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Less U.S. Government Intervention in Corn and Soybean Markets: An Analysis of Program Alternatives*

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ABSTRACT

Title: "Less Government Intervention in Corn and Soybean Markets: An Analysis of Program Alternatives"

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Corn and soybean markets were analyzed with a multi-period, stochastic simulation model. Elimination of current farm program provisions (deficiency payments, farmer-owned reserves, and CCC operations) increased price levels and variation but substantially reduced Treasury costs. Elimination of deficiency payments reduced Treasury costs by one-third but did not affect price behavior.

Less U.S. Government Intervention in Corn and Soybean Markets: An Analysis of Program Alternatives

Commodity programs have been a part of U.S. agricultural policy since the late 1920's. The Food and Agriculture Act of 1977 offers price and income support for farmers, authorizes grain reserves, and provides for various other food and agricultural concerns. Since the legislation expires in 1981, major political decisions will be required as policy is developed to replace the 1977 Act (Dorow, et al., 1980).

Beyond the immediate food and agricultural policy decisions, consumers, producers, agribusiness, and politicians will be facing new challenges resulting from significant changes which recently have been occurring in American agriculture. After two decades of chronic surpluses and excess production capacity, American agriculture in the 1970's experienced considerable instability in food prices and farm incomes. Moreover, rapidly changing conditions in foreign and domestic economies relating to exchange rates, costs of energy and capital, and rapid changes in the foreign demand for food have become major causal factors of instability in food and agricultural prices - and are likely to result in continued uncertainty in farm income and food expenditures. As a result, many analysts now suggest that the decade of the eighties may be a period of unstable, but higher commodity prices in real dollars as growth in foreign and domestic demand for grains outpaces increases in production (Lee, 1980; Martin, 1981).

Food and agricultural policy decisions of the 1980's will be shaped by these unfolding economic conditions and the perceived performance of the 1977 Act. Given current interest and debate over federal budget cuts, it is

particularly timely that the costs and consequences of alternative farm commodity program options be examined to provide factual input into the policy process.

The purpose of this study (Edelman) is to analyze the economic effects on the corn and soybean markets of selected government programs which involve less government intervention. This paper focuses upon three principle U.S. policies: (1) deficiency payments, (2) farmer-owned grain reserves, and (3) Commodity Credit Corporation stocks. A partial equilibrium simulation model is employed to reflect market behavior under alternative policy scenarios. The various policy alternatives are compared to a continuation of current policy.

Policy Environment

The farm price and income provisions of the Food and Agriculture Act of 1977 which prevailed in 1979 form the basis of the analysis in this study. The farm income support program refers to target prices and deficiency payments. Crop insurance and disaster payments also can alter farm income but are beyond the scope of this study. Deficiency payments are received by program participants when the market price falls below a predetermined target price. Payments equal the per bushel payment rate times normal yields for eligible program acreage.

Price policies refer to the acquisition and release of farmer-owned reserve (FOR) stocks and Commodity Credit Corporation (CCC) stocks. Program participants may voluntarily place wheat and feed grains under a nonresource loan and upon maturity face three options: (1) redeem the loan, (2) default on the loan and transfer title to the CCC, or (3) place the grain in the farmer-owned reserve, which effectively extends the nonrecourse loan to a maximum of three additional years. Farmer-owned reserve stocks increase as market prices decline to the loan rate and CCC stock acquisitions serve as a price floor.

Government managed stocks are released back into commercial channels as the market price exceeds various trigger price levels. If the market price rises above the release price, participants in the farmer-owned reserve may keep the grain but forgo storage subsidies or they may redeem the loan without penalty. If the market price reaches the farmer-owned reserve call price, participants are allowed a specified period to redeem all loans or they must forfeit the grain. If the market price continues to rise and reaches the CCC trigger price, then government-owned stocks are also released into commercial market channels (for program details see: Martin and Spitze).

Analytical Framework

A multi-year stochastic market simulator, FEEDSIM, was used to analyze the economic effects of selected policy options upon the domestic corn and soybean markets. The methodology used in FEEDSIM has been used to analyze various policy issues (Meekhof, Tyner and Holland; Sharples and Holland; Sharples). Commercial supply and demand determine the annual equilibrium market price (dollars per bushel) and equilbirum quantity (million bushels). Supply is influenced by initial yield and yield growth assumptions, price expectations, and carryin stocks. Demand is influenced by initial domestic utilization and consumption growth assumptions, initial export level and growth assumptions, and carryout stocks.

Government commodity programs influence market supply in the model through Commodity Credit Corporation stock operations, private carryin stock levels, and by altering expected price levels. Commodity programs influence demand through private carryout stocks that are altered by the farmer-owned reserve and CCC activities.

The model stimulates a seven-year period (1979-80 to 1985-86). Crop yields and exports are stochastic variables. The model is iterated to replicate 300 annual random yield and export combinations over the seven-year simulation period. Since FEEDSIM is documented elsewhere (Holland and Meekhof), only

those modifications that are necessary to analyze the program alternatives addressed in this paper are presented.

Model Validation

The yield and acreage response coefficients are based upon estimates using secondary data from 1960-76 and the analyst's judgment (Holland and Meekhof, 1979). The yield growth rates approximate actual annual growth rates for corn and soybean yields experienced in the period 1960-78 (Sharples, 1980, pp. 1-3). Beginning stocks reflect actual stocks on hand at the beginning of the 1979-80 production and marketing year. Therefore, the supply assumptions incorporate actual 1979 inventory and production conditions and yield growth rates that increase at an annual rate of 2.0 percent for corn and 1.6 percent for soybeans.

The demand coefficients are based primarily on data from the period 1960-76. The growth rates for domestic demand reflect actual observed annual growth rates from 1950-78. The growth rates for export demand reflect approximately half the actual annual growth rates observed during the same period. It is hypothesized that actual future growth in exports is not likely to continue at the recent rapid pace. Initial export and domestic stock demands reflect actual 1979 levels. Therefore, the demand assumptions incorporate actual 1979 conditions and annual total demand growth rates of approximately 3 percent for corn and 4.6 percent for soybeans. The underlying market assumption is that demand growth slightly outpaces supply growth.

Policy parameters for the validation run are based on the actual program parameters in effect in 1979 (Table 1). Since the analysis reflects 1979 real prices over the seven-year simulation period, no changes are made in policy parameters from year-to-year to reflect inflation. The model was validated for the 1979-80 production and marketing year. The simulated and actual values for production, utilization, and prices were essentially the same.

Specification of Policy Options

The policy alternatives were chosen to encompass policy options likely to receive attention in the policy process during the 1980's. A base simulation case reflects a continuation of the provisions of the 1977 Act which prevailed in 1979-80. Then, incremental changes are made in the policy parameters to reflect the selected policy alternatives. All other coefficients and parameters remain the same as those used in the base case. Each policy option is simulated over the seven-year period.

Five policy scenarios were simulated (Table 1). The base case represents 1979 target prices and loan rates, no acreage set-aside and a moderate size farmer-owned reserve of 1.0 billion bushels. The alternative policy options are the following:

1. Free Market. The free market option implies the elimination of all government commodity programs contained in the base case. There would be no deficiency payments, no farmer-owned reserve, and no government-owned CCC stocks. All farmer-owned reserve and CCC stocks are sold during the first year of the seven-year simulation period.

2. No Deficiency Payments. This alternative represents the elimination of the target price and deficiency payment approach to supporting farm income. Cochrane (p. 4) has argued that deficiency payments are more likely to alter farm structure than any of the other program provisions contained in the 1977 Act.

3. Low Farmer-Owned Reserve Stocks. Under this alternative, the maximum size of the farmer-owned reserve would be reduced from 1.0 billion bushels to 600 million bushels of corn. In 1979 the actual farmer-owned reserve carryin stocks were 539 million bushels. However, the reserve increased to approximately 900 million bushels of corn during 1979. Under this alternative the price stabilization role of the programs would be slightly diminished.

Table 1. Selected Alternative Policy Scenarios

Simulation	Policy Parameters[a/]						
	Target Price	Loan Rate	FOR Release	FOR Call	CCC Release	FOR Maximum	Program Participation
	$/bu.					mil. bu.	%
Base	2.20	2.10	2.63	3.05	3.15	1000	90
Free Market	0	0	0	0	0	0	0
No Deficiency Payments	0	2.10	2.63	3.05	3.15	1000	90
Low FOR Stocks	2.20	2.10	2.63	3.05	3.15	600	90
No FOR Stocks	2.20	2.10	0	0	3.15	0	90

a/ The national allocation factor is assumed to be 0.9. The annual FOR storage payment is $0.265 per bushel. The CCC interest rate is 12 percent.

Table 2. Simulated Annual Average Government Expenditures and Total Payments to Producers.[a/]

Simulation	Deficiency Payments	FOR Storage Payments	Total Payments to Producers	Net CCC Costs	Total Program Expenditures	Probability of $3 bil. Government Expenditure	Average Annual Value of Total Production[b/]
	million dollars					%	million dollars
Base Case	63.7	86.7	150.4	68.1	218.5	1.8	41,598
Free Market	0.0	10.2	10.2	2.1	12.3	0.0	42,539
No Deficiency Payments	0.0	85.7	85.7	64.0	149.7	0.8	41,671
Low FOR Stocks	82.5	61.5	141.0	96.5	240.4	3.5	41,618
No FOR Stocks	111.7	10.2	121.9	141.8	263.8	5.9	41,826

a/ The empirical results in this table represent the annual average value for 300 iterations over a seven-year period, 1979-80 through 1986-87.

b/ Sum of average annual production times average annual market price for corn and soybeans.

Table 3. Simulated Seven-Year Average Price Levels, Deficiency Payment Rates, and Production.[a/]

Simulation	Corn			Soybeans	
	Average Price	Deficiency Payment	Average Production	Average Price	Average Production
	dol./bu.		bil. bu.	dol./bu.	bil. bu.
Base Case	3.02	.009	7.967	7.90	2.220
Free Market	3.11	0	7.961	8.02	2.218
No Deficiency Payments	3.03	0	7.962	7.90	2.221
Low FOR Stocks	3.02	.011	7.970	7.91	2.219
No FOR Stocks	3.04	.016	7.974	7.93	2.218

a/ These empirical results are based on 300 iterations over a seven-year period, 1979-80 through 1986-87. These data only reflect averages and do not reflect differences in the annual time path of market prices and production.

b/ Does not include storage payment for grain held in the farmer-owned reserve.

Table 4. Simulated Price Variation for Corn and Soybeans.[a/]

Simulation	Standard Deviation[b/] of Price		Coefficient of Price Variation	
	Corn	Soybeans	Corn	Soybeans
	dollar/bushel		percent	
Base Case	.85	2.33	28	30
Free Market	1.07	2.63	35	33
No Deficiency Payment	.85	2.34	28	30
Low FOR Stocks	.86	2.34	28	30
No FOR Stocks	.90	2.39	30	30

a/ The empirical results are based on 300 iterations over a seven-year period, 1979-80 through 1986-87. Actual real price variation data for seasonal average prices indicate coefficients of variation as follows: Corn--22 percent (1960-79) and 28 percent (1970-79); Soybeans--22 percent (1960-79) and 26 percent (1970-79).

b/ Average annual standard deviations excluding effects of price trend over simulation period.

4. No Farmer-Owned Reserve Stocks. This alternative would eliminate the farmer-owned grain reserve during the first year. CCC stock activities would continue, however. Other variables are equivalent to those used in the base case.

Empirical Results of Simulated Policy Options

The simulation results for the five policy options outlined above are analyzed in this section. Several types of information are particularly important to farmers, consumers, and taxpayers. These include: expected program expenditures, payments to producers, and total value of production (Table 2); expected average price levels and production (Table 3); and annual price variation (Table 4).

Continuation of Current Policy

The base case represents a continuation of current policies. Annual expected farmer payments are $150 million. Annual expected program expenditures are $219 million. This compares with the average value of total production at $41,598 million. The estimated probability that annual program expenditures would reach $3 billion is less than 2 percent. The effective mean price of corn is $3.03 per bushel. The standard deviation is $.85 per bushel with an average deviation of 28 percent about the mean price. The mean price for soybeans is $7.90 per bushel. The standard deviation for soybeans is $2.33 per bushel. This represents an average deviation of 30 percent above and below the mean soybean price. The base case results appear to be plausible when compared with historical data on real price levels and annual variation and program expenditures.

Free Market

In comparing the free market alternative to the base case, expected annual producer payments decline from $150 to $10 million and expected annual program expenditures decline by $206 million to $12 million. Government expenditures under the free market alternative are relatively low because they

only include reserve stock storage costs for one-half year since all of the stocks are released in the first year. Deficiency payments are eliminated for the entire simulation period.

The average price levels for corn and soybeans increased in the free market case. The price of soybeans increased 12 cents per bushel to $8.02. The price of corn increased 8 cents per bushel to $3.11. However, the standard deviation and coefficients of variation for both corn and soybean prices were the largest among all the various policy options analyzed.

The empirical results for the free market case in this study are contrary to those in studies conducted during the 1960's (Heady, Moyer and Madsen). Given the excess production capacity in American agriculture following World War II, they found that government intervention increased farm income and prevented lower average commodity prices in the intermediate term. If the growth in demand for corn and soybeans outpaces growth in supply in the 1980's, the effects of the free market option on farm income and average prices would be reversed. There are at least three reasons why one might expect these results to occur. First, government intervention is designed to prevent extremely high prices as well as extremely low prices. Given the current and expected domestic and foreign market trends, relatively tight supplies and thus relatively high real prices are more probable in the next few years. In the absence of government programs in the 1960's, the excess production capacity in American agriculture would have resulted in even lower prices.

Secondly, if the Commodity Credit Corporation stocks or farmer-owned reserves were discontinued, total carryover stocks would be reduced, ceteris paribus. Increases in privately-held stocks would not fully offset the absence of the government reserve programs. This would reduce total supply which is defined as total carryover stocks plus production . Consequently, higher real prices in the later years of the free market simulation period would more than offset the lower prices in the first year when the government managed reserves are released into the market.

Third, the non-linear form of the commercial demand and supply response curves result in a skewed free market price distribution when shocked by normally distributed random deviates for yields and exports. Therefore, when price floors and price ceilings are implemented the average price level declines because the effects of the extremely high prices on the mean price are eliminated (Just, et al., p. 660). The non-linear form is perferred over the linear, because the linear form can result in negative prices which are contrary to observed behavior.

No Deficiency Payments

A comparison of the base case with elimination of deficiency payments indicates that program expenditures and producer payments decline. If the target price is set at the loan rate or below, no deficiency payments are made. As the target price is reduced from $2.20 in the base case to the loan rate of $2.10 or below, expected producer payments decline by $65 million to $86 million and program expenditures decline by $69 million to $150 million.

The average effective price levels do not change significantly, however. This occurs because the reduced carryover stocks result in less total commercial supply, ceteris paribus, and thus slightly stronger market prices. Therefore, the reduction in deficiency payments is offset by increases in market prices over the period, resulting in little change in effective price levels or price variation.

Farmer-Owned Reserve Stock Alternatives

A comparison of the base case with the two farmer-owned reserve alternatives indicates that expected producer payments decline as the farmer-owned reserve maximum declines. However, total program expenditures actually increase as the reserve maximum declines. This is due to increased deficiency

payments and increased CCC costs. For example, the elimination of the farmer-owned reserve reduces total producer payments by $29 million. However, total expenditures actually increase $45 million due to the increased net CCC costs. These results reflect the interest costs and higher storage costs per bushel that are associated with CCC operations as CCC reserves are substituted for farmer-owned reserve stocks. If the maximum farmer-owned reserve is reduced from 1 billion to 600 million bushels, the direction of the results is similar to the reserve elimination case but the magnitude is less.

The expected price levels do not change significantly except when the farmer-owned reserve is removed. In this case the average price for soybeans and the effective price for corn both increase by $0.03 per bushel compared to the base case. The coefficients of variation remain essentially the same for all farmer-owned reserve alternatives with the exception of a slight increase in the reserve elimination alternative.

Summary and Conclusions

The results of this study indicate that less government intervention in corn and soybean markets has mixed impacts on expected annual Treasury expenditures and price levels and variation. Less government intervention generally increases average effective price levels under the assumed market conditions for the period 1979-80 to 1985-86. Elimination of deficiency payments has little effect upon seven-year average corn and soybean price levels or price variation but reduces average annual Treasury expenditures by $69 million. Elimination of the farmer-owned reserve slightly increases price variation and seven-year average price levels, but CCC operations continue and result in increased Treasury expenditures of $45 million annually. The free market alternative results in increased annual price variation, reduced Treasury expenditures, and higher average prices for corn and soybeans relative to continuation of the current policies embodied in the Food and Agriculture Act of 1977.

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