Managing Risk by Coordinating Investment, Marketing, and Production Strategies: Reply

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Perry correctly states that the distribution of a gross revenue variable differs from an additive distribution of price and yield variables. However, our analysis did not error by treating them as being the same.

One of the key goals of the model was to allow disposal of produced crops through cattle feeding or a variety of marketing programs; practices Iowa farmers follow or might want to follow. Linear programming studies typically use transfer equations to eliminate the need to enter production coefficients in every disposal activity. This is an efficient practice that reduces matrix density and processing costs. Such techniques become even more important in quadratic programming (QP), particularly if the code requires the entire matrix to load into memory (as the Rand QP code does).

This technique causes an inconsistency when applied to QP—production activities have variable output, while disposal activities use fixed amounts. Either this inconsistency has to be eliminated or all disposal activities have to be converted into gross revenue activities. However, the latter solution would eliminate using produced crops to feed cattle, an unrealistic choice for an Iowa farmer.

Instead, the study removed yield variability by adjusting production costs to reflect the purchase or sale of enough output to keep that available for transfer equal to expected output. This increased production cost variability to compensate for the removal of yield variability. So production activities are independent of marketing activities and our analysis is theoretically correct.

The following steps were used:

1. Determine historical costs of production.
2. Determine how much historical yields differed from expected yields.
3. Value the difference between actual and expected yields at actual prices.

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Table 1. Cost of Growing an Acre of Corn Adjusted for Yield Variability

	Cost Index (1)	Actual Cost (2)	Actual Yield (3)	Expected Yield (4)	Yield Difference (5)	Price (6)	Cost Difference (7)	Adjusted Cost (8)	Cost in Johnson (9)
1965	96	38.08	73.5	86.8	13.3	.93	12.37	50.45	50.16
1966	100	39.66	91.6	88.6	−3.0	1.13	−3.39	36.27	36.20
1967	100	39.66	80.2	90.4	10.2	.90	9.18	48.84	48.78
1968	100	39.66	98.2	92.2	−6.0	.82	−4.92	34.74	34.62
1969	104	41.25	111.9	94.0	−17.9	.93	−16.65	24.60	24.56
1970	108	42.84	86.7	95.8	9.1	1.16	10.56	53.39	55.38
1971	113	44.82	105.0	97.6	−7.4	.82	−6.07	38.75	37.90
1972	121	47.99	118.0	99.4	−18.6	1.02	−18.97	29.02	28.94
1973	146	57.91	113.3	101.2	−12.1	2.08	−25.17	32.74	32.68
1974	166	65.84	76.0	103.0	27.0	3.51	94.77	160.61	160.46
1975	182	72.19	100.9	104.8	3.9	2.51	9.79	81.98	81.82
1976	193	76.55	90.6	106.6	16.0	2.21	35.36	111.91	111.82
1977	200	79.33	120.9	108.4	−12.5	1.63	−20.38	58.95	58.90
Means		52.75						58.64	58.63
Variances		241.14						1,512.06	1,511.72

Note: (8) equals (2) plus (7); (7) equals (5) times (6). Actual yield for 1969 was incorrectly shown as 11.9 in Johnson.

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4. Adjust the costs in (1) by the results in (3). If actual yields were below expected, production costs were increased to reflect the purchase of output needed to bring production up to expectations. The reverse occurred if actual yields were above expectations.

This may seem a tortuous route, but it probably reflects what a cattle feeder would do. If produced crops were inadequate for feeding requirements, he would purchase needed amounts. Likewise, he would sell surpluses.

Again, some such procedure was needed to accommodate feeding grown crops; production was variable, but cattle feeding requirements were considered fixed.

Perry mentions that he could not duplicate cost calculations (given in Johnson, p. 286). To help clarify that, calculations are shown in the attached table 1, based only on data reported in Johnson. The first column shows the cost index used to adjust a 1978 cost to prior year costs (second column). The third and fourth columns are the actual and expected yields. The difference is multiplied by the price to get a cost adjustment (seventh column). That is added to the actual production cost (column 2) to get a cost figure adjusted for yield variability (column 8). The figures computed from data reported in Johnson are close to those reported in that study. One difference is that the original data were computed using unrounded data.

As an indication of the impact of adjusting costs for yield variability, means and variances are shown at the bottom of the table for the various production costs. One important observation is that the adjustment for yield variability significantly increases the variance relative to that for original production costs (1,512 vs. 241). Means are higher as well. Johnson also states that the adjustment for yield variability increased expected values for production costs.

Again, we believe the study recognized the problem Perry mentioned and developed a procedure that compensated for it. Consequently, study results are not invalidated by incorrect variance specifications. The analysis did not treat yield and price variances as additive; yield variability was removed by increasing the variability of production costs. Prices and costs were then independent and could be treated as additive.

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References

Johnson, Donald Allan. *Investment, Production, and Marketing Strategies for an Iowa Farmer-Cattle Feeder in a Risky Environment.* Ph.D. thesis, Iowa State University, 1979.

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