Behavioral Implications of counter-cyclical payments and base acreage updating under the 2002 Farm Act

by:

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Abstract: The introduction of counter-cyclical payments (CCPs) and a base acreage updating option under the 2002 Farm Act have potential supply response implications. To gain insight into the economic incentives and efficiency implications of these provisions, this paper presents the design of a 3-stage experimental market used to gauge the actual response of economic agents under conditions simulating those faced by U.S. farmers. When completed, the results of the experiment will be used to assess the impact of the CCP system and of policy uncertainty regarding future base-updating options, relative to a market revenue-only baseline.

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In many respects, the 2002 Farm Security and Rural Investment Act (2002 Act) represents a continuation of the general commodity policy orientation of the 1996 Farm Bill. Marketing loan programs and a system of direct, decoupled payments remain central means of providing farm income support, and the 2002 Act retained the expanded, and nearly complete, planting flexibility provisions adopted in the 1996 Act.[1]

At the same time, the new Act contains two features that have added complexity to farmers' planting decisions, and may have introduced new incentives for farmers to make cropping decisions based partly on potential government payments, rather than expected market returns. These are (1) the prospect of earning "counter-cyclical payments" (CCPs) on the farmer's endowment of "base" (historically produced) acreage when prices of these crops fall below pre-established target levels; and (2) the option for farmers to update the allocation of these base crops—upon which direct payments and CCPs are made—in order to reflect more recent (1998-2001) production history.[2]

The introduction of these two policy provisions has generated uncertainty and debate regarding their potential economic impacts. Although counter-cyclical payments would be made on the basis of historic, not current, planting decisions, observers recognize that risk-averse producers may face incentives to continue producing their base crops as a strategy to minimize revenue risk

[1] Partial planting flexibility was introduced by the 1990 Farm Act. The 1996 and 2002 Farm Acts retained some restrictions on the planting of fruits and vegetables on base acreage.

[2] "Base acreage" refers to a farm's crop-specific acreage of wheat, feed grains, cotton, rice, oilseeds, or peanuts eligible to participate in commodity programs under the 2002 Farm Act. Base acres and yields determine the level of government (direct and counter-cyclical) payments and reflect a farm's historical level of production. Under the 1996 Farm Act, base acres and payment yields for most producers were based on—as in prior legislation—the crop mix and prevailing yields during the 1981-85 period. The 2002 Act allows farmers to update this mix by a) adding newly eligible crops (i.e. oilseeds) to their current mix, or b) revising base acreage to reflect plantings during 1998-2001. For simplicity, we refer to "farmers" or "producers" assuming that they own the base acreage.

and variability. In this event, producers may align current plantings with their base acreage even when their price expectations indicate that higher (current year) returns could be earned by growing an alternative (non-base) crop.[3] As for base acreage updating, this option may have reversed the expectation—developed over several previous rounds of farm legislation—that a farmer's recent historical planting decisions would have no impact on potential farm program payments under ensuing legislation. Consequently, farmers' current production choices may be increasingly influenced by their expectations of how each crop will be treated (e.g. eligible for farm program payments) under future legislation.

As a result, counter-cyclical payments (CCPs) and the base acreage updating option under the 2002 Farm Act have potential supply response implications. However, with little data currently available on planting decisions under the new Farm Act, assessing the direction and magnitude of production impacts of these provisions is not yet possible. Even as data becomes available, delineating their impacts from other policy and market factors will prove challenging. To provide insight into the economic incentives and efficiency implications of CCPs and base updating, we therefore take the innovative step of designing an experimental market to gauge the actual response of economic agents under conditions simulating those facing U.S. producers.

The experiment will entail the creation, in a laboratory setting, of an interactive market under price uncertainty, with a group of individual producers (subjects) making production choices on the mix of three crops (one of which is a non-program crop) on a fixed endowment of land. For simplicity, we assume constant production costs, no marketing loan program, no production risk,

[3] By "non-base" crop, we refer to the farmer's perspective. That is, crops for which the producer does not have a production history for which he/she has established base, or a crop that is not eligible for program payments.

and each producer is assigned an initial base acreage level for the two designated program crops. This experimental design allows us to explore how economic agents with heterogeneous risk preferences make production choices under price uncertainty with and without a CCP-type system, and under policy uncertainty (regarding future base updating options).

We consider three treatments using an ABA crossover design. The three treatments (scenarios) are (1) the baseline case of price uncertainty without CCPs; (2) price uncertainty with CCPs available, and (3) price uncertainty with future policy uncertainty. The consequent effects of (2) and (3) on efficiency are then assessed relative to the baseline (1). The experimental design is aimed at isolating, and controlling for, the influences of the two policy changes, and at using the results to assess the economic efficiency and supply response implications of a CCP system and policy uncertainty relative to a (pure market) baseline.[4] To control for learning and experience, the ABA design presents subjects with treatments in a sequence in which the first scenario (A) is repeated following the second scenario (B).[5]

The remainder of this paper provides an overview of key policy provisions under the 2002 Act, a brief section on the historical background and evolution of farm programs pertaining to the establishment of base acreage, a more comprehensive discussion of the research question and hypotheses, and a description of the proposed methodology of the experimental design.

[4] Efficiency is defined as the set of production decisions that maximize expected market revenue. In this paper, the terms "revenue," "income," "returns," and "profit" are used interchangeably as the experiment assumes no production costs.

[5] For example: treatment (1), followed by treatment (2), then repeating treatment (1). All permutations are covered.

Overview of 2002 Farm Act commodity provisions

The 2002 Farm Act employs three primary methods to provide income support to field crop producers (principally wheat, feed grains, cotton, rice, and oilseeds): direct payments, counter-cyclical payments (CCPs), and marketing loans. Marketing loans and direct payments were also available under the 1996 Farm Act, while the target-price system of CCPs represents the reintroduction—in modified form—of deficiency payments, which were eliminated by the 1996 Farm Act. Although this paper focuses on the impact of CCPs and the base updating option, we briefly summarize the main features of each program to provide an overview of the different sources of market income and program payments available to eligible farmers. The options for establishing and updating the base acres and yields—upon which direct and counter-cyclical payments are made—are also summarized.[6]

- *Direct payments*

Under this program, farmers and eligible landowners entering into an agreement with USDA will receive annual fixed direct payments during 2002-2007. Similar to the annual production flexibility contract (PFC) payments made under the 1996 Farm Act, the new direct payments are made on the basis of the producer's historical production (base acres and yields) and are made (with some limitations) regardless of the farmer's current planting decisions or current market prices. The notable difference from the 1996 Act is that oilseed producers (soybeans, peanuts, other oilseeds) have become eligible for the program. The amount of the payment is equal to a fixed payment rate for each crop multiplied by the payment acres (85 percent of base for each

[6] For a more detailed presentation of the main commodity policy provisions of the 2002 Farm Act, and a comparison with provisions available under the 1996 Farm Bill, see the ERS, USDA side-by-side analysis available on the ERS website at: http://www.ers.usda.gov/Features/FarmBill/Titles/TitleICommodities.htm

crop) times the payment yield (for an illustration of program payments in an example farm, see Appendix Table 1).[7]

- *Counter-cyclical payments*

Counter-cyclical payments (CCPs) are available to covered commodities for which the producer has base acres whenever the **effective price** for that commodity is below a pre-determined **target price**. The per-unit payment rate for CCPs is equal to the amount that the target price exceeds the effective price. The effective price equals the direct payment rate plus the higher of (a) market price or (b) the commodity marketing loan rate. Similar to direct payments, CCPs are made regardless of what crop the producer currently grows (with some limitations), and the amount of the CCP is equal to the payment rate for each crop multiplied by the payment acres (85 percent of base) times the payment yield.[8] Unlike direct payments, CCPs depend on current market prices for the base crop. If market prices for the base crop are above the effective price, no CCP is received on that base crop.

- *Marketing Assistance Loans and Loan Deficiency Payments*

Nonrecourse loans with marketing loan provisions operate as they did under the 1996 Farm Act, with some revisions to loan rates, and with eligibility extended to additional commodities (peanuts, wool, mohair, honey, pulses). Farmers must produce the covered program crop in order to be eligible for marketing loans. Generally, when market prices are below the loan rate, producers can benefit from the program in two ways. In the first instance, farmers are allowed to repay the commodity loan at a lower "loan repayment rate" established by the government. The

[7] Appendix Table 1 and the ensuing calculations demonstrate the different sources of market revenue and policy payments available to farmers, and re-emphasizes the point that direct payments and CCPs are both linked to historical (base), rather than current, production, but CCPs do fluctuate with the base crop's current market price. As market prices for the planted crop rise above loan rates, producers no longer receive marketing loan benefits. As the market price on base crops move above the effective price for each base crop, CCPs are no longer made.

difference between the initial loan and the amount repaid is the marketing loan gain. Alternatively, the producer can opt to receive the marketing loan gain directly by foregoing the loan and taking the difference between the lower prevailing (applicable) market price and the loan rate as a Loan Deficiency Payment (LDP).

- *Base acreage and base update option*

The 2002 farm legislation allowed farmers who received direct (PFC) payments during 1996-2002 the choice between keeping their old base acreage (generally linked to 1981-85 plantings) or to update base acres to reflect average planted acres for each eligible commodity during the 1998-2001 crop years. Producers must select one of the two options for all covered commodities. Although base yields for direct payments will still reflect yields during 1981-85, producers who choose to update their base acres to reflect 1998-01 plantings, will also have the option of updating yields on which CCPs are made. If the producer chooses this option, CCP yields will be set at the higher of either a) 93.5 pct of average yields on planted acres during 1998-01 or b) adding 70 pct of the difference between program yields for PFC payments and actual average yields during 1998-01.

Evolution of base acreage and planting flexibility (1974-1996)

Recognizing that price and income supports create incentives for existing farmers to produce more and have the potential to induce new entrants, a longstanding dilemma for farm program designers has been how to provide income transfers without causing rising expenditure levels over time—as the quantity of farmers/farm land eligible for support increases, and from possible price effects caused by increased production. With origins stretching back to Depression-era

[8] For each crop, the CCP payment rate = (Target price) – (Direct Payment rate) – (higher of loan rate or market price).

policies, the U.S. farm policy approach from 1974 to 1996 was to offer farmers price and income support, while simultaneously providing incentives that limited overall production and constrained planting flexibility.

Beginning in 1974—when base acres were introduced—farmers' eligibility for farm program payments was contingent upon their willingness to limit current production to a certain percentage of historical production. Under this system, the government assigned each producer a base acreage level (and crop-specific payment yields) for each eligible crop, and farmers were then told what proportion of their historical base of each crop they could plant through acreage reduction programs (ARPs). In return, producers were eligible for commodity loan program price supports. Producers also received deficiency payments for a particular crop when the target price exceeded the greater of the national average farm price or the loan rate for the crop. To receive program benefits, farmers were required to produce (or attempt to produce) the specific base crop—thus limiting planting flexibility—and, although the government could not legally compel farmers to produce these crops or reduce acreage, the incentive it provided encouraged high participation rates.

Limiting eligibility for farm program benefits to farmers that participated in prior acreage control programs acted as a barrier to entry and resulted in "base lock," as farmers were inhibited from responding to market signals by the potential loss of program payments (Skully). Under the 1981 and 1985 Farm Acts, for example, restrictive rules governing base acreage calculations made it costly for producers to switch from specific program crops to other program or nonprogram crops. Planting fewer program crop acres in any given year reduced the eligible

base acreage for that crop in both that year and subsequent years, unless the producer left the program to rebuild base.[9]

With the introduction of normal and optional flex acreage, 1990 legislation did introduce limited planting flexibility, but the 1996 Farm Act represented a more significant change in policy with regard to the planting flexibility and market orientation of the U.S. farm sector. Deficiency payment programs and ARPs were abandoned, and the limited planting flexibility introduced in 1990 was revised to permit nearly complete planting flexibility. Under the 1996 legislation, farm income support was provided primarily through the continuation of a system of commodity loans with marketing loan provisions, supplemented by a new program of direct, "decoupled" income supports.[10] These production flexibility contract (PFC) payments—made annually to participating producers during 1996-2002—were still linked to base (historical) acreage, but were made regardless of producers' current production decisions during the covered period.

These changes were made, in part, due to budgetary concerns, but were also due to the recognition that direct payments are more efficient than payments tied to output or acreage planted. In any event, the combination of planting flexibility and the shift from deficiency payments to a system of direct, decoupled payments removed "base-lock" and resulted in some major shifts in crop production. Many farmers felt that the implication was that then-current plantings would have no bearing on potential payments in future legislation.

[9] Other factors, such as Acreage Reduction Programs (ARPs), also influenced producer decisions.
[10] Marketing loan benefits for various crops were introduced incrementally, beginning with rice and cotton in 1985. Commodity loans with marketing loan provisions (potentially) provide support that is not decoupled from production or prices, but the marketing loan provisions adopted in the 1996 Act provides incentives to minimize the price-supporting holding of stocks by the government that occurred when marketing loan provisions were not available.

2002 Farm Act – Impact of CCP and Base Update options

As noted earlier, the 2002 Farm Security and Rural Investment Act maintained key market-oriented features of the 1996 Farm legislation, including a system of direct, decoupled payments, and planting flexibility. Existing research indicates that decoupled payments have little impact on crop mix and production (Chavas and Holt, 1990; Westcott and Young, 2000; USDA-AER 822, 2003), and that planting flexibility has allowed producers to respond more easily to price changes (Lin et al., 2000), thus improving allocational efficiency in the farm sector.

Under the 2002 Farm Act, CCPs are still de-coupled from current production decisions, and current production decisions have no impact on producers' current endowment of base acreage. Despite this, in certain situations the new CCP provisions and the base updating option could, in practice, make U.S. producers less responsive to price signals. The base updating option also may cause producers to consider the implications of current planting decisions on future farm program benefits. Depending on assumptions about the structure of future farm programs, this may result in efforts to maintain or increase ("build") base acreage to maximize future benefits rather than current income. This paper considers two general hypotheses:

1) ***Under the counter-cyclical payment system, risk-averse producers are less responsive to price incentives from non-base crops***

2) ***Different assumptions about program payments and base updating options in future legislation leads producers facing the same price incentives to make different choices on the allocation between current base and non-base crops.***

Impact of CCP system

Under the new target price system, counter-cyclical payments are not directly linked to individual producers' yearly planting decisions—as they generally were prior to 1996—since

payments are based on historical acreage and yields. At first glance, then, target prices and potential CCPs should have no impact on current planting decisions. However, while farmers are free to plant any crop on their base acres, some producers could choose to align their current planting decisions with their base acreage endowment if they prefer a less-variable income stream to a higher, but more variable income stream - that is, if producers are risk-averse.

A risk-averse individual is defined as one who prefers, in an environment of uncertainty, a sure income rather than a lottery with the same expected value. A risk-averse person may also prefer a smaller expected value with less variance to a larger expected value with greater variance. Risk-aversion is relevant in the presence of a CCP system when producers face the possibility of receiving low revenues from the production of a non-base crop, while at the same time being deprived of CCPs if prices on their base crops rise above target (effective) price levels.

As noted by the European Commission, "since the farmer is only guaranteed the income in relation to the crops grown in the reference year, in order to reduce risk, he or she may choose (or the bank manager may insist) that only those crops are grown." (EU, 2002, p. 6). Thus, the cropping mix and acreage allocation chosen by the producer would be based on the tradeoff between expected net returns (profit maximization) and the value of revenue risk reduction (Westcott, Young, and Price, 2002). Supply responsiveness to changes in relative returns between crops could therefore be affected by the amount of risk producers (or their lenders) are willing to accept.

In the absence of other price-risk hedging options, one possible strategy that a risk-averse producer may adopt in the presence of a CCP system is the "maximize minimum return" strategy.[11] Based on price expectations at planting, this strategy would call for producers to select a crop mix that results in a "worst-case scenario" revenue that is higher than for any other crop mix choice. Say, for example, a farmer has the choice between producing two crops ("Yellow" and "Red"). Assume the producer has 100 base acres of "Yellow" and no base acres of "Red" and, for simplicity, must choose between planting all of his/her current acres to one of the two crops. There are no production costs, and potential sources of revenue to the producer are from market revenues and CCPs, both of which depend on market price outcomes. Further assume that each crop has two equally possible price outcomes known to the producer, a low price and a high price. The low price outcome for each crop is the same ($P_{Y,R}$=1), but the "Red" (non-base) crop has the greater of the two possible high price outcomes (P_Y = 2; P_R = 2.5).

Table 1 shows the possible revenue (profit) outcomes for the farmer under the two different crop planting options and the four possible price outcomes: 1) High yellow, High Red (H_Y,H_R); 2) High Yellow, Low Red (H_Y,L_R), 3) Low Yellow, High Red (L_Y,H_R); and 4) Low Yellow, Low Red (L_Y,L_R). Finally, assume the target price for the base (Yellow) crop is 1.5, and that there is no direct payment on the base crop (target price and effective price are the same).

[11] Skully (2002) suggests that, in the context of counter-cyclical payments, this income risk can be easily hedged by using tools available in futures markets. Specifically, he notes that "buying a put [option] at the effective target price and selling a put [option] at the loan rate will generate an identical settlement value as the counter-cyclical payments specified in the 2002 Act."

Table 1: Alternative Revenue Outcomes from Planting Base versus non-Base Crop

Crop Planting Decision: 100 Acres "Yellow" (base crop)

Price outcome	market revenue	CCP	Net Revenue
(H_Y,H_R) Y=2, R=2.5	200	0	200
(H_Y,L_R) Y=2, R=1	200	0	200
(L_Y,H_R) Y=1, R=2.5	100	50	150
(L_Y,L_R) Y=1, R=1	100	50	150
			(175 average)

Crop Planting Decision: 100 Acres "Red" (non-base crop)

Price outcome	market revenue	CCP	Net Revenue
(H_Y,H_R) Y=2, R=2.5	250	0	250
(H_Y,L_R) Y=2, R=1	100	0	100 * (lowest)
(L_Y,H_R) Y=1, R=2.5	250	50	300 * (highest)
(L_Y,L_R) Y=1, R=1	100	50	150
			(200 average)

In this example, planting the non-base ("Red") crop offers both the highest potential annual income (300) to the producer as well as a higher long-term average income than planting the base ("Yellow") crop (200 versus 175). Nevertheless, a risk-averse producer may prefer to plant the base crop since it is clearly a "maximize minimum return" strategy (the lowest revenue outcome is 150 compared to a possible revenue outcome of 100 from producing "Red"), and because year-to-year income variability is reduced (ranging from 150 to 200 for "Yellow," compared to a range of 100 to 300 for "Red").[12] Our experimental design will present subjects with a set of conditions similar to those shown in Table 1, and the results will be used to assess

[12] Similarly, the producer could pursue a "minimize maximum loss" strategy. For example, if there were constant, per-acre, production costs of 1.5 for each crop, the producer would still choose to plant the base ("Yellow") crop since the worst outcome would be zero net revenue, compared to a possible net revenue of negative 50 if Red is planted and the high Yellow price, low Red price outcome occurs.

whether producers are more likely to adopt a "maximize minimum return" type strategy in the presence of a CCP system.

Base Acreage Updating

Westcott (1993) states that government commodity programs influence agricultural supplies—through planting decisions—by affecting farmers' expectations for costs and benefits of program participation. From 1974 until the 1996 Farm Act, planting decisions in the U.S. were affected by commodity loan and deficiency payment (target price) programs that generally required farmers to produce their "base" (historically grown) crops to receive program benefits – thus limiting the flexibility to plant alternative crops.[13] In addition, following the 1985 Farm Act, the base acres and yield levels that determined program benefits (i.e. deficiency payments) were generally fixed at levels prevailing during the 1981-85 period. Even when deficiency payments were replaced by the direct, decoupled production flexibility contract (PFC) payments following the 1996 Farm Act, these PFC payments continued to reflect historical (1981-85) base acreage and yield levels. As a result, the 1996 Act reinforced the perception among farmers that current production decisions would not affect future program benefits.

Nevertheless, the 2002 Farm Act granted farmers the opportunity to establish new base acres and yield levels so that their current direct and CCP program benefits would be based on more recent production history. This option potentially increases incentives for farmers to consider building and maintaining a planting history for program crops to use for possible future base acreage updating. Young et al. (2002) notes that, if producers perceive a link between the future and

[13] 1990 legislation introduced partial planting flexibility on base acres with 15 percent "normal flex acres" and 10 percent "optional flex acres."

present, farmers' profit maximizing decisions will produce different results than if there is no link:

> Farm based payments can have a larger impact on production decisions when the programs create expectations of future program benefits that are linked to current production decisions or when the payments are linked to current production or market conditions. For example, if farmers expect future payments to be based on current plantings, they may keep current plantings of those crops high. (p. 3)

The OECD also points out that "the relevant issue for this "expectation effect" is that farmers believe that current production may have a positive effect on the probability of and/or the amount of payments received in the future. The fact that this is not written or stated anywhere does not exclude this effect." (p.21)

Although it is intuitive that the base updating option would have some impact on current planting decisions, the actual magnitude and direction of these effects are difficult to anticipate. Some possible consequences include increased aggregate planted area, reduced willingness to plant non-program crops or to enroll in conservation programs. Westcott, Young, and Price (2002) also point out that use of non-land inputs (such as machinery and chemicals) that affect current yields may be influenced if farmers expect that future farm legislation will permit an updating of payment yields. However, in making any such calculation, the farmer faces a number of uncertainties. Will base updating be allowed in the future? Will crops eligible for program payments be eliminated or added? Will the relative attractiveness of program payments from different crops vary? Will the current year's planting decision be included in a future base update? Some of these potential effects can be delineated in the experimental design.

Methodological Approach:

Our experimental design is structured to simulate the incentives and conditions placed on U.S. farmers who are eligible for CCPs, and face policy uncertainty regarding future base acreage updating options. The intent is to separate and isolate the individual impacts of these policy provisions from other commodity program incentives, and to allow us to draw more informed conclusions about their implications for supply responsiveness and economic efficiency.

In the experiment, we ask participants to make allocation (planting) decisions, given varying levels of price risk for three crops—two program and one non-program. Program crops are those eligible for government payments (e.g. direct and counter-cyclical payments). Earnings from the non-program ("non-base") crop are from market revenues only. Under a given set of price expectations for each crop, production decisions are made over multiple years ("rounds") on the percentage mix of the three crops. Price risk consists of 2 possible price outcomes (known to the participant), with a set of odds assigned to each outcome. Each participant is endowed with 100 acres ("chips") to allocate among the three crops. For simplicity, we assume no production costs, no production risk, and we assign each participant with an initial base acreage ("banked chips") level for the two designated program crops.

We then consider three treatments using an ABA crossover design. The three treatments (scenarios) are (1) the baseline case of price uncertainty without CCPs (market revenue and a constant, lump-sum ("direct") payment determined by the allocation of base acreage); (2) price uncertainty with CCPs available for base crops, and (3) price uncertainty with policy uncertainty

regarding potential future income streams tied to base acreage. We then compare behavior in treatments (2) and (3) relative to behavior in the baseline (1).

Under the ABA design, for example, each participant will make production decisions over 30 market periods ("rounds"), consisting of 3 ten-round round "sessions." The producer makes production decisions under the baseline conditions—price uncertainty only—over 10 rounds; then he or she makes production decisions under price uncertainty with a CCP system on base crops for rounds 11-20; finally, in rounds 21-30, he or she makes production decisions under price uncertainty, and with uncertainty regarding future availability of CCPs and base acreage updating options. To control for learning and experience, we construct the ABA design to cover all six factorial sampling designs.[14] We then run multiple experimental sessions, each using a different set of subject volunteers.

Since the hypothesis (#1) on the impact of CCPs is that risk-averse producers are less responsive to non-base crop price signals (more likely to plant base crops in a given set of price expectations), we first measure the level of each participant's risk aversion using a "risk-aversion x-test" described in Appendix 1. This allows us to assess the actual magnitude and distribution of risk-aversion among participants—providing a check on the robustness of any assumption about the level of risk-aversion among farmers—and lets us estimate the degree of variance in behavior among participants with different levels of risk-aversion.

With regard to the second hypothesis, the experiment simulates policy uncertainty by confronting participants with two possible outcomes at the end of each round within the third

session (price uncertainty with policy uncertainty regarding future program payments from base acreage): (a) the CCP system continues on as-is, with no change in current endowment of base acreage, or (b) the CCP system continues, but any realized CCPs are withdrawn in a proportion equal to the percentage of land planted (tokens chosen) to the non-base crop. Appendix 2 contains a more detailed set of instructions and description of the experimental design.

In summary, the laboratory environment in each session is designed to mimic incentives that exist in agricultural markets without exactly replicating the decisions required in any particular market setting that might occur. Producer endowments and base acreage each round remain constant throughout an ABA session. After all choices are made, the monitor informs subjects about the resolution of the price or policy uncertainty or both, and their profits earned. At the end of the experiment, each producer is paid in cash an amount based on their accumulated lab-dollar earnings over the experimental rounds, thus providing similar economic incentives as those faced by actual producers. Relative to the baseline case, participants are expected to be less responsive to price signals under the CCP system and under policy uncertainty. The statistical significance of these hypotheses will be examined following the experimental sessions.

Conclusion

Roth (1995) notes that an important potential contribution of experimental and survey research is to "provide rapid feedback to policymakers about issues that are not easily analyzed with observed data: e.g., the volatility implications of altering market structure, the dynamic effects of changing regulatory regimes, and the costs and benefits of altering the level of public goods

[14] Specifically, the scenarios will be presented to subjects in each of the following sequences: (1,2,1) (1,3,1) (2,1,2) (2,3,2) (3,1,3) (3,2,3).

offered." (Roe and Randall, p. 282). The experimental design used in this paper will allow us to explore how economic agents with heterogeneous risk preferences make production choices given the different risks and institutional contexts he or she confronts.

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Appendix Table 1: Program Benefits under the 2002 Farm Act (corn and soybeans)[1/]

	Corn	Soybeans
	---------- $/bushel ---------	
Assumed market price (2003)	1.88	4.90
Marketing Loan Rate (2002-03)[2/]	1.98	5.00
Target Price (2002-03)[2/]	2.60	5.80
Direct Payment Rate	0.28	0.44
Assumed base acres[3/]	50	50
Assumed planted acres (2003)	100	0
	-------- bushels/acre --------	
Assumed direct payment yield[3/]	100	30
Assumed CCP yield[3/]	120	35
Assumed actual yield (2003)	140	n/a

1/ This table presents information on the marketing loan rate, direct payment rate, and target prices for corn and soybeans, and illustrates how a producer can receive benefits under each of these programs, assuming the producer has 50 acres of corn base area and 50 acres of soybean base area, and chooses in the current year to plant 100 acres of corn and no soybeans. 2/ During 2004-2007, the corn loan rate falls to $1.95/bushel, and the target price rises to $2.63/bushel. 3/ Once established, base acres, direct payment yield, and CCP yield are fixed throughout the current legislative period. For each crop, the CCP payment rate = (Target price) – (Direct Payment rate) – (higher of loan rate or market price).

In this example, the producer would receive revenue from 4 sources: 1) market revenues from corn production; 2) marketing loan benefits from corn production; 3) direct payments from corn and soybean base acreage; and 4) counter-cyclical payments on corn and soybean base.

1) market revenue = corn market price ($1.88/bushel) * corn production (100 acres*140 bushes/acre) = $26,320

2) marketing loan benefit (or loan deficiency payment) = [corn loan rate ($1.98/bushel) – corn market price ($1.88/bushel)] * corn production (14,000 bushels) = $1,400

3) Direct payment (DP) = DP on corn base + DP on soybean base =
Corn DP rate ($0.28/bushel) * corn DP yield (100) * corn base acres (50) * 0.85
\+ Soy DP rate ($0.44/bushel) * soy DP yield (30) * soy base acres (50) * 0.85
= $1,190 (corn DP) + $561 (soybean DP)

4) CCP = CCP on corn base + CCP on soybean base =
Corn payment rate ($0.44/bushel) * corn CCP yield (120) * corn base acres (50) * 0.85
\+ soy payment rate (0.46/bushel) * soy CCP yield (35) * soy base acres (50) * 0.85
= $2,244 (corn CCP) + $684.25 (soy CCP).

Appendix 1: (Risk-aversion X test)

General Experiment Information

Today you will participate in two experiments in the economics of decision-making.

- If you follow the instructions carefully, you may earn a considerable amount of money.
- **Both experiments are entirely separate, and information or instructions from one SHOULD NOT be confused with information for the other.**
- In both experiments you will be asked to make a series of decisions. There are no right or wrong answers but the amount you will earn will depend upon the choices you will make.
- **The amount of money you earn in the first experiment will have no effect on the money you will earn in the second.**
- You will be paid for both experiments in cash when we are finished.
- If at any time during either experiment you have any questions, please raise your hand and an experiment proctor will come to assist you, although they will not advise you.

Experiment 1: Choice Between Two Alternatives

You will soon be asked to make nine (9) choices. Each will ask you to choose between two options, labeled "Option A" and "Option B". The options will differ as follows:

Option A: Option A always pays $2.50 in cash.

Option B: There will always be two possible payoffs associated with Option B:
HIGH payoff: $5.00
LOW payoff: $0.00

Which payoff Option B pays is randomly determined by drawing one of ten numbered balls from a bingo cage. For example, you might have the following two options to choose between:

****

Game 0 Example

	OptionA	Option B	
Payoff:	$2.50	0.00	$5.00
	Numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Numbers 1, 2, 3, 4, 5	Numbers 6, 7, 8, 9, 10

Circle your preferred Option: Option A Option B

****

Option A always pays $2.50 no matter which ball is chosen from the number cage. Option B will pay $0.00 in this example if ball selected is number 1, 2, 3, 4 or 5. It will pay $5.00 if the number on the ball selected is 6, 7, 8, 9, or 10. You may choose Option A or Option B, and will indicate which option you prefer by circling your choice where indicated.

Your Payoff in Experiment 1:

You will be asked to choose whether you prefer Option A or Option B across 9 different decisions shortly. Only one of these games, however, will actually be played. AFTER EXPERIMENT 2 IS FINISHED, one of nine balls, labeled 1-9, will be drawn from the number cage. The number on this ball will determine which of the nine games you chose over is played. If you chose Option a in that game you will receive $2.50 in addition to your earnings in Experiment 2. If you chose Option B, one of ten balls will be drawn from the bingo cage to determine your payoff.

Summary of Experiment 1:

1. In each of nine games you will be asked to choose which of the payoff options (A or B) you prefer.
2. When everyone has made their decisions, we will collect your choices.
3. After the second experiment is completed, we will draw one of nine balls labeled 1-9 to determine which of the nine games is played.
4. We will then draw one of ten balls, labeled 1-10 to determine whether the payoff for Option B is HIGH or LOW.
5. You will be paid in cash an amount determined by which of the nine games was played, and whether you chose Option A or B for that game.

Appendix 2: Instructions

This is an experiment in decision making that will take approximately __ hours to complete. At the end of the experiment, you will be paid in cash for participating. How much you earn depends on your decisions and chance.

* Please do not talk and do not try to communicate with any subjects during the experiment. If you have questions, please raise your hand.
* If you fail to follow these instructions you will be asked to leave and forfeit any money earned
* You can leave the experiment at any time without prejudice.

In this experiment you will be given three cases in three sessions. The cases in different sessions may or may not be the same. The case instructions are given along with this overview. In each of these separate cases you will be asked to make decisions that will determine your earnings. A session is 10 rounds; therefore the experiment will last for a total of 30 rounds. You will be given a recording sheet to keep track of the earnings you accrue in each round and therefore the entire experiment. The amounts shown in the given cases are in lab dollars. At the end of the experiment you will be paid in cash at the exchange rate of $_.__ per lab dollar.

Overview
You will be given 100 tokens in each round. You will make choices on how many tokens you wish to contribute to each of three colors. You may allocate these tokens in any manner across the three colors as long as all 100 tokens are used. Additionally, you will be endowed with a given number of banked tokens for each color. These tokens stay banked, you cannot remove them and put them in another color. Your decisions may or may not affect the amount of banked tokens you have for each color. The case instructions will give the specific information on how you will earn lab dollars for each color in that case. Each session has four steps:

Step 1. The moderator will announce which case will be used for the session. Re-read the instructions for the case if necessary.

Step 2. In each round the moderator will give you information about each of the colors. Then make your decision on how to allocate your tokens between the three colors on your recording sheet.

Step 3. Once everyone has completed Step 2 for each round, the moderator will announce the results and you will be given time to compute your lab dollar earnings for that round.

Step 4. Steps 2 and 3 will be repeated for the remaining rounds in that case.

Instructions for Case 1

You will be given 100 tokens to allocate between Blue, Yellow, and Red in each round. You may do this in any fashion you choose as long at all 100 tokens are used. You have been endowed with Banked tokens for both the Blue and Red options. These tokens are "banked" and cannot be moved to another color and will be the same for all ten rounds.

For **each color**, there are **two possible prices**; a low price and a high price. The realized price is the actual price that is announced by the monitor after all choices have been made for the round. The odds that the realized price is high or low are given below the option boxes. Your lab dollar earnings will be determined based on the realized price and the number of tokens you have chosen for each color.

For Blue and Yellow, there is also a Direct Rate listed. This **Direct Rate** is applied **only to the Banked** tokens for the given color.

Steps for Case1:

1. Look at each of the three color options for Case1. The moderator will tell you (and you will be given a handout that contains) the possible prices and odds of the prices for each color and the direct rates for Blue and Yellow options.

2. Make your choice of how to distribute your 100 tokens across each color; blue, yellow, and red.

3. The moderator will announce the realized price for each color. Based on the revenue equations in the color dialog boxes, lab dollar earnings for that round will be calculated for each color and summed for total round earnings.

4. Steps 1 through 3 will be repeated for 10 total rounds.

Instructions for Case 2

You will be given 100 tokens to allocate between Blue, Yellow, and Red in each round. You may do this in any fashion you choose as long at all 100 tokens are used. You have been endowed with Banked tokens for both the Blue and Red options. These tokens are "banked" and cannot be moved to another color and will be the same for all ten rounds.

For **each color**, there are **two possible prices**; a low price and a high price. The realized price is the actual price that is announced by the monitor after all choices have been made for the round. The odds that the realized price is high or low are given below the option boxes. Your lab dollar earnings will be determined based on the realized price and the number of tokens you have chosen for each color.

For Blue and Yellow, there is also a Direct Rate listed. This **Direct Rate** is applied **only to the Banked** tokens for the given color.

For Blue and Yellow, there is also a CCP Rate listed. The **CCP Rate** is given **only when the realized price is below the target price**. This CCP Rate is applied **only to the Banked** tokens for the given color.
The CCP Rate is determined as follows: CCP Rate = (Target Price - Direct Rate - Price)

Steps for Case2:

1. Look at each of the three color options for Case1. The moderator will tell you (and you will be given a handout that contains) the possible prices and odds of the prices for each color, the target price, the direct rates, and the possible CCP rates for Blue and Yellow options.

2. Make your choice of how to distribute your 100 tokens across each color; blue, yellow, and red.

3. The moderator will announce the realized price for each color. Based on the revenue equations in the color dialog boxes, lab dollar earnings for that round will be calculated for each color and summed for total round earnings.

4. Steps 1 through 3 will be repeated for 10 total rounds.

Instructions for Case 3

You will be given 100 tokens to allocate between Blue, Yellow, and Red in each round. You may do this in any fashion you choose as long at all 100 tokens are used. You have been endowed with Banked tokens for both the Blue and Red options. These tokens are "banked" and cannot be moved to another color and will be the same for all ten rounds.

For **this case**, there are **two possibilities regarding change**. Either a change occurs or it dos not. Either way, the dialog boxes for each color describe how payments are made.

For **each color**, there are **two possible prices**; a low price and a high price. The realized price is the actual price that is announced by the monitor after all choices have been made for the round. The odds that the realized price is high or low are given below the option boxes. Your lab dollar earnings will be determined based on the realized price and the number of tokens you have chosen for each color.

For Blue and Yellow, there is also a Direct Rate listed. This **Direct Rate** is applied **only to the Banked** tokens for the given color.

For Blue and Yellow, there is also a CCP Rate listed. The **CCP Rate** is given **only when the realized price is below the target price**. This CCP Rate is applied **only to the Banked** tokens for the given color.

The CCP Rate is determined as follows: CCP Rate = (Target Price - Direct Rate - Price)

Steps for Case3:

1. Look at each of the three color options for Case3. The moderator will tell you (and you will be given a handout that contains) the odds for the possible change, the possible prices for each color, the target price, the direct rates, and the possible CCP rates for Blue and Yellow options.

2. Make your choice of how to distribute your 100 tokens across each color; blue, yellow, and red.

3. The moderator will announce whether or not a change occurred and the realized price for each color. Based on the revenue equations in the color dialog boxes, lab dollar earnings for that round will be calculated for each color and summed for total round earnings.

4. Steps 1 through 3 will be repeated for 10 total rounds.