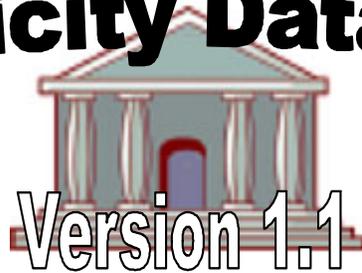


# Elasticity Databank



## User Manual and Documentation Report

September 2003

Prepared for

U.S. Environmental Protection Agency  
Office of Air Quality Planning and Standards  
Research Triangle Park, NC 27711  
Tyler Fox, Project Manager

Prepared by

Research Triangle Institute

## **ACKNOWLEDGMENTS**

The Elasticity Database was developed for the Innovative Strategies and Economics Group (ISEG) under EPA contract number 68-D-99-024 by RTI International's Center for Regulatory Economics and Policy Research in Research Triangle Park, NC. Tyler Fox and Virgis Brown of ISEG were the EPA project managers. Special thanks to Bryan Hubbell and other EPA ISEG STAFF as well as to Brooks Depro, Catherine Corey, and Shawn Karns of RTI International for their efforts in the development of this tool and its documentation.

## CONTENTS

<u>Section</u>	<u>Page</u>
1. Welcome to the Elasticity Databank . . . . .	1
1.1 Who Is this Tool For? . . . . .	1
1.2 How Is the User’s Guide Organized? . . . . .	1
1.3 Computer Requirements? . . . . .	2
1.4 Whom to Contact with Comments and Questions? . . . . .	2
1.5 Sources for More Information . . . . .	2
2. Populating the Database . . . . .	3
2.1 EPA Generated Estimates . . . . .	3
2.2 Economic Literature . . . . .	4
Step 1: Select Index Search Terms . . . . .	5
Step 2: Choose Descriptors Index and Search by “Industry” Term . . . . .	6
Step 3: Restrict Search to Records that Contain All Variations of the Keyword “Elasticity” . . . . .	7
3. Using the Elasticity Databank . . . . .	8
3.1 Viewing Record in Elasticity Databank . . . . .	9
3.2 Searching and Retrieving Records in Elasticity Databank: Making Withdrawals . . . . .	9
3.2.1 Reviewing Records and Generating Reports . . . . .	11
3.3 Adding Records in Elasticity Databank: Making Deposits . . . . .	11
3.3.1 Entering Product Information . . . . .	13
3.3.2 Entering Source/Reference Information . . . . .	14
3.3.3 Elasticity and Estimation Information . . . . .	16

3.3.3.1	Parameter Value and Type of Elasticity . . . . .	16
3.3.3.2	Econometric Method and Specification . . . . .	17
3.3.3.3	Data Characteristics . . . . .	19
3.3.3.4	Significance of Parameter and Confidence Intervals . . .	19
4.	Help Features in Elasticity Databank . . . . .	20
5.	References . . . . .	22

**Appendixes**

A	Elasticity Databank: Database Structure . . . . .	A-1
B	Glossary of Terms . . . . .	B-1
C	Using the Elasticity Databank: Two Illustrated Examples . . . . .	C-1
D	Instructions on How to Delete Items from the Switchboard and Create a “Read-Only” for Distribution . . . . .	D-1

## LIST OF FIGURES

<u>Number</u>		<u>Page</u>
1	Selecting Index Search Terms . . . . .	5
2	Choosing Descriptors Index and Searching by “Industry” Term . . . . .	6
3	Restricting Search to Records that Contain All Variations of the Keyword “Elasticity” . . . . .	7
4	Elasticity Databank Welcome Screen . . . . .	8
5	Select Search Method . . . . .	9
6	Selecting Records for Review: Example of Product List Screen . . . . .	10
7	Selecting Records for Review: Example of the Search Screen for Products . . .	10
8	Accessing the Summary Form . . . . .	11
9	Duplicate Existing Records . . . . .	12
10	Select the Record to Duplicate . . . . .	12
11	Step 1: Entering Product Information . . . . .	14
12a	Step 2: Entering Bibliographic Information . . . . .	15
12b	Step 2: Entering Bibliographic Information . . . . .	15
13	Entering Elasticity Information . . . . .	17
14	Describing Technical Aspects of the Elasticity Estimation Procedure: Step #1 . . . . .	18
15	Describing Technical Aspects of the Elasticity Estimation Procedure: Step #2 . . . . .	18
16	Describing Data Characteristics Used in the Estimation Process . . . . .	19
17	Hypothesis Testing and Confidence Intervals Information . . . . .	20
18	Activate the Office Assistant by Selecting Key F1 . . . . .	21
19	Activate the Glossary: An Example . . . . .	21
20	Example of Elasticity Databank’s Help Features: Tool Tip Showing the Function of a Command Button “Back” . . . . .	22

# **1. Welcome to the Elasticity Databank**

As part of its regulatory support role for Clean Air Act (CAA) programs, the Innovative Strategies and Economics Group (ISEG) within the Office of Air Quality Planning and Standards (OAQPS) analyzes the economic impacts of sector-specific and broad national emission reduction strategies. To perform these analyses, staff must parameterize economic models and discuss issues related to commodity and input substitution choices. Unfortunately, an encyclopedic “Book of Elasticities” to which the analyst can always refer does not to date exist. This document details the development and design of a database of elasticity parameters (Elasticity Databank) with particular focus on those sectors of the U.S. economy that ISEG will need to analyze for the NAAQS as well as other CAA programs. The database includes a variety of elasticity types including demand and supply elasticities, substitution elasticities, and trade elasticities.

## **1.1 Who Is this Tool For?**

The Elasticity Databank can be used by a wide range of persons including policy analysts, academics and economic researchers. The database can be easily searched to review available elasticity estimates and to obtain estimates for use in regulatory and non-regulatory economic studies or modeling efforts. It therefore reduces the time and effort typically associated with obtaining such key parameters for these economic analyses. It also provides the opportunity for analysts and academics to share their work in developing these estimates and make them available to the broader community for use in these economic analyses.

## **1.2 How Is the User’s Guide Organized?**

This document contains the following two Chapters and two Appendices:

- Chapter 2: Populating the Database—this chapter provides details on the sources of information used to compile the current set of X records contained in the Elasticity Databank.
- Chapter 3: Using the Elasticity Databank—this chapter provides details on how the user can search and retrieve records from the databank (i.e., making withdrawals), viewing the records within the databank, and adding records to the databank (i.e., making deposits).

- Appendix A: Database Structure—An important part of the Elasticity Databank is the underlying database and its structure. This appendix provides a detailed description of the programming related to the Elasticity Databank’s design.
- Appendix B: Glossary of Terms—This glossary provides definitions for key terms used in Elasticity Databank.
- Appendix C: Examples—This Appendix provides an illustrated examples of viewing records and data entry.

### **1.3 Computer Requirements?**

This tool was developed with MS Access database software. Based on our testing and evaluation, the minimum system requirements for installation and operation include the following:

- Operating System: Microsoft® Windows 98 Second Edition, Millennium Edition, Windows NT® 4.0 with Service Pack 6, Windows 2000 with Service Pack 2, Windows XP Professional or Home Edition, Windows XP Tablet PC Edition
- RAM: 32MB (64MB recommended)
- Storage: 60MB of available hard-disk space
- Software: MS Access 2000 or higher

### **1.4 Whom to Contact with Comments and Questions?**

For comments and questions, please contact Tyler Fox at the Environmental Protection Agency’s Office of Air Quality Planning and Standards (OAQPS).

Address: EPA/OAQPS C339-01, Research Triangle Park, NC 27711

E-mail: Fox.Tyler@epa.gov

Telephone: (919) 541-0503

### **1.5 Sources for More Information**

The database is designed to support methodologies described in the U.S. EPA’s *Guidelines for Preparing Economic Analyses* (EPA, 2000) and the *OAQPS Economic Analysis Resource Document* (EPA, 1999), which can be accessed using the following web addresses:

- <http://yosemite1.epa.gov/ee/epa/eed.nsf/pages/Guidelines.html>
- <http://www.epa.gov/ttnecas1/analguid.html>

The *OAQPS Resource Manual* provides ISEG with guidance on preparing economic analyses. Several examples of economic impact analyses (EIAs) conducted by our group can be accessed at the following web address:

- <http://www.epa.gov/ttnecas1/econguid.html>

These two links are part of ISEG's economics and cost analysis support web site that provides analysts and the public with other relevant documents.

- <http://www.epa.gov/ttnecas1/>.

Other econometric and statistical references that may be helpful include:

- Greene, William H. 2000. *Econometric Analysis*, 4<sup>th</sup> Ed. Upper Saddle River, NJ: Prentice Hall.
- Kennedy, Peter. 1998. *A Guide to Econometrics*, 4<sup>th</sup> Ed. Cambridge, MA: MIT Press.

## **2. Populating the Database**

Version 1.0 of the Elasticity Databank was populated by RTI International for the Agency used EPA generated estimates for economic impact analysis (EIA), and economic literature searches. The remainder of this chapter provides details on each of these sources and the records available from each within the database.

### **2.1 EPA Generated Estimates**

For several analysis, EPA has econometrically estimated elasticity parameter estimates for economic impact analysis. We reviewed a variety of EIA studies<sup>1</sup> conducted by the Agency since 1990 a collected estimates from those that documented the estimation procedure. Currently, the following industries have been included in the Elasticity Databank:

- aluminum,
- iron and steel castings,

---

<sup>1</sup>Several of the studies use literature estimates of these parameters. In these cases, we have identified the source study.

- polymers and resins,
- pulp and paper products,
- portland cement,
- secondary lead smelters,
- steel mill products,
- vegetable oils and meal products, and
- wood furniture products.

## **2.2 Economic Literature**

Although the literature contains a variety of approaches for identifying elasticity parameters, we selected an approach that uses a single database, *EconLit*, to identify the initial list of relevant articles (<http://www.econlit.org/>). As noted on its web page, *EconLit* is the American Economic Association's widely used electronic bibliography of economics literature. It contains abstracts, indexing, and links to full-text articles in economics journals. In addition, the website abstracts books and indexes articles in books, working paper series, and dissertations.

RTI used *EconLit*'s indexing feature, which allows us to *systematically* search this database and find high-value articles. We outline the approach below.

## Step 1: Select Index Search Terms

We clicked on the index command button on the right of the search screen (see Figure 1).

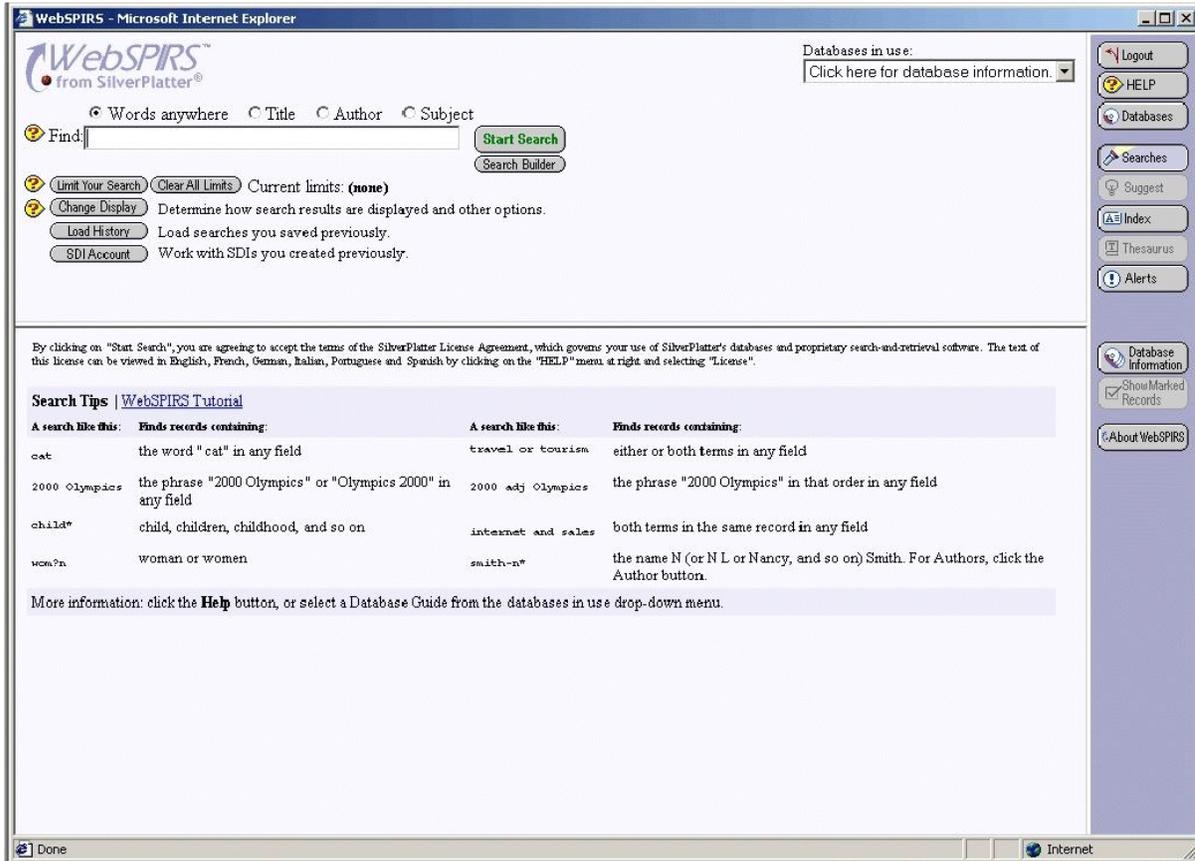
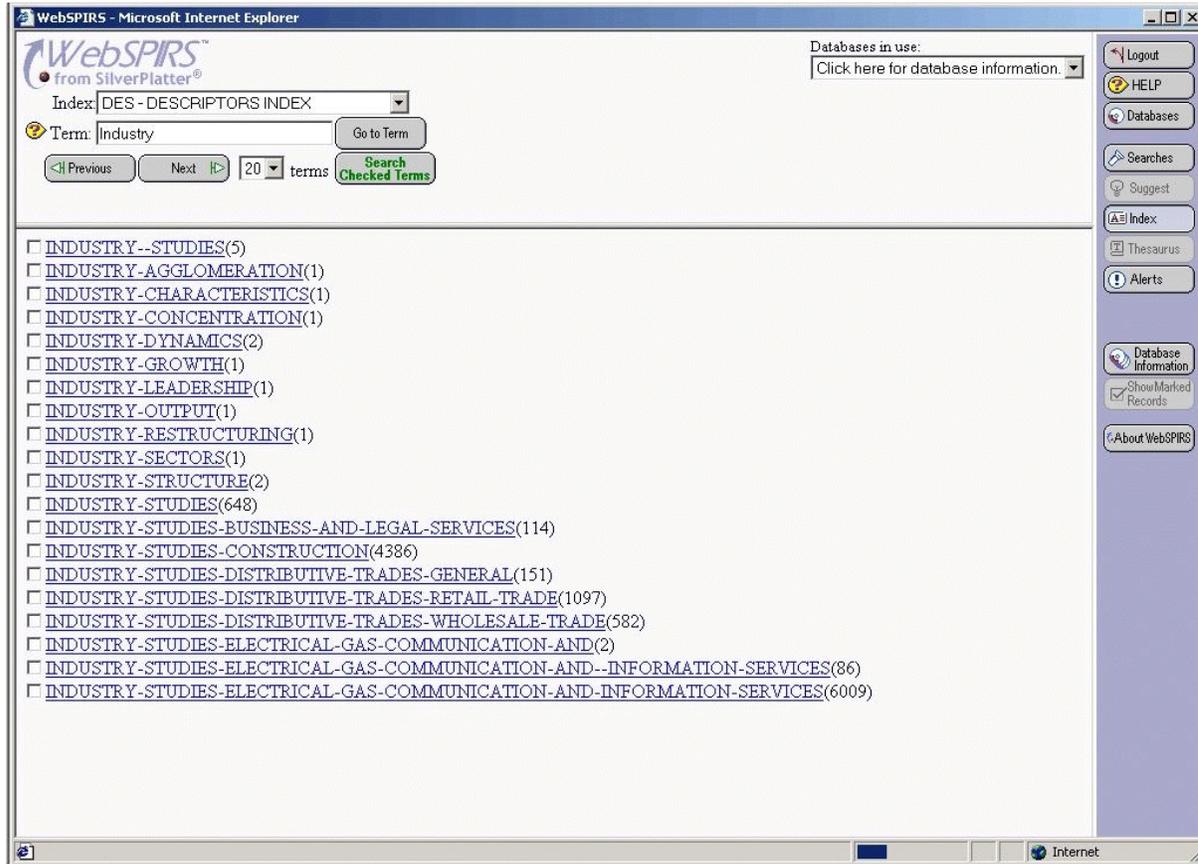


Figure 1. Selecting Index Search Terms

**Step 2: Choose Descriptors Index and Search by “Industry” Term**

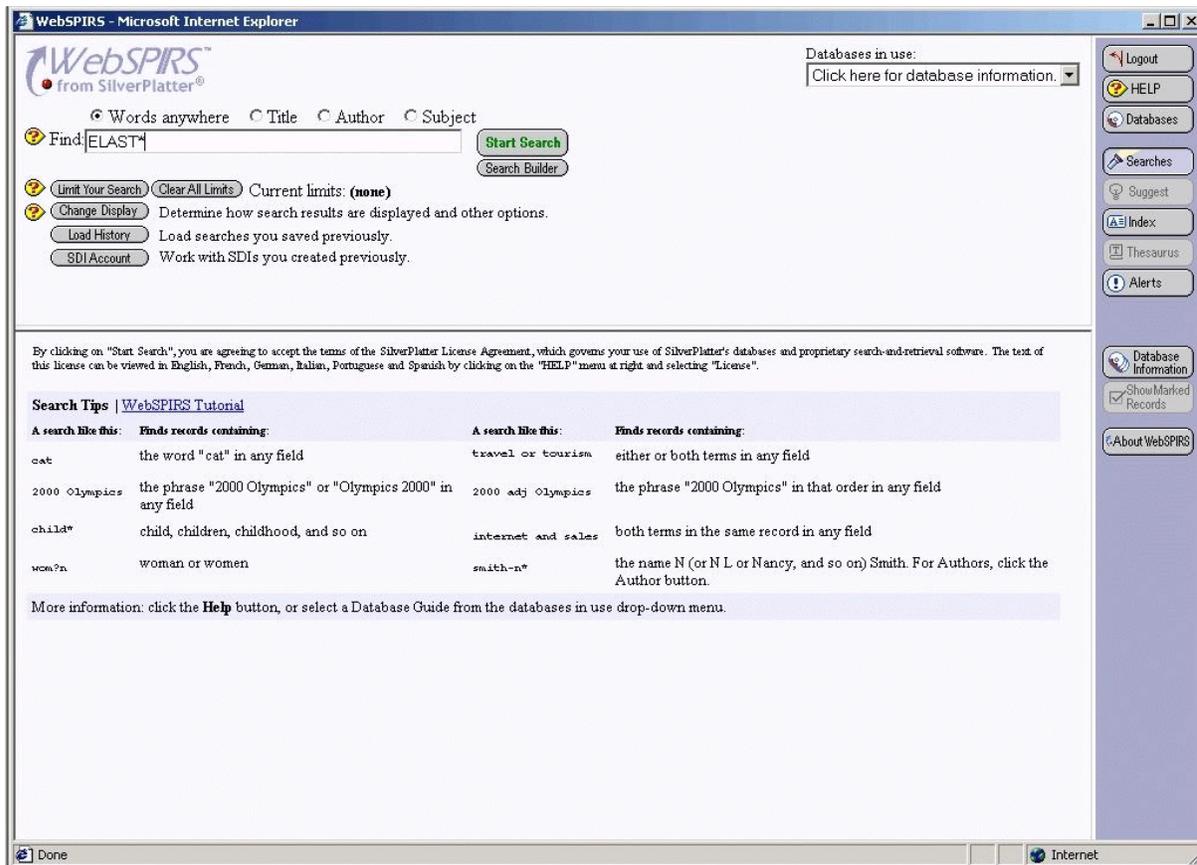
We selected the **DESCRIPTORS INDEX** and used the term **INDUSTRY** to capture all records related to industry studies (see Figure 2). This search found over 17,000 potential records.



**Figure 2. Choosing Descriptors Index and Searching by “Industry” Term**

### Step 3: Restrict Search to Records that Contain All Variations of the Keyword “Elasticity”

Finally, we restricted this descriptors index search by returning to the search page and entering the keyword **ELAST\***. Note that this search includes a wild-card term that enables us to limit the articles to those containing “ELAST” in any field. This process narrowed our initial search to over 700 records. To date, the database includes 28 of these records.



**Figure 3. Restricting Search to Records that Contain All Variations of the Keyword “Elasticity”**

### 3. Using the Elasticity Databank

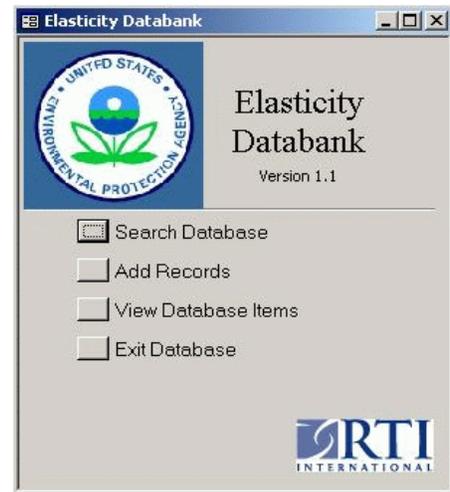
RTI developed the Elasticity Databank for EPA using Microsoft Access database software. This tool provides the user with a convenient way to view, search, retrieve, and input elasticity records. Elasticity Databank also contains an input wizard to guide the user through the process of data entry. To retrieve the elasticity estimates, the database allows the user to search by product description based on the North American Industry Classification System (NAICS) code or Standard Industrial Classification (SIC) code as well as by type of elasticity (i.e., own- and cross-price supply or demand, input substitution, or trade). A list of these classification codes is available at the U.S. Census Bureau's website <<http://www.census.gov/epcd/www/naics.html>>.

This section describes the key database forms and step-by-step instructions on navigating in Elasticity Databank. Descriptions of the database structure and tables are included in Appendix A. Appendix B contains a glossary of key terms.

As Figure 4 illustrates, the Welcome Screen serves as the interface by which the user can select one of three options:

- View records from Elasticity Databank
- Search and retrieve records in the Elasticity Databank
- Add records to the Elasticity Databank

The user can select these options by clicking the appropriate command button. The user may also EXIT the tool from the Welcome Screen as shown in Figure 4.



**Figure 4. Elasticity Databank Welcome Screen**

### 3.1 Viewing Record in Elasticity Databank

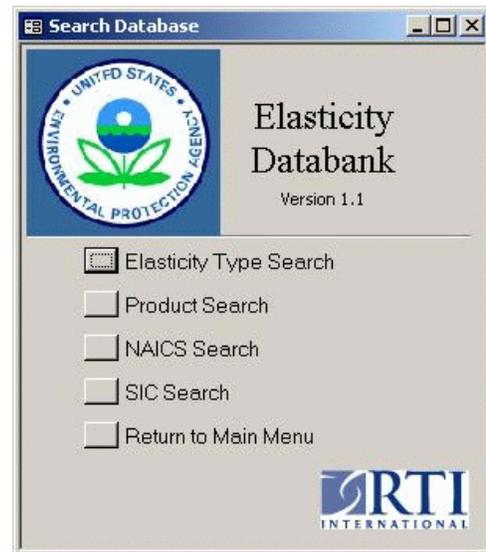
User's familiar with database and spreadsheet programs may like to browse the data records of the Elasticity Databank in a more traditional sense (i.e. not using the preset data entry forms of the data bank). Viewing the databank in the manner also offers the use with the capability of sorting or filtering records. To view the database items in the manner and access these traditional features, the user can click the **VIEW DATABASE ITEMS** button.

### 3.2 Searching and Retrieving Records in Elasticity Databank: Making Withdrawals

The user may search the Elasticity Databank by entering criteria through the interface and retrieve those records that meet those criteria. This function allows for a more directed search by the user especially for those not familiar with Microsoft Access. After clicking the **SEARCH** button, the user sees the product search screen. The user can choose among three methods of record searches: product search, NAICS search, or SIC search, or elasticity type (see Figure 5).

Once the search type is selected, the user can retrieve the records in one of the following options:

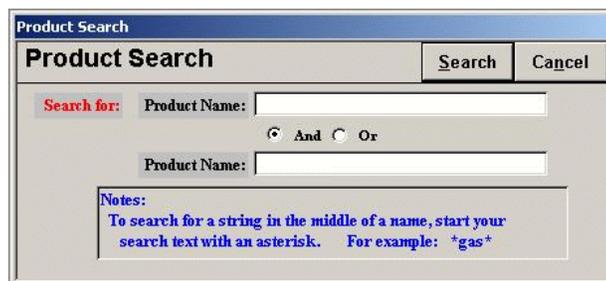
- *Select a single product, NAICS, or SIC:* select the item of interest and click **VIEW**.
- *Select multiple products, NAICS, or SIC:* the user can depress the control or shift key and click on multiple items of interest. Those selected are highlighted. Click **VIEW**.
- *View all records in the database:* click **VIEW ALL**.
- *Search for a specific product, NAICS, SIC, or elasticity type:* click **SEARCH** (see Figure 6). Note the search screen allows the user to conduct searches and/or text string searches (see Figure 7). After entering search criteria, click **SEARCH** to execute the search. Once the search is complete, a product list will appear and the user can follow the guidelines above to select items.
- *Add Record:* click **ADD RECORD** (see Figure 6) to add a new record to the elasticity databank. (See Section 3.3).



**Figure 5. Select Search Method**



**Figure 6. Selecting Records for Review:  
Example of Product List Screen**



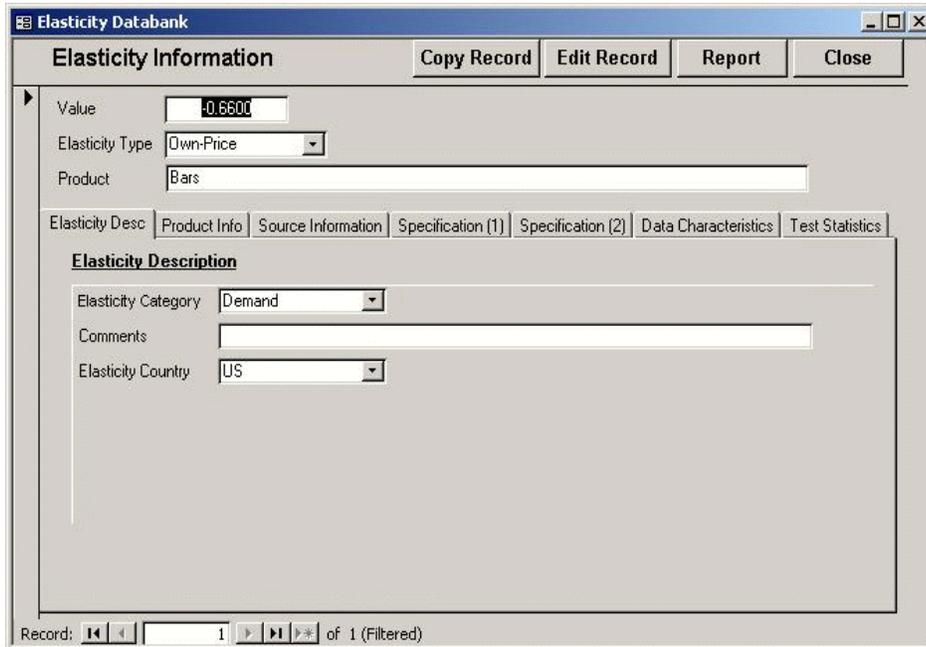
**Figure 7. Selecting Records for Review:  
Example of the Search Screen for Products**

- *Exporting Search Results to MS Excel:* The user can export the current elasticity search by clicking the **EXPORT TO MS EXCEL**. This tool provides the user with a stand-alone spreadsheet file that contains key data.
- *Close:* The user can close the product list form and return to welcome screen by clicking the **CLOSE** button.

Based on the user selection, the next screen to appear will contain the appropriate list. For this example, as shown in Figure 6, the user is presented with the product list screen.

### 3.2.1 Reviewing Records and Generating Reports

Once records have been selected for viewing, the summary form will appear that provides all the information currently available for the database record (see Figure 8). The user can navigate among the information “tabs” by clicking on the tab of interest. In addition, the user can view a report by clicking the **REPORT** button. To navigate among selected records, the user can use the page up/down key or click on the arrows at the bottom of the screen.



The screenshot shows a window titled "Elasticity Databank" with a menu bar containing "Copy Record", "Edit Record", "Report", and "Close". The main area is titled "Elasticity Information" and contains the following fields:

- Value:
- Elasticity Type:
- Product:

Below these fields is a tabbed interface with tabs for "Elasticity Desc", "Product Info", "Source Information", "Specification (1)", "Specification (2)", "Data Characteristics", and "Test Statistics". The "Elasticity Description" tab is active and contains:

- Elasticity Category:
- Comments:
- Elasticity Country:

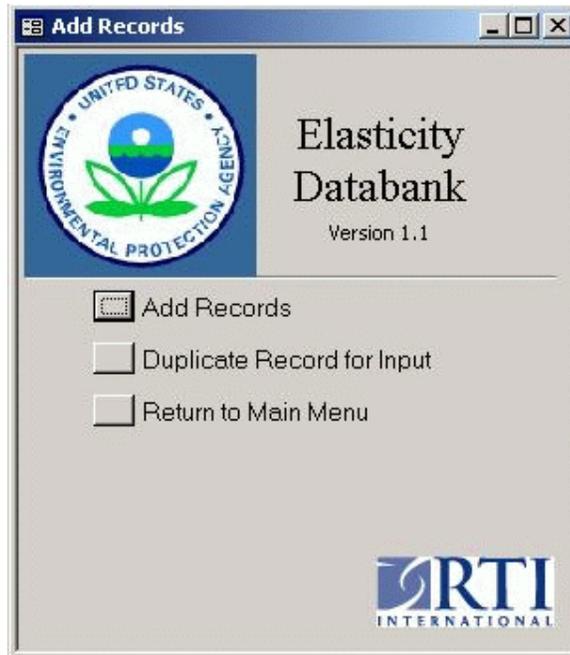
At the bottom, there is a record navigation bar showing "Record: 1 of 1 (Filtered)".

**Figure 8. Accessing the Summary Form**

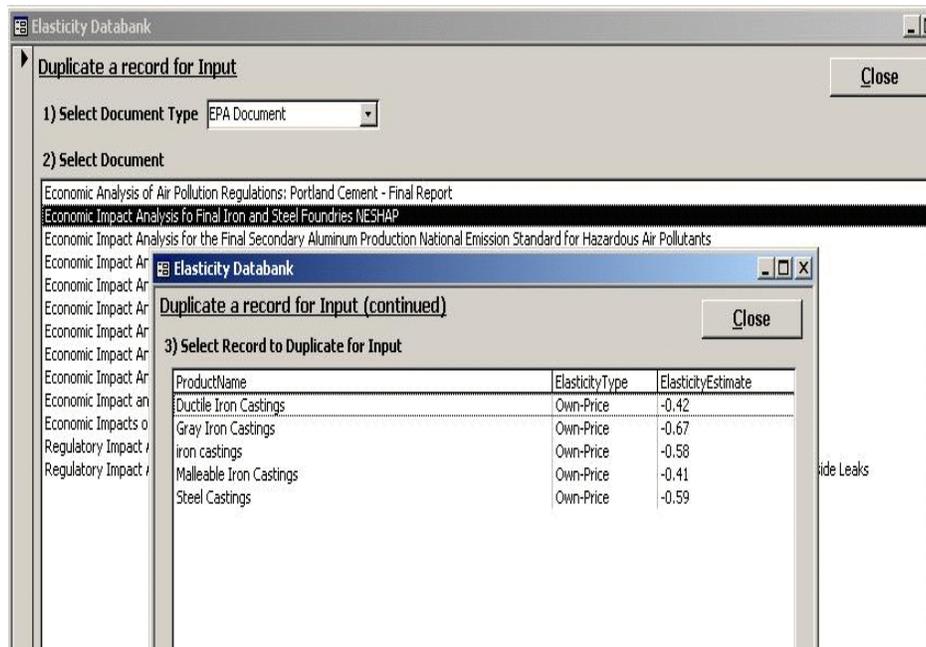
Note the summary form is specified as read-only to prevent accidental changes to the elasticity record.

### 3.3 Adding Records in Elasticity Databank: Making Deposits

There are two ways a user can add record to the database. The standard way is to utilize the **ADD RECORDS** button that appear on selected forms. However, in there may be certain cases where a significant portion of record information is the same for multiple estimates. In these cases, the user can duplicate records and only change information selected input (see Figure 9). Once the user selects the duplicate record button, the databank prompts the user for the record to duplicate. Users select the document type, document, and record for duplicate input (see Figure 10).



**Figure 9. Duplicate Existing Records**



**Figure 10. Select the Record to Duplicate**

When using the **ADD RECORDS** button, the user sees a series of data entry screens. These screens guide the user through the data entry procedures:

- Step 1: entering product information;
- Step 2: entering source/reference information; and
- Step 3: entering parameter and estimation information.

The remainder of this section will provide details for each of the above steps.

### ***3.3.1 Entering Product Information***

As Figure 11 shows, this form requires the user to provide basic information about the product and industry, including the product name and the industry classification codes. Currently, the government uses two classification systems:

- **SIC System:** The SIC system was established to promote uniformity and comparability of data collected and published by agencies within the U.S. government, state agencies, trade associations, and research organizations. It was developed as an establishment-based industry classification system that classifies each establishment (defined as a single physical location at which economic activity occurs) according to its primary activity. The SIC system covers the entire field of economic activities by defining industries in accordance with the composition and structure of the economy. Since the 1930s, the SIC system has been revised periodically to reflect changes in the economic structure of the United States. New industries were added and small, declining industries deleted or combined with other activities. The SIC system was last revised in 1987, when approximately 20 new service industries were added to it and a few new industries were added to manufacturing to reflect technological changes occurring in that sector. The new NAICS replaced the SIC system in 1997.
- **NAICS:** In 1997, the Office of Management and Budget (OMB) announced its decision to adopt the NAICS (pronounced Nakes) as the industry classification system used by the statistical agencies of the United States. NAICS replaces the 1987 SIC system. It is the first economic classification system to be constructed based on a single economic concept. Economic units that use like processes to produce goods or services are grouped together.

Once this form is completed, the user can move to the next screen by clicking **NEXT** or return to the previous screen by selecting **BACK**. Currently the product name and NAICS fields are required prior to moving to the next screen.

**Elasticity Databank Input Wizard**

**Product Information**

Name

**Industry Classification Code**

1) SIC Code: Choose a 2-, 3-, or 4-digit SIC Code that best describes the product.

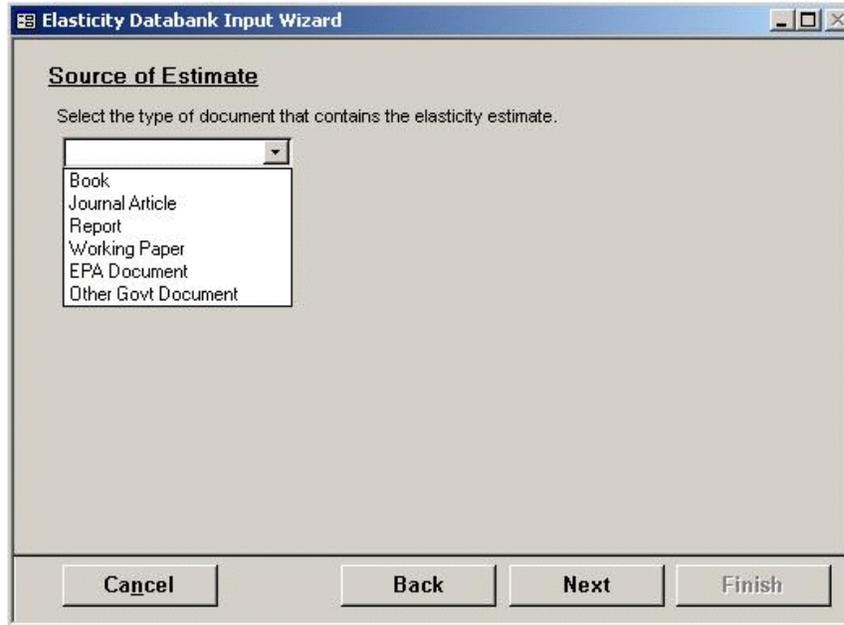
2) NAICS Code: Choose a 3- or 6-digit NAICS Code that best describes the product.

**Figure 11. Step 1: Entering Product Information**

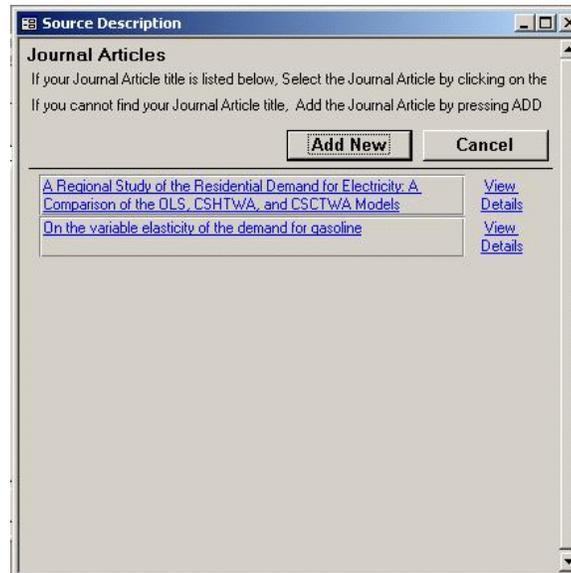
### ***3.3.2 Entering Source/Reference Information***

The next step, as shown in Figures 12a and 12b, requires the user to provide information about the source of the elasticity estimate. The user can enter bibliographic information by document type (e.g., book, journal article, report, working paper, EPA document).

Once the document type has been selected, the database displays a screen with a current list of documents. This simplifies the data entry process by allowing the user to enter bibliographic information *once*. If the document does not currently exist in the database, the user can select **ADD NEW** and will be guided through the data entry process.



**Figure 12a. Step 2: Entering Bibliographic Information**



**Figure 12b. Step 2: Entering Bibliographic Information**

### 3.3.3 *Elasticity and Estimation Information*

The last step requires the user to provide information on the elasticity and details related to its estimation. This last step contains multiple input fields and requires the user to provide the following information over multiple screen prompts:

- parameter value and type of elasticity
- econometric method and specification
- characteristics of underlying data
- significance of parameter value and confidence intervals

The remainder of this section provides step-by-step details for each of the above entry screens.

#### 3.3.3.1 *Parameter Value and Type of Elasticity*

The first user prompt, as shown in Figure 13, requires the user to provide basic information about the elasticity estimate, including the following:

- the parameter value,
- type of elasticity:
  - ✓ own-price elasticity—A measure of the percentage change in quantity (demanded or supplied) brought about by a 1 percent change in own price.
  - ✓ cross-price elasticity—A measure of the percentage change in quantity (demanded or supplied) brought about by a 1 percent change in another good's price.
  - ✓ elasticity of substitution—A measure of how “easy” it is to substitute one factor input for another. It is the proportionate change in the ratio of factors to the rate at which one input may be traded off against another while holding output constant.
  - ✓ income elasticity of demand—A measure of the percentage change in quantity brought about by a 1 percent change in income.
  - ✓ trade elasticity—This concept is similar to elasticity of substitution. A measure of how “easy” it is to substitute imports for domestic goods consumed or substitute exports for domestic goods produced.

The database then uses a wizard to ask a series of basic questions about the elasticity estimate based on the type of elasticity entered in the “Type” field.

The image shows a software dialog box titled "Elasticity Databank Input Wizard". Inside the dialog, there is a section titled "Elasticity Information". This section contains a text input field labeled "Value", followed by the question "Is this a Own-price, Cross-price, Substitution, Income, or Other Elasticity?". Below the question is a dropdown menu. At the bottom of the dialog, there are four buttons: "Cancel", "Back", "Next", and "Finish".

**Figure 13. Entering Elasticity Information**

### 3.3.3.2 *Econometric Method and Specification*

This form requires the user to provide information on the technical aspects of the elasticity estimation procedure (see Figures 14 and 15):

- Description of method—A text box allows the user to describe relevant econometric procedures.
- Constant or point elasticity—A constant elasticity assumes elasticity is unchanging for the relevant changes in the independent variable (i.e., price). A point elasticity assumes elasticity varies as the relevant independent variable (i.e., price) changes. Therefore, one must specify the point at which the elasticity is measured. “Points” frequently used are the mean, median, or xth percentile.
- Functional form—The user enters the pattern for one or more continuous (possible piecewise) physical or economic relationships used in the model. Examples of functional forms used in production analysis include Leontief, linear, Cobb-Douglas, and generalized Box-Cox.

**Figure 14. Describing Technical Aspects of the Elasticity Estimation Procedure: Step #1**

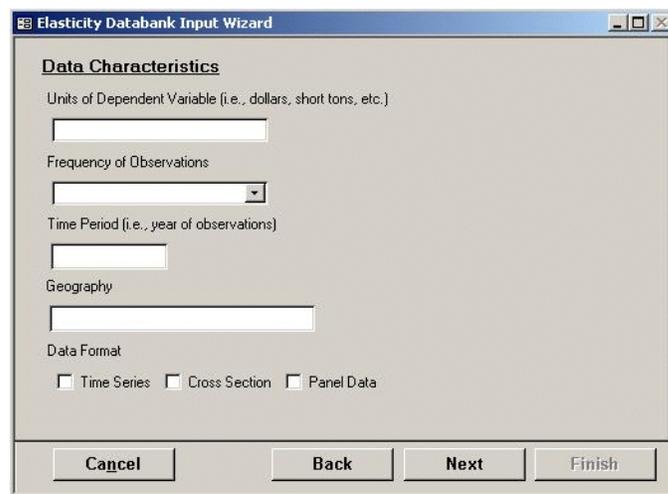
**Figure 15. Describing Technical Aspects of the Elasticity Estimation Procedure: Step #2**

- Lag structure—Time series that cover a substantial period often require lagged explanatory variables in the model. Users can identify the lag structure in the model with this text box. Examples include distributed, geometric lag, and polynomial distributed lag.
- Equation—This text box allows the user to enter the page number(s) that contain the econometric equation(s) specified in the model. The user can then conveniently find the details in the original journal article.

### 3.3.3.3 Data Characteristics

As Figure 16 illustrates, this form requires the user to provide basic information about the data set used in the analysis. Information includes

- the units of the dependant variable (i.e., . . . ),
- frequency of observations (i.e., . . . ),
- time period (i.e., . . . ),
- geographic scope (i.e., . . . ), and
- data format (i.e., time-series, cross-section, or panel data).

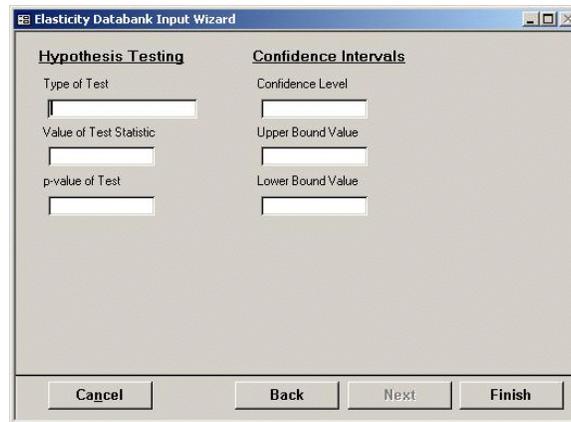


**Figure 16. Describing Data Characteristics Used in the Estimation Process**

### 3.3.3.4 Significance of Parameter and Confidence Intervals

The literature articles collected for the database generally include information about procedures the author(s) followed to test the hypothesis about the parameter. This provides potential users with information about the statistical significance of the estimate and observed confidence intervals for the estimate and may be useful for sensitivity analysis.

In order to encourage informed use of parameters found in the literature, the Elasticity Databank requires the user to collect and record the following information during the data entry process: the test used by the author(s) in the analysis, the value of the test statistic, and the observed significance of the statistical test (p-value). It also requires the user to record the upper and lower bounds of the estimate based on a predetermined confidence level (see Figure 17).



The screenshot shows a dialog box titled "Elasticity Databank Input Wizard". It is divided into two main sections: "Hypothesis Testing" and "Confidence Intervals".

- Hypothesis Testing:** Contains three input fields: "Type of Test", "Value of Test Statistic", and "p-value of Test".
- Confidence Intervals:** Contains three input fields: "Confidence Level", "Upper Bound Value", and "Lower Bound Value".

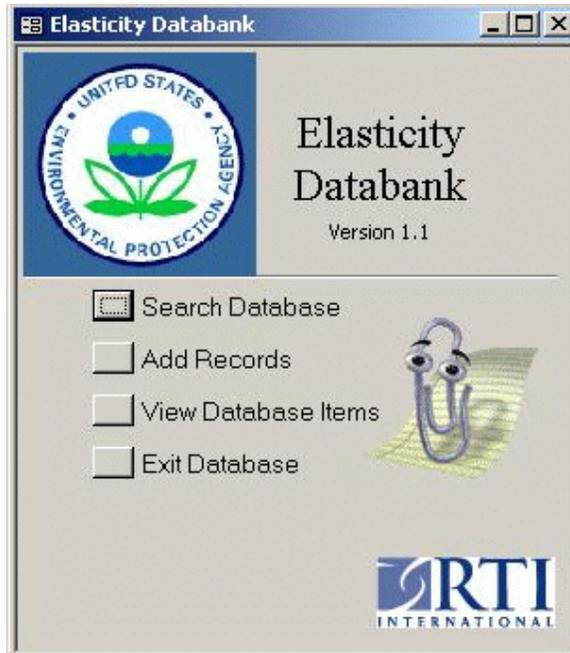
At the bottom of the dialog box, there are four buttons: "Cancel", "Back", "Next", and "Finish".

**Figure 17. Hypothesis Testing and Confidence Intervals Information**

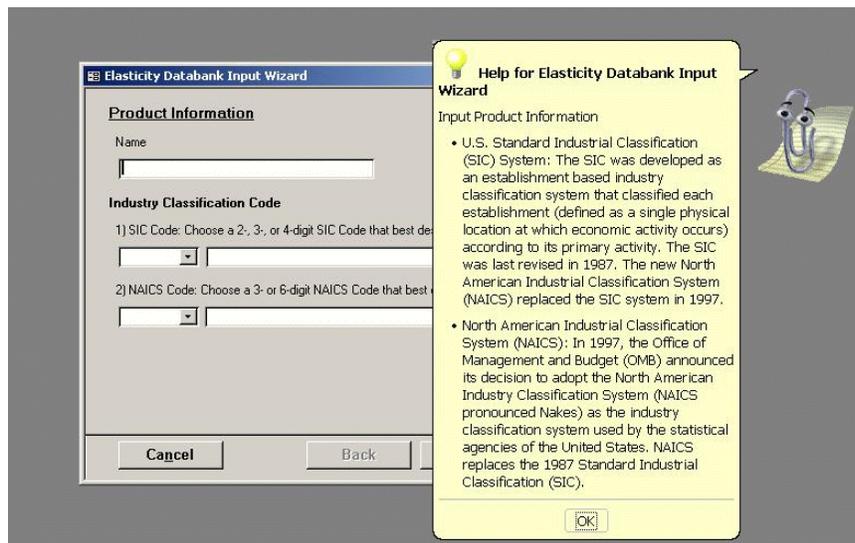
#### **4. Help Features in Elasticity Databank**

The database also includes basic help features that provide a glossary of terms used for selected input fields. To access this help feature, the user can turn on the office assistant feature of MS Access. To do this, select "Show the Office Assistant" from the Access Help menu and click F1. The office assistant should appear in the window (see Figure 18). After the office assistant is activated, the user can click F1 again with any input form to gain access to the glossary for important terms included on the form. Figure 19 provides an example glossary.

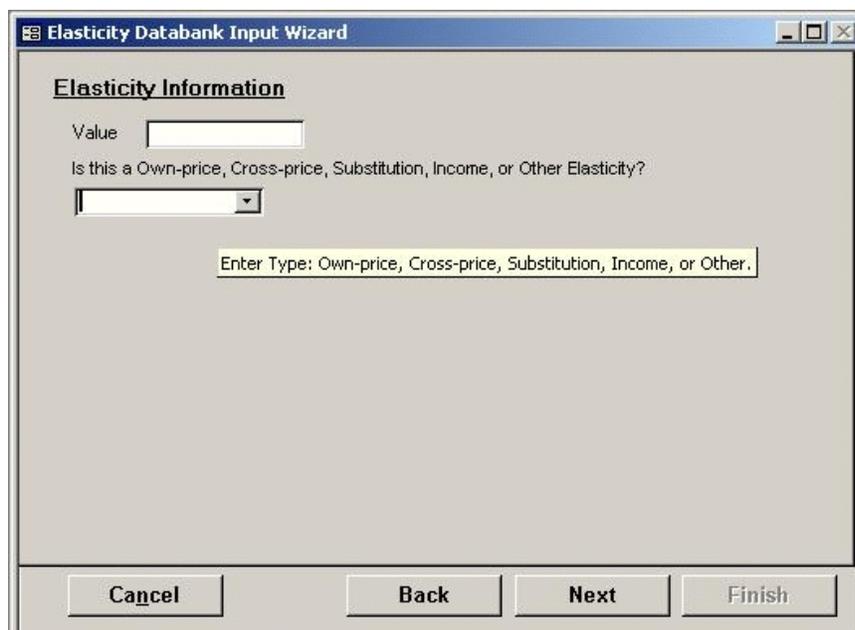
Additional help features (i.e., tool tips) have also been placed throughout the forms. The user can access these tips by "hovering" over the data entry field of interest with the mouse (see Figure 20). Help text also appears at the bottom of the selected user forms.



**Figure 18. Activate the Office Assistant by Selecting Key F1**



**Figure 19. Activate the Glossary: An Example**



**Figure 20. Example of Elasticity Databank’s Help Features: Tool Tip Showing the Function of a Command Button “Back”**

## 5. References

- Armington, Paul S. 1969. “A Theory of Demand for Products Distinguished by Place of Production.” *IMF Staff Papers* 16(1):159-176.
- Greene, William H. 2000. *Econometric Analysis*, 4<sup>th</sup> Ed. Upper Saddle River, NJ: Prentice Hall.
- Kennedy, Peter. 1998. *A Guide to Econometrics*, 4<sup>th</sup> Ed. Cambridge, MA: MIT Press.
- Nicholson, Walker. 1992. *Microeconomic Theory: Basic Principles and Extensions*, 5<sup>th</sup> Ed. Fort Worth, TX: Dryden Press.
- U.S. Environmental Protection Agency (EPA). 1999. *OAQPS Economic Analysis Resource Document*. Durham, NC: Innovative Strategies and Economics Group.
- U.S. Environmental Protection Agency (EPA). 2000. *Guidelines for Preparing Economic Analyses*. Washington, DC: U.S. Environmental Protection Agency.

## Appendix A

### Elasticity Databank: Database Structure

An important part of the Elasticity Databank is the underlying database and its structure. This appendix provides a detailed description of the Elasticity Databank's design and identifies key components such as tables (data and support) and objects.

#### A.1 Database Tables

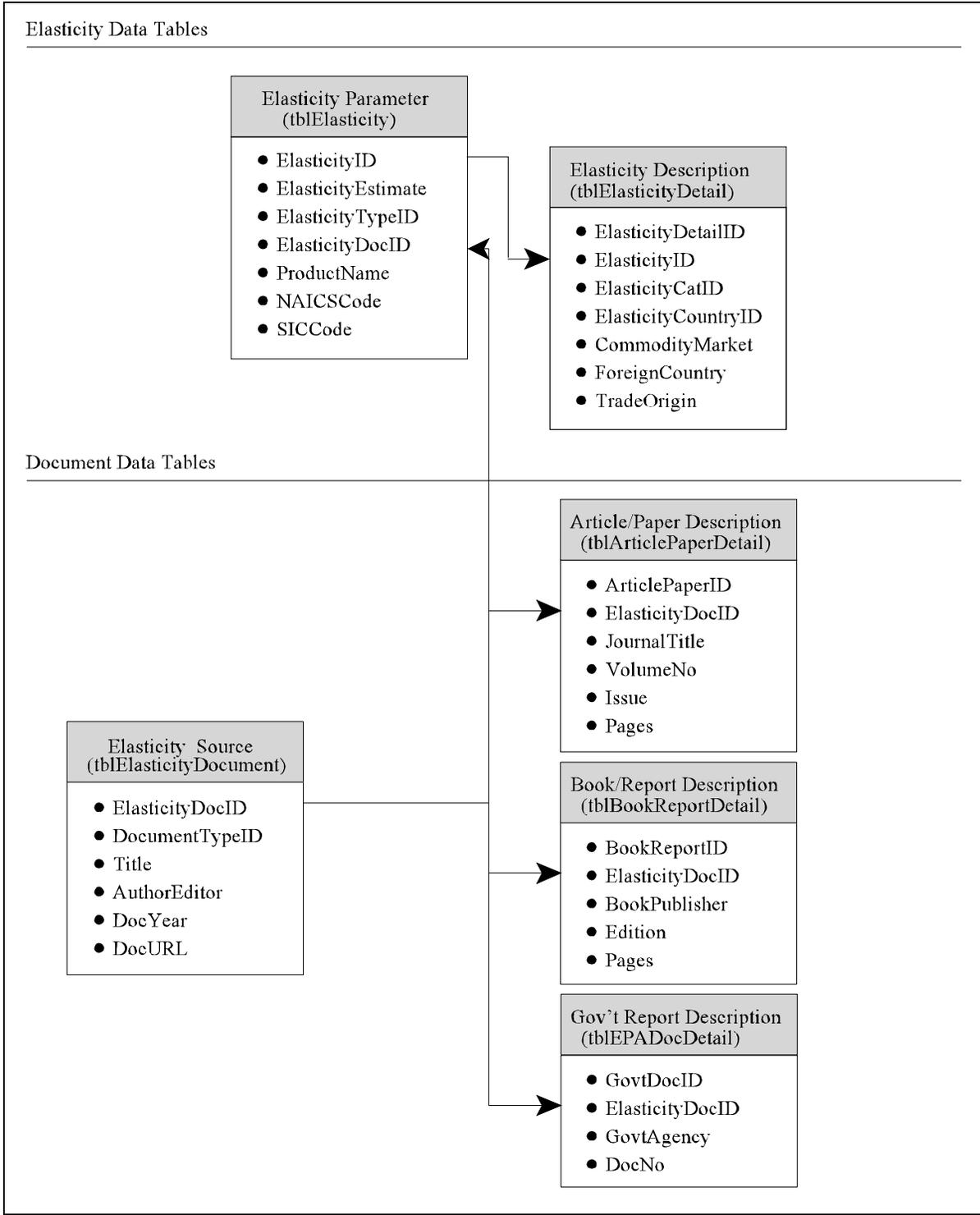
The database tables can be separated into two categories: data tables and support tables. The data tables contain the information on the elasticity parameters entered by users and the source documents. The support tables are used to populate the drop-down lists used throughout the database. The drop-down lists ensure the consistent entry of data across all records.

##### A.1.1 Data Tables

An overview of the six data tables and their linkages is provided in Figure A-1. The elasticity parameter table (tblElasticity) is the main table of the database. Each elasticity parameter is a separate record in this table. The elasticity parameter table captures all the information related to the elasticity estimate. The elasticity description table (tblElasticityDetail) captures detailed information about the elasticity type. The source document information is captured in the elasticity document table (tblElasticityDocument). The fields in this table include title, author, year of publication, and other information that is not specific to a document type. The information specific to a document type is captured in one of the three document description tables (tblArticlePaperDetail, tblBookReportDetail, and tblEPADocDetail). Tables A-1 through Table A-6 list the fields in each of the six data tables.

##### A.1.2 Support Tables

The nine support tables are listed in Table A-7. These tables usually contain two fields: a numeric identifier field and a text field. As mentioned above, the support tables are used to populate the drop-down lists found throughout the database.



**Figure A-1. Overview of Data Tables**

**Table A-1. Fields in Elasticity Parameter Table (tblElasticity)**

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
ElasticityID	Long integer	Unique elasticity identifier
ElasticityEstimate	Double	Elasticity value
ElasticityTypeID	Long integer	Elasticity type identifier (own-price, income, etc.). Links to tblElasticityType
ElasticityDocID	Long integer	Elasticity document identifier. Links to tblElasticityDocument
ProductName	Text	Name of product
NAICSCode	Double	NAICS code. Links to tblNAICS
SICCode	Double	SIC code. Links to tblSIC
FunctionalFormID	Long integer	Functional form identifier. Links to tblFunctionalForm
LagStructure	Long integer	Lag structure
QuantityMeasure	Long integer	Units of dependent variable
FreqofObsID	Long integer	Frequency of observations. Links to tblFrequencyofObservations
DataYear	Long integer	Time period of observations
Geography	Text	Geographical location of data set (i.e., national, state, etc.)
TimeSeries	Yes/no	Data set is in time series format
CrossSection	Yes/no	Data set is in cross-sectional format
PanelData	Yes/no	Data set is in panel format
MethodDescription	Text	Describe relevant econometric procedures
ConstantorPoint	Text	Elasticity is either constant or variable
PointMedian	Double	If point, elasticity measured at median
PointMean	Double	If point, elasticity measured at mean
PointXthPercentile	Double	If point, elasticity measured at Xth percentile
PointEquation	Text	Page number of the econometric equation used in the analysis
TypeofTest	Text	Test used in hypothesis testing
TestStatValue	Double	Value of test statistic
TestStatp_value	Double	The observed significance of the statistical test
ConfidenceLevel	Single	Level of upper and lower bounds
UpperBound	Single	Upper bound of elasticity estimate
LowerBound	Single	Lower bound of elasticity estimate

**Table A-2. Fields in Elasticity Detail Table (tblElasticityDetail)**

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
ElasticityDetailID	Long integer	Unique elasticity detail identifier
ElasticityID	Long integer	Elasticity identifier. Links to tblElasticity
ElasticityType	Text	Elasticity type (own-price, income, etc.)
ElasticityCatID	Long integer	Elasticity category identifier (demand, supply). Link to tblElasticityCategory
ElastComments	Text	Further description of elasticity category
ElasticityCountryID	Long integer	Domestic or foreign identifier. Links to tblElasticityCountry
CommodityMarket	Text	Cross-price: other commodity
ForeignCountry	Text	Country name
TradeOrigin	Text	Trade elasticity: country of origin
TradeDestination	Text	Trade elasticity: country of destination
InputSub1	Text	Input substitution: input #1
InputSub2	Text	Input substitution: input #2
IncomeTypeID	Long integer	Income type identifier. Links to tblIncomeType
IncomeSpecify	Text	If income type = other, then specify
OtherSpecify	Text	Other elasticity: describe elasticity

**Table A-3. Fields in Elasticity Document Table (tblElasticityDocument)**

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
ElasticityDocID	Long integer	Unique document identifier
DocumentTypeID	Long integer	Document type (book, article, etc.) identifier. Links to tblDocumentType
Title	Text	Title of document
AuthorEditor	Text	Author or editor of document
DocYear	Long integer	Year document was published
DocURL	Anchor	Web address of document (if available)
ViewDetails	Text	Used for programming
ChangeSource	Text	Used for programming

**Table A-4. Fields in Document Description Table (tblArticlePaperDetail)**

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
ArticlePaperID	Long integer	Unique journal article or working paper identifier
ElasticityDocID	Long integer	Elasticity document identifier. Links to tblElasticityDocument
JournalTitle	Text	Title of journal
VolumeNo	Single	Volume number of journal
Issue	Single	Issue number of journal
Pages	Text	Pages for article or paper

**Table A-5. Fields in Document Description Table (tblBookReportDetail)**

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
BookReportID	Long integer	Unique book or report identifier
ElasticityDocID	Long integer	Elasticity document identifier. Links to tblElasticityDocument
BookPublisher	Text	Name of book publisher
Edition	Single	Book edition
Pages	Text	Pages of book

**Table A-6. Fields in Document Description Table (tblEPADocDetail)**

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
GovtDocID	Long integer	Unique government document identifier
ElasticityDocID	Long integer	Elasticity document identifier. Links to tblElasticityDocument
GovtAgency	Text	Name of government agency
DocNo	Text	Government agency document number

**Table A-7. List of Database Support Tables**

<b>Table Name</b>
tblSIC
tblNAICS
tblElasticityType
tblElasticityCategory
tblIncomeType
tblDocumentType
tblFunctionalForm
tblLagStructure
tblQuantityMeasure
tblFrequencyofObservations
tblElasticityCountry

## Appendix B

### Glossary of Terms

This glossary provides definitions for key terms used in Elasticity Databank. Definitions were drawn from the following commonly used textbooks and the U.S. Census Bureau's website.

- Nicholson, Walker. 1992. *Microeconomic Theory: Basic Principles and Extensions*, 5<sup>th</sup> Ed. Fort Worth, TX: Dryden Press.
- Kennedy, Peter. 1998. *A Guide to Econometrics*, 4<sup>th</sup> Ed. Cambridge, MA: MIT Press.
- Greene, William H. 2000. *Econometric Analysis*, 4<sup>th</sup> Ed. Upper Saddle River, NJ: Prentice Hall.

**Confidence Intervals:** Sample data can be used to construct a low and high interval in a way that one can expect the interval to contain the true parameter in some specified proportion of samples. Analysts often construct 90 or 95 percent confidence intervals to show the range of the values for which the estimate will fall 90 or 95 percent of the time.

**Constant Elasticity:** Assumes elasticity is constant (unchanging) for the relevant changes in the independent variable (i.e., price).

**Cross-Price Elasticity:** A measure of the percentage change in quantity (demanded or supplied) brought about by a 1 percent change in another good's price.

**Cross-Section Data:** Data that describe activities of individual persons, firms, or other units at a given point in time.

**Elasticity:** A measure of the percentage change in one variable brought about by a 1 percent change in some other variable. If  $y = f(x)$ , then the elasticity of  $y$  with respect to  $x$  is given by  $dy/dx * x/y$ .

**Elasticity of Substitution:** A measure of how "easy" it is to substitute one factor input for another. It is the proportionate change in the ratio of factors to the rate at which one input may be traded off against another while holding output constant.

**Hypothesis Testing:** Statistical inference procedure based on constructing a test statistic from a random sample that will enable the analyst to decide, with reasonable confidence, whether the hypothesized population would have generated the data in the sample.

**Income Elasticity of Demand:** A measure of the percentage change in quantity brought about by a 1 percent change in income.

**Lag Structure:** Time series where decision and response period covers a substantial period, often requires lagged explanatory variable in the model. Examples include distributed, geometric lag, and polynomial distributed lag.

**Mean:** Measure of central tendency of random variable  $x$ . It is a weighted average of the values taken by  $x$ , where the weights are the respective probabilities.

**Median:** Measure of central tendency. For an odd number of observations, the median is the middle observation when the data points are ranked low to high or high to low. For an even number of observations, the median usually is calculated by convention to be the average of the two middle observations.

**NAICS:** In 1997, the Office of Management and Budget (OMB) announced its decision to adopt the North American Industry Classification System (NAICS pronounced Nakes) as the industry classification system used by the statistical agencies of the United States. NAICS replaces the 1987 SIC system. It is the first economic classification system to be constructed based on a single economic concept. Economic units that use like processes to produce goods or services are grouped together. This “production-oriented” system means that statistical agencies in the United States can produce data that can be used for measuring productivity, unit labor costs, and the capital intensity of production; constructing input-output relationships; and estimating employment-output relationships and other such statistics that require that inputs and outputs be used together.

**Own-Price Elasticity:** A measure of the percentage change in quantity (demanded or supplied) brought about by a 1 percent change in own price.

**p value:** Observed significance of the statistical test. The probability of obtaining a test statistic that contradicts the hypothesis. For example, a p-value of 0.03 suggests there is only a 3 percent probability of observing a test statistic if the hypothesis was in fact true.

**Point Elasticity:** Assumes elasticity varies as the relevant independent variable (i.e., price) changes. Therefore, one must specify the point at which the elasticity is measured. Frequently used “points” are the mean, median, or  $x$ th percentile.

**Pooled or Panel Data:** Combine time-series and cross-section data (i.e., include data that describe activities of individual persons, firms, or other units over time).

**SIC System:** The SIC system was established to promote uniformity and comparability of data collected and published by agencies within the U.S. government, state agencies, trade associations, and research organizations. It was developed as an establishment-based industry classification system that classifies each establishment (defined as a single physical location at which economic activity occurs) according to its primary activity. The SIC system covers the entire field of economic activities by defining industries in accordance with the composition and structure of the economy. Since the 1930s, the SIC system has been revised periodically to reflect changes in the economic structure of the United States. New industries were added and small, declining industries deleted or combined with other activities. However, the overall structure of the SIC system remained essentially unchanged since the 1930s. The SIC system was last revised in 1987, when approximately 20 new service industries were added to it and a few new industries were added to manufacturing to reflect technological changes occurring in that sector. The new NAICS replaced the SIC system in 1997.

**Time-Series Data:** Data that describe the movement of a variable over time.

**Trade Elasticity:** This concept is similar to elasticity of substitution. It is a measure of how “easy” it is to substitute imports for domestic goods consumed or substitute exports for domestic goods produced. This relationship is commonly referred to as the “Armington elasticity”(Armington, 1969).

**t-Statistic:** Statistic used in hypothesis testing when the variance is unknown. The t distribution is used to test whether the mean of a random variable is equal to any particular value.

**Xth Percentile:** Returns the rank of a value in a data set as a percentage of the data set. For example, data can be examined at or above the 90th percentile.

## Appendix C

### Using the Elasticity Databank: Two Illustrated Examples

The Elasticity Databank contains an input wizard to guide the user through the process of data entry. We have provided two simple examples to familiarize you with the wizard below.

#### C.1 Making Withdrawals

For this example, let's consider an analysis of the cement industry. In this case, the you will begin the process by selecting **Search Database**. Next, you are presented with three ways to select the product or industry cement. In this example, we will use a product search and assume we do not know the NAICS or SIC codes.

There are two basic ways to search for the cement industry records:

1. After selecting product search, the user now uses the drop down box to select portland cement.
2. Alternative, she can click the **Search...**, type \*cement\*, and click **Search**.

After finding the records, the you can view the records using the pre-set form. All of the basic information can be retrieved by clicking the appropriate index tab on this form. The record can also be printed using the **Report** button. Alternatively, the she can export the record(s) to an MS Excel spreadsheet by clicking the **Export to MS Excel** button. You can close and perform other searches by clicking the **Close** button.

#### C.2 Making Deposits

For this example, the you will enter an elasticity record for iron casting products based on EPA econometric estimate used in the *Iron and Steel Foundries NESHAP*.. You will begin the process by selecting **Add Records**. The databank will then present a prompt to add the product name NAICS or SIC code. In this example, you will enter iron castings as the product name, SIC = 3321, and NAICS =33211 as the industry codes.

Next, the databank asks for the source of the estimate. In this case, you should select "EPA document" from the drop-down menu. The databank will ask if this is a new record (yes, it is), and we select **Add Record** and types in bibliographic information. If the

bibliographic information for this document has already been entered previously, the user can click on the appropriate document title from the list and all of the information is copied automatically.

Next, the data bank prompts you for the elasticity estimate. You should enter the information from EPA's econometric estimate for All iron castings products (-0.58). The user then uses a series of descriptor prompts and user forms to enter in additional information about the elasticity (i.e., the value is an own-price demand elasticity for the United States).

EPA used a two-stage least squares (2SLS) method to estimation method, constant elasticity, and a log-log specification. You can enter this information in the appropriate data entry boxes. There was no lag structure specified, so we can leave this data entry box blank. In the last step, you should note the page number of where the equation can be found for future reference.

Next, the databank also prompts you for information about the data characteristics of the data set and asks you to. The EPA report identifies the units of observation (short tons), time period (1987-1992), and data format (time-series). Once the user completes the data entry process, the databank asks if she wants to enter another parameter. If so, the user can follow a similar process for a new records.

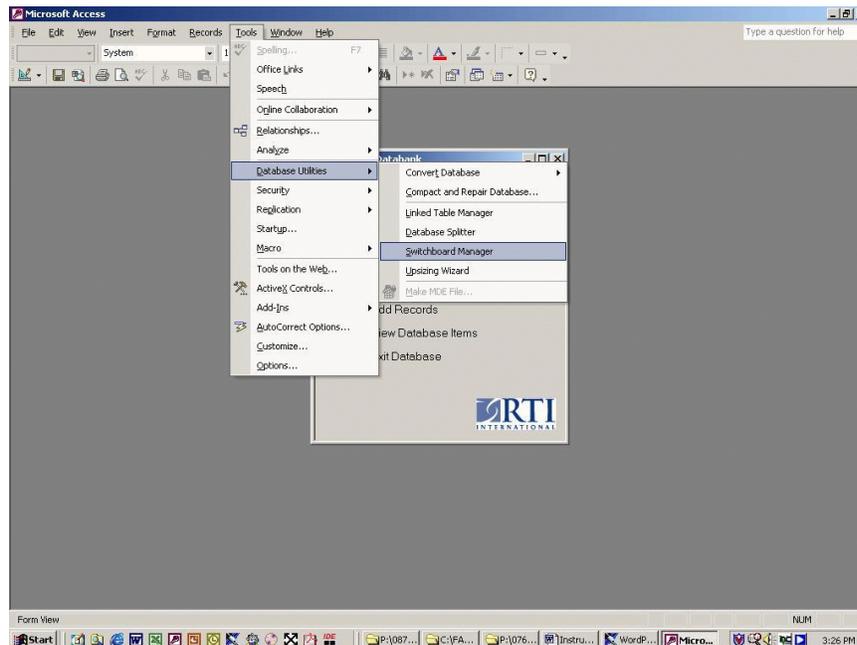
Finally, the databank asks you to record information about the hypothesis test performed for the parameter. In this case, EPA used a t-test and the value of the test statistic was -2.52. The report also shows that the elasticity parameter was significant at the 99 percent confidence level. A p-value, upper and lower bounds, were not reported, so you can leave these values blank and click **Finish**.

## Appendix D

### Instructions on How to Delete Items from the Switchboard and Create a “Read-Only” for Distribution

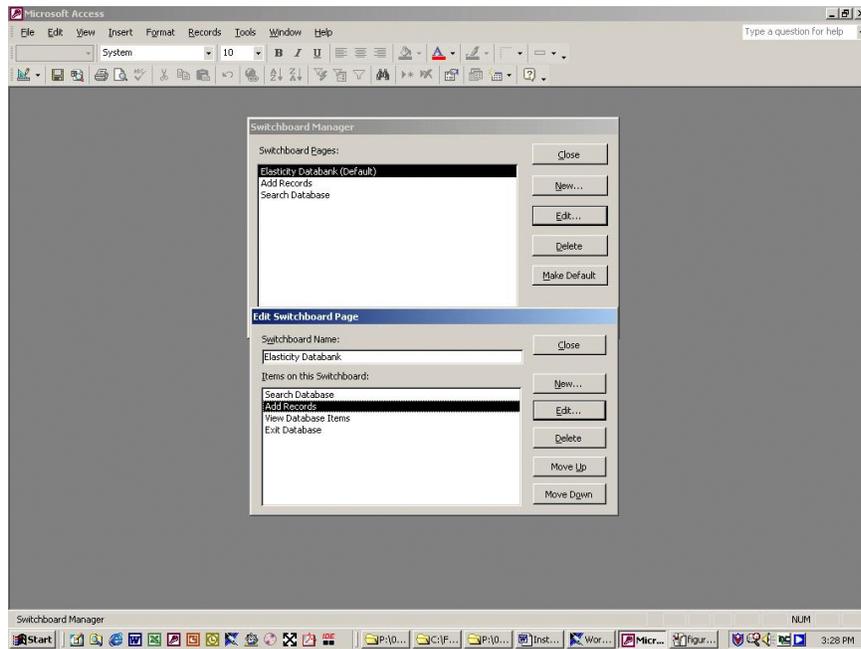
Prior to widespread distribution of the database to users, you should disable features of the database that allow users to modify/add records and make the file “Read-Only.” To do this, you can follow these instructions:

1. **MAKE A COPY OF THE DATABASE.** Failure to do this may lead to deletion of menu features.
2. Open the new database that you just copied.
3. On the **Tools** menu, point to **Database Utilities**, and then click **Switchboard Manager** (see Figure D-1).



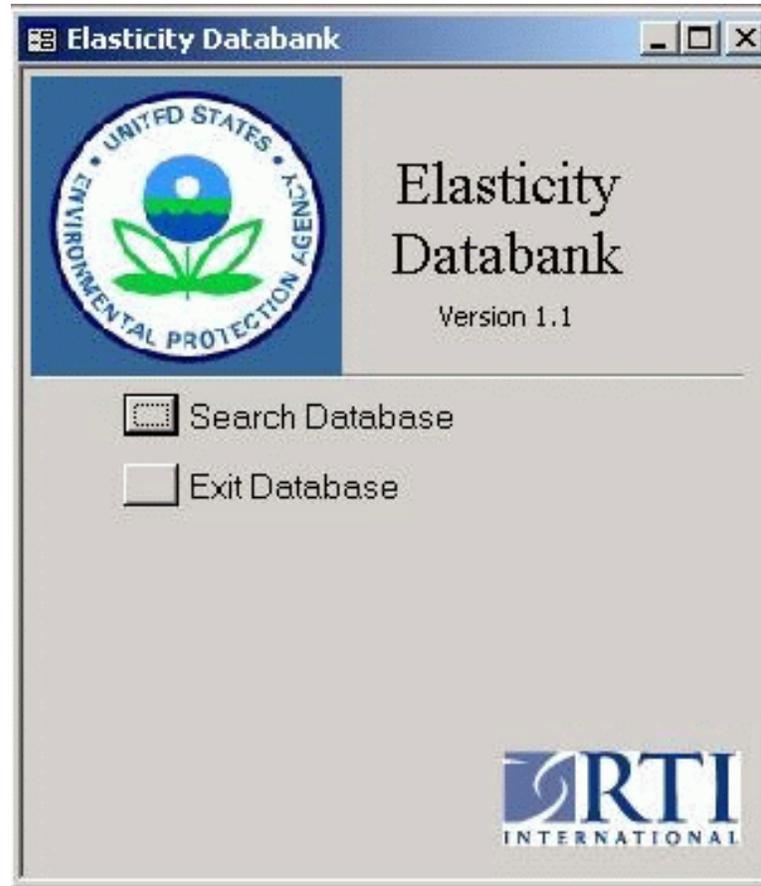
**Figure D-1. Click Switchboard Manager form Database Utilities Menu**

4. In the **Switchboard Manager** dialog box, select the “**Elasticity Databank (Default)**” switchboard, and then click **Edit** (see Figure D-2).



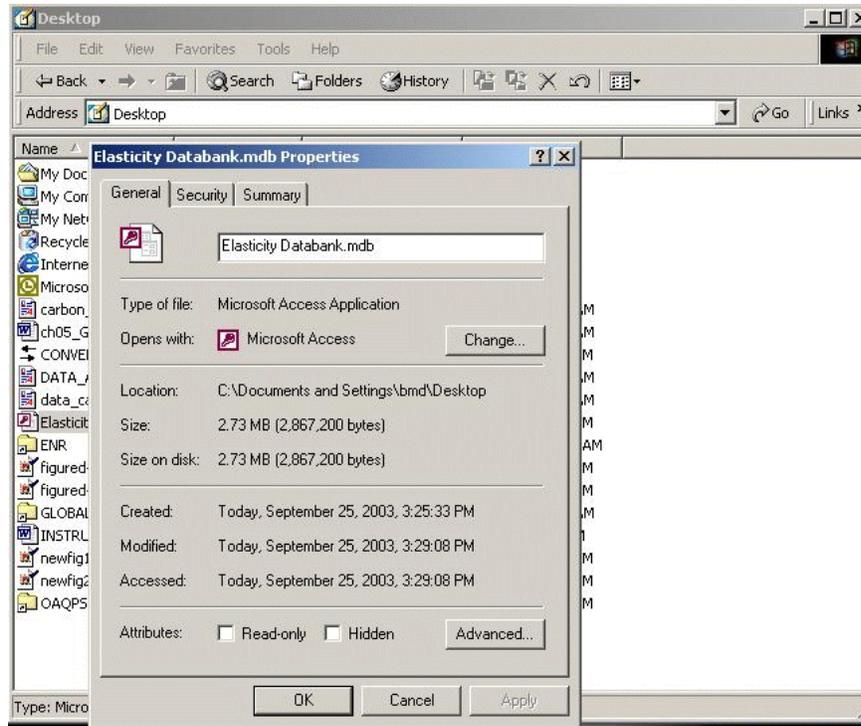
**Figure D-2. Select Switchboard and Click Edit**

5. Click “**Add Records,**” and then click **Delete**.
6. Click “**View Database Items,**” and then click **Delete**.
7. Click **Close**.
8. Click **Close**.
9. Close the database by using the **File** menu and clicking **Close**. The switchboard “**Exit Database**” will be inoperable due to the changes.
10. Open the database. The switchboard should now reflect your changes (see Figure D-3).



**Figure D-3. Open Database With Revised Menu Options**

11. Close the database.
12. Using **Window's Explorer**, right click on the file name and select the check box read only (see Figure D-4).
13. You are now ready to distribute this database to users.



**Figure D-4. Use Window's Explorer to Make the File Read Only**