

## Estimating Counter-Cyclical Repayment Frequencies and Repayment Rates

Repaying counter-cyclical payments can cause cash-flow problems for producers, especially if the counter-cyclical payment instrument is not used to protect crop price. Central to the decision concerning the use of an advance counter-cyclical payment is its expected repayment probability and repayment rate.

We estimated expected repayment probabilities and expected repayment rates for the advance payments offered for the 2002, 2003, and 2004 marketing years using the option pricing procedure discussed in appendix B.<sup>12</sup> Data for making our estimated repayment probabilities and rates included the WASDE marketing-year average price forecasts for the 2002, 2003, and 2004 marketing years, the historical variability of WASDE marketing-year average price forecasts, and the effective target prices and national loan rates. We omitted peanuts and upland cotton from this part of our analysis because these two commodities do not have a history of WASDE forecast errors.

The large range of estimated repayment probabilities draws attention to the need for producers to be aware of their current situation regarding repayment probabilities (table 4). We estimated that the probabilities of repaying the entire advance payment were less than ½ percent for rice in both October and February in the 2002 marketing year and for corn and sorghum in February of the 2004 marketing year. The corresponding estimated repayment rates were small relative to the advance payments.<sup>13</sup> For example, for corn in February of the 2004 marketing year, the total advance payment was \$0.28 (\$0.14 + \$0.14) per bushel and the estimated repayment rate was \$-0.0023 per bushel.

At the other extreme, the probability estimate of repaying the entire advance payment for sorghum in February for the 2003 marketing year was 99 percent. We estimated that nearly all the corn advance in February of the 2003 marketing year would be repaid. The estimated probability of repaying all or part of the advance payment for corn was 98 percent (91 percent plus 7 percent).

We further compared the estimates in table 4 to understand the influences of WASDE price forecasts, forecast variability, effective target prices, and national loan rates on repayment probabilities and rates. The large variation in estimated repayment probabilities and rates provides an opportunity to sort out the influences of these variables. Understanding the influences of these variables, in turn, enables us to understand why there is such a large range in estimated repayment probabilities.

Estimated corn repayment probabilities and rates vary considerably between the 2003 and 2004 marketing years in February due to the higher WASDE February corn price forecast for the 2003 marketing year. The February corn price forecast for the 2003 marketing year was 13 cents per bushel above the effective target price while the corresponding forecast for 2004 was 40 cents

<sup>12</sup>We simulated marketing-year price outcomes and corresponding counter-cyclical payment rate outcomes given a USDA-WASDE marketing-year average price forecast and the advance payment rate based on the price forecast. Then we tabulated the repayment frequency and calculated the average repayment rate from the simulated payment rate outcomes and the advance payment rate. The tabulated frequencies are our repayment probability estimates.

<sup>13</sup>USDA, FSA reports counter-cyclical payment rates to four decimal places.

Table 4

**Estimated repayment probabilities and rates, for advance counter-cyclical payments made in the 2002, 2003, and 2004 marketing years**

Commodity	Marketing-year average price <sup>1</sup>			Counter-cyclical payment rates <sup>1</sup>			Probability of total repayment, %		Probability of partial repayment, %		Expected repayment rate <sup>1,3</sup>	
	October (forecast)	February (forecast)	Final (actual)	October advance payment	February advance payment	Final payment <sup>2</sup>	October	February	October	February	October	February
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
2002												
Rice	4.10	3.80	4.49	0.5775	0.5775	0.4950	<1/2	<1/2	<1/2	<1/2	<-0.0005	<-0.0005
2003												
Corn	2.10	2.45	2.42	0.0770	0	-0.0770	10	91	10	7	-0.0109	-0.0737
Sorghum	2.15	2.45	2.39	0.0140	0	-0.0140	39	99	3	<1/2	-0.0058	-0.0138
Rice	6.35	7.25	8.08	0.5775	0.0525	-0.5600	2	4	5	24	-0.0195	-0.0880
Wheat	3.25	3.35	3.40	0.0315	0	-0.0315	24	56	8	17	-0.0087	-0.0203
2004												
Corn	1.95	1.95	2.06	0.1400	0.1400	0.0100	1	<1/2	4	6	-0.0035	-0.0023
Oats	1.40	1.40	1.48	0.0056	0.0056	-0.0112	43	34	2	11	-0.0024	-0.0045
Sorghum	1.90	1.70	1.79	0.0945	0.0945	0.0810	2	<1/2	5	<1/2	-0.0041	<-0.0005
Soybeans	5.10	5.10	5.74	0.0910	0.0910	-0.1820	25	10	7	24	-0.0261	-0.0378
Rice	7.25	7.40	7.33	0.3150	0.2100	0.2950	15	8	9	24	-0.0608	-0.0946
Wheat	3.30	3.375	3.40	0.0350	0	-0.0350	22	35	8	20	-0.0091	-0.0159

<sup>1</sup> Prices and payment rates are in \$/cwt for rice and \$/bu for other commodities.

<sup>2</sup> Negative final payment indicates repayment to government.

<sup>3</sup> Calculated as difference between expected counter-cyclical payment rate (taking account of forecast variability) and advance payments received to date.

Source: Prepared by USDA, Economic Research Service using USDA, Farm Service Agency reported advance payments and WASDE forecast errors.

per bushel below the effective target price. The estimated repayment rate of \$-0.0737 per bushel in February for the 2003 marketing year is just slightly below the entire advance October payment of \$0.0777 per bushel. Our corresponding estimated repayment rate for the 2004 marketing year is \$-0.0023 per bushel, although the total advance payment in February is much larger—\$0.28 (\$0.14 + \$ 0.14) per bushel versus \$0.077 per bushel. The estimated total repayment probability in February for the 2004 marketing year was less than ½ percent while that for the 2003 marketing year was 91 percent. The repayment probability and rate estimates for corn in the 2003 and 2004 marketing years emphasizes the need to consider the influence of the level of the price forecast relative to the effective target price.

The variation in the sorghum repayment probability and rate estimates for the 2003 and 2004 marketing years mirrors those for corn and reinforces the need to consider the influence of the WASDE price forecast level relative to the effective target price. The large sorghum WASDE price forecast in February relative to the effective target price for the 2003 marketing year had the same effect as that for corn. The estimated repayment rate in February of the 2003 marketing year was essentially equal to advance payment. The estimated repayment probability was 99 percent. The esti-

mated sorghum repayment probability was less than ½ percent in February of the 2004 marketing year. The estimated repayment rate is less than \$0.0005 per bushel, an extremely small amount compared with the advance payment rate of \$0.1890 (0.0945 + 0.0945) per bushel.

Estimated rice total repayment probabilities were low for the 2002 and 2003 marketing years. For the 2002 marketing year, estimated total repayment probabilities in October and in February were less than ½ percent. For the 2003 marketing year, the corresponding estimates were 2 and 4 percent. Yet \$0.56 per cwt of \$0.63 (\$0.5775 + \$0.0525) per cwt advance payment rate in the 2003 marketing year had to be repaid.<sup>14</sup> This example points out that unexpected outcomes do occur and that maximum losses from counter-cyclical payments need to be considered in addition to estimated repayment probabilities and rates.

Our probability estimates for rice in February of the 2003 marketing year do indicate a significant chance of repayment. We estimated a 29-percent (4 +24) probability that all or some of the advance would have to be repaid. The expected repayment rate is \$-0.0880 per bushel. These estimates could raise concerns about the need for repayment.

For February of the 2004 marketing year, we estimated total and partial rice repayment probabilities of 8 and 24 percent and an expected repayment rate of \$0.09 per cwt. However, no repayment was required.

Soybeans in the 2004 marketing year provide the other example of a large counter-cyclical repayment rate. However, the large repayment rate for soybeans was not as unexpected as it was for rice in the 2003 marketing year. For October, we estimated that there was a 25-percent repayment probability that the entire 2004 advance payment would have to be repaid. The probability of repaying the entire advance decreased to 10 percent in February even though the total advance in February was two times as large as the total advance in October. Both the October and February WASDE forecasts were \$5.10 per bushel. The estimated February repayment rate was lower because the variability of the WASDE marketing-year average price forecast was lower for February than for October. The unexpected total soybean counter-cyclical repayment, especially as viewed from February, again points out the need to consider maximum possible repayment. The soybean example also points out the need to consider differences in the variability of the WASDE marketing-year average price forecasts between October and February.

Oats in the 2004 marketing year had small advance payment rates and large estimated repayment probabilities because the WASDE price forecast of \$1.40 per bushel was just below the effective target price of \$1.416 per bushel. The estimated total repayment probability in October was 43 percent. The entire advance payment had to be repaid. This example draws attention to large repayment probabilities that are associated with small advance payments. The WASDE marketing-year price forecast in this situation was just slightly below the effective target price, implying that that the marketing-year average outcome would be above the target price about as frequently as it would be below it.

<sup>14</sup>On a per bushel basis, the rice repayment rate is \$0.32 per bushel.

Wheat in October of the 2003 and 2004 marketing years had nearly equal advance payments because the WASDE wheat price forecasts were \$0.09 and \$0.10 per bushel below the effective target prices, respectively. As would be expected, the estimated repayment probabilities are slightly larger in October of the 2003 marketing year. The estimated repayment rate is slightly larger for October of the 2004 marketing year because of the slightly larger advance payment rate. The estimated total repayment probability was higher in February of the 2003 marketing year because the WASDE wheat price forecast was \$0.01 per bushel higher than the effective support price while the price forecast in February of the 2004 marketing year was \$0.025 lower.