A Trade Estimates System to Assist Forecasting
U.S. Agricultural Exports

by

S. W. Hiemstra and S. A. MacDonald

Suggested citation format:

A TRADE ESTIMATES SYSTEM TO ASSIST
FORECASTING U.S. AGRICULTURAL EXPORTS

S.W. Hiemstra and S.A. MacDonald*

In recent years, ERS outlook analysts concerned with international trade have made quarterly estimates of U.S. agricultural exports to most major importing countries for the current fiscal year. These analysts were typically country specialists who devoted a substantial portion of their time to analyzing developments affecting their countries' agricultural markets and policies. While the need for these estimates has increased with the increasing world market competition, the staffing resources available to make these estimates have diminished. The increased availability of micro-computers offers the potential to automate the statistical, graphical, and data processing components of these estimates.

The Trade Estimates System is a menu-driven, spreadsheet macro program. The program automates data management, statistical analysis, printing, and graphing of U.S. agricultural exports on a country basis. Analysts are provided with historical data, several statistical projections, and graphs for each commodity in the country file. The analyst reviews the data provided by the system and other information to make an estimate. The objective of the procedure is to reduce the time required to analyze market trends and, as a consequence, to allow more time to focus on qualitative analysis.

This report outlines the forecasting process, describes use of the Trade Estimates System, and discusses special issues raised by the procedure. A final section reviews areas for further system refinement and research.

Organization of the International Outlook Program

The USDA situation and outlook program is widely recognized as a leading source of information on international agriculture. Every month, USDA forecasts U.S. and world export volumes of several commodities on a crop year basis, and every quarter forecasts the quantity and value of U.S. agricultural exports on an October to September fiscal year basis. The monthly volume forecasts of food grains, feed grains, oilseeds, oilseed products, and cotton form the basis for the quarterly forecasts. The quarterly forecasts also include estimates of the total volume and value of U.S. agricultural exports to selected countries and regions.

The monthly forecasts are approved by the World Agricultural Outlook Board (WAOB). The WAOB oversees interagency committees composed of representatives from the Economic Research Service (ERS), the Foreign Agricultural Service (FAS), the Agricultural Stabilization and Conservation Service, and the Agricultural Marketing Service. The WAOB also approves the quarterly export forecasts developed by ERS and FAS.

The main difference between ERS's and FAS's procedures in developing export forecasts is the greater interaction between regional and commodity oriented analysts at ERS. FAS's regional analysts are largely based overseas and include forecasting among a wide range of embassy duties. ERS regional and commodity analysts work together in Washington and focus primarily on analysis. Because of its greater regionally oriented resources, ERS has almost exclusive responsibility for the regional portion of the quarterly trade forecasts and for analyzing cross-commodity linkages.

The procedure ERS uses to develop its quarterly forecasts is best described as a series of exchanges between regional and commodity analysts. Regional analysts are first briefed on global commodity and economic trends and they then receive price forecasts and the most current U.S. agricultural export data provided by the Bureau of the Census. Analysts have several days to review the data they receive and to make commodity forecasts of fiscal year U.S. exports for their countries. The forecasts produced by regional analysts are passed to world commodity and macroeconomic analysts who review the regional estimates for consistency with world commodity, economic, and financial trends. Once a satisfactory forecast has been agreed upon, the forecasts are presented to WAOB in the formal interagency process with FAS.

FAS also prepares forecasts for the interagency process. The FAS review process involves two discrete steps and is quite different from that in ERS. In the first step, agricultural analysts in U.S. embassies abroad employ host country data to forecast U.S. agricultural exports to their country. These forecasts are reported periodically in attache reports and cables. In the second step, commodity analysts in FAS's Washington office aggregate data from the attache reports and other sources such as the data published weekly in U.S. Export Sales, and amend it in consultation with the attaches.

The forecasts derived through the interagency process are published by the WAOB. World supply-utilization estimates are published monthly in the World Agricultural Supply and Demand Estimates (WASDE), and U.S. export forecasts are published quarterly in the Outlook for U.S. Agricultural Exports. The Board also works jointly with the National Oceanic and Atmospheric Administration of the Department of Commerce to publish the Weekly Weather and Crop Bulletin which reports weather conditions as they affect world agricultural production.

**Estimating the demand for U.S. agricultural exports**

The significant factors affecting the demand for U.S. agricultural exports vary over time, country, and commodity. The problem faced by the outlook analyst is to identify the factors which are currently significant, anticipating factors that may become significant, and reporting a forecast. Time is a critical element in this process because many events can affect export demand within a season and a limited number information sources can be reviewed and analyzed. To the extent that prompt statistical and graphical analysis are unavailable, forecasts may be based on crude expectations and rules of thumb.
Under ideal circumstances, market share calculations provide an important point of departure in forecasting exports. Market shares are calculated by dividing U.S. exports by the country's total imports (appendix 1). FAS supply-utilization tables, used to compute the summary tables published monthly in the WASDE, can be used to obtain total imports over the past and forecast periods. Past U.S. exports can likewise be taken from the Foreign Agricultural Trade of the United States (FATUS) published by ERS. Historical shares computed from these data can then be used to project U.S. exports.

Market share calculations are an accounting tool to provide the analyst with a benchmark from which to evaluate the country's usual import demand for U.S. products. This year's imports can then be forecasted after evaluating the world supply situation. Are world prices up or down? Which supplier offers the lowest price? Answers to these questions vary by country and commodity. FAS's commodity circulars provide an important source for information necessary to answer these questions (for example, see: FAS, 1987). Trade and regional publications are other useful sources (for example, see: Oil World; and Agra Europe).

Unfortunately, time constraints typically do not allow country analysts to assess market shares and prices in making their forecasts. Regional and world commodity coordinators make these assessments but not as often and with as much detail as might be desired. This is the void which the Trade Estimates System attempts to fill.

Johnson (1986) provides a simple paradigm for decision-making which is helpful in analyzing the dilemma faced by outlook analysts. He divides the decision process into six steps—need identification, data collection, analysis, decision-making, and responsibility bearing. Positive and normative knowledge are both seen to be utilized in each step of the decision process.

In this case, the "need" described in Johnson's paradigm is to forecast commodity exports to different countries for the current fiscal year and, in the last two quarters, the "out" year. The problem is defined differently for different commodities because the effort applied in analysis and the data available for analysis differ by commodity. Statistical and graphical analysis permits the analyst to identify quickly the commodities with unusual trading patterns. The analyst can then devote additional time to gathering data on these commodities. A more routine review of data is appropriate for other commodities. The data thus assembled can then be analyzed for coherence and consistency with other observations and a decision on the forecast can be made.

The Need for Greater Analysis of Export Data

The need for greater analysis of export data is apparent to most observers of the international outlook program. Each quarter, analysts receive export quantity, value, and unit value data for their countries including: cumulative exports this and last year to date, total exports last year, and their own most recent forecast. This data permits them to compare data
this year with last, and project exports as a percent change over last year.

Several kinds of records would add new information to this process. Analysts could assemble historical data, either annual data or cumulative quarterly data. Analysts could also keep track of their forecasts and compare them with actual trade. No formal procedure to undertake these tasks currently exists. If it is done, it is done by individual analysts.

Although it will soon be possible to retrieve historical data on U.S. agricultural exports in current formats from the ARIES retrieval system, data must currently be assembled manually by reviewing old copies of FATUS and records kept within the agency. It takes roughly one working day to assemble ten years of historical data for one country using this procedure. Since software currently available permits calculation of trends, export elasticities, and commodity graphs from this data, the opportunity to improve the analytical capacity of country analysts now exists.

Description of the System

The Trade Estimates System is a menu-driven, spreadsheet macro program operating in LOTUS 123 version 2. The program automates data management, statistical analysis, printing, and graphing of U.S. agricultural exports on a country basis. The regional analyst is provided with historical data, several statistical projections, and graphs of historical data by commodity for each country or region. The analyst reviews the information provided by the system and other information to make a forecast. The objective of the procedure is to reduce the time required to analyze market trends and, as a consequence, as to allow more time to focus on qualitative analysis.

The macro program is contained in a spreadsheet file called CONTROL. The program is executed automatically as CONTROL is called up and the operator need only respond to the menus and questions posed. Only one other file--INITIAL--is required to operate the system. INITIAL is a spreadsheet file which contains the basic format of the country files where the data of the system are stored.

The Trade Estimates System is based on country spreadsheet files. Each file contains ten years of annual export values, quantities, and unit values and corresponding annual fiscal year exchange rates. The file also contains cumulative quarterly data for the current and previous year and each of the forecasts previously made for the forecast year. These country files and regionally-aggregated data summed from country files are used by the macro program to compute projections and to print review tables and graphs. The program is menu-driven to facilitate quick and efficient use.

The core menu in the control file presents these options:
(1) File edit, (2) Execute_projections, (3) Create_file, (4) Print, (5) Graph, and (6) Quit.

Each option can operate directly on the country file and is independent of other options. The Edit options permits data entry and updating of historical data. The "Execute" option calculates three projections: trend
projection, an elasticity projection, and a percentage-change over last year (period change) projection. The "Create_file" option permits creation of a new country file according to the prescribed country file format. The "Print" option prints a portion of the country file for review by country analysts. "The Graph" option sets up and formats graphs for each of the commodities in the country file for later printing. The "Quit" option allows the operator to exit the macro program. These options are discussed in greater depth below.

File_edit option

The Edit option facilitates data entry in country files. These options are presented:

(1) Update, (2) Amend, (3) Save, and (4) Return.

The operator will typically update a country file, entering the most recent quarter’s cumulative trade or amend annual data or last year’s quarterly data already in the file and then save the contents. The "Return" option returns execution to the core menu.

Using either the Update or Amend option allows the operator to select the appropriate columns in the country file and to send the pointer to the top of the appropriate column. Data are then recorded by entering new data or highlighting existing data. Keyboard arrows may be used at any time to move around the spreadsheet and enter data when greater flexibility is required.

The Update option normally asks the operator which quarter is being estimated and whether the previous forecast needs to be archived or "moved". The proper quarter to select is the quarter of the fiscal year for which cumulative data has most recently become available. Estimates made in May, for example, are based on cumulative data for the second quarter (October to March), so is considered the second quarter estimate. If this is the first attempt to update the file for the new quarter, then the previous forecast needs to be archived. If an error was made and the file needs to be opened a second time using the Update option, then archiving would be inappropriate because the archived file would be overwritten with a blank entry.

The first quarter of each fiscal year requires more updating than other quarters because actual exports for the previous year are available for the first time and because the cumulative quarterly figures for the previous forecast year need to be archived in the columns reserved for the previous year. Data for the previous year’s actual exports and the current quarter’s cumulative exports are typically all that need to be entered in the first quarter. Questions and menus presented in this option permit, however, a fair degree of flexibility in responding to special circumstances. Default answers to these questions are given in the menus on the left side of the screen.

The Amend option is more straightforward. It asks which year or quarter needs to be revised and brings the pointer to the top of the appropriate column. Any number of years or quarters may be edited.
In both the Update and the Amend options, some entries in the country file require aggregation of several entries from the longer Census tabulation. The entry--Fruit & Prps(Inc.Frt.Jc)--is, for example, the sum of Fruit and preparations (excluding fruit juice), and Fruit juices (including frozen). The macro program facilitates this aggregation by moving to another position on the spreadsheet where both figures can be entered. These figures can then be summed and copied back into the appropriate country file.

After using the Update or the Amend options to edit, it is necessary to save the changes made using the Save option. This option extracts the country file from the macro control file and saves it in a file entitled NEWFILE. After saving the country file, the operator needs to exit the macro program and call up NEWFILE. If NEWFILE is in order, its contents need to be saved under the appropriate country name. The country file for Spain, for example, is saved in a file entitled: SPAIN. The use of NEWFILE prevents the possible overwriting of country file with a spreadsheet containing errors.

Execute option

The Execute option requests unit value and exchange rate forecasts, the name of the country file, and the quarter for which projections are to be made. Although the most complex portions of the macro program are executed in this option, nothing else is required of the operator.

The price and exchange rate forecasts require management by an analyst but are straightforward in a mechanical sense: The numbers must simply be entered. The macro program uses these forecasts to project unit values. The purpose of the Execute option is to project exports for each of the commodities in the country file. Three separate projections are made of quantity exports: a trend projection, an elasticity projection, and a period change projection.

The trend projection is based on a regression of quantity exports on trend. The coefficient on the trend variable is then multiplied by 11 to compute projected quantity exports in the forecast year (appendix 2). The projected quantity is multiplied by the projected unit value to compute the projected export value. When no quantities are available for commodity aggregates, export values are regressed on trend and projected analogously. Each commodity's projections are recorded in the country file as are the intercept, slope, and standard errors of the regression equations. The latter coefficients are recorded at the bottom of the country file for later graphing of trends against actual exports over the historical period.

The elasticity projection is based on a CES function in which the logarithm of unit values converted to national currencies are regressed on the logarithm of export quantities. The coefficient thus obtained is an elasticity (Allen, 1964, pp. 254-257). The projection is derived by multiplying this elasticity by the percentage change in the national currency unit values to get a percentage change in quantity exported. This new percentage is then applied against the quantity exported in the previous year to obtain the projected export quantity for the forecast year.
(appendix 3). The projected dollar unit value is multiplied by this figure to get the export value projection.

Several statistical problems arise from this procedure. First, unit values and export quantities are both required to calculate export price elasticities. Commodity export value aggregates without a corresponding export quantity cannot therefore be projected using this procedure. Second, the CES function requires that logarithms be used and logarithms are undefined for zero. Since exports are often zero, the macro program must provide a substitute for these zero values.

A number of alternatives were explored for substituting values in place of zero. Approximations (i.e. 0.00001 or some equivalently small number) were rejected because they led to unacceptably high standard errors and large swings in the elasticity coefficients. Since quantities as well as prices are zero in the file when no exports are reported, a test was made to determine the effect of assuming that the price had increased dramatically (20 to 50 percent) over the previous year. This procedure seemed reasonable when only one observation was missing, but if several were missing it led to progressively higher elasticity estimates. This procedure was therefore also rejected.

The procedure finally adopted substituted the previous or the following year’s observation in for the zero values. If these were also zero, then it filled in an approximation for zero. The use of other observations in the file gave a higher weight to these observations, but did not otherwise introduce bias into the estimates.

The period change projection is computed by dividing this year’s cumulative trade to date by last year’s and multiplying this ratio by last year’s total quantity exports (appendix 4). The quantity export projection is then multiplied by the unit value projection to get the export value projection.

Since the ten years of data contained in the country files remains the same throughout the year, trend and price elasticity computations are computed only once a year in the first quarter. These computations require roughly 15 minutes per country file, primarily because of the substitutions required for zeros in the elasticity computations. In other quarters only unit value and period change projections are required and execution takes only a few minutes.

Create_file option

The create_file option was set up to assist operators with creating new country files according to the prescribed format. This format is stored in a file called INITIAL. This option is limited in its scope because only country names listed in the menu can be used. Other names must be programmed into the control file if automated execution is desired. Note that the procedure also sets up an output file called NEWFILE.

Print option
Since the country files are too wide to print on a single computer printout, some data need to be edited out for efficient printing. The printing option edits out the first seven years of the historical period so that the remaining file is only one sheet wide.

Two basic alternatives are available in the Print option. Country 1 option allows the operator to print a file currently in the control file. Country 2 option permits printing of a country file stored on disk. The Region option was included to permit regional aggregation of country files, but was never written because a complete set of test files have yet to be assembled.

Graph option

The Graph option plots the years of historical data for each commodity in the country file against its regressed trend. Once DOS directories have been set up for each country file and previous print files have been deleted, the operator need only select the country file desired in order to execute this option. Commodity graphs are then saved both with the country file in NEWFILE for viewing and with the country directory for printing.

The graphing option is most useful when each analyst has access to a computer. After selecting the country file desired, spreadsheet commands allow the operator to select the desired commodity graph for immediate display on the screen.

Printing the commodity graphs is more time consuming. Since graph must be saved as print files rather than as an auxiliary files attached to the country file, each file must have a unique name. A graph of cotton exports to Spain, for example, must reflect both the commodity and the country indicated. If the print file is simply named "COTTON", then the next country file to be run will overwrite this file and its contents will be lost. In order to avoid this problem, the macro program writes print files for each country to a DOS directory named exactly the same as the country file. The Spanish country file is, for example, called SPAIN and so is the directory to avoid confusion. To print the graphs in this directory, the operator calls up the country directory up from PRINTGRAPH and selects the desired commodity print file.

Quit option

Since completion of most options returns execution to the core menu, it is convenient to be able to exit the macro program from the core menu. The Quit option provides this facility.

Selecting the Quit option terminates macro execution and allows the operator to use normal spreadsheet commands. The appropriate next step normally is to call up NEWFILE, to inspect its contents for errors, and to save the contents under the desired country name.

Inputs Required to Make a Projection

Census data
The Trade Estimates System is based on export data reported by the Bureau of the Census. These data include quantity, value, and unit value data by commodity and country. The current ten year data included in the country files dates back to fiscal year 1977.

Historical data for the files can be obtained from back issues of FATUS and agency records. Current data are received on tape files from the Bureau of the Census roughly 40 to 45 days following the end of the statistical month. This includes a 10 day increase in the waiting period added on in February 1987 because of a carryover problem the Bureau has experienced in recent years in receiving and processing import and export declarations (IPSC2Tradenet Newsletter, 1987; Bailey, 1985).

Price and exchange rate forecasts

Price and exchange rate forecasts are required to project unit values for the forecast year and, thereby, to compute export value projections. Unit value forecasts are prepared quarterly by ERS's world commodity coordinators. Exchange rate forecasts for most countries are published quarterly by Wharton Econometrics (1987).

However, the unit value forecasts are not defined at the same level of aggregation as the export forecast requirements. The forecasts are global averages for all U.S. exports and do not exactly match the characteristics of U.S. exports to any particular country. The forecasts cannot therefore be employed directly in projecting country export unit values.

The Trade Estimates System takes advantage of the correlation between changes in global and country commodity import prices. The macro program calculates changes in the actual export unit value for the previous fiscal year and the estimate of the export unit value for the forecast year. This percentage is then used together with the actual export unit value reported by Census for the previous year to compute a forecast of the Census aggregate. The macro program is therefore able to use the ERS unit value forecasts and Census data to compute a unit value forecast at the appropriate level of aggregation. This forecast is reasonable except in the case when the composition of an aggregated commodity changes significantly. If the majority of trade in beef changed from high-quality to utility beef, for example, then a composition problem would arise and the export unit value forecast for pork products would be inaccurate.

The exchange rates used in the country files also require special attention. Most annual exchange rates are reported on a calendar year basis while the Trade Estimates System operates on an October to September fiscal year. Historical exchange rates can be computed by averaging monthly rates reported by the International Monetary Fund (1987) on a fiscal year basis. Exchange rate forecasts are somewhat less precise because only calendar year forecasts are available. Forecast values are calculated by weighting the forecasts by the number of quarters covered by the forecast year. An average for 1986/87, for example, is computed by multiplying the 1986 forecast by (0.25) and the 1987 forecast by (0.75) reflecting the fact that one quarter is taken from 1986 (October to December) and three quarters are taken from 1987 (January to September).
The price and exchange rate forecasts are requested by the Execute option of the core menu (see discussion above). Once these data have been entered, they are retained in the control file until new changes are entered. It is accordingly not necessary to enter these data again as new country files are processed.

Analysis of market and policy changes

The outputs of the Trade Estimates System--improved records, graphs of historical trends, and projections based on trends, elasticities, and period changes--are designed to complement the traditional market and policy analyses of the country analyst. Mechanical projections of export data are not a useful substitute for these analyses. Provision of these projections does, however, substantially improve the ability of analysts to judge the magnitude of effects of market and policy changes on their forecasts.

The forecast for feed grain exports to Spain in 1986/87 is a case in point. U.S. exports over the past ten years show little tendency to follow a trend, above trend in early years and later below. A mechanical forecast of trend exports would therefore likely overestimate 1986/87 exports, but this is not necessarily obvious without knowledge of recent policy developments. In February 1987, the United States signed an agreement with the European Community (EC) under Article 24-6 of the General Agreement on Tariffs and Trade which provides that Spain will import at least 2.0 million tons of corn and 0.3 million tons of sorghum from non-EC countries (Newman, 1987). The EC grain import policy insures that with use of variable levies, however, this will be the maximum amount of feed grains imported because the EC has large stocks of barley and wheat. Spain will not, therefore, import the roughly 3.0 million tons of U.S. feed grains that the trend projection would suggest. The graph is not useless, however, since it suggests that exchange rates are important in explaining U.S. exports from 1977 to 1986.

Although policy and market developments are likely to render mechanical projections invalid as forecasts, there is an obvious advantage to blending statistical analysis of trends with more qualitative analysis. The primary advantage of statistical analysis relates to its ability to identify elements of seasonality, trend, cyclicality, and randomness in an efficient and objective manner (Wheelwright, 1985, p. 8).

System Outputs

Some of the outputs of the Trade Estimates System--improved records, graphs, and projections--vary in usefulness by the commodity and the quarter being projected.

The basic distinction among commodities is whether the commodity a quantity export reported in addition to a value export figure. If a quantity export figure is reported, then unit values and price forecasts are also available and export elasticities can be calculated to make an elasticity projection. If no quantity export figure is available, then it is impossible to make an elasticity projection.
The availability of cumulative monthly export statistics determines the amount of uncertainty inherent in making a quarterly forecast and the likely usefulness of the three projections calculated by the macro program. Before the forecast year begins, no monthly data are available and only the trend projection, and, for some commodities, the elasticity projection, are available. Since the elasticity projection is based both on historical trends and the price forecasts, it contains more information than the trend projection. When available, the elasticity projection is therefore likely to be preferred. This situation is likely to persist through the first quarter because the period change projection is based on only three months of export data in the first quarter. By the second quarter, however, enough data is available, particularly for crops harvested in the fall, to give the monthly data a fair degree of credibility. Consequently, somewhere between the second and third quarters, the period change projection is likely to be preferred and used for the remainder of the forecast year. By the third quarter, the focus of analysis has normally shifted to forecasting the next year.

**System Management**

The Trade Estimates System was designed during a period in ERS when agricultural exports were forecasted primarily by country analysts working in regional branches. The system was designed to be managed by a coordinator working with a statistical assistant in a regional branch. The macro program is menu-driven to minimize the need for computer fluency and it requires little or no additional data to be entered than previous procedures used by the regional branches. Ideally, the data necessary to produce 15 to 20 country printouts—enough to forecast exports to Western Europe—can be entered in roughly a day, provided that country files have already been set up. It takes roughly a day to set up an individual country file.

This system is designed to complement a quarterly outlook exercise rather than a research exercise. Only ten observations are maintained in each country file—too few to yield statistically significant coefficients or to provide the basis for extensive statistical analysis. In an outlook exercise conducted under tight time constraints, computations based on such a small sample provide less uncertainty than the alternative—no statistical analysis. These computations may also be acceptable in the context of staff work in which similar time constraints prevail. As such time constraints are relaxed, as might be true in an annual forecasting exercise or in a research project, there will, however, be a need to develop a more elaborate forecasting system.

If the system is to be used by a world trade forecasting coordinator rather than a regional coordinator, certain constraints arise in using this system. The most obvious constraint is time. Each country is run individually and there are too many countries in the world to have one person enter data and prepare country printouts in a day or two. This is particularly true in the first quarter when trend and elasticity coefficients and graphs need to be run. A similar constraint arises because the macro program’s menus need to list each country’s name in each of several different menus. Key countries could be handled this way by a
world coordinator, but an exhaustive list of countries would likely prove unworkable.

SPECIAL COUNTRY, COMMODITY, AND AGGREGATION ISSUES

Sustained commercial trade is an implicit requirement for proper calculation of the projections provided by the Trade Estimates System, particularly for the elasticity estimates. Zero values for quantity or value exports will make it difficult to compute the regressions required to calculate the trend and elasticity projections and the ratios required for the period change projection (appendices 2, 3, and 4). Infrequent trading or trade in small quantities are enough to make the regression estimates statistically insignificant because of the additional variance likely introduced. As a consequence, countries and commodities for which a strong commercial link is established may get little benefit from the projections computed by this system.

Since exports to a region are more regular than country exports, there is an incentive to create region files and treat them as country files for computational purposes. Experiments using a region file for the EC have proven to be useful, but more experience using such files is required before they should be used in place of country files in the forecasting process. Reliance on regional files for forecasts will remain risky as long as countries in the region have had policies at variance with other countries in the region over the historical period. The chief advantage of the region files lies in the additional information they provide to regional coordinators.

Another set of special issues arise when countries maintain border policies designed to insulate domestic from world market prices. The EC variable levies for grain are an example of such a policy. A problem arises in using the elasticity projection under such circumstances because it is calculated from export unit values converted to national currencies with an exchange rate. This procedure assumes 100 percent price transmission from the world to the domestic market when theoretical transmission under the variable levy has traditionally been assumed to be zero. The Trade Estimates System has under such circumstances computed highly elastic elasticities for grains exported to EC countries. Although theoretical work has posited the existence of price transmission despite the variable levy (Abbott, 1979), greater experience working with the elasticities is needed before conclusions can be drawn.

AREAS FOR FURTHER INQUIRY

An important objective in setting up the Trade Estimates System was to stimulate further inquiry into development of statistical tools to assist analysts in making export forecasts. While system has deficiencies, implementation of an interim system was believed to be more important than waiting until a more ideal framework could be worked out.

Extensions of the Trade Estimates System can take a number of forms, depending on the need. Most improvements in the system depend on the
addition of more data: more years of annual export data, more quarters of cumulative quarterly data, or addition of more explanatory variables. The addition of more export data would permit greater freedom to pursue statistical analysis. With the addition of price deflators and an income variable, for example, a much more sophisticated set of export price and income elasticity projections could be made. Additional cumulative quarterly or monthly export data could likewise be used to develop a system for seasonally adjusting projections instead of relying exclusively on a period change calculation.

Several software refinements are also possible. It might be desirable to add an option which uses a smoothing function, such as a moving average, to project exports (Granger, 1977). Other options could be added which aggregate country files across regions or commodities, or permit hypothesis testing using the elasticity projections. One refinement would be to test projections routinely for the effect of exchange rate changes.

Software could be written to transfer Census data electronically from the mainframe to the micro-computer or to place the entire Trade Estimates System on the mainframe so as to eliminate much of the needed data entry. Several of these ideas could over time be added to the system once the basic routine of making estimates had been established.

BIBLIOGRAPHY


International Monetary Fund. International Financial Statistics. February
1987.


______. _____. Weekly Weather and Crop Bulletin.
MATHEMATICAL APPENDIX

Appendix 1: Calculation of projected U.S. exports given an average market share

\[ S = \frac{\text{sum}(X_i/M_i)}{n} \]

\[ X(t+1) = M(t+1) \times S \]

where:
- \( X_i \) = U.S. exports of commodity \( i \) to a given country
- \( M_i \) = Total country imports of commodity \( i \)
- \( N \) = Number of years of data summed
- \( S \) = Average U.S. market share
  - Indicates variable estimate

Description: Estimated U.S. exports equal estimated foreign country imports multiplied by the average U.S. market share.

Appendix 2: Projection of U.S. exports using a regression of quantity (or value) exports on trend

\[ X_i = a + b(t) \]

\[ X(t+1) = a + (b \times 11) \]

Where:
- \( X_i \) = U.S. exports of commodity \( i \)
- \( t = 1, 2, 3, \ldots, 10 \)
- \( a \) = Constant regression coefficient
- \( b \) = Trend regression coefficient

Description: Estimated U.S. exports equal the estimated coefficient on the trend variable multiplied by the next year in the trend (11) plus the constant regression coefficient.

Appendix 3: Projection of U.S. exports using an estimated export price elasticity of demand

\[ X_i = c \times P(t) \exp(d) \text{ or equivalently} \]

\[ \log X_i = \log c + d \times \log P(t) \]
\[ X(t+1) = X(t) \times \left( \frac{(d \times PC) / 100 + 1}{1} \right) \]

Where:  
- \( X_i \) = U.S. exports of commodity \( i \)  
- \( c \) = constant regression coefficient  
- \( d \) = export price elasticity  
- \( P \) = National currency unit value  
- \( PC = \left[ \frac{P(t) - P(t-1)}{P(t-1)} \right] \times 100 \)

Description: Estimated U.S. exports equal exports in the previous year times the change in exports. The change in exports is measured by multiplying the price change by the export price elasticity and adjusting the result to be a decimal change.

Appendix 4: Projection of U.S. exports as a percentage change over the previous year

\[ X(t) = X(t-1) \times Q(t)/Q(t-1) \]

Where:  
- \( X \) = U.S. exports  
- \( Q \) = Cumulative quarterly exports

Description: Estimated U.S. exports equal exports in the previous year times a ratio of cumulative quarterly trade this year to last year.

Appendix 5: Projection of U.S. export unit values

\[ $P(t+1) = $P(t) \times (1 + PC) \]

\[ PC = \left[ \frac{$P(t) - $P(t-1)}{$P(t-1)} \right] \]

Where: \( $P \) = Unit value in U.S. dollars

Description: The projected unit value is estimated by multiplying the previous unit value by a decimal percent change forecast.