Post-Optimal Calculations of Performance Variables

Because the value of the model's objective function is confounded by the presence of calibration constraint values, it is necessary to post-optimally calculate several model performance measures. These post-optimal calculations are in a page labeled INCOMES of the Excel spreadsheet model. This section of this bulletin describes the calculation of farm income measures, Government budgetary expenditures, consumer and producer surpluses, and commodity cash incomes, expenses, and margins.

Net Farm Income and Net Cash Flow

Shortrun net farm income is calculated as the sum of:

+ Commodity cash receipts from domestic and export markets;

+ Government payments (direct and counter-cyclical payments, loan deficiency payments, conservation reserve and wetlands reserve payments, and crop insurance indemnities);

+ Farm-related income;

- Variable input purchases (hired labor, seed and genetics, specialized technologies, fertilizer, chemicals, and fuel, lube, and electricity, and miscellaneous variable inputs);

- Rent paid;

- Crop insurance premiums;

- Interest paid;

- Cash overhead expenditures;

- Other fixed cash expenditures; and

- Storage-related costs (hired labor, variable inputs, technology, capital costs, and fixed cash expenditures).

Note:

• The dollar value of operator and family labor is not an expense in net farm income but is a resource endowment that can be allocated among activities.

• Longrun net farm income includes all of the above items and adds in the value of perquisites and subtracts out capital replacement costs.

• Shortrun net cash flow includes all of shortrun net farm income plus off-farm income and subtracts principal paid and family living expenses.

• Longrun net cash flow adds in the value of perquisites and subtracts out capital replacement costs.

Government Budgetary Exposure

Government budgetary exposure is also calculated in the INCOMES page of the Excel spreadsheet. The parameter values of Government programs are shown in table 4 but may be changed if policy provisions or parameters change. The INCOMES spreadsheet shows the calculated values of major Government programs—direct payments, counter-cyclical payments, loan deficiency payments, conservation reserve payments, and crop insurance subsidies.

Direct payments and counter-cyclical payments are decoupled from current production by individual farmers. Counter-cyclical payments depend on average market prices, which in turn depend on aggregate production of the covered commodities; thus they are semicoupled. Since both are disbursed irrespective of whether the recipient grows the covered crop, they do not alter the effective market prices perceived by producers and have the same effect as lump-sum payments to producers and/or nonoperator landlords.

Loan deficiency payments and marketing loan gains, on the other hand, are paid on all production of actual producers of the covered commodity. They are fully coupled to individual production and stimulate additional supply because they raise the effective prices perceived by the producers.

Conservation reserve and wetlands reserve payments essentially rent the land in question on a long-term basis, and remove it from production. Thus, these programs have a supply control component that enhances their effects on farm income by restricting supply.

Crop insurance subsidies act in the opposite way—they stimulate additional production by underwriting some of the costs of production and possibly paying out indemnities in excess of premiums collected.

Consumer and Producer Surpluses

Changes in consumer surplus, also calculated in the INCOMES spreadsheet, correctly measure the consumer welfare implications of changes in supply or demand because they vary directly with consumer preferences—increasing with either increases in quantity or decreases in price. Consumer expenditures, in contrast, are not a reliable measure of consumer welfare, because consumer expenditures may or may not reflect changes in welfare, depending on whether consumer demand is elastic or inelastic. With an inelastic demand, a change in quantity results in a larger change in prices in the opposite direction, thereby causing the change in expenditures to be opposite in direction to the change in consumer welfare. With an elastic demand, a change in quantity has only a small opposite effect on price; thus consumer expenditures have the same sign as consumer welfare changes but are smaller by the price effect. In the INCOMES page, the model separately calculates and sums consumer surplus for each commodity in domestic markets and in export markets using the formula:

$$CS = \tfrac{1}{2} \, (Intercept - Price) * Quantity. \qquad (15)$$

This model does **not** calculate changes in producer surplus by commodity to correspond with the consumer surplus. The reason for this is that changes in producer surplus for a single commodity do not conceptually represent the producer welfare implications of a change in production if Government transfer payments coupled to production or price levels are present. In the EDMP model, the loan deficiency payment program, the CRP, and crop insurance subsidies are all coupled to production levels, and the counter-cyclical payments are coupled to price levels. For more defensible and infor-mative measures of changes in producer welfare by commodity, we suggest commodity cash incomes, expenses, and margins, as calculated below.

Commodity Cash Incomes, Expenses, and Margins

Cash incomes, expenses, and margins by commodity are included in the INCOMES spreadsheet. These measures accurately track the shortrun net farm income implications of changes in the model solutions. For crop commodities, the formulas are:

> Accrued cash market income = Acreage * Yield * Domestic market price, (16)

> Commodity cash expenses = Acreage * Variable cash costs per acre, and (17)

> Net cash market income = Accrued cash market income – Commodity cash expenses. (18)

For livestock commodities, "production" is substituted for "acreage times yield."

These measures reveal important producer welfare information for each commodity. For example, rice, oats, and cotton all have negative net cash market incomes, indicating that their variable production costs exceed their market revenues, with Government transfer payments making up all of their net cash margins. There is an incentive for production of these commodi-ties to decline if decoupled payments are used to effect the Government transfer payments because producers can avoid the cash income losses from production and still receive the decoupled payments. However, if coupled payments, such as the loan deficiency payment program, are used to effect the Government transfer payments, then there is no incentive for farmers to reduce production. Additional commodities that have very high ratios of cash expenses to cash incomes include barley, grain sorghum, sugar (beets and cane), and peanuts, all of which have high levels of Government income supports, which distort their cost structures relative to their market prices.

Livestock commodities have uniformly high costs and low margins because the internal transfer prices of the farm-produced grains and forages they consume are calculated at their opportunity costs (market prices) instead of their variable production costs. Using opportunity costs as the internal transfer prices is conceptually correct, but it causes the production costs of farm-produced feeds to be over-estimated and livestock margins to be correspondingly under-estimated. Both independent and contract turkeys

display negative net cash incomes. That result is probably not true in actual production, however, because these industries are highly industrialized and exercise strict cost control at all stages. These activities and results should be re-examined in later improvements to the EDMP model. The results may be due to errors in specification of the production budgets for these activities or errors in the distribution of market receipts between independent and contract producers.