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Documentation for the Animal Product Branch's Cost Benefit Calculation Model for red meat and poulty,

by

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Documentation for the Animal Product Branch's Cost-Benefit Calculation Model for Red Meat and Poultry

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Abstract

This serves as a manual for COSTBEN, a spreadsheet model designed to forecast the effects of supply and demand shifts on livestock, meat, and poultry markets. COSTBEN is not a stand-alone model. It requires a pre-existing baseline forecast of production, trade, consumption and prices.

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What It is Good for and Why You Should Get a Copy

The Cost/Benefit calculation model (COSTBEN) provides quick turn-around analysis of policy changes and other shocks to a single species' livestock and meat market. It supplements, but is not intended as a substitute for, complete, multi-species models. It is contained within a Lotus 1-2-3 file (Windows versions 4.0 or higher) called "COSTBEN.WK4." COSTBEN is a small model and easily fits on a 3.5-inch floppy disk. You may receive your own copy of the COSTBEN file. Contact the Animal Products Branch of ERS for details.

COSTBEN is not a stand-alone model. To run COSTBEN, you need a set of forecasts (or baseline projections) of future prices, production, and trade of a livestock species and its meat. When the forecasts are put into the worksheet, the spreadsheet builds a model that predicts the effects of supply and demand shocks. COSTBEN is flexible enough to use any institution's baseline forecasts. The model that COSTBEN builds will reproduce the baseline it is given if there are no shocks to the system. The COSTBEN model is consistent with the baseline because it uses the baseline itself to build the model.

Because COSTBEN runs in a spreadsheet, one need not be familiar with econometrics programs in order to use it. One need only know the basics of using Lotus 1-2-3 for Windows. The workbook file was developed using version 4.0, but can be used in version 5 as well.

What's in COSTBEN

COSTBEN is quick and easy to use because it has a simple structure. COSTBEN deals with only one "species" and its meat. Also, COSTBEN solves for only 10 variables: livestock production, imports, exports, slaughter, and prices, and meat production, imports, exports, consumption, and prices.

The simplifications start with the specifications of livestock supply, imports, exports, and slaughter. COSTBEN assumes that all imported, exported, and produced livestock are the same, and that all are ready for slaughter. Because of this assumption, imports, exports, and slaughter animals all have the same price. COSTBEN has economic equations for farm supply of livestock, livestock imports, and livestock exports and calculates slaughter by adding imports to

production and subtracting exports. Meat production is proportional to livestock slaughter. COSTBEN is also based on the assumption that the meat exported, imported, produced, and consumed is identical and has the same price.

COSTBEN's structure is also mathematically simple: all the equations are linear in both prices and quantities. The user puts elasticity assumptions into COSTBEN, and it uses the baseline prices and quantities to create slopes and intercepts that are consistent both with the baseline and the elasticity assumptions.

Using COSTBEN

A Quick Tour of the COSTBEN Spreadsheet

For the rest of the body of this paper, we will assume that you have your own copy of COSTBEN and that you have opened this file while in Lotus 1-2-3 for Windows, version 4.xx or higher. If not, figure 1 is a crude map to the COSTBEN workbook.

When you open the COSTBEN workbook, you will see that it consists of six sheets. These sheets are labeled "intro," "baselines," "shocks," "coefficients," "results," and "macros." It is possible to run COSTBEN and only directly modify the contents of "intro." Unless you are responsible for entering the baseline assumptions, you need to work only with the sheets named "intro," "results," and, possibly, "shocks."

If you are the first user of your copy of COSTBEN, you will find yourself at the top, left-hand corner of the intro sheet. At the top of this sheet are four macro buttons that allow you to select the type of analysis that you want to run: beef, pork, poultry, and red meat. The intro sheet also has a brief description of the model's equations and an area into which one can enter various economic parameters. If you push one of the macro buttons, you will skip over these areas and find yourself near the top of the last part of the intro sheet, the "quickset" area. You can change the market that you analyze at any time by moving near the "home" position of the intro sheet and pressing a different macro button.

One of the things that the macro buttons do is to fill in the appropriate name of the market you are analyzing. For instance, if you had just pushed the "Run Beef Analysis" button, the cell above your current position would read, "Cattle and Beef Markets." The words "Cattle and Beef Markets" will appear in the tables in the results sheet. The cell to your left would read "Name of policy change or shock." The words that you fill in this cell will also appear in the tables in the results section.

Below the macro buttons is a brief description of the equations in the COSTBEN model. A description of the equations can also be found in header rows of the coefficients worksheet. Immediately below the equations' description is an area where you can enter the supply and

Figure 1--A map of the COSTBEN worksheets

Intro sheet map

Macro buttons
Equation descriptions
Elasticity assumptions
"Quickset" policy area

Coefficients sheet map

Baseline coefficients
Coefficients given shocks

Baselines sheet map

Live baseline	Cattle and beef parameters
Cattle and beef baseline	Hogs and pork parameters
Hogs and pork baseline	Poultry parameters
Poultry baseline	Red meat parameters
Red meat baseline	

Results sheet map

Replicated baseline	Economic welfare analysis table
New baseline (after shocks)	
Percent change from baseline caused by shocks	

Shocks sheet map

Title columns with years and shortrun shock effects		Title rows for shock entry tables
Years	Approximate short-run supply shocks	Live shocks that you may enter by hand
		Quickset shocks, which can be copied to live shocks

Macros sheet map

Macro commands	Macro names	Brief explanation of macro functions

demand elasticities that generate the equations. Stored in the baseline worksheet, COSTBEN has sets of default elasticities for each of the four markets that it analyzes. Again, if you are in charge of setting up the baseline and economic assumptions for the model, you will want to enter your own default elasticities in the baseline sheet. The macro buttons automatically copy the default elasticities into the live elasticity area. After the defaults have been copied into the live area, you are free to modify them as you wish. As you change your elasticity assumptions, COSTBEN updates its parameters.

The last part of the intro sheet is titled "Quickset Shocks." The cells in this area allow you to enter simple patterns of shocks to each of the supply and demand equations.

The next sheet is the "baselines" sheet. In this sheet, are five baselines and four sets of elasticity assumptions. The top baseline is the "live" baseline or active baseline. The live baseline is the baseline that COSTBEN uses to create its economic model. Below this are beef, pork, poultry, and red-meat baselines. To the right of the baselines, are four sets of economic parameters for beef, pork, poultry, and red meat. The macro buttons on the first sheet copy the appropriate baseline to the "live" baseline and copy the economic parameters to the "live" parameter area in the intro sheet. As noted above, unless you are in charge of setting up the default elasticity assumptions and the four baselines, you need not work in this sheet.

Your spreadsheet will not have the official USDA baseline. Someone from your institution may have entered your most recent baselines and the appropriate economic parameters into this sheet for you. If not, you will find sets of place-holding baselines and parameters. These should not be construed as official USDA estimates or forecasts. If you are in charge of putting in the baselines and other assumptions, you will want to read the Appendix.

For added convenience, COSTBEN is set up for a 20-year baseline because it would be harder for the user to add more years of data than it would be to get rid of unneeded years. If you have our placeholder baselines, you will notice that the data start with 1995 and run until 2015 giving you 21 years of data. If you move over to the "shocks" sheet, you will see a column of dates running from 1996 to 2015. If someone has installed a different baseline in your version of COSTBEN, you will find that the first year of your baseline is dropped from the shocks sheet. The first year is there because the equation for the current supply of livestock may depend on lagged prices and quantities. The economic parameters that you select will determine whether or not lagged prices or lagged quantities affect current livestock supply.

If you move to the "home" position in the shocks sheet, you will notice that this sheet has a two-column and six-row title. The "A" column contains the years. The "B" column is labeled "dynamic supply effect." These are the approximate shortrun effects and will be discussed later.

The shocks sheet has two sets of shocks. One is the live or active set. The other is a set determined by the "quickset" shock area in the intro sheet. Using the quickset buttons allows you to fill in 20 years of shocks in one of the columns by putting values in only four cells.

Control W wipes the live area clean, resetting your assumptions when you want to run a different analysis. Control Q copies the quickset shocks into the live area, allowing you to forecast the effects of these shocks.

The next sheet is the coefficients sheet. The coefficients in this sheet are calculated using the baseline, economic parameters, and shocks that you select. The contents of this sheet are protected. You will have to turn off the protection if you want to make any changes.

There are four tables in the "results" sheet. The first table is the replicated baseline. This table takes the coefficients from the previous sheet and solves them for prices and quantities given no shocks. The coefficients in the previous worksheet are calculated so that if there are no shocks, then prices and quantities will not change. If the replicated baseline is not the same as the original baseline, then you may have violated some of the implicit assumptions built into the COSTBEN model. These assumptions are discussed in the Appendix. Below the baseline table is the alternative run table. This table is named "Scenario." The scenario table uses the user-generated shocks and calculates how these will affect prices and quantities. If there are no shocks, then the scenario and the baseline will be the same. Below this table is a table of percentage changes from the baseline called "deviation." The fourth table in the results section is an economic welfare table named "netbenres." This table has the calculated change in producer surplus, consumer surplus, packer profits, government costs, net welfare for each year, and a running total of discounted, net economic benefits.

Like the coefficients sheet, the results sheet is also protected.

The last sheet in COSTBEN has the macros. COSTBEN was originally developed using Lotus version 2.4, and the macro commands use the DOS version's structure. This sheet is also protected.

The Equations in COSTBEN, How You Control Them, and What Shocks Do

There are 10 equations in COSTBEN. Seven of these equations depend upon economic parameters that must be entered into the model. The other three are identities. The seven equations that need economic parameters are the farm supply of livestock, the import supply of livestock, the export demand for livestock, the farm-price to wholesale-price margin equation, the elasticity of meat import supply, the elasticity of meat export demand, and the demand for wholesale meat. There is a brief description of the forms of these seven equations in two places in the COSTBEN file. The first is near the top of the intro sheet. The second is in the title rows of the coefficients sheet.

You can control the seven economic equations through the parameters that you enter in the "elasticity" section of the "intro" sheet. This section is actually named "elasticity," and you can

use the "GOTO" command to get there.[1] In the elasticity section are cells that you can fill out that in part determine the parameters of COSTBEN's equations. To the left of the input cells, you will find a brief description of the parameter you have to enter. To the right of the cell is its range name.

There are two ways to control the elasticities that COSTBEN uses to generate its equations. One method is to enter the elasticities directly into their area in the intro sheet. If you want to save these elasticities for later use, you should enter them in the appropriate area of the baseline sheet. Then, when you press one of the macro buttons, the elasticities that you have entered are automatically copied into the elasticity range of the worksheet.

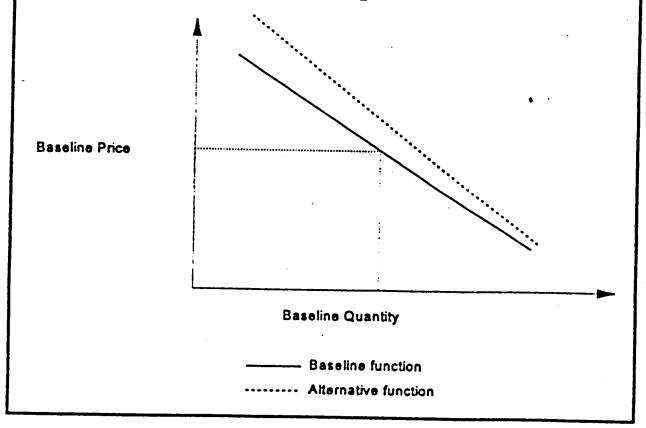
Six of the equations need only one parameter. The livestock supply equation needs three. Livestock supply is potentially dynamic. Livestock supply equations almost always have dynamic specifications in the models used to generate annual baselines.

Generating the "Static" Equations' Coefficients

There are two large sets of coefficients in the coefficients worksheet: one set for the baseline, and the other for the scenario or set of shocks that you wish to analyze. COSTBEN first calculates all the coefficients for the baseline. For the non-dynamic equations, COSTBEN takes the price and quantity from the baseline and the appropriate elasticity from the intro sheet and calculates a slope that is consistent with the price, quantity, and elasticity. Then, given that slope, it calculates an intercept so that the baseline price and quantity lie on the line. Figure 2 shows how COSTBEN draws a line through the baseline price and quantity. Even though the elasticities are fixed for the baseline coefficients, if 2 years have different prices or different quantities, they will have different slopes and intercepts.

The packer margin equation is different in that it asks for a flexibility rather than an elasticity. COSTBEN uses the baseline relationship between the value of animals killed and the value of meat produced to calculate an average packing margin per unit of meat produced. If you set the flexibility of this margin to zero, the margin for any year will be independent of the amount of meat produced. A positive flexibility means that the margin will get wider as more animals are killed and more meat is produced. We used a

Figure 2--A "baseline" function and an alternative function with a positive shift.



[1] The GOTO command can be found under the pull-down menu for edit or it can be accessed by pressing [F5].

flexibility instead of an elasticity as it is not uncommon for baseline procedures to use fixed live-to-wholesale margins. A fixed margin implies an infinite elasticity of the supply of slaughter services. Since it is not possible to enter an infinite elasticity, we use the more convenient zero flexibility.

How Entering Shocks Changes the Static Equations

After calculating the coefficients for the baseline, COSTBEN uses the information in the shocks sheet and the baseline coefficients to create a set of alternative coefficients. Each of the seven equations that requires elasticities has an associated column in the shocks sheet. The rows in the shocks sheet determine what year is affected by the shock. If you wish, you may enter shocks one year and one equation at a time.

The numbers that you enter in the shocks sheet are percentage changes in a supply or demand equation. COSTBEN's equations are set up so that shocks are multiplicative. Except for the margin equation, all the equations are specified with quantity as the dependent variable. A 5-percent increase in one of the static supplies or demands means that for any given price, 5-percent more quantity will be demanded because of the shock. A 5-percent increase in the packer margin equation means that the farm-to-wholesale spread will be 5-percent higher at each level of output.

Figure 2, above, also shows how putting in a shock affects the alternative equation. For example, suppose you decide that one of the effects of the policy you are analyzing is a 5-percent increase in meat export demand in the year 2000. You could then put .05 in the shocks sheet in the meat export demand column and the "live" row for the year 2000. COSTBEN will create a new meat export demand function for the year 2000 by multiplying 2000's baseline meat-export demand's slope and intercept by 1.05. Because of the multiplicative nature of the shocks in COSTBEN, you get the same elasticities for the alternative and baseline static functions when you evaluate them at the same price.

We also used multiplicative shocks because it makes it easier to handle trade policies or other problems that could lead to the elimination of either exports or imports. For instance, a wide-spread animal disease epidemic could lead trading partners to totally prohibit exports. You could model this total cut-off of export opportunities by putting a negative one (a 100-percent decline) in the appropriate cell(s).

Generating Livestock-Supply-Equation Coefficients

Many models used for baseline work have complex dynamic supply responses. Therefore, we set up COSTBEN to allow for dynamic supply responses. COSTBEN's livestock supply can depend on this year's price, last year's price, and last year's quantity. To allow for this added flexibility, there are three cells in the livestock supply response's elasticity area. There is a cell for the longrun supply elasticity, one for the current year supply response, and one for the lagged

quantity's coefficient. The values you put in these three cells determine the coefficients on last year's price, this year's price, and last year's production.

You can make the current supply of livestock depend only on the current price of livestock by setting the lagged quantity's coefficient to zero and by making the longrun response equal to the current year's response. This would give you a static supply response. Static livestock supplies are not, however, commonly used in annual econometric models.

A simple dynamic supply model is the cobweb model, in which lagged prices determine current supply. To specify the "classic" cobweb model, set both the current year's supply elasticity and the lagged dependent variable's coefficient to zero. Modified cobweb models are very common in explaining livestock supply. These have the current supply determined by lagged production and lagged price, but not by the current price. To make COSTBEN work as a modified cobweb, set the current year's elasticity to zero and fill in the appropriate values in the longrun elasticity's and lagged-dependent variable's cells. If the supply equation is to be dynamically stable, the lag coefficient must be between 1 and -1.[2]

COSTBEN takes the values you put in the three cells in the livestock supply response part of the elasticity range and uses them to calculate slopes for the current price, lagged price, and lagged production for each year of the baseline. Given these slopes, COSTBEN calculates the intercept so that each year's actual supply is consistent with its prices, lagged price, and lagged supply.

Shocks to Livestock Supply

Recall that COSTBEN multiplies the shocks to the static equations by these equations' slopes and intercepts. The livestock supply equation uses a different type of specification. The shocks do not multiply all the supply equation's coefficients, only those of the current and lagged price and intercept. The alternative model's and baseline model's lagged production coefficients are the same.

Changing the lagged-dependent variable's coefficient between the alternative and baseline would change the dynamic properties of the supply response. We did not want to change these dynamic properties. Provided that you put in a dynamically stable value for the lagged-dependent variable's coefficient, the percent changes that you put in the shocks sheet represent the expansion in the longrun supply of livestock.

The shortrun supply shift will be different. The "B" column in the shocks sheet shows the approximate shortrun shift in supply implied by the shocks you put in the cells of the livestock-

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[2] The lagged dependent variable's coefficient could lie outside the range between -1 and 1, and the *system* of equations still be stable depending on the relationship between supply and demand elasticities.

supply-shock column. If the coefficient on the lagged dependent variable is zero, then the values in the longrun and shortrun supply shift columns will be the same. Otherwise they will differ. You will notice that a one-period shock to livestock supply will have effects in following periods when the lagged dependent variable has a non-zero coefficient. When an equation has lagged dependent variables, any change in a variable in one time period will have effects in the following time periods. The effects of sustained shocks will accumulate over time.

The shocks sheet has a column for government costs. You will not need to fill in this column unless you are interested in using the cost/benefit table in the results section.

Using the "Quickset" Shocks

One way of entering shocks to the equations is to enter the numbers in the shocks sheet cell by cell. However, if you are willing to accept simple patterns, you can enter shocks using the "quickset" section of the intro sheet.

There are eight quickset areas, one for each of the equations in the model and one for government costs. Each equation has four quickset cells, while the government cost area has five. You will find a brief description of the cells in column A and the cells themselves in column B. To the right of each set of quickset cells is a small graph that shows the pattern of the shocks implied by your entries. The graph for the farm supply shocks shows both the longrun and approximate shortrun pattern implied by the cell entries.

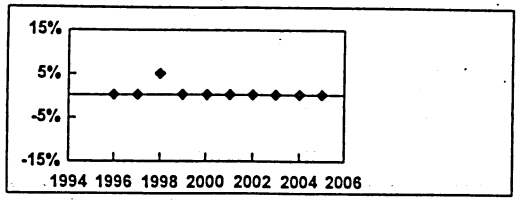
The seven quickset areas for the equations share a common format and all work the same way. The first cell you fill in is the cell for the start of the shock. Nothing happens to the equations until the year you put in that cell. At the selected "start of the shock" year, the equation shifts by the percent that you fill in the next cell, which contains the percent shift for the first year of the impact. The next cell is for the ultimate shock to the equation, and the last cell is the year in which the ultimate shock kicks in. On and after the ultimate shock year, the percent shock is set to the ultimate shock level. The ultimate shock year should be greater than the beginning shock year. In any years between the beginning and ending shock, the value of the shock is set by interpolation between the two years' shocks. You can leave an equation unchanged by setting both the beginning and ultimate shock to zero.

Figure 3, below, shows how you can enter a one-time shock using the livestock import supply equation as an example. Suppose you want to increase livestock import supply by 5 percent in 1998, but leave it unchanged in every other year in your baseline. You would put 1998 in the cell for the beginning of the shock. The shock in that first year is 5 percent, (0.05), the value you enter in the next cell. After 1998, there are no further shocks, so the ultimate effect is zero, the next entry. This ultimate effect kicks in in 1999, the last cell of livestock import supply's quickset area.

Figure 3--An example of how you enter a one time shock using the quickset cells.

Policy effects on livestock import supply.

Year in which policy first affects livestock import supply	1998
Increase in livestock import supply that year	5.0%
Ulitimate expansion	0.0%
Year of ultimate expansion	1999

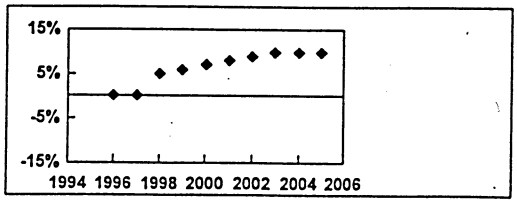


Suppose you think the policy you have been asked to analyze will first affect livestock import supply by 5 percent in 1998. After 1998, it would increase livestock imports 1 percent per year until 2003, when they would be 10 percent higher. After that, they would stay 10 percent higher. You would enter 1998 as the beginning year, 5 percent as the initial shock, 10 percent as the final shock, and 2003 as the year of the ultimate shock. The result would resemble figure 4 below.

Figure 4--Another example of how the quickset shocks work.

Policy effects on livestock import supply.

Year in which policy first affects livestock import supply	1998
Increase in livestock import supply that year	5.0%
Ulitimate expansion	10.0%
Year of ultimate expansion	2003

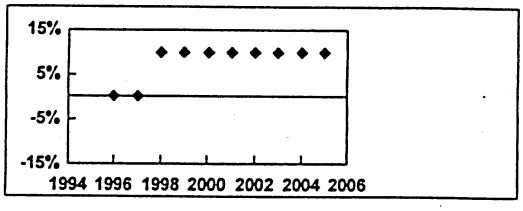


You might be interested in what happens if you make the ultimate shock date the same as or before the initial shock date. In this case the shock is set to the ultimate shock at the start date and stays at the ultimate shock for all following dates. See figure 5.

Figure 5--What happens when you set the ultimate shock date before or on the beginning shock date.

Policy effects on livestock import supply.

Year in which policy first affects livestock import supply	1998
Increase in livestock import supply that year	-100.0%
Ulitimate expansion	10.0%
Year of ultimate expansion	1997



The government quickset works differently than the others. One reason is that COSTBEN needs to be given an initial cost of the program. The economic costs of supply and demand shifts are determined in part by the baseline prices and quantities. You need to put in the cost of the program if it were fully implemented in the first year. If you are analyzing the elimination of a program that costs the government money, then the program costs will be negative.

After filling in the cell for program costs, the next cell asks for a projected growth in the real cost of the program. COSTBEN was built assuming that the baseline prices you enter would be real

prices. You need not use real prices in your baseline. If you do not, you will want to put in the nominal growth of program costs. The next two cells are the starting year of the program and the ending year of the program. COSTBEN assumes that the program is phased in or out linearly between the start and end of the policy reform period.

Figure 6-- An example of how the quickset government cost switches work.

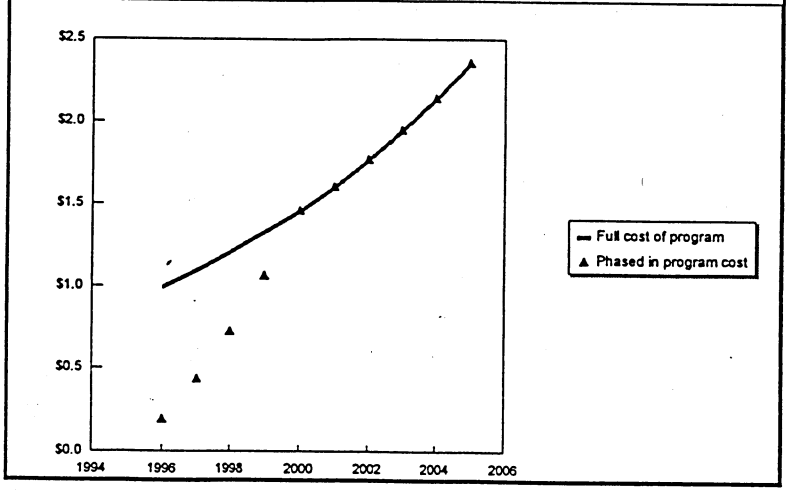


Figure 6 shows an example of how the quickset government cost switches work. Figure 6 is based on a program that would cost $1 million to fully implement in 1996, is phased in between 1996 and 2000, and whose cost grows at 10 percent per year. The solid line is the full cost of the program. The triangles are the projected costs of the program as implemented. In the example in figure 6, 1996's cost is 20 percent of the full cost, 1997's is 40 percent, and so on until 2000. After 2000, the program is fully implemented and implemented costs are equal to the full costs.

The last cell in the government section is labeled the real, social discount rate. You may put in the nominal rate if your baseline uses nominal prices and government costs. This discount rate is used to create the net present values in the cost/benefits table in the results section.

The quickset shocks are calculated in one area of the shocks sheet, while the actual shocks that affect the equations are contained in an area above the calculated shocks. The command, control Q, copies the quickset values to the live shock area. The command, control W, wipes the live shock area clean. Changes that you make to the quickset cells are <u>not</u> automatically copied to the live area. When you make changes after pressing control Q, you must press control Q again to feed those changes into the live shock area.

It is possible to mix the quickset and hand entry approaches to adding shocks to COSTBEN. Once you have set the quickset shocks in place with a control Q, you can go to the shocks sheet and modify or edit any of the live cells. You may want to use this approach when most, but not all, of the shocks follow a simple pattern.

COSTBEN continually updates its predictions as you enter shocks. Once you are finished entering shocks, you need only go to the results section to see what their implications are.

Interpreting the Economic Welfare Table

One of the tables in the results calculates the economic costs and benefits of the shocks that you entered. The benefits to livestock producers, packers, and consumers are measured by economic surplus. You must either directly input government costs or indirectly input them through the use of the government's quickset cells.

For consumers, COSTBEN calculates the net benefits of the shocks you enter by subtracting the consumer surplus implied by the alternative price and demand curve from the surplus implied by the baseline price and demand curve. The "consumers" of COSTBEN are not consumers as such. The consumer surplus defined in COSTBEN is the sum of actual consumers' surplus and the producers' surplus of meat processing and retailing firms. COSTBEN does not split these two different surpluses apart. If the split is important to you, then you will need to develop your own process for dividing the benefits.

Further, COSTBEN's consumer surplus can be difficult to interpret in those cases when the wholesale demand curve shifts. You might want to run a scenario where meat demand increases because you believe that income growth will be higher than was assumed when the baseline was generated. Higher demand is likely to lead to higher prices, and the calculated consumer surplus could be lower because of the increase in price. It is likely that the higher income of consumers will more than compensate them for the loss of meat consumption surplus.

Packers' surplus is calculated based on the assumption that the margin equation in COSTBEN represents packers' marginal cost and the farm-to-wholesale price spread is equal to the marginal costs of slaughter. If the flexibility of packing margins is set to zero, then the marginal costs of meatpacking are fixed at all levels of production and COSTBEN will calculate that packers' profits are zero in all cases. If you set the flexibility to zero, nothing you do to shock the equations will change packers' surplus. With a positive flexibility, COSTBEN will calculate that packers earn profits and (absent any shocks to their costs) increased livestock slaughter will lead to higher packers' surplus.

Calculating livestock producers' surplus is complicated because livestock supply can be dynamic. There is a shortrun and a longrun supply response. Each shortrun supply function, which depends on current price, lagged price, and lagged production, implies some longrun supply function which depends only on prices. COSTBEN's coefficient sheet calculates the longrun supply slope and intercept from the values of the shortrun coefficients. (These longrun parameters will make sense only if the supply response is dynamically stable.) While the shortrun supply helps to determine the market price for a year, the longrun supply more closely reflects the costs of livestock production.

Figure 7--The calculation of livestock producers' surplus.

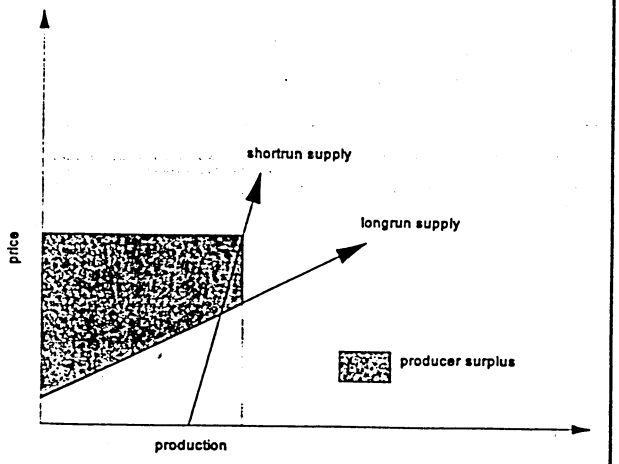


Figure 7 shows how COSTBEN calculates livestock producers' surplus. In figure 7, the shortrun supply curve runs through the shortrun equilibrium price and production. The longrun supply curve runs under this point in this example. Figure 7 represents the case where shortrun supply exceeds longrun supply. Longrun supply can also exceed shortrun supply.

Total revenue from livestock sales is represented by the rectangle formed by current price and current production. The longrun cost of livestock production is the area under the longrun supply function. The surplus area is the shaded area in the figure. It is the difference between the cost area and the revenue area.

Figure 7 shows the usual case for dynamic livestock supply model: the shortrun supply is less elastic than the longrun supply. One explanation for this phenomenon is that fewer inputs are variable in the short run. Because of this, producer surplus measured with respect to the shortrun supply curve is greater than that measured with respect to the longrun supply curve. In the commonly used modified cobweb model, the shortrun supply is totally inelastic and, technically, the entire revenue earned by producers is surplus.

COSTBEN calculates consumer and producer surplus for both its baseline and the alternative models. The net benefits reported in the table is the difference between the two surplus measures. COSTBEN is a linear approximation to a baseline generating model. There is no guarantee that the estimated surpluses for either the baseline or alternative will accurately reflect the surpluses implied by the baseline generating model. The estimated changes in surpluses will be more accurate than the estimated levels.

COSTBEN might surprise you by demonstrating that something economic theory says should be "good" decreases net welfare. For example, theory states that lifting trade restrictions should improve economic welfare. COSTBEN might say otherwise. The reason that this can happen is that COSTBEN does not calculate the economic surplus of the foreign trade partners. In theory, trade restrictions can transfer surplus to the restricting country. COSTBEN focuses only on the economic welfare of domestic producers and consumers.

Some Limitations of COSTBEN and Suggestions for Getting Around Them

To conclude our discussion of using COSTBEN, we would like to mention some things that COSTBEN cannot do well, some things that could go wrong, and how you could fix these potential problems. First, COSTBEN has only a limited ability to handle quantitative limits on imports or exports. However, it can handle newly introduced absolute bans on either imports or exports. To eliminate exports or imports for a year, simply put a 100 percent decline (a minus one) in the appropriate cell of the shocks sheet.

You can handle non-zero quotas in special cases. If the quotas are set so they are always binding in the baseline, and if you expect that none of the policy innovations or other shocks you will be analyzing will move imports or exports off their limits, you could make the restricted supply or demand perfectly inelastic. This approach will work even if the new policy will expand the quota on the restricted item as long as you expect there will be no problem filling the new higher quota.

COSTBEN is not equipped to deal with the "small country case" in which the supplies and demands for imports and exports are perfectly elastic. You may try to approximate the small country case by making export demands and import supplies extremely elastic, but you have to realize that there is nothing in COSTBEN to prevent any quantity or price from being negative. Given the right set of supply or demand shifts, an extremely elastic export demand or import supply could give you negative quantities.

Another potential problem arises if one or more of your static equations' baseline quantities are zero. Say for example that meat imports for a year are zero. The calculated slope and intercept for meat imports in that year will be zero as well. Since COSTBEN uses multiplicative changes, and since zero times anything is zero, your alternative baselines will always have zero meat imports. This will not be a problem if you do not expect the shocks you analyze to lead to positive meat imports. If you expect otherwise, you will have to make some modifications to COSTBEN to account for this problem. You could get around this problem by specifying a set of slopes and intercepts in the alternative model's coefficient list by hand, although you might consider that too much trouble.

Appendix: Setting Up COSTBEN's Baselines

Before COSTBEN can be used, someone needs to put baselines in it. This is not simply a job of data entry as there are two limitations on how the baselines must be entered.

COSTBEN's baselines have two sets of quantities, livestock numbers and meat, and two prices. In the version of COSTBEN that comes from ERS, livestock numbers are expressed in thousands of head, livestock prices in thousands of dollars per head, meat quantities in millions of pounds, and meat prices in dollars per pound. The units we selected are more or less arbitrary. You may use any other units you like, with the following two restrictions.

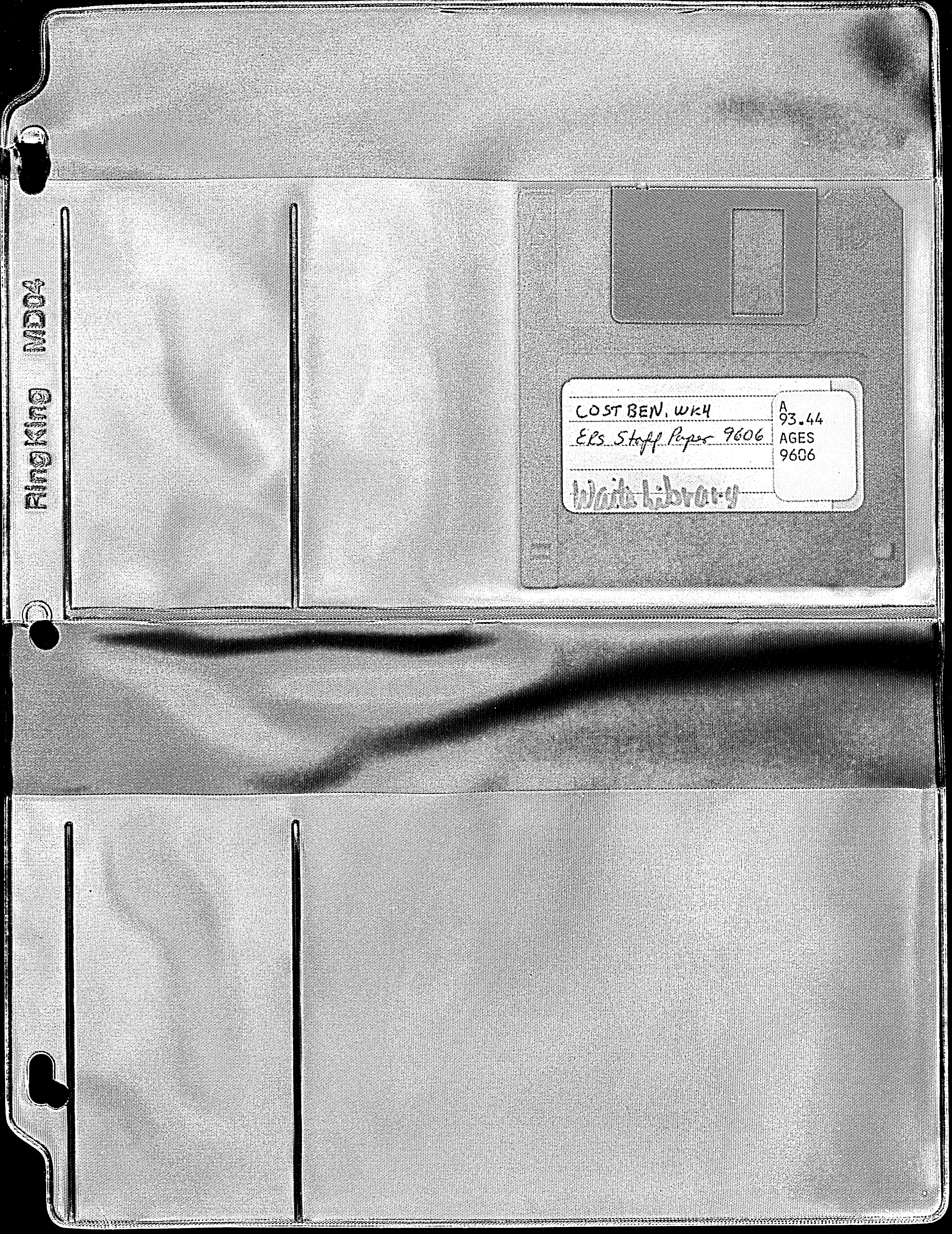
The first, and most obvious, is that like quantities be measured with like units. That is, livestock production, imports, exports, and total slaughter numbers must all be in the same unit. The same is true for meat production, imports, exports, and consumption.

As noted in the main part of this document, COSTBEN has three identity equations. Two of these are balancing equations that state production plus imports equals consumption (slaughter for livestock) minus exports. You will get into trouble if these balancing relationships do not hold for both livestock and meat. COSTBEN is set up to replicate the baseline. If these two balancing restrictions do not hold, then COSTBEN will not be able to replicate its own baseline.

In case you are interested, the third identity is that the production of meat is proportional to slaughter. The meat-to-slaughter ratio used in a year in COSTBEN depends on the ratio in the baseline. If this ratio changes from one year to the next, the ratio used in the equations also changes from one year to the next.

The other limitation on how the data is entered is that the prices and quantities for livestock and prices and quantities for meat have to be specified so that when you multiply either price times its quantity, you get the same units. In the version of COSTBEN that comes from ERS, meat prices are in dollars per pound and meat production is in millions of pounds. When you multiply meat production by meat prices you get millions of dollars. Since livestock are measured in thousands of head, we needed to express livestock prices in thousands of dollars per head so that livestock prices times livestock quantities are equal to millions of dollars also.

If your poultry baseline comes from ERS, you will see that farm price and farm production are equal to wholesale meat price and production. Because of the integrated nature of U.S. poultry production, ERS is not able to collect reliable numbers on the farm price of poultry. We, therefore, have combined the farm production and slaughtering into a single stage. We did this by making both live animal and meat production and prices the same. We assigned all the trade to the meat level. If you use one of our poultry baselines, the farm-to-wholesale spread for poultry is zero. The slope and intercept of the margin equation is also zero. Nothing you do to shock the margin equation will affect the solution.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