Price Supports

ADJUSTING PRICE SUPPORTS:

COMPARISON OF ALTERNATIVE METHODS

by

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Price supports have been at the heart of agricultural policy for many years. In this year's debate over a farm bill the level of price supports and the method of adjusting price supports were central issues. What standard should be used for setting equitable supports? "Parity" was the standard of the past. "Cost of Production" is the favorite this year. What will be the next standard?

In this paper five methods of adjusting price supports are discussed. After a brief description of each, they are compared using several economic and pragmatic criteria.

Description of Methods

Parity: For over 30 years parity has been used to adjust price supports. Though more popular prior to the 1970's, parity still appears in recent legislation. The Agricultural Act of 1970 specified that the milk price support would be between 75 and 90 percent of parity. The Agriculture and Consumer Protection Act of 1973 set the loan rate for wheat for the next four years between $1.37 and the parity price. The Corn loan rate was set between $1.10 and 90 percent of parity.

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A parity price is a price per unit sold that generates the same purchasing power as in the 1910-1914 base period. For a recent discussion of parity see Holland.

Cost of Production (COP): During the 1977 farm policy debate, average cost of production was the most popular candidate for indexing price supports. For example, the Senate version of the 1977 farm bill (S. 275) set minimum loan rates at 85 percent of the total cost of production and target prices at 100 percent of the cost of production. Average cost of production would be updated annually. It would be the average of all costs of production including overhead, management, and a composite land charge based upon rents and average acquisition value. A normal yield would be based upon the most recent 5-year average of actual yields.

Strengths, weaknesses and a general discussion of using cost of production for adjusting loan rates and target prices are found in Sharples and Krenz, Schuh, and Ericksen.

Prices Paid Index Adjusted for Yield Changes (PPI/Y): This method of price support adjustment was introduced in the 1973 Act. Target prices for wheat, corn, grain sorghum, barley (if designated by the Secretary as eligible), and cotton were specified for 1974 and 1975 in the Act. They were to be adjusted in 1976 and 1977 to reflect changes in the index of prices paid by farmers for production items, interest, taxes and wage rates; and changes in average yield.

The Rice Production Act of 1975 and the Senate version of the 1977 farm bill specified adjustment of both rice loan rates and target prices for changes in PPI/Y.

The adjustment factor for a specific year, t, is computed as the fraction increase (in t-1 relative to t-2) in the Index of Prices Paid for production items, interest, taxes and wage rates, minus the fraction increase (in t-1 relative to t-2) in the 3-year moving average of yield. For an explanation of how this adjustment is computed and used, see Penn and Brown (page 71).

Historical Price Trends: Price supports also could be linked to a moving average of historical prices. The 1973 Act set the cotton loan rate at 90 percent of the average world price the three previous years. In H.R. 33, introduced January 4, 1977 by Representative Smith of Iowa, the loan on feed grains was set between 80 and 90 percent of the average of feed grain prices the previous three years.

Base prices in Canadian stabilization programs are the average of market prices the five previous years.

Discretionary Authority: The previous four methods of adjustment involve computing an adjustor using a specified formula and specific data. The Secretary of Agriculture can be given discretionary authority to modify the loan rate. For example, he may be given authority to set the loan rate within specified bounds (e.g., the loan rates for corn and wheat as specified in the 1973 Act), or "as the Secretary determines appropriate, but not less than 85 percentum of the cost of production"

(S. 275 for wheat and feed grains). The Secretary can use discretionary authority to react to the current economic and political conditions--conditions that cannot be built into a formula, but conditions that lawmakers know arise and are willing to let the Secretary consider.

Conceptual Model

In the following discussion, only the nonrecourse loan rate is discussed to simplify the presentation. The same concepts apply with only minor modification for target prices.

In order to evaluate alternative loan rate adjustment mechanisms, the objective of the loan must be specified. Participants in the farm policy process likely perceive several objectives--to provide orderly marketing within the crop year, to provide working capital, to provide equitable income, to protect farmers from unusual price drops. The last objective is assumed to be paramount and is modeled in the following paragraphs.

Assume a simple market exists over time for a specified commodity such that there are no structural changes, no changes in stock levels and no changes in prices of all other goods. There are, however, random shocks in supply and demand caused by acts of nature domestically (supply) and abroad (demand for U.S. exports). For one period in time or for many years the distribution of price, f(P), of the given commodity could look like that shown in figure 1.

In this context a loan rate, L in figure 1, would be used to protect producers from the unusually low market prices in the tail of

the distribution. The loan rate always would be below $\bar{P}$, the "equilibrium" or "trend" price, but because of random shocks to the market the market price would dip periodically below L. The nonrecourse nature of the loan truncates the distribution at L. A very low loan rate provides no price protection to producers. A very high loan rate provides considerable price protection but distorts resource allocation by stimulating production and discouraging demand. In this case the market clears only because of government loan takeover. Graphically, as the loan rate, L, moves toward $\bar{P}$ in figure 1, producers' price protection increases, but so does the possibility of greater market distortion and greater Treasury costs. During the 1960's L equaled or exceeded $\bar{P}$ most years.

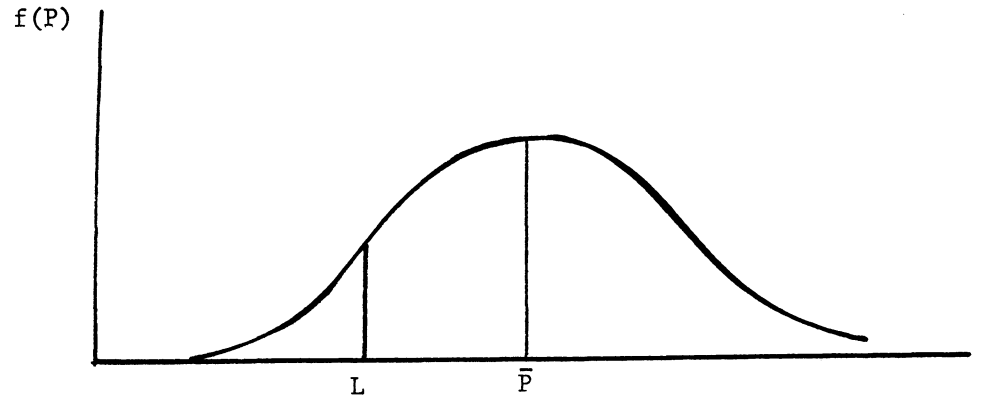

Figure 1.

Conceptually, a socially optimal loan rate exists that equates the marginal social gain from price protection with the marginal social loss from resource misallocation. The challenge in the legislative process is (1) to identify that optimal loan rate in the context of the then current market conditions, and (2) to devise a method for adjusting

the loan rate over time as market conditions change, so that it continues to perform the original intent of Congress. Within the context of this simple model, the second challenge is irrelevant because market conditions are assumed not to change.

In the real world, however, the problem is more complicated. Because of supply and demand shifters such as changes in population, income, technology, prices of other goods, etc., the distribution, f(P) shifts over time. Thus, the problem is to identify an adjustment procedure that will shift L each year to maintain the same relationship to f(P). This is a tall order. The price distribution shown in figure 1 at best can be only roughly approximated for a specified period of time. Regardless, a procedure for adjusting the loan must still be specified.

The market--the interaction of forces effecting supply and demand--determines how the distribution in figure 1 will shift over time. Ideally, the adjustment mechanism should be sensitive to changes affecting both supply and demand. This criteria is used here to evaluate the five methods for adjusting loan rates. For convenience, changes in supply are divided into (1) changes in productivity, and (2) changes in prices of inputs. An "X" in the chart below indicates some sensitivity in the specified adjustment mechanism to the particular supply or demand factor.

Method of adjustment	Adjustment for changes in: Supply: Productivity	Supply: Cost of inputs	Demand
1. Parity		X	
2. PPI adjusted by change in yield (PPI/Y)	X	X	
3. Cost of production (COP)	X	X	
4. Historical price trends	X	X	X
5. Discretionary authority	X	X	X

Parity includes indices of prices paid and prices received for all items purchased and sold by farmers, not just those prices relating to the production and sale of the commodity in question. Parity was designed to measure the purchasing power of one unit of production, so the correlation between parity and the ideal adjustment mechanism could be very weak.

Recent substitutes for parity, PPI/Y and COP, more accurately reflect production costs, but these also ignore changes in demand for the product. This could lead to eventual escalation of the loan rate above the normal price, $\bar{P}$, in figure 1 chronically stimulating production and inhibiting domestic and export sales.

Historical price trends reflect recent changes on both the supply and demand side of the market. To the extent that recent trends reflect near-future trends, this method of price support adjustment should be capable of approximating the optimal adjustment presented in the conceptual model. But projected trends cause problems when price movements over time are cyclical.

Discretionary authority can be used to respond to all market (and nonmarket) forces. Herein lies both the strength and the weakness of this procedure. More will be said on this subject in the following paragraphs.

Other Criteria

"Objectivity" of the adjustment

A more pragmatic desirable characteristic of loan rate adjustment is that it should not by itself be a source of uncertainty in the market. If market participants can accurately anticipate the level of the loan rate, they can plan and use resources more efficiently. Those adjustment methods that are most "objective" (i.e., calculated using a formula and data that are in the public domain) generate the least uncertainty.

Placed on this objective scale, parity, price trends and PPI/Y rank highest followed by COP, with discretionary authority being least objective and most difficult for market participants to anticipate.

Measurement problems

The indices used to compute parity and PPI/Y are not commodity specific. The impact of a major increase in the price of agricultural chemicals, for example, would have the same impact on cotton (heavy chemical user) and soybeans (light chemical user), if both crops' loan rates were adjusted with the same formula.

Cost of production, though enterprise specific, is complicated and expensive to measure. Many official definitions must be specified--Whose cost? Which land charge? What costs to include? Imputed values

must be assigned to those inputs having no market-determined value. Also, overhead costs must be allocated among enterprises. Periodically a major, expensive survey of producers would be needed to update the cost figures.

Basing the loan rate on cost of production brings up the familiar problem of a loan rate-cost of production spiral.

Application of Adjustment Methods 1970-1977

In order to demonstrate how the various adjustment methods perform, they are applied to the 1970/71 - 1977/78 crop years. Market prices for grains these years dramatically increased, then tapered off. Corn is used as an example. The level of the loan rate was a relevant consideration for the 1971/72 crop year when the season average corn price dropped to $1.08. Other years until recently the market price was substantially higher than the actual or any proposed loan rate.

Five formulae are used to adjust the corn loan rate over the eight years. Each formula is specified to obtain a loan rate of $1.05 per bushel of corn in 1970/71. That specification is then applied to each of the following years. Results, compared with actual corn prices are shown in table 1. In the last two formulae the cost of production is for corn grown in Central Illinois--one of the lowest cost corn growing areas in the country--because comparable data are not available over the eight years for the U.S. The U.S. average would be strongly correlated, however, though higher.

Three methods of adjusting the loan rate (PPI/Y, 59 percent of parity and 133 percent of COP-land) all yield a 1977 loan of slightly over $2.00. Their time paths differ, however. The PPI/Y adjuster did

Table 1. The national season-average corn price, and five methods of indexing the corn loan rate, 1970-1977.

Year	Season average corn price	The corn loan rate indexed by:[1]				
		PPI/Y adjusted[2]	59% of parity[3]	93% of 4 yr. average[4]	102% of full COP[5]	133% of COP-land[6]
		Dollars per bushel				
1970/71	1.33	1.05	1.05	1.05	1.05	1.05
1971/72	1.08	1.13	1.10	1.07	1.07	1.06
1972/73	1.57	1.18	1.18	1.08	1.21	1.22
1973/74	2.55	1.18	1.37	1.19	1.34	1.30
1974/75	3.03	1.19	1.60	1.51	1.71	1.63
1975/76	2.54	1.59	1.82	1.91	1.95	1.83
1976/77	2.20[7]	1.91	1.92	2.25	2.16	1.97
1977/78	--	2.06	--	2.41	2.41	2.01

[1] Each index is specifically set to define a corn loan rate of $1.05 per bushel in 1970.

[2] Uses formula as stated in the 1973 Act for adjusting target prices except that feed and feeder livestock prices are removed from the index. They constitute one-third of the unadjusted index. Policy analysts point out that these items are inappropriate in an index used to adjust crop price supports.

[3] Parity as of September of the specified crop year.

[4] Simple average of season average corn price the four years prior to the specified crop year.

[5] Time series on U.S. average cost of production does not exist prior to 1974. As a substitute, costs were obtained for Central Illinois grain farms using data from Illinois Farm Business Farm Management records. Costs per acre were divided by a trend yield to compute cost per bushel. Average U.S. cost per bushel would be higher but highly correlated.

[6] Same procedure as in footnote 5 except the land charge is removed.

[7] Estimated.

not show a major increase until 1975/76. Costs increased throughout the period but average yields decreased the last three years, further boosting the adjustment factor.

Loan rates based on the 4-year average price lag behind the price rise and, though not shown, also lag on the high side as the market price falls. The corn loan in 1977/78 of $2.41 would be considered unacceptably high by most policy analysts. A 3-year average would be more sensitive to short-run price fluctuations. On the other hand, a 5-year average would flatten out the fluctuations but be insensitive to rapid structural change in the market.

The full cost-of-production formula escalates loan rates rapidly with the land charge causing major increases in the last three years. With the land charge removed (the last column in table 1), the loan rate increases less.

Two conclusions can be drawn from table 1. First, any of the methods of adjusting loan rates can be used to obtain (or justify) a specified loan rate at a given point in time. This was done in the 1970/71 example in table 1. Similarly it can be done for the base year in new legislation. Second, the method of adjustment makes a difference, but it is not obvious that one is any better than any other. A corn loan rate pegged to full cost-of-production, or a 4-year moving average back in 1970, for example, would have led to a politically unacceptable loan rate in 1977.

Conclusions

I assume the primary objective of the loan rate adjustor is to keep the loan rate in a specified relationship with a "normal" market price over time, i.e., to cushion farmers from unusually low temporary price shocks. The problem is that the "normal" price is unknown. A proxy that is highly correlated with the normal price is needed to adjust loan rates over time. Five familiar adjustment mechanisms are examined within this context. Each of the five fall short of the ideal proxy, but some fall shorter than others.

Parity is based upon welfare criteria from a past era. It has little market orientation. PPI/Y and cost-of-production only measure variables on the supply side of the market. Structural changes on the demand side could cause these adjustors to get loan rates out of line with market price trends.

An adjustment formula based upon historical price trends reflects changes in both supply and demand conditions, but it cannot differentiate in the short-run between random deviations from trend and rapid structural change.

Because of these problems with formulae, a practical strategy is to use one of the above (I prefer historical price trends because of simplicity and being tied to actual prices) in combination with discretionary authority of the Secretary. Though adding to market uncertainty, discretionary authority could "bail out" the farm programs when the formula led to an unacceptable market distortion.

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