_pac=min(tier3_cap*ct_etarget*cpred06,max(0,tier3cl*ct_etarget*cpred ed06-myaprc*cyield));

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/* current policy */
ct_direct_pmt_pac = (fpred06*ct_direct_rat)*ct_direct_per*ct_direct_rate;
ct_ldp_pac = fyield*max(0, ct_loan-myaprc);
ct_ccp_pac =
ct_ccp_per*(fpred06*ct_ccp_rat)*max(0, ct_target-ct_direct_rate-max(ct_loan,myaprc));

/******* USDA PROPOSAL **********************/
increased, direct rate, lowered loan rate revenue countercyclical, grp layer*/
ct_udirect_rate=0.1108; ct_ccp_base_yield = 638.9; ct_grp_cl=0.9; ct_grp_fl=0.7;
ct_uloan = 0.457; grp_sub = 0.55;
ct_uld_pac = fyield*max(0, ct_uloan-myaprc);
ct_udirect_pmt_pac = (fpred06*ct_direct_rat)*ct_direct_per*ct_udirect_rate;
ct_rccp_pac = ct_ccp_per*(fpred06*ct_ccp_rat)*
(max(0, (ct_target-ct_direct_rate)*npred06-(max(ct_loan,myaprc)*(nyield*1.01**i)))/
cp_base_yield);
ct_rccps_pac = ct_ccp_per*(fpred06*ct_ccp_rat)*
(max(0, (ct_target-ct_direct_rate)*stpred06-
(max(ct_loan,myaprc)*(styield*1.01**i)))/(stpred06*ct_direct_rat));
ct_rccpc_pac = ct_ccp_per*(fpred06*ct_ccp_rat)*
(max(0, (ct_target-ct_direct_rate)*cpred06-
(max(ct_loan,myaprc)*(cyield*1.01**i)))/(cpred06*ct_direct_rat));
ct_grp_indem_pac = grp_sub*eprice*max(0,ct_grp_cl*cpred06-max(ct_grp_fl*cpred06,
cyield));
run;
data big; set big comb3;
if i ne '.'
drop seed_1 x1;
proc means; title 'big';
%end;

%mend analysis;
%analysis; run;
data pricesim; set big;
if locstate ne '.'
if i ne 0;
if I ne '.'
proc sort; by i;
*proc print; title 'Price Sim'
proc means ; by i;
var eprice myaprc;
run;

data big2; set big;
/*********************** state with no cost data *******************/
if locstate = 12 or locstate = 35 or locstate = 51 then delete;
if locstate ne .
if i ne 0;
if I ne .
proc sort; by locstate loccnty ;
proc means; title big2 ;
/*proc means noprint; by locstate loccnty i;
  var myaprc enet net ct_aph_indem_pac ct_tier1_indem_pac ct_tier2_indem_pac
  ct_direct_pmt_pac ct_ldp_pac ct_ccp_pac ctrev fyield cyield eprice ;
  output out=big3 mean=myaprcm enetm netm ct_aph_indem_pacm
  ct_tier1_indem_pacm ct_tier2_indem_pacm
  ct_tier3_indem_pacm ct_direct_pmt_pacm ct_ldp_pacm ct_ccp_pacm ct_revm fyieldm
cyieldm epricem;
*/
run;

data big3; set big2;
  proc sort; by locstate loccnty;

data big4; merge big3 acres2; by locstate loccnty;
*if fyieldm ne .
ct_rev_tot =ctrev* ct_plt_ac ;
ct_aph_indem_tot =ct_aph_indem_pac* ct_plt_ac;
cr_tier1_indem_tot =ct_tier1_indem_pac*ct_plt_ac;
cr_tier2_indem_tot =ct_tier2_indem_pac*ct_plt_ac;
*ct_tier3_indem_tot =ct_tier3_indem_pacm*ctbase;
cr_tier1_indem_tot =ct_tier1_indem_pac*ct_plt_ac;
cr_tier2_indem_tot =ct_tier2_indem_pac*ct_plt_ac;
cr_tier3_indem_tot =ct_tier3_indem_pacm*ctbase;
cr_direct_pmt_tot =ct_direct_pmt_pac*ctbase;
cr_ldp_tot =ct_ldp_pac * ct_plt_ac;
cr_udirect_pmt_tot =ct_udirect_pmt_pac*ctbase;
cr_uldp_tot =ct_uldp_pac * ct_plt_ac;
cr_ccp_tot =ct_ccp_pac*ctbase;
cr_rccp_tot =ct_rccp_pac*ctbase;
cr_rccps_tot =ct_rccps_pac*ctbase;
cr_rccpc_tot =ct_rccpc_pac*ctbase;
cr_grp_indem_tot =ct_grp_indem_pac* ct_plt_ac;
cr_current_ppac =ct_current_ppac =ct_direct_pmt_tot + ct_ldp_tot + ct_ccp_tot + ct_aph_indem_tot + ct_rev_tot)/ct_plt_ac;
ct_ncga_ppac = (ct_direct_pmt_tot + ct_tier1_indem_tot + ct_tier2_indem_tot /* +
ct_tier3_indem_tot */ + ct_rev_tot)/ct_plt_ac;
ct_wrap_ppac = (ct_direct_pmt_tot + ct_tier1_indem_tot + ct_tier2_indem_tot +
ct_rev_tot)/ct_plt_ac;
ct_usda_ppac = (ct_udirect_pmt_tot + ct_ulp_tot + ct_rccp_tot + ct_aph_indem_tot +
ct_grp_indem_tot + ct_rev_tot)/ct_plt_ac;
CURRENT_PAC = ct_ldp_pac + ct_ccp_pac + ct_aph_indem_pac +
current_pac;
wrap_PAC = ct_direct_pmt_pac + ct_tier1_indem_pac + ct_tier2_indem_pac;
NCGA_PAC = ct_direct_pmt_pac + ct_tier1_indem_pac + ct_tier2_indem_pac;
USDA_PAC = ct_udirect_pmt_pac + ct_tier1_indem_pac + ct_tier2_indem_pac +
ct_grp_indem_pac + ct_aph_indem_pac;
USDA_PAC = ct_udirect_pmt_pac + ct_tier1_indem_pac + ct_tier2_indem_pac +
ct_grp_indem_pac + ct_aph_indem_pac;
/* proc sort; by locstate i; */
proc means n mean std min max sum; title 'Aggregates';
run;

DATA big5; set big4;
proc means n mean std; title 'big5';
proc means noprint; by locstate loccnty;
var ctrev ct_current_ppac ct_wrap_ppac ct_ncga_ppac ct_plt_ac ct_usda_ppac
ct_tier1_indem_pac ct_tier2_indem_pac CURRENT_PAC USDA_PAC
NCGA_PAC wrap_PAC ct_rccp_pac
   ct_rccps_pac ct_rccpc_pac ct_grp_indem_pac;
output out=big5
   mean= ct_rev_totm ct_current_ppacm ct_wrap_ppacm ct_ncga_ppacm ct_plt_acm
current_pacm
   ct_udusa_ppacm
current_pacm
   ct_tier1_indem_pacman ct_tier2_indem_pacman CURRENT_PACm USDA_PACm
NCGAPACm wrap_PACm ct_rccp_pacm
   ct_rccps_pacm ct_rccpc_pacm ct_grp_indem_pacman;
std = ct_rev_totstd ct_current_ppacstd ct_wrap_ppacstd ct_ncga_ppacstd ct_plt_acstd
current_pacstd
   ct_udusa_ppacstd ct_tier1_indem_pacstd ct_tier2_indem_pacstd CURRENT_PACstd USDA_PACstd
NCGAPACstd wrap_PACstd ct_rccp_pacstd
   ct_rccps_pacstd ct_rccpc_pacstd ct_grp_indem_pacstd;
run;

data big6; set big5;
   state=locstate; county = loccnty;
   ct_rev_cv = ct_rev_totstd / ct_rev_totm;
   ct_NCGA_cv = ct_NCGA_ppacstd / ct_NCGA_ppacm;
   ct_wrap_cv = ct_wrap_ppacstd / ct_wrap_ppacm;
   ct_current_cv = ct_current_ppacstd / ct_current_ppacm;
\[
\begin{align*}
\text{ct\_usda\_cv} &= \frac{\text{ct\_usda\_ppacstd}}{\text{ct\_usda\_ppacm}}; \\
\text{Risk\_Reduction\_wrap} &= \frac{(\text{ct\_rev\_cv} - \text{ct\_wrap\_cv})}{\text{ct\_rev\_cv}}; \\
\text{Risk\_Reduction\_Current} &= \frac{(\text{ct\_rev\_cv} - \text{ct\_current\_cv})}{\text{ct\_rev\_cv}}; \\
\text{Risk\_Reduction\_NCGA} &= \frac{(\text{ct\_rev\_cv} - \text{ct\_ncga\_cv})}{\text{ct\_rev\_cv}}; \\
\text{Risk\_Reduction\_usda} &= \frac{(\text{ct\_rev\_cv} - \text{ct\_usda\_cv})}{\text{ct\_rev\_cv}}; \\
\text{if Risk\_Reduction\_usda} &= \text{. then delete}; \\
\text{if Risk\_Reduction\_wrap} &= \text{. then delete}; \\
\text{if Risk\_Reduction\_nega} &= \text{. then delete}; \\
\text{if Risk\_Reduction\_Current} &= \text{. then delete}; \\
\text{Risk1} &= \frac{\text{Risk\_Reduction\_usda}}{\text{Risk\_Reduction\_Current}}; \\
\text{if Risk1} < 0.95 \text{ then Difference} &= \text{Current Risk Red.} > \text{USDA - National Level}; \\
\text{else if Risk1} < 1.05 \text{ then Difference} &= \text{Current Risk Red.} = \text{USDA - National Level}; \\
\text{else Difference} &= \text{Current Risk Red.} < \text{USDA- National Level}; \\
\end{align*}
\]
data big7b; set big5;
    state=locstate; county = loccnty;
    Payment_difference = ct_current_ppacm - ct_usda_ppacm;
    if payment_difference = . then delete;
    if payment_difference < 0 then Difference = 'Current < USDA Proposal';
    *else if payment_difference < 5 then diffdum = 2;
    else Difference = 'Current > USDA Proposal';
run;

data big8; set big5;
    state=locstate; county = loccnty;
    if ct_rtier1_indem_pacm ne .
    if ct_rtier1_indem_pacm < 3 then RAWrap = '$ 0-3 ';
    else if ct_rtier1_indem_pacm < 6 then RAWrap = '$3-6';
    else if ct_rtier1_indem_pacm < 9 then RAWrap = '$6-9';
    else RAWrap = '>$9';
run;
data big9; set big5;
state=locstate; county = loccnty;
if ct_rtier2_indem_pacm ne .

if ct_rtier2_indem_pacm < 12 then rtier2 = '$ 0-12 '
else if ct_rtier2_indem_pacm < 24 then rtier2 = '$12-24'
else if ct_rtier2_indem_pacm < 36 then rtier2= '$24-36'
else rtier2 = '> $36'
goptions reset=global gunit=pct border cback=white
   /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan )
   ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=3;

proc gmap map=maps.uscounty data=big9 all;
id state county ;
choro rtier2
   /*outline=black levels=4 midpoints=old
cempty=black missing */
title 'Cotton 95% County Revenue Guarantee'
run;

data big10; set big5;
state=locstate; county = loccnty;
if current_pacm ne .

if CURRENT_PACm < 40 then Current = '$ 0-40 '
else if CURRENT_PACm < 80 then Current = '$40-80'
else if CURRENT_PACm < 120 then Current= '$80-120'
else Current = '> $120'
goptions reset=global gunit=pct border cback=white
   /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan )
   ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=3;

proc gmap map=maps.uscounty data=big10 all;
id state county ;
choro current
data big11; set big5;
state=locstate; county = loccnty;
if usda_pacm ne '"'
    if USDA_PACm < 40 then USDA = '$ 0-40';
else if USDA_PACm < 80 then USDA = '$40-80';
else if USDA_PACm < 120 then USDA = '$80-120';
else USDA = '> $120';
goptions reset=global gunit=pct border cback=white
    /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
    colors=(Red  orange yellow green cyan  )
    ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
    htext=3;
proc gmap map=maps.uscounty data=big11 all;
   id state county ;
   choro usda
   / coutline=black levels=4 midpoints=old
      cempty=black missing ;
   title 'Cotton USDA Proposal';
run;

data big12; set big5;
state=locstate; county = loccnty;
if ct_rccp_pacm ne '"'
    if ct_rccp_pacm < 10 then RCCP = '$ 0-10  ';
else if ct_rccp_pacm < 20 then RCCP = '$10-20';
else if ct_rccp_pacm < 30 then RCCP = '$20-30  ';
else RCCP = '> $30';
goptions reset=global gunit=pct border cback=white
    /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
    colors=(Red  orange yellow green cyan  )
    ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
    htext=3;
proc gmap map=maps.uscounty data=big12 all;
   id state county ;
   choro rccp
   / coutline=black levels=4 midpoints=old
      cempty=black missing ;
   title 'Cotton USDA Proposal';
run;

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data big13; set big5;
  state=locstate; county = loccnty;
if ct_grp_indem_pacm ne '.'
  if ct_grp_indem_pacm < 3 then GRP = '$ 0-3  ';
  else if ct_grp_indem_pacm < 6 then GRP = '$3-6';
  else if ct_grp_indem_pacm < 9 then GRP = '$6-9 ';
  else GRP = '> $9';
goptions reset=global gunit=pct border cback=white
  /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
  colors=(Red  orange yellow green cyan  )
  ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
  htext=3;
proc gmap map=maps.uscounty data=big13 all;
  id state county ;
  choro GRP
  / coutline=black levels=4 midpoints=old
  cempty=black missing ;
title 'Cotton USDA GRP Layer Payments';
run;

data big14; set big5;
  state=locstate; county = loccnty;
if ct_rccpc_pacm ne '.'
  if ct_rccpc_pacm < 30 then RCCPC = '$ 0-30  ';
  else if ct_rccpc_pacm < 45 then RCCPC = '$30-45';
  else if ct_rccpc_pacm < 60 then RCCPC = '$45-60 ';
  else RCCPC = '> $60';
goptions reset=global gunit=pct border cback=white
  /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
  colors=(Red  orange yellow green cyan  )
  ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
  htext=3;
proc gmap map=maps.uscounty data=big14 all;
  id state county ;
  choro RCCPC
  / coutline=black levels=4 midpoints=old
  cempty=black missing ;

title 'Cotton USDA RCCP County-Triggered Payments';
run;

data big15; set big5;
state=locstate; county = loccnty;
if ct_rccps_pacm ne '.
if ct_rccps_pacm < 30 then RCCPS = '$ 0-30  ';
else if ct_rccps_pacm < 45 then RCCPS = '$30-45';
else if ct_rccps_pacm < 60 then RCCPS = '$45-60 ';
else RCCPS = '> $60';
goptions reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan )
ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=3;
proc gmap map=maps.uscounty data=big15 all;
id state county ;
choro rccps
/ coutline=black levels=4 midpoints=old
  cempty=black missing ;
title 'Cotton USDA RCCP State-Triggered Payments';
run;

data big16; set big5;
state=locstate; county = loccnty;
ct_rev_cv = ct_rev_totstd / ct_rev_totm;
ct_wrap_cv = ct_wrap_ppacstd / ct_wrap_ppacm;
ct_current_cv = ct_current_ppacstd / ct_current_ppacm;
Risk_Reduction_wrap = (ct_rev_cv - ct_wrap_cv)/ct_rev_cv;
Risk_Reduction_Current = (ct_rev_cv - ct_current_cv)/ct_rev_cv;
if Risk_Reduction_wrap = '.' then delete;
if Risk_Reduction_Current = '.' then delete;
Risk2 = Risk_Reduction_wrap/Risk_Reduction_Current;
if Risk2 = '.' then delete;
proc means; title 'big 16';
run;

data big16x; set big16;
if Risk2 < 0.98 then Risk2d = ' Current  <  Wrap ';
else if Risk2 < 1.02 then Risk2d = 'Current = Wrap';
else Risk2d = 'Current > Wrap';
goptions reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(orange green yellow cyan red)
ceterangan=black fonttext=swiss htitle=4 htext=2 fontres=presentation htext=6;

proc gmap map=maps.uscounty data=big16x all;
   id state county ;
   choro Risk2d / coutline=black levels=3 midpoints=old
cemporary=black missing ;
title 'Cotton Risk Reduction of Current Program vs. Wrap Program';
run;

data big30; set big5;
state=locstate; county = loccnty;
ct_rev_cv = ct_rev_totstd / ct_rev_totm;
ct_nega_cv = ct_nega_ppacstd / ct_nega_ppacom;
ct_current_cv = ct_current_ppacstd / ct_current_ppacm;
Risk Reduction_nega = (ct_rev_cv - ct_nega_cv)/ct_rev_cv;
Risk Reduction_Current = (ct_rev_cv - ct_current_cv)/ct_rev_cv;
if Risk Reduction_nega = . then delete;
if Risk Reduction_Current = . then delete;
Risk3 = Risk Reduction_nega/Risk Reduction_Current;
if Risk3 = . then delete;
run;

data big31; set big30;
if Risk3 < 0.98 then Risk3d = 'Current  <  NCGA ';
else if Risk3 < 1.02 then Risk3d = 'Current = NCGA ';
else Risk3d = 'Current > NCGA ';
goptions reset=global gunit=pct border cback=white
   /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(orange green yellow cyan red)
ceterangan=black fonttext=swiss htitle=4 htext=2 fontres=presentation htext=6;

proc gmap map=maps.uscounty data=big31 all;
   id state county ;
   choro Risk3d / coutline=black levels=3 midpoints=old
cemporary=black missing ;
title 'Cotton Risk Reduction of Current Program vs. NCGA Program';
run;

data big17; set big5;
state=locstate; county = loccnty;
Payment_difference = ct_current_ppacm - ct_nenga_ppacm;
if payment_difference = then delete;
if payment_difference < 0 then Difference = Current < NCGA Revenue;
*else if payment_difference < 5 then diffdum = 2;
else Difference = Current > NCGA Revenue;

GOPTIONS reset=global gunit=pct border cback=white
COLORS=(Red green orange yellow cyan  )
CTEXT=black FTEXT=swiss HTITLE=4 HTEXT=2 FONTRES=presentation
HTEXT=6;

PROC GMAP MAP=MAPS.USCOUNTY DATA=BIG17 ALL;
id state county;
choro Difference / coutline=black levels=2 midpoints=old
empty=black missing;
title 'Cotton Average Current Program Payments - NCGA Revenue Proposal';
run;

DATA BIG18; SET BIG4;
state=locstate; county = loccnty;
if ct_tier1_indem_pac ne '
if ct_tier1_indem_pac < 25 then BRP = $0-25/ac;
else if ct_tier1_indem_pac < 50 then BRP = $25-50/ac;
else if ct_tier1_indem_pac < 75 then BRP = $50-75/ac;
else BRP = $75/ac;
GOPTIONS reset=global gunit=pct border cback=white
COLORS=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan  )
CTEXT=black FTEXT=swiss HTITLE=4 HTEXT=1 FONTRES=presentation
HTEXT=6;

PROC GMAP MAP=MAPS.USCOUNTY DATA=BIG18 ALL;
id state county;
choro BRP / coutline=black levels=3 midpoints=old
empty=black missing;
title 'Cotton Average NCGA BRP Payment';
run;

DATA BIG19; SET BIG4;
state=locstate; county = loccnty;
if ct_tier2_indem_pac ne '.

if ct_tier2_indem_pac < 25 then RCCP = $0-25/ac;
else if ct_tier2_indem_pac < 50 then RCCP = $26-49/ac;
else if ct_tier2_indem_pac < 75 then RCCP = $50-75/ac;
else RCCP = > $75/ac;
goptions reset=global gunit=pct border cback=white
   /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
   colors=(Red orange yellow green cyan )
   ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=5;

proc gmap map=maps.uscounty data=big19 all;
   id state county;
   choro rccp
      / coutline=black levels=4 midpoints=old
         empty=black missing;
title 'Cotton Average NCGA RCCP Payment';
run;

data big21; set big5;
   state=locstate; county = loccnty;
   if NCGA_PACm ne '.
      if NCGA_PACm < 40 then NCGA = $0-40 ;
      else if NCGA_PACm < 80 then NCGA = $40-80;
      else if NCGA_PACm < 120 then NCGA = $80-120;
      else NCGA = > $120;
   goptions reset=global gunit=pct border cback=white
      /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
      colors=(Red orange yellow green cyan )
      ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=3;

proc gmap map=maps.uscounty data=big21 all;
   id state county;
   choro NCGA
      / coutline=black levels=4 midpoints=old
         empty=black missing;
title 'NCGA Average Payments';
run;

data big22; set big5;
   state=locstate; county = loccnty;
   if wrap_PACm ne '
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if wrap_PACm < 40 then Wrap = $0-40$
else if wrap_PACm < 80 then Wrap = $40-80$
else if wrap_PACm < 120 then Wrap = $80-120$
else Wrap = $> 120$

```plaintext
gooptions reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan )
  ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=3;

proc gmap map=maps.uscounty data=big22 all;
  id state county ;
  choro wrap
/ coutline=black levels=4 midpoints=old
  cempty=black missing ;
title 'Wrap Average Payments';
run;
```

/*
PROC EXPORT DATA= WORK.big7
OUTFILE= "u:\Research Project\Output.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
PROC EXPORT DATA= WORK.big5
OUTFILE= "u:\Research Project\Output.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
PROC EXPORT DATA= WORK.big4
OUTFILE= "u:\Research Project\CottonOutput.xls"
DBMS=EXCEL2000 REPLACE;
run;
*/
PROC EXPORT DATA= WORK.big7
OUTFILE= "C:\Documents and Settings\admin\Desktop\F Drive\Research Project\CottonOutput.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
PROC EXPORT DATA= WORK.big5
OUTFILE= "C:\Documents and Settings\admin\Desktop\F Drive\Research Project\CottonOutput.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
PROC EXPORT DATA= WORK.big4
OUTFILE= "C:\Documents and Settings\admin\Desktop\F Drive\Research Project\CottonOutput.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
quit;

dm log clear output;
dm output clear output;

LIBNAME sd2 'C:\Documents and Settings\admin\Desktop\F Drive\Research Project';
*LIBNAME sd2 'u:\Research project';

options nocenter;

/* data yieldf takes the yield history for each county and organizes it into one data set keeping certain variables. Used to sort a data set. This will be used to get a farm yield per county*/
DATA yieldcf; set sd2.sb_scaler;
fpred06 = cpred06;
*if locstate =28; *mississippi;
*if loccnty = 11;
*if loccnty < 99; *excludes total;
keep locstate loccnty cyield scaler fyield crpyr fpred06;
*keep the state name, county name, fyield, year, and predicted value for 06;
proc sort; by locstate crpyr;
proc means; title 'cyield and fyield data';
*proc print;
run;
*******************************************************************************/
data styield1; set sd2.sb_styld1pt;
if locstate < 99;
stpred06=pred06;
keep locstate crpyr styield stpred06;
proc sort; by locstate crpyr;
proc means; title 'st yield data';
*proc print;
run;
proc means; title 'merged farm county state yield data';
*proc print;
run;

data yldscf; merge styield1 yieldcf;
by locstate crpyr;
/********** cost data ***********************/
data cost1; set sd2.cost7505;

/*Proc import datafile = d:\saswork\policy model\data\cost7505.sas
********** to keep just Soybean ***********/
if crop_reg eq 'sb_d' or crop_reg eq 'sb_se' or crop_reg eq 'sb_nc' or crop_reg eq 'sb_np';
cstpred06 = pred06;

proc sort; by locstate crpyr;
proc print; title 'cost data';
run;

data yldcf cst; merge cost1 yldscf;
by locstate crpyr;

proc sort; by locstate loccnty crpyr;
run;
quit;

/*This will combine the simulated county yield with the simulated farm yield*/
DATA yield1; set yldcf cst ;
cpred06 = fpred06;
proc sort; by locstate loccnty;
proc means; title 'yield data';
proc print;
run;

DATA baseac;
proc import datafile = L:\Sarah\BaseAcres2002.xls dbms=excel out=baseac replace;

data baseac; set baseac;
/*The next two equations are making the variable names of the new data set to match the names used in the other data sets.*/
locstate = floor(fips/1000); /*floor returns the lgst. integer that is less than or equal to the argument.*/
loccnty = fips - (locstate*1000);
sbase = soybean;
*if locstate = 28;*mississippi;
*if loccnty = 11; sb_direct_rat = 0.76; *amount of land dedicated to Soybean in direct payment;
sb_ccp_rat = 0.84; *amount of land dedicated to Soybean in counter cyclical payments;
DATA pltac;
/*Proc import datafile = u:\research project\soybean.2005.Acres.xls*/
dbms=excel out=pltac replace;*
/*Proc import datafile = C:\Documents and Settings\admin\Desktop\F Drive\Research Project\soybean.2005.Acres.xls*/
dbms=excel out=pltac replace;

data pltac; set pltac;
locstate = StFips;
loccnty = Cofips;
sb_plt_ac=planted;
*if locstate = 28;
*if loccnty = 11;
if loccnty < 888;

keep locstate loccnty sb_plt_ac ;
proc sort; by locstate loccnty;
proc print; title pltac acres data;

run;

DATA yield1; merge yield1 acres2;
by locstate loccnty ;
proc sort; by locstate crpyr;
proc means; title base and planted acres;
*proc print;
run;

DATA price1; set sd2.sbpricept;
if 2005 > year > 1974;
*if locstate= 28;
*if loccnty = 11;
*if loccnty < 99;
crpyr=year;
drop year luscrprice;
proc sort; by crpyr;
proc means; title price data;
*proc print;
run;

DATA usprice1; set sd2.sbpricept;
if 2005 > year > 1974;
if locstate = 99;
crpyr=year;
usrat =crrat;
*keep usrat loccnty crpyr;
proc sort; by crpyr;
proc means; title us price data;
proc print;
run;

data usyield1; set sd2.sb_styld1pt;
if locstate = 99;
nyield = styield;
keep crpyr nyield;
proc sort; by crpyr;
proc means; title us yield data;
proc print;
run;

DATA price2; merge price1 usprice1 usyield1;
by crpyr;
proc sort; by locstate crpyr;
proc means; title price data;
*proc print;
run;

data comb1; merge yield1 price2;
by locstate crpyr;
if locstate < 99;

proc sort; by locstate loccnty crpyr;

run;

data comb2; set comb1;

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*if locstate =28;
*if loccnty = 11;
drop crprice;
proc sort; by crpyr;
proc means; title comb2 data;
*proc print;
run;

data big;
locstate=0; loccnty=0; crpyr=0; fyield=0; crrat=0; draw =0;
i = 0; eprice = 0; myaprc=0; sbrev=0; cyield = 0;

%macro analysis;

%do randrw1 = 1 %to 500 %by 1;

data drw1;
retain Seed_1 0;
do i=1 to 5;
    call ranuni(Seed_1,X1);
crpyr=round(29*X1+1975);
    output;
end;
run;

data drw2; set drw1;
drop seed_1 ;
proc sort; by crpyr;
*proc print; title drw2;
run;

data drw3; merge drw2 usprice1; by crpyr;
if i ne .
proc sort; by i;
*proc print; title drw3;
run;

data drw4; set drw3;
if i = 1 then eprice = 6.25;
if i = 1 then myaprc = eprice*usrat;
*proc print; title drw4;
data drw5; set drw4;
eprice2 = lag(myaprc);
if i = 2 then eprice = eprice2;
if i = 2 then myaprc = eprice*usrat;
*proc print; title drw5;
run;

data drw6; set drw5;
eprice2 = lag(myaprc);
if i = 3 then eprice = eprice2;
if i = 3 then myaprc = eprice*usrat;

data drw7; set drw6;
eprice2 = lag(myaprc);
if i = 4 then eprice = eprice2;
if i = 4 then myaprc = eprice*usrat;

data drw8; set drw7;
eprice2 = lag(myaprc);
if i = 5 then eprice = eprice2;
if i = 5 then myaprc = eprice*usrat;
drop eprice2;
*proc print; title drw8;
run;

/************* sets the initial price *************/
*if i = 1 then leprice = 0.52;
drop locstate x1 usrat;
proc sort; by crpyr;

data comb3; merge comb2 drw9; by crpyr;
if i ne 0;
draw = &randrw1;
sbrev = myaprc * fyield;

/************* program parms *************/
apcl = 0.65; rtier1cl = 0.65; rtier2cl = 0.95; rtier2_cap = 1.0; rtier3cl = 0.95; rtier3_cap = 0.1;
sb_loan = 5.00; sb_target = 5.80; sb_direct_rate = 0.44; sb_direct_per = 0.85;
sb_ccp_per = 0.85;
sb_etarget = sb_target - sb_direct_rate; mpci_sub = 0.59;
tier1cl = 0.70; tier2cl = 1.00; tier2_cap= 0.30; tier3cl=0.95; tier3_cap= 0.1;

/*program parms***************************************************************************/

sb_aph_indem_pac =mpci_sub*eprice*max(0,aphcl*fpred06-fyield);
enet = eprice*fpred06-cstpred06;
netguar= enet-(1-tier1cl)*abs(enet);
net = myaprc*fyield-scost;

sb_tier1_indem_pac =max(0,netguar-(myaprc*fyield-scost));
sb_tier2_indem_pac =min(tier2_cap*ct_etarget*cpred06,
max(0,tier2cl*ct_etarget*cpred06-myaprc*cyield));
*sb_tier3_indem_pac=min(tier3_cap*ct_etarget*cpred06,max(0,tier3cl*ct_etarget*cpred06-myaprc*cyield));

sb_rtier1_indem_pac = 0;
/* revenue variation
sb_tier1_indem_pac = max(0,rtier1cl*eprice*cpred06-myaprc*cyield);
*sb_tier3_indem_pac=min(tier3_cap*sb_etarget*cpred06,max(0,tier3cl*sb_etarget*cpred06-myaprc*cyield));

sb_direct_pmt_pac =(fpred06*sb_direct_rat)*sb_direct_per*sb_direct_rate;
sb_ldp_pac = fyield*max(0, sb_loan-myaprc);
sb_ccp_pac =
sb_ccp_per*(fpred06*sb_ccp_rat)*max(0, sb_target-sb_direct_rate-
max(sb_loan,myaprc));

/* current policy *******/

sb_uloan = 4.92; grp_sub = 0.55;
sb_uloan = fyield*max(0, sb_loan-myaprc);
sb_rccps_pac = sb_ccp_per*(fpred06*sb_ccp_rat) *(max(0, (sb_target-sb_udirect_rate)*npred06-
(max(sb_loan,myaprc))*cyield))

sb_rccps_pac = sb_ccp_per*(fpred06*sb_ccp_rat)
*(max(0, (sb_target-sb_udirect_rate)*stpred06-
(max(sb_loan,myaprc)*(styield*1.01**i))))
/(stpred06*sb_direct_rat)) ;
sb_rccpc_pac = sb_ccp_per*(fpred06*sb_ccp_rat)
* (max(0, (sb_target-sb_udirect_rate)*cpred06-
(max(sb_loan,myaprc)*(cyield*1.01**i))))
/(cpred06*sb_direct_rat)) ;
sb_grp_indem_pac = grp_sub*eprice*max(0,sb_grp_cl*cpred06-max(sb_grp_fl*cpred06,
cyield));
/******************** USDA PROPOSAL  ***********************/
proc sort; by locstate loccnty;
proc means; title 'big2';
/*proc means noprint; by locstate loccnty i;
var myaprc enet net sb_aph_indem_pac sb_tier1_indem_pac sb_tier2_indem_pac
sb_direct_pmt_pac sb_ldp_pac sb_ccp_pac crrev fyield cyield eprice;
output out= big3 mean= myaprcm enetm netm sb_aph_indem_pacm
sb_tier1_indem_pacm sb_tier2_indem_pacm
sb_tier3_indem_pacm sb_direct_pmt_pacm sb_ldp_pacm sb_ccp_pacm sb_revm
fyieldm cyieldm epricem;*/
run;

data big3; set big2;
   proc sort; by locstate loccnty;
data big4; merge big3 acres2; by locstate loccnty;
   *if fyieldm ne '.';
sb_rev_tot = sbrev* sb_plt_ac;
sb_aph_indem_tot = sb_aph_indem_pac* sb_plt_ac;
sb_tier1_indem_tot = sb_tier1_indem_pac* sb_plt_ac;
sb_tier2_indem_tot = sb_tier2_indem_pac* sb_plt_ac;
*ct_tier3_indem_tot  = ct_tier3_indem_pacm*ctbase;
sb_rtier1_indem_tot  = sb_rtier1_indem_pac* sb_plt_ac;
sb_rtier2_indem_tot  = sb_rtier2_indem_pac* sb_plt_ac;
*ct_rtier3_indem_tot  = ct_tier3_indem_pacm*ctbase;
sb_direct_pmt_tot    = sb_direct_pmt_pac* sbbase;
sb_ldp_tot  = sb_ldp_pac * sb_plt_ac;
sb_udirect_pmt_tot = sb_udirect_pmt_pac* sbbase;
sb_cce_pac  = sb_ccpac* sb_plt_ac;
sb_rccp_pac  = sb_rccpc_pac* sbbase;
sb_rccps_pac = sb_rccps_pac* sbbase;
sb_grp_indem_tot = sb_grp_indem_pac* sb_plt_ac;
sb_current_ppac = (sb_direct_pmt_tot + sb_ldp_tot + sb_cce_pac + sb_aph_indem_tot +
   sb_rev_tot)/sb_plt_ac;
sb_wrap_ppac  = (sb_direct_pmt_tot + sb_rtier1_indem_tot + sb_rtier2_indem_tot +
   sb_rev_tot)/sb_plt_ac;
sb_nega_ppac  = (sb_direct_pmt_tot + sb_tier1_indem_tot + sb_tier2_indem_tot +
   sb_rev_tot)/sb_plt_ac;
sb_usda_ppac  = (sb_udirect_pmt_tot + sb_udirect_pmt_pac + sb_rccp_pac +
   sb_aph_indem_tot + sb_grp_indem_tot + sb_rev_tot)/sb_plt_ac;
CURRENT_PAC   = sb_ldp_pac + sb_cce_pac + sb_aph_indem_pac +
   sb_direct_pmt_pac;
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wrap_PAC = sb_direct_pmt_pac + sb_rtier1_indem_pac + sb_rtier2_indem_pac;
NCGA_PAC = sb_direct_pmt_pac + sb_tier1_indem_pac + sb_tier2_indem_pac;
USDA_PAC = sb_uldp_pac + sb_udirect_pmt_pac + sb_rccp_pac +
sb_grp_indem_pac + sb_aph_indem_pac;
*if fyieldm ne .
/*proc sort; by locstate i;
proc print;title 'aggregates';*/
proc means n mean std min max sum; title 'aggregates';
run;
*by locstate i;

proc means; title 'big4';
run;

DATA big5; set big4;
proc means n mean std; title 'big5';
proc means noprint; by locstate loccnty;
var sbrev sb_current_ppac sb_wrap_ppac sb_ncga_ppac sb_plt_ac sb_usda_ppac
   sb_rtier1_indem_pac sb_rtier2_indem_pac CURRENT_PAC USDA_PAC
NCGA_PAC WRAP_PAC sb_rccp_pac
   sb_rccps_pac sb_rccpc_pac sb_grp_indem_pac sb_tier1_indem_pac
sb_tier2_indem_pac;
output out= big5
   mean= sb_rev_totm sb_current_ppacm sb_wrap_ppacm sb_ncga_ppacm sb_plt_acm
   sb_usda_ppacm
   sb_rtier1_indem_pacman sb_rtier2_indem_pacm CURRENT_PACm USDA_PACm
NCGA_PACm wrap_PACm sb_rccp_pacm
   sb_rccps_pacm sb_rccpc_pacm sb_grp_indem_pacman sb_tier1_indem_pacman
sb_tier2_indem_pacman

std = sb_rev_totstd sb_current_ppacstd sb_wrap_ppacstd sb_ncga_ppacstd sb_plt_acstd
   sb_usda_ppacstd
   sb_rtier1_indem_pacstd sb_rtier2_indem_pacstd CURRENT_PACstd USDA_PACstd
NCGA_PACstd wrap_PACstd sb_rccp_pacstd
   sb_rccps_pacstd sb_rccpc_pacstd sb_grp_indem_pacstd;
RUN;

proc sort; by locstate loccnty;

data big6; set big5;
state=locstate; county = loccnty;
sb_rev_cv = sb_rev_totstd / sb_rev_totm;

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\[ \text{sb\_nega\_cv} = \frac{\text{sb\_nega\_ppacstd}}{\text{sb\_nega\_ppacm}}; \]
\[ \text{sb\_wrap\_cv} = \frac{\text{sb\_wrap\_ppacstd}}{\text{sb\_wrap\_ppacm}}; \]
\[ \text{sb\_current\_cv} = \frac{\text{sb\_current\_ppacstd}}{\text{sb\_current\_ppacm}}; \]
\[ \text{sb\_usda\_cv} = \frac{\text{sb\_usda\_ppacstd}}{\text{sb\_usda\_ppacm}}; \]
\[ \text{Risk\_Reduction\_NGCA} = \frac{(\text{sb\_rev\_cv} - \text{sb\_nega\_cv})}{\text{sb\_rev\_cv}}; \]
\[ \text{Risk\_Reduction\_Current} = \frac{(\text{sb\_rev\_cv} - \text{sb\_current\_cv})}{\text{sb\_rev\_cv}}; \]
\[ \text{Risk\_Reduction\_usda} = \frac{(\text{sb\_rev\_cv} - \text{sb\_usda\_cv})}{\text{sb\_rev\_cv}}; \]
\[ \text{if Risk\_Reduction\_usda} = \text{. then delete}; \]
\[ \text{if Risk\_Reduction\_Current} = \text{. then delete}; \]
\[ \text{Risk} = \frac{\text{Risk\_Reduction\_usda}}{\text{Risk\_Reduction\_Current}}; \]
\[ \text{if Risk} < 0.95 \text{ then Difference} = \text{Current Risk Red. > USDA}; \]
\[ \text{else if risk} < 1.05 \text{ then Difference} = \text{Current Risk Red. = USDA}; \]
\[ \text{else Difference} = \text{Current Risk Red. < USDA}; \]
\[ \text{proc means mean min max sum; title} \text{ Risk red.}; \]
\[ \text{goptions reset=global gunit=pct border cback=white}; \]
\[ \text{colors=(red orange green yellow cyan)}; \]
\[ \text{ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation htext=6}; \]
\[ \text{proc gmap map=maps.uscounty data=big6 all}; \]
\[ \text{id state county}; \]
\[ \text{choro Difference / coutline=black levels=3 midpoints=old cempty=black missing}; \]
\[ \text{title Soybean Risk Reduction of Current Program vs. USDA}; \]
\[ \text{run}; \]
\[ \text{data big8; set big5}; \]
\[ \text{state=locstate; county = loccnty}; \]
\[ \text{if sb\_rtier1\_indem\_pacom ne . }; \]
\[ \text{if sb\_rtier1\_indem\_pacom < 3 then RAWrap = \$0-3}; \]
\[ \text{else if sb\_rtier1\_indem\_pacom < 6 then RAWrap = \$3-6}; \]
\[ \text{else if sb\_rtier1\_indem\_pacom < 9 then RAWrap = \$6-9}; \]
\[ \text{else RAWrap = \$9}; \]
\[ \text{goptions reset=global gunit=pct border cback=white}; \]
\[ \text{colors=(Red orange yellow green cyan)}; \]
\[ \text{ctext=black ftext=swiss htitle=4 htext=1 fontres=presentation htext=6}; \]
\[ \text{proc gmap map=maps.uscounty data=big8 all}; \]
\[ \text{id state county}; \]
\[ \text{choro RAWRAP / coutline=black levels=3 midpoints=old}; \]
data big9; set big5;
state=locstate; county = loccnty;
if sb_rtier2_indem_pacm ne 'x'
    if sb_rtier2_indem_pacm < 5 then tier2 = '$0-5';
    else if sb_rtier2_indem_pacm < 10 then tier2 = '$5-10';
    else if sb_rtier2_indem_pacm < 15 then tier2 = '$10-15';
    else tier2 = '> $15';
goptions reset=global gunit=pct border cback=white
    colors=(Red orange yellow green cyan)
    ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
    htext=3;
proc gmap map=maps.uscounty data=big9 all;
    id state county ;
    choro tier2
        / coutline=black levels=4 midpoints=old
cempty=black missing ;
title Soybean 95% County Revenue Guarantee
run;

data big10; set big5;
state=locstate; county = loccnty;
if current_pacm ne 'x'
    if CURRENT_PACm < 12 then Current = '$0-12';
    else if CURRENT_PACm < 24 then Current = '$12-24';
    else if CURRENT_PACm < 36 then Current = '$24-36';
    else Current = '> $36';
goptions reset=global gunit=pct border cback=white
    /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan)
    ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
    htext=3;
proc gmap map=maps.uscounty data=big10 all;
    id state county ;
    choro current
        / coutline=black levels=4 midpoints=old
cempty=black missing;
title 'Soybean Combined LDP, Counter-Cyclical, Direct, and Crop Insurance Payments';
run;

data big11; set big5;
state=locstate; county = loccnty;
if usda_pacm ne .
   if USDA_PACm < 12 then USDA = '$ 0-12';
   else if USDA_PACm < 24 then USDA = '$12-24';
   else if USDA_PACm < 36 then USDA = '$24-36';
   else USDA = '> $36';
goptions reset=global gunit=pct border cback=white
   colors=(Red orange yellow green cyan)
   ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
   htext=3;
proc gmap map=maps.uscounty data=big11 all;
id state county;
choro usda
   / coutline=black levels=4 midpoints=old
cempty=black missing;
title 'Soybean USDA Proposal';
run;

data big12; set big5;
state=locstate; county = loccnty;
if sb_rccp_pacm ne .
   if sb_rccp_pacm < 1 then RCCP = '$ 0-1';
   else if sb_rccp_pacm < 2 then RCCP = '$1-2';
   else if sb_rccp_pacm < 3 then RCCP = '$2-3';
   else RCCP = '> $3';
goptions reset=global gunit=pct border cback=white
   colors=(GRAYDF GRAYA1 GRAY5C GRAY00)
   ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
   htext=3;
proc gmap map=maps.uscounty data=big12 all;
id state county;
choro rccp
   / coutline=black levels=4 midpoints=old
run;

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cempty=black missing;
title Soybean USDA RCCP Payments;
run;

data big13; set big5;
state=locstate; county = loccnty;
if sb_grp_indem_pacm ne .
if sb_grp_indem_pacm < 2 then GRP = $ 0-2 $
else if sb_grp_indem_pacm < 4 then GRP = $2-4$
else if sb_grp_indem_pacm < 6 then GRP = $4-6$
else GRP = $ > 6$

goptions reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00)*/
colors=(Red orange yellow green cyan)
ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=3;

proc gmap map=maps.uscounty data=big13 all;
id state county ;
choro GRP
/ coutline=black levels=4 midpoints=old
cempty=black missing;
title Soybean USDA GRP Layer Payments;
run;

data big14; set big5;
state=locstate; county = loccnty;
if sb_rccpc_pacm ne .
if sb_rccpc_pacm < 1 then RCCPC = $ 0-1 $
else if sb_rccpc_pacm < 2 then RCCPC = $1-2$
else if sb_rccpc_pacm < 3 then RCCPC = $2-3$
else RCCPC = $ > 3$

goptions reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00)*/
colors=(Red orange yellow green cyan)
ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=3;

proc gmap map=maps.uscounty data=big14 all;
id state county ;
choro rccpc
/ coutline=black levels=4 midpoints=old
cempty=black missing;

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title Soybean USDA RCCP County-Triggered Payments;
run;

data big15; set big5;
state=locstate; county = loccnty;
if sb_rccps_pacm ne .
  if sb_rccps_pacm < 1 then RCCPS = '$0-1'
  else if sb_rccps_pacm < 2 then RCCPS = '$1-2'
  else if sb_rccps_pacm < 3 then RCCPS = '$2-3'
  else RCCPS = '> $3'
goptions reset=global gunit=pct border cback=white
  /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
  colors=(Red orange yellow green cyan)
  ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=3;
proc gmap map=maps.uscounty data=big15 all;
id state county;
choro rccpS
  / coutline=black levels=4 midpoints=old
cempty=black missing;
title Soybean USDA RCCP State-Triggered Payments;
run;

data big16; set big5;
state=locstate; county = loccnty;
sb_rev_cv = sb_rev_totstd / sb_rev_totm;
sb_wrap_cv = sb_wrap_ppacstd / sb_wrap_ppacm;
sb_current_cv = sb_current_ppacstd / sb_current_ppacm;
Risk_Reduction_wrap = (sb_rev_cv - sb_wrap_cv)/sb_rev_cv;
Risk_Reduction_Current = (sb_rev_cv - sb_current_cv)/sb_rev_cv;
if Risk_Reduction_wrap = . then delete;
if Risk_Reduction_Current = . then delete;
Risk2 = Risk_Reduction_wrap/Risk_Reduction_Current;
if Risk2 = . then delete;

data big16x; set big16;
if Risk2 < 0.98 then Risk2d = 'Current < Wrap'
else if Risk2 < 1.02 then Risk2d = 'Current = Wrap'
else Risk2d = 'Current > Wrap'
goptions reset=global gunit=pct border cback=white
  /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(orange green yellow cyan red)
    ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation htext=6;

proc gmap map=maps.uscounty data=big16x all;
id state county ;
choro Risk2d / coutline=black levels=3 midpoints=old
    empty=black missing ;
title 'Soybean Risk Reduction of Current Program vs. Wrap Program';
run;

data big30; set big5;
    state=locstate; county = loccnty;
sb_rev_cv = sb_rev_totstd / sb_rev_totm;
sb_nega_cv = sb_nega_ppacstd / sb_nega_ppacm;
sb_current_cv = sb_current_ppacstd / sb_current_ppacm;
Risk_Reduction_nega = (sb_rev_cv - sb_nega_cv)/sb_rev_cv;
Risk_Reduction_Current = (sb_rev_cv - sb_current_cv)/sb_rev_cv;
if Risk_Reduction_nega = . then delete;
if Risk_Reduction_Current = . then delete;
Risk3 = Risk_Reduction_nega/Risk_Reduction_Current;
if Risk3 = . then delete;
run;

data big31; set big30;
    if Risk3 < 0.98 then Risk3d = ' Current < NCGA ';
    else if Risk3 < 1.02 then Risk3d = 'Current = NCGA ';
    else Risk3d = 'Current > NCGA ';

proc gmap map=maps.uscounty data=big31 all;
id state county ;
choro Risk3d / coutline=black levels=3 midpoints=old
    empty=black missing ;
title 'Soybean Risk Reduction of Current Program vs. NCGA Program';
run;

data big17; set big5;
    state=locstate; county = loccnty;
    Payment_difference = sb_current_ppacm - sb_nega_ppacm;
    if payment_difference = . then delete;

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if payment_difference < 0 then Difference = 'Current < NCGA Revenue';
*else if payment_difference < 5 then diffdum = 2;
else Difference = 'Current > NCGA Revenue';

go\options reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red green orange yellow cyan )
ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=6;

proc gmap map=maps.uscounty data=big17 all;
id state county ;
choro Difference / coutline=black levels=2 midpoints=old
cempty=black missing ;
title 'Soybean Average Current Program Payments - NCGA Revenue Proposal';
run;

data big18; set big4;
state=locstate; county = loccnty;
if sb_tier1_indem_pac ne .
if sb_tier1_indem_pac < 20 then BRP = '$ 0-20/ac'
else if sb_tier1_indem_pac < 40 then BRP = '$20-40/ac'
else BRP = '> $40/ac

go\options reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan )
ctext=black ftext=swiss htitle=4 htext=1 fontres=presentation
htext=6;

proc gmap map=maps.uscounty data=big18 all;
id state county ;
choro BRP
/ coutline=black levels=3 midpoints=old
cempty=black missing ;
title 'Soybean Average NCGA BRP Payment';
run;

data big19; set big4;
state=locstate; county = loccnty;
if sb_tier2_indem_pac ne .
if sb_tier2_indem_pac < 1 then RCCP = '$ 1/ac'
else if sb_tier2_indem_pac < 2 then RCCP = '$2/ac';
else if sb_tier2_indem_pac < 3 then RCCP = $3/ac
else RCCP = > $3/ac

goptions reset=global gunit=pct border cback=white
/*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan )
ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=5;

proc gmap map=maps.uscounty data=big19 all;
  id state county ;
  choro rccp
    / coutline=black levels=4 midpoints=old
cempty=black missing ;
title Soybean Average NCGA RCCP Payment ;
run;

data big21; set big5;
  state=locstate; county = loccnty;
  if NCGA_PACm ne .
    if NCGA_PACm < 20 then NCGA = $0-20
    else if NCGA_PACm < 40 then NCGA = $20-40
    else if NCGA_PACm < 60 then NCGA= $40-60
    else NCGA = > $60
  goptions reset=global gunit=pct border cback=white
  /*colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
colors=(Red orange yellow green cyan )
ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
htext=3;

proc gmap map=maps.uscounty data=big21 all;
  id state county ;
  choro NCGA
    / coutline=black levels=4 midpoints=old
cempty=black missing ;
title NCGA Average Payments ;
run;

data big22; set big5;
  state=locstate; county = loccnty;
  if wrap_PACm ne .
    if wrap_PACm < 20 then Wrap = $0-20
    else if wrap_PACm < 40 then Wrap = $20-40
    else if wrap_PACm < 60 then Wrap= $40-60
    else Wrap = > $60
  
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goptions reset=global gunit=pct border cback=white
   / *colors=(GRAYDF GRAYA1 GRAY5C GRAY00) */
   colors=(Red orange yellow green cyan )
   ctext=black ftext=swiss htitle=4 htext=2 fontres=presentation
   htext=3;

proc gmap map=maps.uscounty data=big22 all;
   id state county ;
   choro wrap
      / coutline=black levels=4 midpoints=old
         cempty=black missing ;
   title 'Wrap Average Payments';
run;

PROC EXPORT DATA= WORK.big4
OUTFILE= "u:\Research Project\SoybeanOutput.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
PROC EXPORT DATA= WORK.big5
OUTFILE= "u:\Research Project\SoybeanOutput.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
PROC EXPORT DATA= WORK.big7
OUTFILE= "u:\Research Project\SoybeanOutput.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
PROC EXPORT DATA= WORK.big4
OUTFILE= "C:\Documents and Settings\admin\Desktop\F Drive\Research Project\SoybeanOutput.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
PROC EXPORT DATA= WORK.big5
OUTFILE= "C:\Documents and Settings\admin\Desktop\F Drive\Research Project\SoybeanOutput.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
PROC EXPORT DATA= WORK.big7
OUTFILE= "C:\Documents and Settings\admin\Desktop\F Drive\Research Project\SoybeanOutput.xls"
DBMS=EXCEL2000 REPLACE;
RUN;
quit;