Enterprise Human Resources Integration
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Civilian Forecasting System (CIVFORS) 4.0
User's Manual

Version 1.0

December 2003

Managing Partner

In coordination with our partners:

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DoJ	**GSA**	**SBA**	

Revision Sheet

Release No.	Date	Revision Description
Rev 1.0	December 2003	Creation of the CIVFORS Manual.

The Civilian Forecasting System (CIVFORS)

A component of the Office of Personnel Management (OPM) e-Gov initiative, the Civilian Forecasting System (CIVFORS) is used for projecting strength, gains, and losses by various types such as occupational series and employment tenure for the civilian Executive Branch. A totally integrated system, CIVFORS uses advanced decision support and computer modeling to track civilian strength and personnel management transactions.

Developed for OPM by the Government Solutions division of the AT&T Company, the Civilian Forecasting System is under the auspices of the Assistant G-1for Civilian Personnel Policy in the Office of the Deputy Chief of Staff for Personnel, HQ, Department of the Army.

The Verification and Validation (V&V) documentation for CIVFORS is currently under development. It will include model assumptions, logic flow, and other relevant V&V documentation. An executive summary of this document will be attached to this document when it is completed.

CIVFORS Manual Quick Reference

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List of Acronyms

CIVFORS	Civilian Forecasting System
EHRI	Enterprise Human Resources Integration
HR	Human Resources
NAG	Non Accession Gains
NOA	Nature of Action
NSL	Non Separation Losses
OPM	Office of Personnel Management
SSN	Social Security Number
V&V	Verification and Validation

Section 1.0 Accessing CIVFORS

1.1 Accessing the EHRI Home Page

The *CIVFORS Forecasting System* can be accessed from the *Enterprise Human Resource Integration – EHRI* home page at the following address: http://opmweb01/opm/EHRI-Intro.htm.

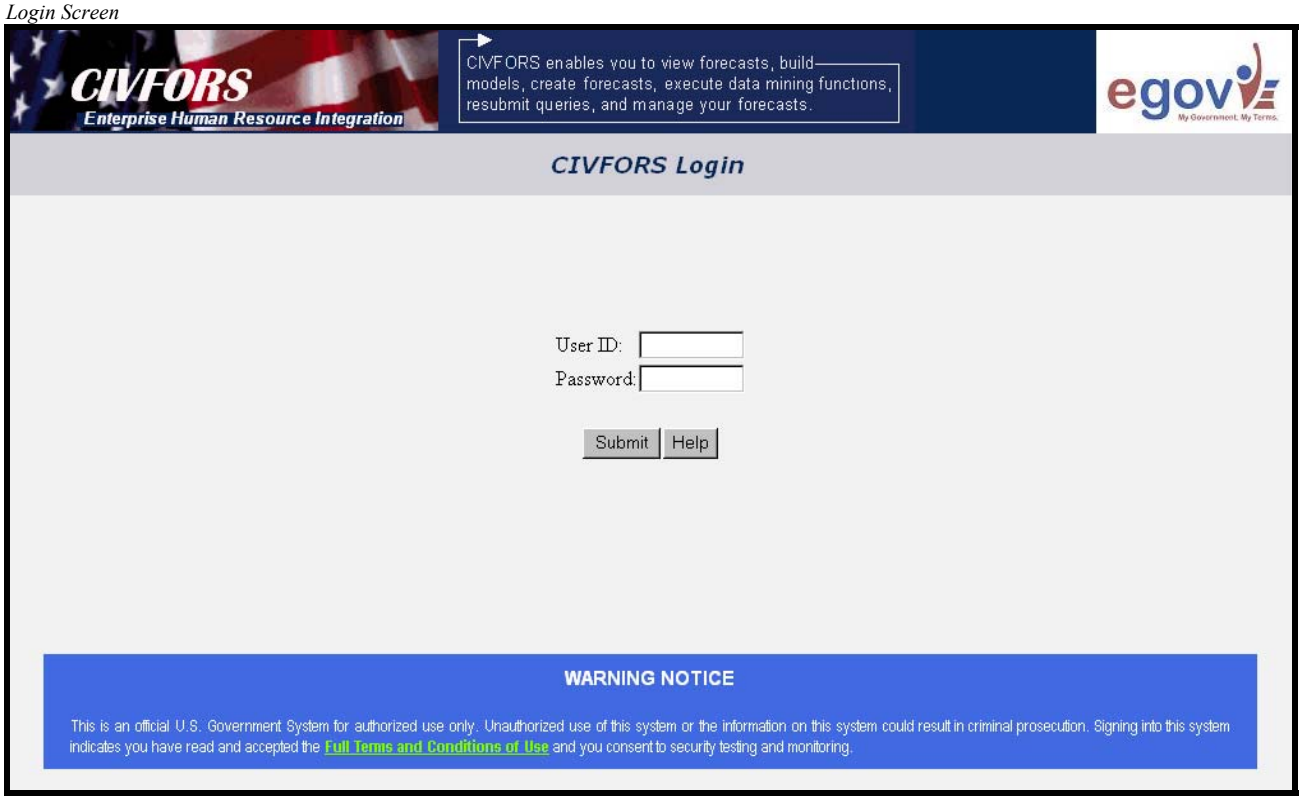
1.2 Entering CIVFORS

Welcome Screen

Once you enter the EHRI home page, a *Welcome* screen appears. Click ***CIVFORS***.

1.3 Login

Login Screen



The *Login Screen* appears.

Login Steps

Login Screen

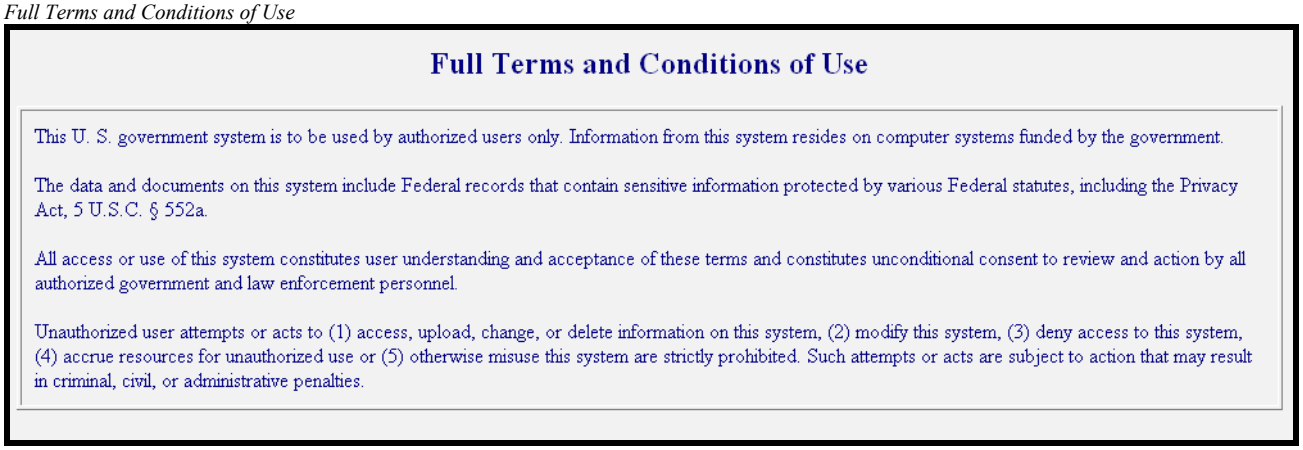
To log in to CIVFORS:

1. Enter your **User ID** and **Password**.
2. Click **Submit**

User Access

Individuals must be authorized by OPM or their employing agency to use CIVFORS. Authorized users will be assigned a User ID and Password to enter the system. Users must abide by the **Full Terms and Conditions of Use**, which can be accessed from the Login Screen and which is listed below:

Full Terms and Conditions of Use



Full Terms and Conditions of Use

This U. S. government system is to be used by authorized users only. Information from this system resides on computer systems funded by the government.

The data and documents on this system include Federal records that contain sensitive information protected by various Federal statutes, including the Privacy Act, 5 U.S.C. § 552a.

All access or use of this system constitutes user understanding and acceptance of these terms and constitutes unconditional consent to review and action by all authorized government and law enforcement personnel.

Unauthorized user attempts or acts to (1) access, upload, change, or delete information on this system, (2) modify this system, (3) deny access to this system, (4) accrue resources for unauthorized use or (5) otherwise misuse this system are strictly prohibited. Such attempts or acts are subject to action that may result in criminal, civil, or administrative penalties.

Login Support

If you are unable to login, check your User ID and Passwords carefully. Both User IDs and Passwords are case sensitive (i.e., each character must be correctly typed in the same case as it was originally established).

If you are still unable to login, please send an email to Rich Shaffer (richardshaffer@att.com) and Reid Gilliam (reidgilliam@att.com). One of them will get back to you as soon as possible. If you have an urgent need, please call Rich Shaffer at 703-506-5286 or Reid Gilliam at 703-506-5642.

1.4 System Requirements

The following system requirements are necessary for access to the CIVFORS system:

Internet Explorer
Users must have access to **Internet Explorer (IE) 5.5** or greater for CIVFORS.

Computer Screen Adjustments
Please make sure you adjust your screen to the correct resolution so that you are able to view the whole screen with very little need for scrolling. Each computer is different, so you may have to make some adjustments. It may be helpful to hide your bottom and top browser bars before you begin.

System Access Problems
It is recommended that you first contact your system administrator to resolve system access problems. If problems persist, please use the information above to contact the appropriate person.

User System Survey
All first time users are required to complete a survey for documentation of their experiences with the system. This survey should be completed after reading survey instructions and must be completed by the fifth use of the system. Any system comments and/or recommendations upon completion of the survey should be forwarded to Dr. Engin Crosby at Engin.Crosby@asamra.hoffman.army.mil.

1.5 CIVFORS Upcoming Features

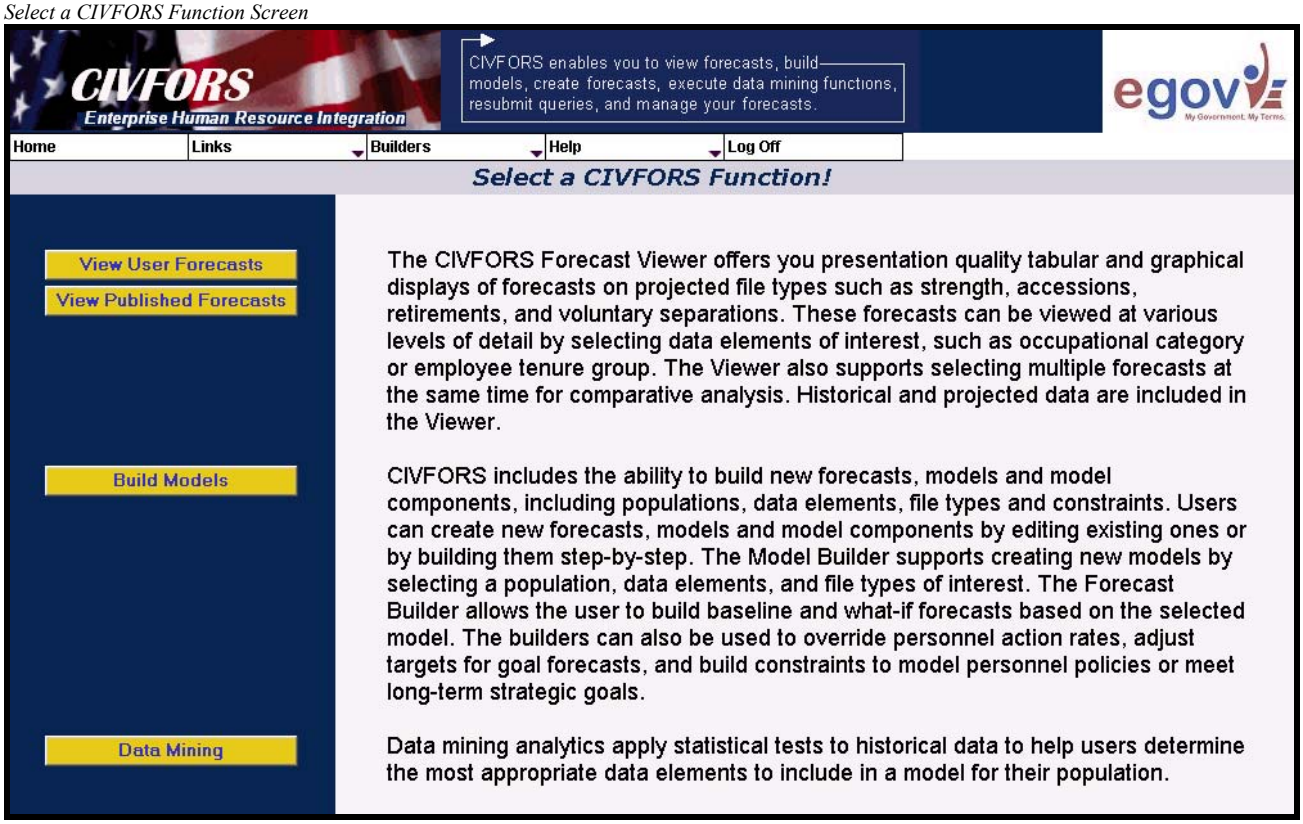
Analytic Forecasting Library
The *Analytic Forecasting Library* will consist of commonly executed HR based analyses for instant use. Users will have the ability to highlight the desired analysis, specify population changes, and instantaneously execute the analysis based on the new population.

Diagnostic Tools
The *Diagnostic Tools* will be available for HR managers to highlight areas of interest for the system to determine potential problem areas. The Diagnostic Tools will have the ability to provide you with a quick at a glance, analytically burden free view of whether potential problems may exist in areas such as:

- Recruitment
- Turnover
- Training
- Customer Satisfaction
- Demographics
- HR Work Performance
- Budget/Execution
- Automation
- Awards & Incentives
- Succession Planning
- Management & Employee Relations

Section 2.0 CIVFORS Functions

Select a CIVFORS Function Screen



The first screen to appear when you log in to CIVFORS is the *Select a CIVFORS Function* screen.

2.1 View Forecasts

The CIVFORS Forecast Viewer offers you presentation quality tabular and graphical displays of forecasts on projected file types such as strength, accessions, retirements, and voluntary separations. These forecasts can be viewed at various levels of detail by selecting data elements of interest, such as occupational category or employee tenure group. The Viewer also supports selecting multiple forecasts at the same time for comparative analysis. Historical and projected data are included in the Viewer.

View Forecasts is broken into two (2) levels:

- **View User Forecasts** is for users who have built their own forecasts and wish to view them. If you have not built forecasts there will be nothing for you to view under this.
- **View Published Forecasts** is for all users of CIVFORS who wish to view the results of published forecasts.

2.2 Build Models, Forecasts, and Model Components

CIVFORS includes the ability to build new forecasts, models and model components, including populations, data elements, file types and constraints. Users can create new forecasts, models and model components by editing existing ones or by building them step-by-step. The Model Builder supports creating new models by

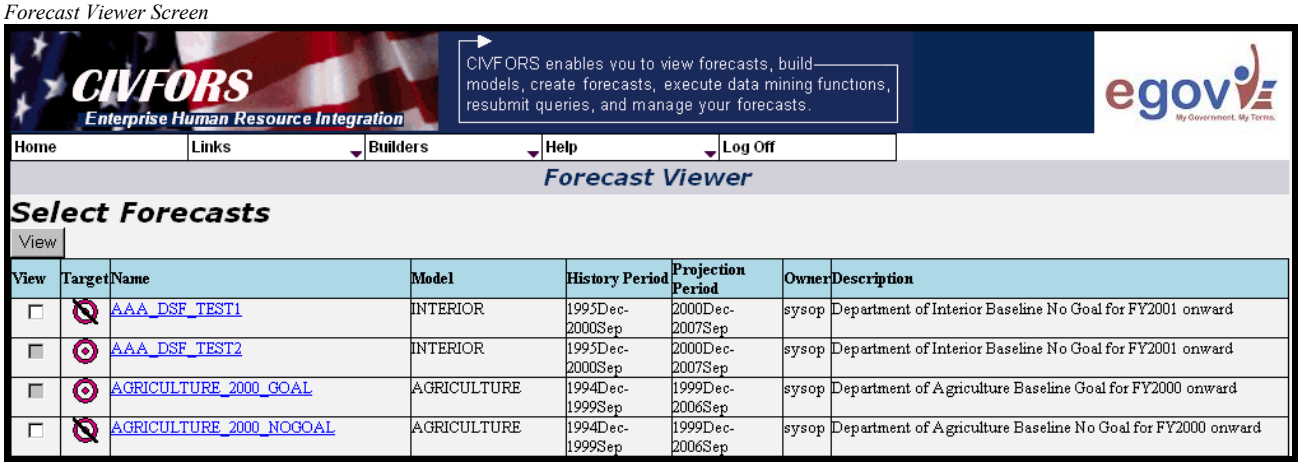
selecting a population, data elements, and file types of interest. The Forecast Builder allows you to build baseline and what-if forecasts based on the selected model. The builders can also be used to override personnel action rates, adjust targets for goal forecasts, and build constraints to model personnel policies or meet long-term strategic goals.

2.3 Data Mining Analytics

CIVFORS data mining analytics apply statistical tests to historical data to help you determine the most appropriate data elements to include in a model for their population. These analytics are generally run in conjunction with building your own forecast models. You can first build your forecast model and then run the Data Mining tool to view the results of the quality of your model and make modifications as needed based on results.

Section 3.0 Forecast Viewer

Forecast Viewer Screen



View	Target	Name	Model	History Period	Projection Period	Owner	Description
☐		AAA_DSF_TEST1	INTERIOR	1995Dec-2000Sep	2000Dec-2007Sep	sysop	Department of Interior Baseline No Goal for FY2001 onward
☐		AAA_DSF_TEST2	INTERIOR	1995Dec-2000Sep	2000Dec-2007Sep	sysop	Department of Interior Baseline No Goal for FY2001 onward
☐		AGRICULTURE_2000_GOAL	AGRICULTURE	1994Dec-1999Sep	1999Dec-2006Sep	sysop	Department of Agriculture Baseline Goal for FY2000 onward
☐		AGRICULTURE_2000_NOGOAL	AGRICULTURE	1994Dec-1999Sep	1999Dec-2006Sep	sysop	Department of Agriculture Baseline No Goal for FY2000 onward

Once you have chosen the ***View User Forecasts*** or ***View Published Forecasts*** options on the *Select a CIVFORS Function* screen, the first screen to appear is the *Forecast Viewer* screen. The *Forecast Viewer* provides access to all of your forecast results. If you elected to ***View User Forecasts***, you can select from all of the forecasts created under your ID, regardless of whether they have been made public. If you elected to ***View Published Forecasts***, you can select from all of the forecasts created under any ID, provided that you have made the forecast public.

In the **View** column, place a check mark next to each forecast you wish to view. You can select any number of forecasts to view. If the check box is not active (i.e., if it is grayed out), it indicates that this forecast is still being processed or has not successfully completed. Once you have made your selections, click on the ***View*** button to proceed. If you select more than one forecast, you will be asked to select your view parameters from lists containing all of the file types, data elements, and values from each forecast. However, results will only be returned for those forecasts where the particular items are included.

The **Target** column indicates whether the forecast is *Targeted* or *Non–Targeted. Targeted* forecasts have workforce manpower level goals specified into the future and are represented by the target symbol. *Non-Targeted* forecasts have NO workforce manpower level goals and simply project the future based on history. They are represented by the target symbol crossed out with a diagonal line. Generally, targeted and non-targeted forecasts pertaining to the same model and period of forecast are selected together so that you can see what is likely to happen if history repeats vs. meeting targets.

Symbol for Targeted ("goal") runs	
Symbol for Non-Targeted ("no goal") runs	

The **Name** column provides the name of each forecast. If you click on a given forecast name, you will be taken to the *Forecast and Model Summary* screen where you can review most of the important details concerning that forecast

The **Model** column provides the name of the model associated with each forecast.

The **History Period** column provides the date range of historical data for each forecast.

The **Projection Period** column provides the date range of the projected data for each forecast.

The **Owner** column provides the username of the owner of each forecast.

The **Description** column provides a brief description that was supplied during the creation of each available forecast.

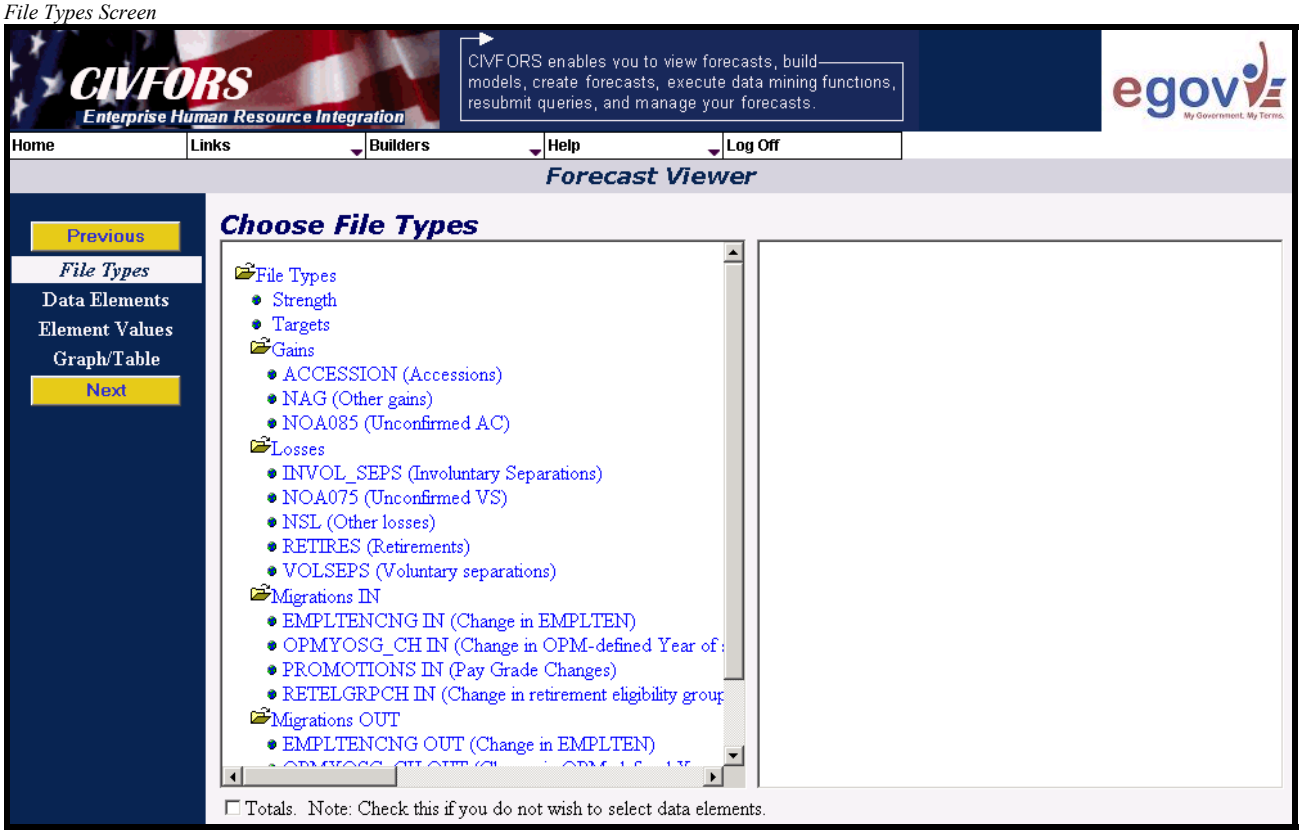
Menu Instructions

Click ***View*** after making your selections. The *File Types* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.1 File Types

File Types Screen



The next screen to appear is the *File Types* screen. Forecasts can be viewed for the file types listed on this menu. The primary categories of forecasts are listed next to the folders. They are **Strength, Targets, Gains, Losses, Migrations In,** and **Migrations Out**. Within each folder are individual files types that are associated with each category. For instance, *Gains* might contain files types for *Accessions* (new hires for the population you are interested in), *NAGs* (Non-Accession Gains), or other sub-categories you define.

Strength refers to the number of personnel (civilian) in a specified population at a given point in time.

Targets refer to the number of personnel (civilian) authorized (or desired) to be in a specified population at a given point in time. This File Type will only appear for Goal runs.

Gains to strength identify all individuals that enter your population group. While the names and composition of the file types is dependent on the groupings you establish in the File Type Builder, some commonly defined file types include:

- **Accessions (new-hires) -** gains from external sources to government.
- **Active Gains** - transfers of employees from inactive status into active status.
- **Non-Accession Gains (NAGs)** - gains to your population from elsewhere in the government and internal non-tracked migrations-in.

Losses to strength identify all individuals that leave your population group. While the names and composition of the file types is dependent on the groupings you establish in the File Type Builder, some commonly defined file types include:

- **Active Losses** - transfers of employees from active status into inactive status.
- **Involuntary Separations –** losses to the government resulting from agency-initiated actions that separated the employee from the agency.
- **Non-Separation Losses (NSLs) –** transfers from your agency to elsewhere in the government and internal non-tracked migrations-out.
- **Retirements** - losses to the government resulting from employee-initiated decisions to retire.
- **Voluntary Separations** - losses to the government resulting from employee-initiated decisions for separating from the agency.

Migrations refer to changes in the number of personnel with a specific data element value due to employees within the population obtaining or losing that value while still remaining within that population. For example, if grade is a data element being modeled within a given agency population, then changes to grade might be modeled as a migration category (e.g., promotions).

While the flexible nature of CIVFORS allows you to group gain and loss transactions into any groups or combinations desired, below are commonly defined file types used in the system:

NOA Codes for Accession Actions - ACCESSIONS

Type of Gain	*Nature of Action Code*
Appointment	100
Career-Conditional Appointment	101
Emergency Appointment	107
Term Appointment--Not-to-Exceed Date	108
Temporary Appointment Pending--Establishment of Register	112
Appointment--Not-to-Exceed Date	115
Summer Appt.--Not-to-Exceed Date	117
Overseas Limited Appointment	120
Overseas Limited Appointment--Not to-Exceed Date	122
Appointment--Status Quo	124
Transfer	130
Mass Transfer	132
Reinstatement--Career	140
Reinstatement--Career Conditional	141
SES Career Appointment	142
Reinstatement--SES Career	143
Transfer--SES Career	145
SES Non-Career Appointment	146
Transfer--SES Non-Career	147
SES Limited Term Appointment--Not-to-Exceed Date	148
SES Limited Emergency Appointment--Not-to-Exceed Date	149
Canal Area Career-Conditional Appt.	150
Canal Area Career Appointment	151
Canal Area Appt.--Not-to-Exceed Date	153
Canal Area Term Appointment--Not-to-Exceed Date	154
Canal Area Reappointment	155
Canal Area Transfer	157
Excepted Appointment	170
Excepted Appt.--Not-to-Exceed Date	171

Provisional Appt.--Not-to-Exceed Date	190
Interim Appt. in Non-Duty Status	198
Interim Appointment	199

NOA Codes for Active Gain Actions – ACTGAIN

Type of Gain	*Nature of Action Code*
Unconfirmed Gain to Active Force	087*
Placement in Pay Status	280
Return to Duty	292
Return to Pay Status	293

*CIVFORS generated Nature of Action code

NOA Codes for Involuntary Separation Actions – ACTLOSS

Type of Separation	*Nature of Action Code*
Unconfirmed Loss from Active Force	076*
Placement in Nonpay Status	430
Suspension Not-to-exceed (date).	450
Suspension-Indefinite	452
LWOP NTE	460
Furlough NTE	472
LWOP-US	473

NOA Codes for Involuntary Separation Actions – INVOL SEPS

Type of Separation	*Nature of Action Code*
In Lieu of Involuntary Action	312
Removal	330
Separation--RIF (Termination-Involuntary)	356
Termination During Probation/Trial Period	385
Discharge	386

NOA Codes for Retirement Actions - RETIRES

Type of Separation	*Nature of Action Code*
Mandatory	300
Disability	301
Voluntary	302
Special Option	303
In Lieu of Involuntary Action	304

NOA Codes for Voluntary Separation Actions - VOLSEPS

Type of Separation	*Nature of Action Code*
Resignation	317
Death	350
Termination--Sponsor Relocating	351
Termination--Appointment in (Agency)	352
Separation --US (Termination-Mil)	353
Termination--Expiration of Appointment	355
Termination	357
Separation--Appt In	390
Change in Social Security Number	499

Choose the **File Type(s)** you would like to view in your forecast by selecting them from the file types on the left side of the screen to move them to the right side of the screen. (You can also select all file types within a folder by simply clicking on the folder.)

To *deselect* a file type from the **Selected File Types** box, click the file type from the right side of the screen you would like to remove. It will return to the left side of the screen.

Forecasts can be viewed at aggregate levels or at detailed levels. To view aggregate levels, place a check mark in the box next to ***Totals***. If you are interested in detailed levels do not place a check mark in the box next to ***Totals***. Instead, select one or more of the listed file types and move them to the right side of the panel. The next panel will then provide you with the data elements by which you can view the more detailed forecast.

Menu Instructions

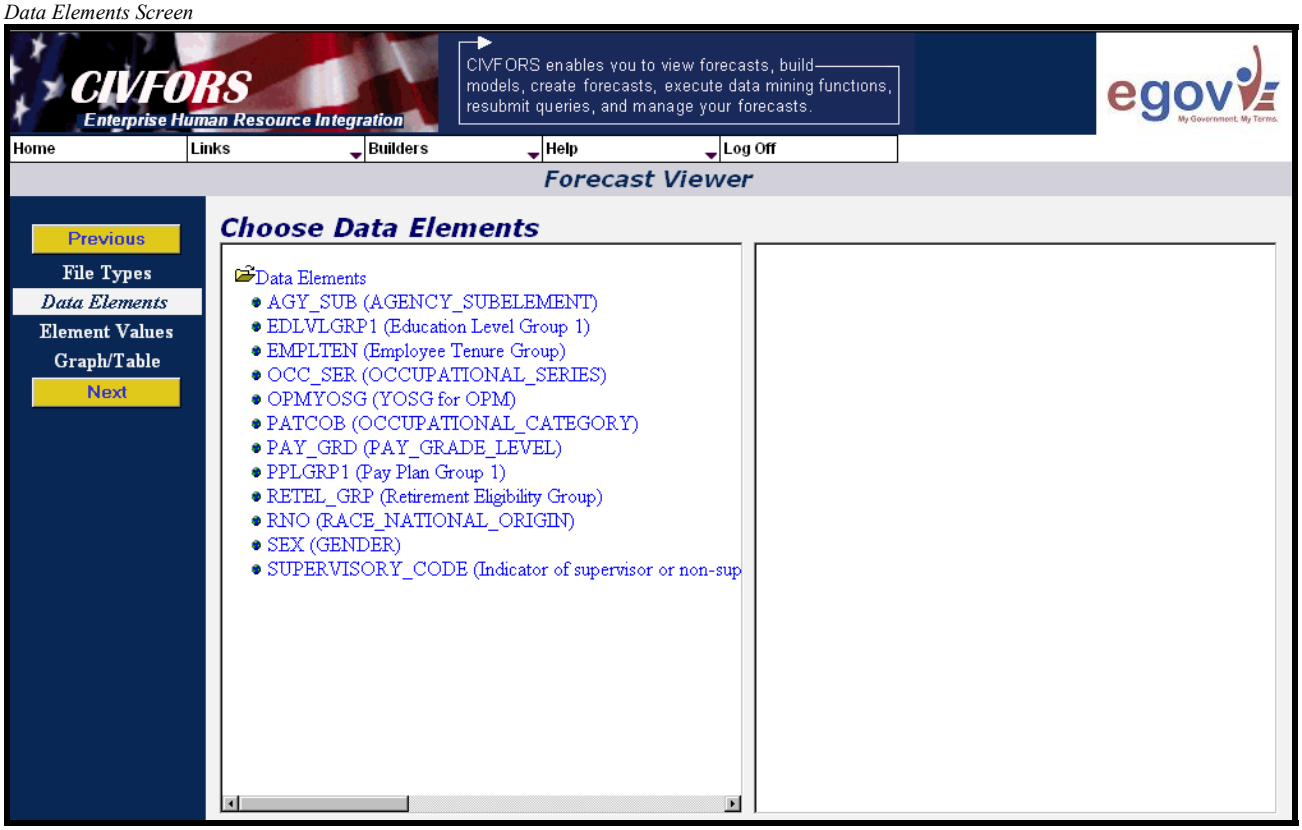
Click ***Next*** after making your selections. The *Data Elements* screen appears.

Click ***Previous***. The *Forecast Viewer – Select Forecasts* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.2 Data Elements

Data Elements Screen



The next screen to appear is the *Data Elements* screen. The *Data Elements* screen displays the data elements included in your forecast. For instance, if you have included occupational series in your forecast and you wish to view data by this data element, click OCC_SER. If you have selected multiple forecasts and the data elements differ between the forecasts, you will receive a "union" of these data elements in the selection list.

Choose the **Data Element(s)** you would like to view in your forecast by selecting the data elements on the left side of the screen to move them to the right side of the screen.

To *deselect* a data element from the **Selected Data Element** box, click the data element from the right side of the screen you would like to remove. It will return to the left side of the screen.

If you do not choose any Data Elements, the system will display **Aggregate Population Totals**. Simply proceed to the next step.

Menu Instructions

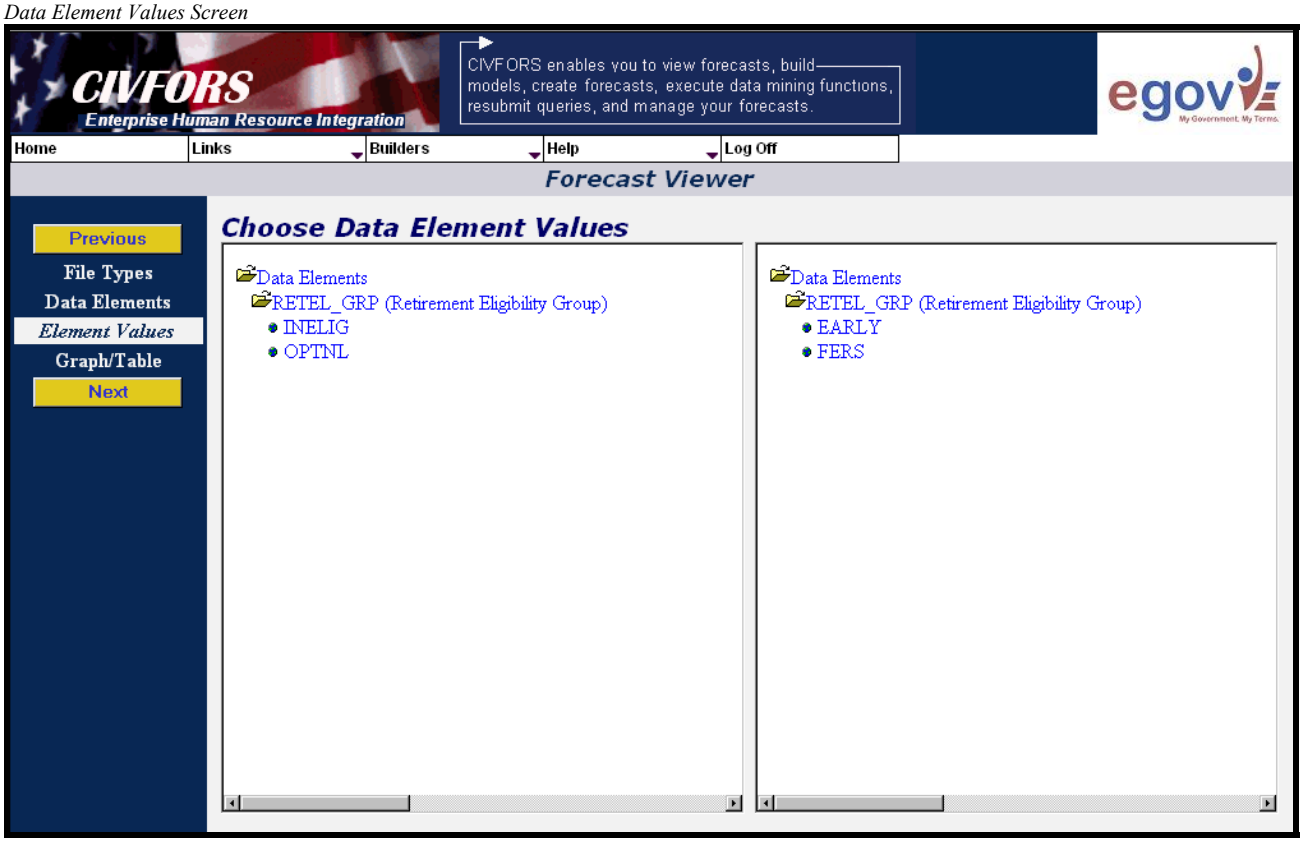
Click ***Next*** after making your selections. The *Data Element Values* screen appears.

Click ***Previous***. The *File Types* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.3 Data Element Values

Data Element Values Screen



The next screen to appear is the *Data Element Values* screen. The *Data Element Values* screen provides access to the specific values for each chosen data element so that you can further refine the list of information to view.

To select specific values, click the Data Element folders to expand and display these values. Then, choose the **Data Element Values** you would like to view in your forecast by selecting it from available data element values on the left side of the screen to move them to the right side of the screen. (You can also select all Data Element Values within a folder by simply clicking on the Data Element folder.)

To *deselect* a data element value from the **Selected Data Element** value box, click the data element value from the right side of the screen you would like to remove. It will return to the left side of the screen.

Note: Data elements cannot be deselected from this screen. To deselect a data element, return to the *Data Element* screen.

Menu Instructions

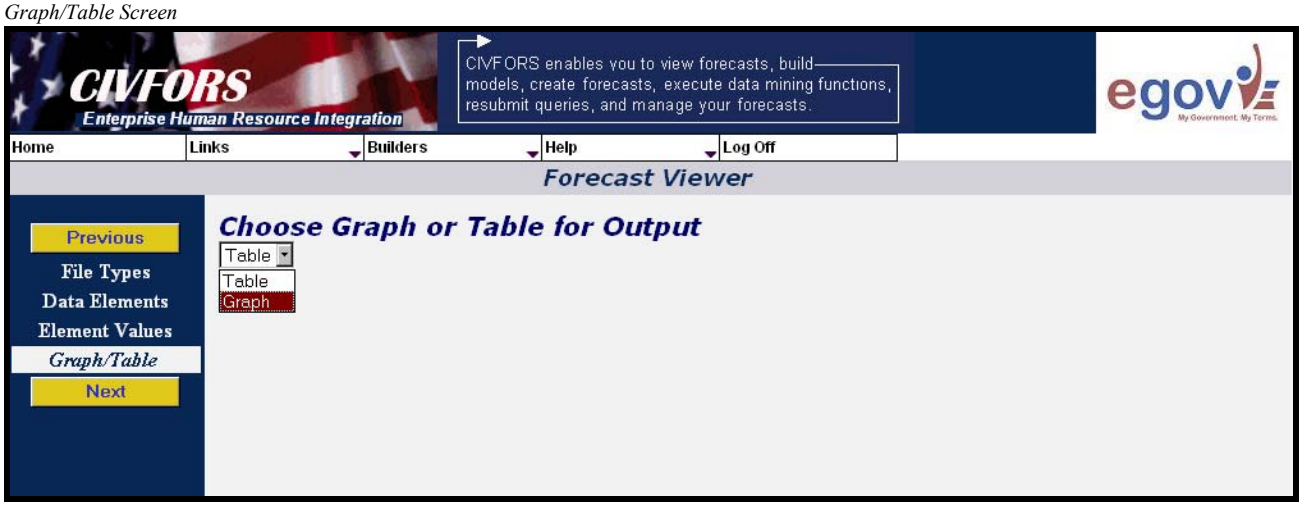
Click ***Next*** after making your selections. The *Graph/Table* screen appears.

Click ***Previous***. The *Data Elements* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.4 Graph/Table (Graph)

Graph/Table Screen



The next screen to appear is the *Graph/Table* screen. The *Graph/Table* screen allows you to select the visual arrangement – Graph or Table – you want your forecast to have.

Select ***Graph*** from the drop down menu.

Menu Instructions

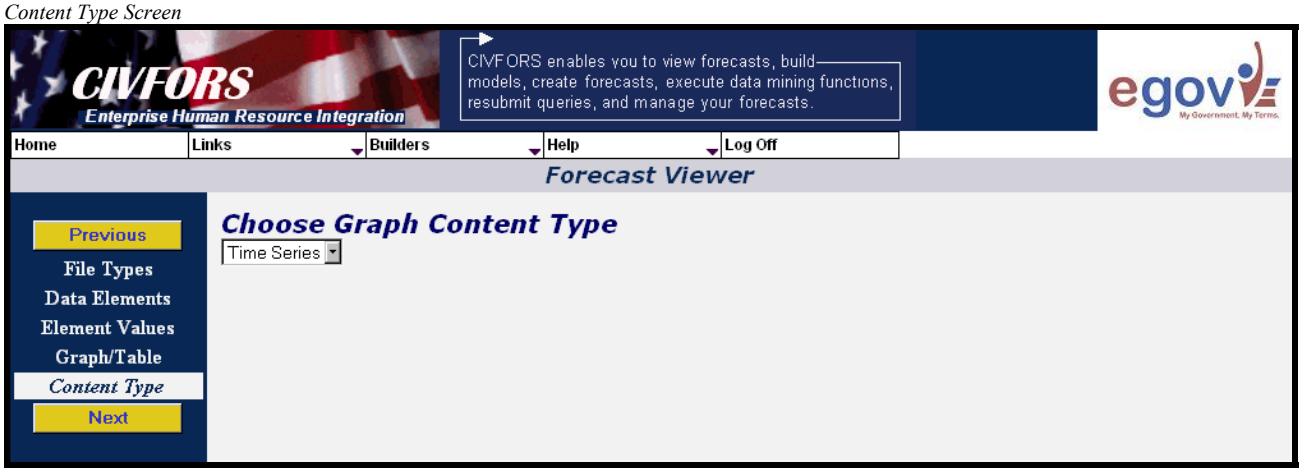
Click ***Next*** after making your selection. The *Content Type* screen appears.

Click ***Previous***. The *Data Element Values* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.4.1 Content Type (Time Series)

Content Type Screen



When you select ***Graph*** from the *Graph/Table* screen drop down menu, the next screen to appear is the *Content Type* screen. The *Content Type* screen allows you to select either a Time Series or Distribution graph from the drop down menu.

Time Series graphs are suited for when you have aggregate or detailed forecast information that you want to display over a time period.

Distribution graphs are suited for viewing categorized data for a selected time period.

Select ***Time Series*** from the drop down menu.

Menu Instructions

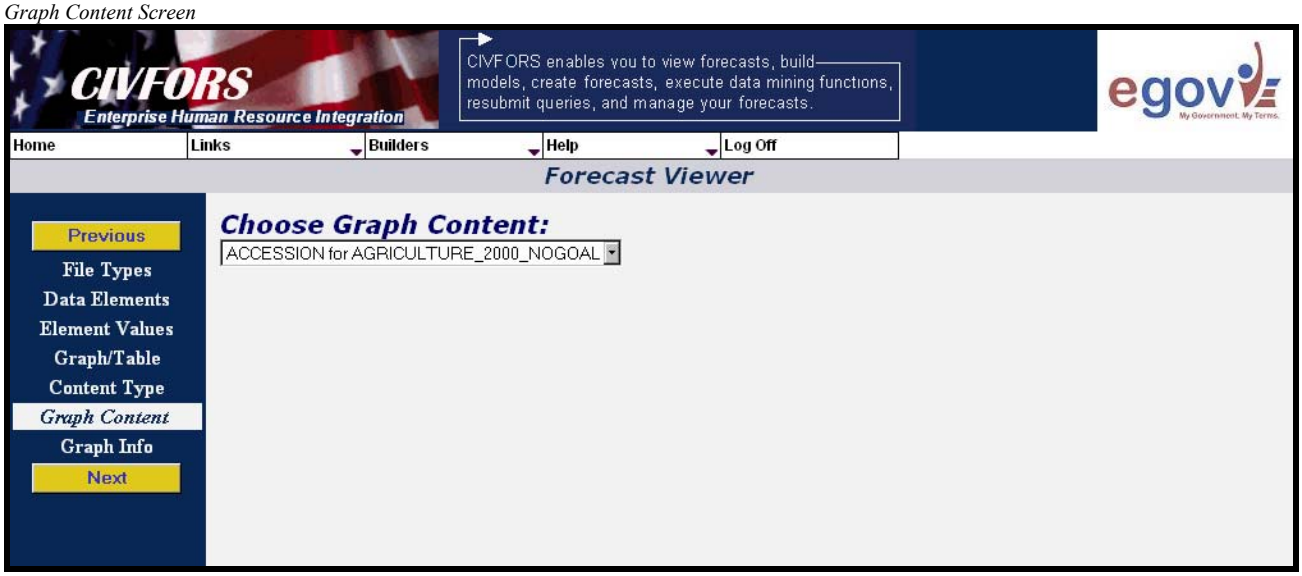
Click ***Next*** after making your selection. The *Graph Content* screen appears.

Click ***Previous***. The *Graph/Table* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.4.1.1 Graph Content

Graph Content Screen



When you select the *Time Series* graph, the next screen to appear is the *Graph Content* screen. The *Graph Content* screen allows you to select the file types and forecast combinations to display on your graph.

Select the Graph Content from the combinations listed in the drop down menu.

Menu Instructions

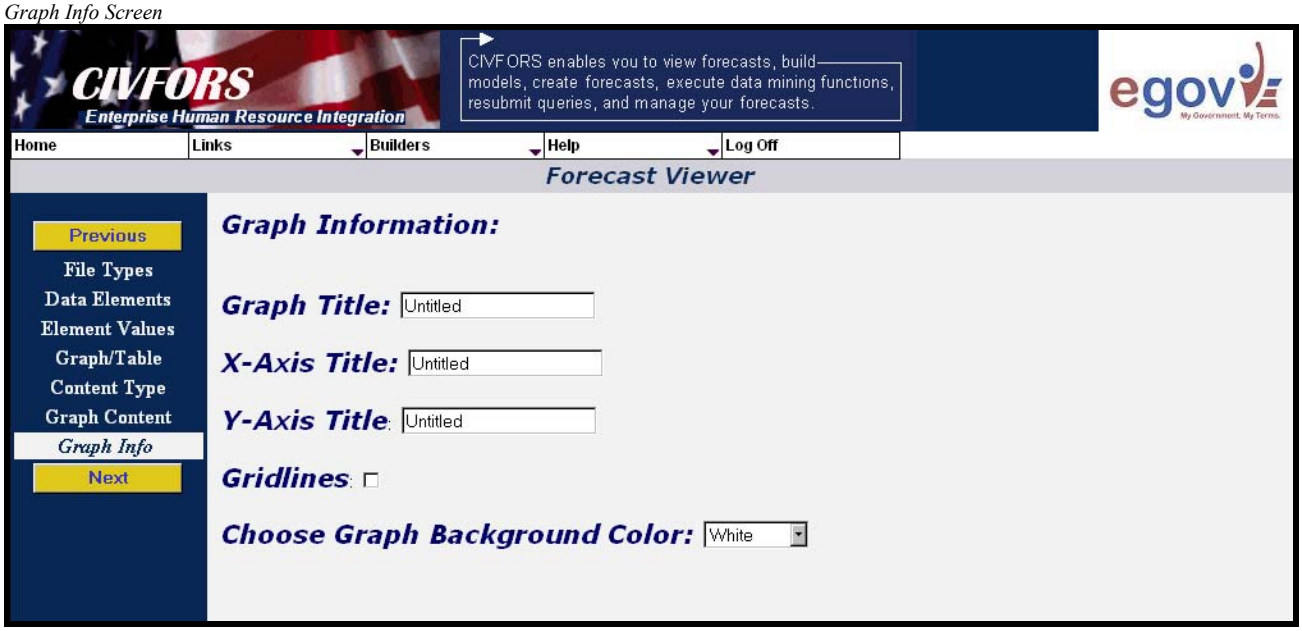
Click ***Next*** after making your selection. The *Graph Info* screen appears.

Click ***Previous***. The *Content Type* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.4.1.2 Graph Info

Graph Info Screen



The next screen to appear is the *Graph Info* screen. The *Graph Info* screen allows you add titles and format your time series chart output.

In the **Graph Title** field enter a brief title (50 characters or less) for the graph. The default value in this field is *Untitled*.

In the **X-Axis Title** field enter a brief title (50 characters or less) to appear on the X-Axis of the graph. The default value in this field is *Untitled*.

In the **Y-Axis Title** field enter a brief title (50 characters or less) to appear on the Y-Axis of the graph. The default value in this field is *Untitled*.

Place a check mark in the box next to **Gridlines** if you would like to include gridlines in your graph.

Select the **Graph Background Color** from the drop down menu. The default value is *White*.

Menu Instructions

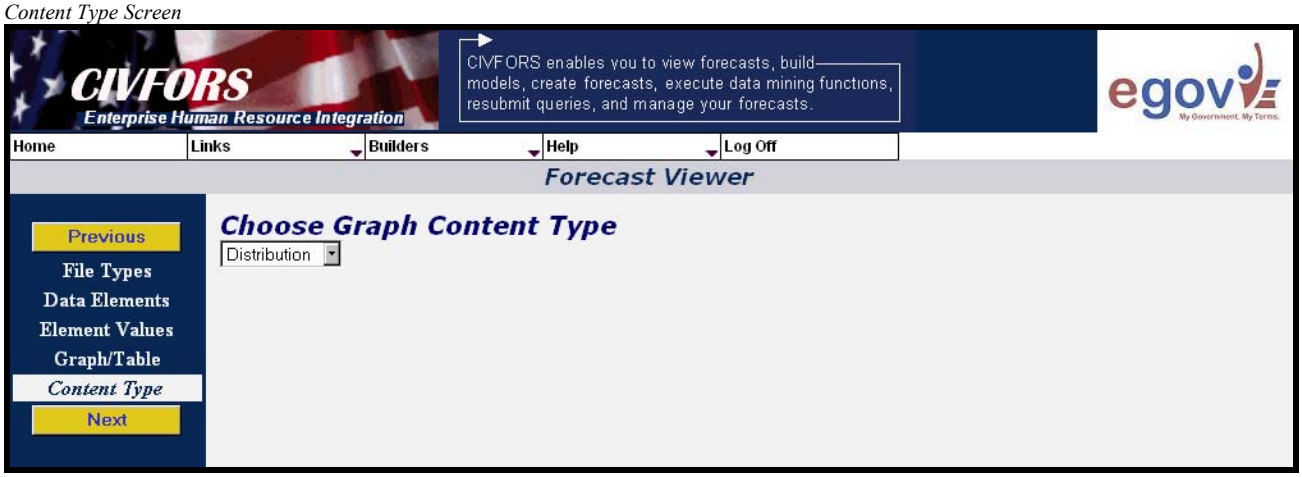
Click ***Next*** after entering your data and making your selections. The analysis results appear.

Click ***Previous***. The *Graph Content* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.4.2 Content Type (Distribution)

Content Type Screen



When you select ***Graph*** from the *Graph/Table* screen drop down menu, the next screen to appear is the *Content Type* screen. The *Content Type* screen allows you to select either a *Time Series* or *Distribution* graph from the drop down menu.

Time Series graphs are suited for when you have aggregate or detailed forecast information that you want to display over a time period.

Distribution graphs are suited for viewing categorized data for a selected time period.

Select ***Distribution*** from the drop down menu.

Menu Instructions

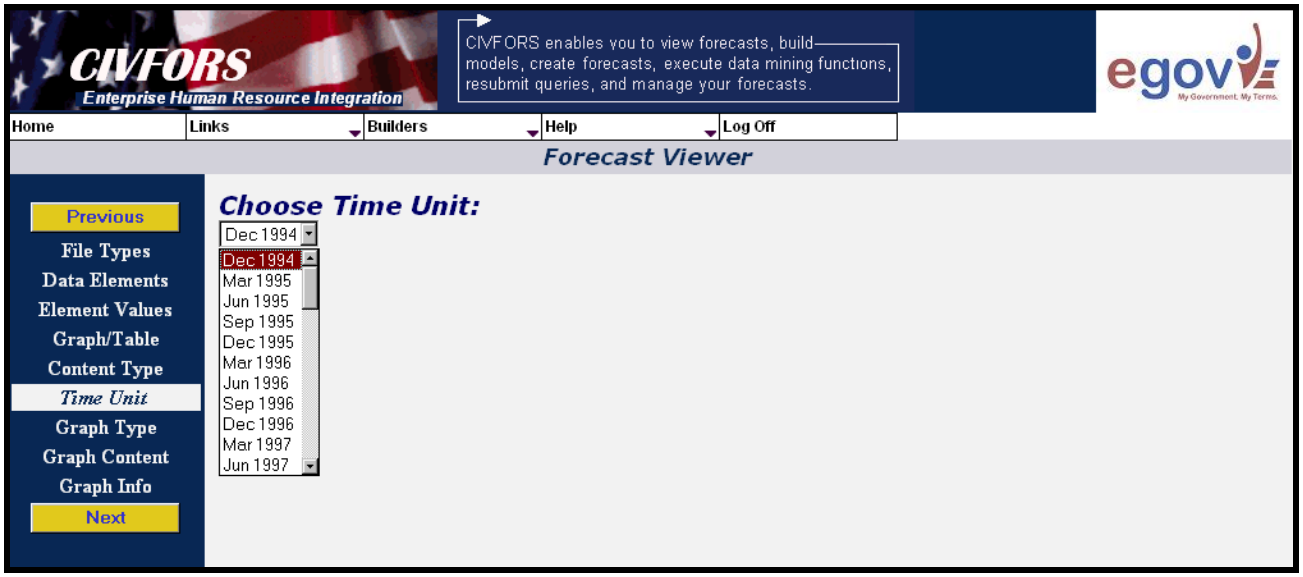
Click ***Next*** after making your selection. The *Time Unit* screen appears.

Click ***Previous***. The *Graph/Table* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.4.2.1 Time Unit

Time Unit Screen



When you select the *Distribution* graph, the next screen to appear is the *Time Unit* screen. The *Time Unit* screen enables you to isolate one particular quarter in order to get a distribution graph for that quarter. You cannot select more that one quarter at a time.

Select the time unit from the drop down menu.

Menu Instructions

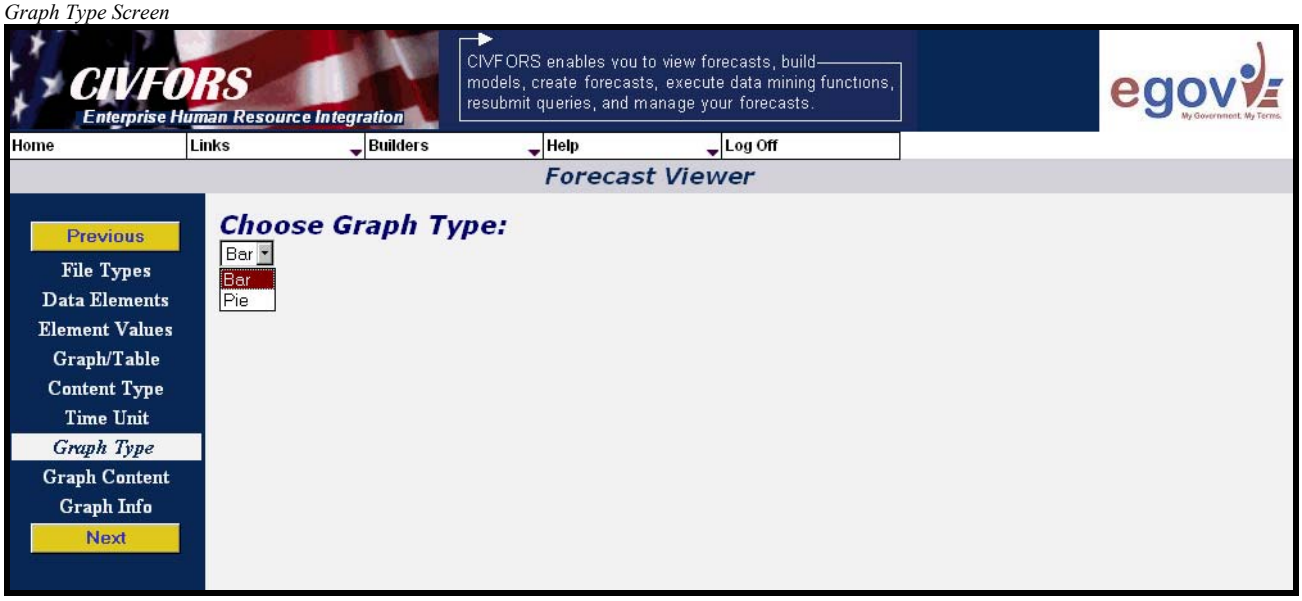
Click ***Next*** after making your selection. The *Graph Type* screen appears.

Click ***Previous***. The *Content Type* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.4.2.2 Graph Type

Graph Type Screen



The next screen to appear is the *Graph Type* screen. The *Graph Type* screen allows you to display your distribution graph as either a **Pie Chart** or **Bar Chart**.

Select one of these options from the drop down menu.

Menu Instructions

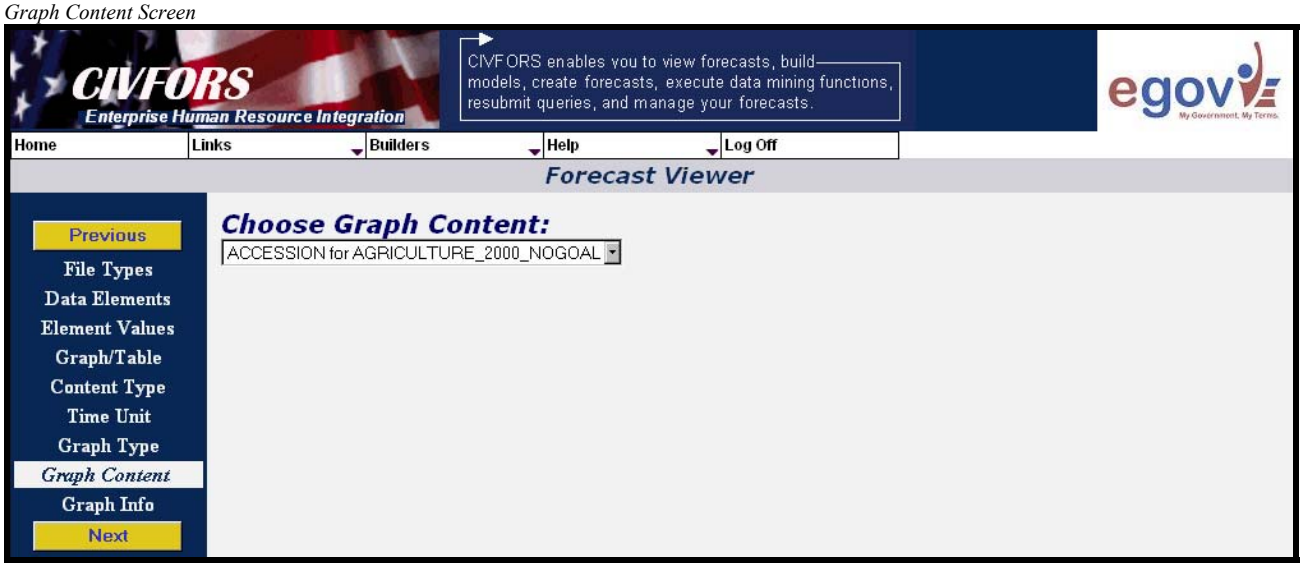
Click ***Next*** after making your selection. The *Graph Content* screen appears.

Click ***Previous***. The *Time Unit* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.4.2.3 Graph Content

Graph Content Screen



The next screen to appear is the *Graph Content* screen. The **Graph Content** screen allows you to select the file types and forecast combinations to display on your graph.

Select the Graph Content from the combinations listed in the drop down menu.

Menu Instructions

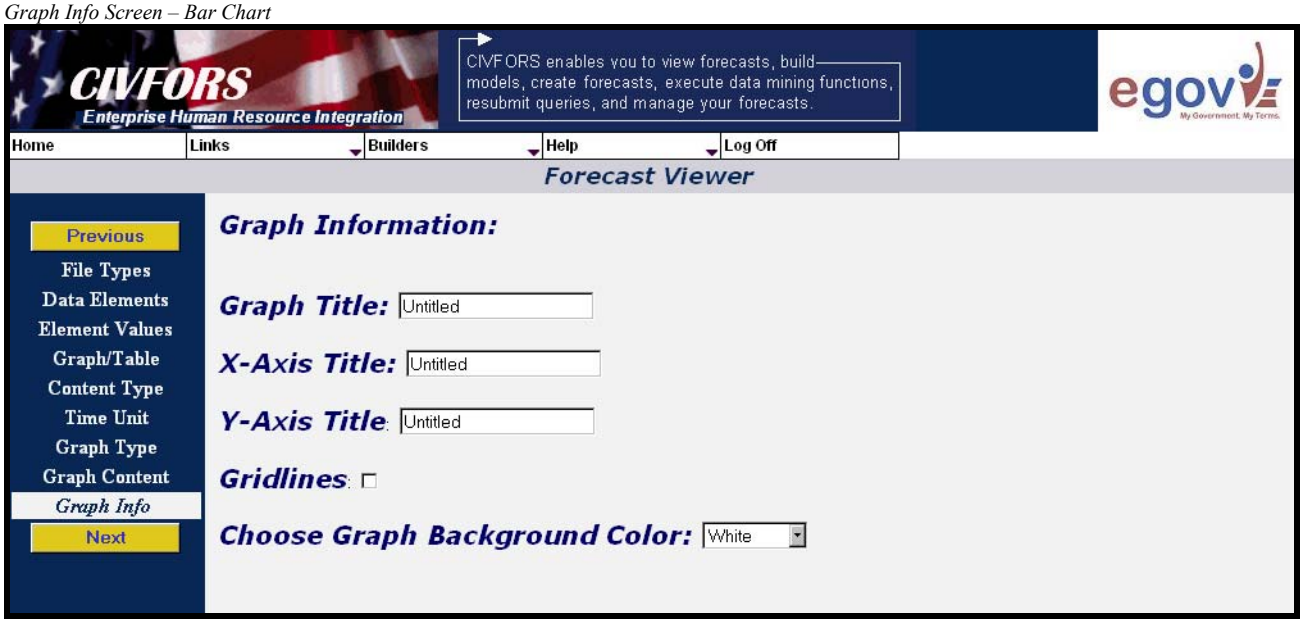
Click ***Next*** after making your selection. The *Graph Info* screen appears.

Click ***Previous***. The *Graph Type* screen appears.

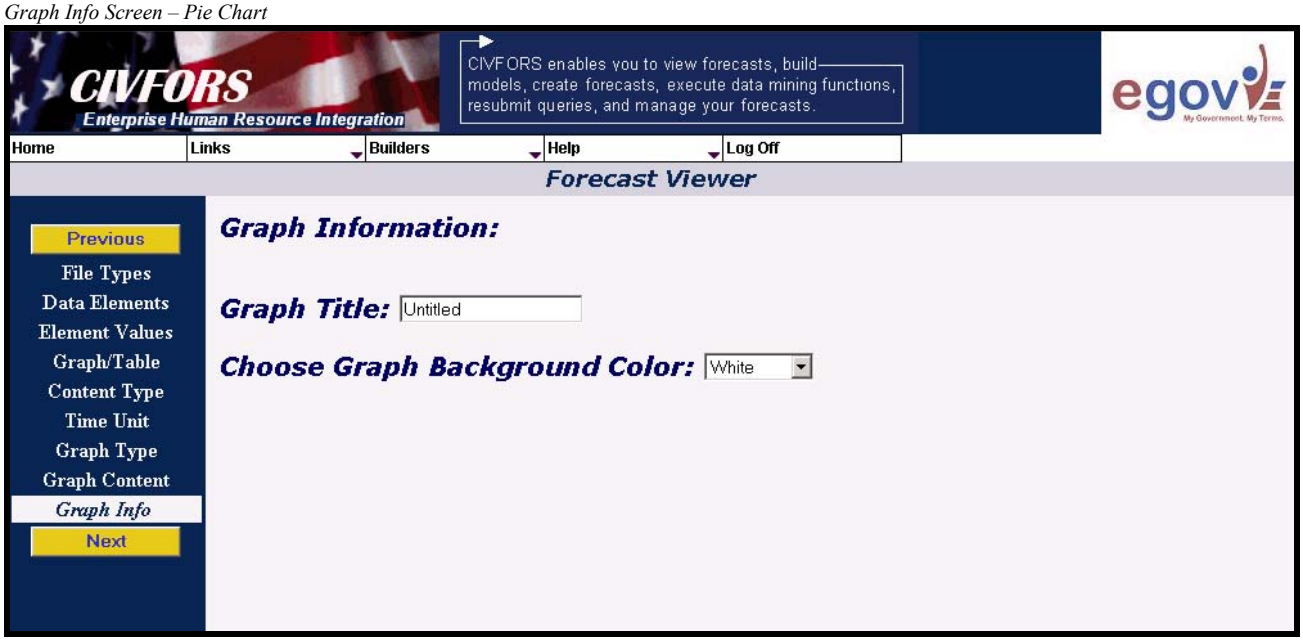
Click ***Help*** to access CIVFORS online Help instructions.

3.4.2.4 Graph Info

Graph Info Screen – Bar Chart



Graph Info Screen – Pie Chart



The next screen to appear is the *Graph Info* screen. The Graph Info screen will be in one of two forms, depending on the type of graph you selected on the *Graph Type* screen.

Bar Chart

The **Graph Info** screen allows you add titles and format your bar chart output.

In the **Graph Title** field enter a brief title (50 characters or less) for the graph. The default value in this field is *Untitled*.

In the **X-Axis Title** field enter a brief title (50 characters or less) to appear on the X-Axis of the graph. The default value in this field is *Untitled*.

In the **Y-Axis Title** field enter a brief title (50 characters or less) to appear on the Y-Axis of the graph. The default value in this field is *Untitled*.

Place a check mark in the box next to **Gridlines** if you would like to include gridlines in your graph.

Select the **Graph Background Color** from the drop down menu. The default value is *White*.

Pie Chart

The **Graph Info** screen allows you add titles and format your pie chart output.

In the **Graph Title** field enter a brief title (50 characters or less) for the graph. The default value in this field is *Untitled*.

Select the **Graph Background Color** from the drop down menu. The default value is *White*.

Menu Instructions

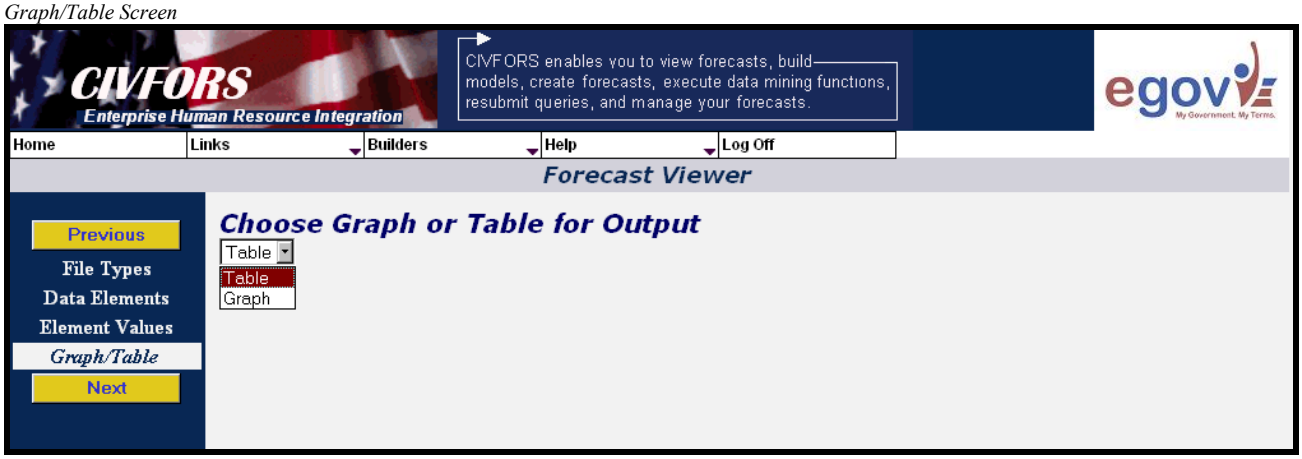
Click ***Next*** after entering your data and making your selections. The analysis results appear.

Click ***Previous***. The *Graph Content* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.5 Graph/Table (Table)

Graph/Table Screen



The next screen to appear is the *Graph/Table* screen. The *Graph/Table* screen allows you to select the visual arrangement – Graph or Table – you want your forecast to have.

Select ***Table*** from the drop down menu.

Menu Instructions

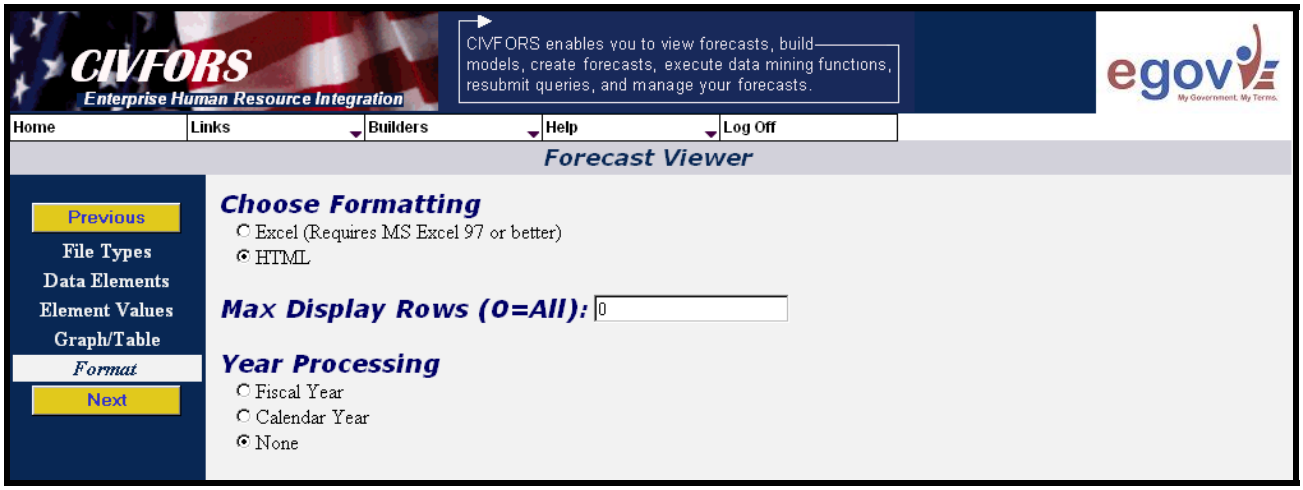
Click ***Next*** after making your selection. The *Format* screen appears.

Click ***Previous***. The *Data Element Values* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

3.5.1 Format

Format Screen



If you select ***Table*** from the drop down menu, the next screen to appear is the *Format* screen. The *Format* screen allows you to select the formatting options for viewing your tabular results.

Choose the **Formatting** of the results as either *HTML* or *Excel*. When you select *Excel*, the results are automatically displayed in an Excel spreadsheet. You can then use Excel to edit, graph, save, and print your information. If *HTML* is chosen, you can highlight the results, copy and paste into another application for further analysis. *HTML* is the default selection. Click on the button next to the option to make the selection.

Enter the maximum number of rows (not to exceed your page size) you would like to display in your forecast results in the **Max Display Rows** field. Zero (0) is the default and this value signifies that all rows will be displayed in the query results. The value you enter must be an integer greater than or equal to 0.

Select the **Year Processing** as either *Fiscal Year, Calendar Year* or *None*. *Fiscal Year* and *Calendar Year* will summarize transaction data by fiscal or calendar year, and display strength and target data at the year-end points. *None* (which is the default) will display the results at each quarter-end point.

Menu Instructions

Click ***Next*** after entering your data and making your selections. The analysis results appear. Historical results will be shaded, while forecast results are not shaded.

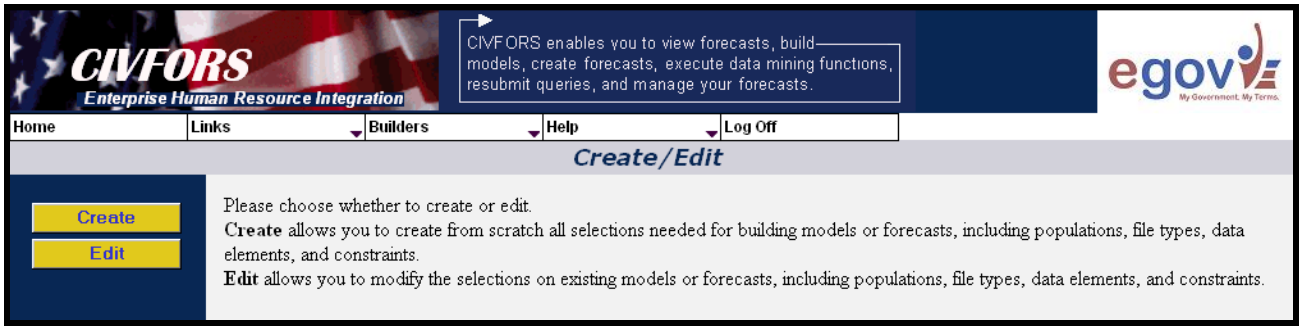
Click ***Previous***. The *Graph/Table* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

Section 4.0 Build Models, Forecasts, and Model Components

CIVFORS includes the ability create new forecasts, models and model components by editing existing ones or by building them step-by-step. The Model Builder supports creating new models by selecting a population, data elements, and file types of interest. The Forecast Builder allows you to build baseline and what-if forecasts based on the selected model. The builders can also be used to override personnel action rates, adjust targets for goal forecasts, and build constraints to model personnel policies or meet long-term strategic goals.

Edit/Create Screen



Once you have chosen the ***Build Models*** option on the *Select a CIVFORS Function* screen, the first screen to appear is the *Create/Edit* screen. From the **Create/Edit** screen, you can select either the **Create** or **Edit** button.

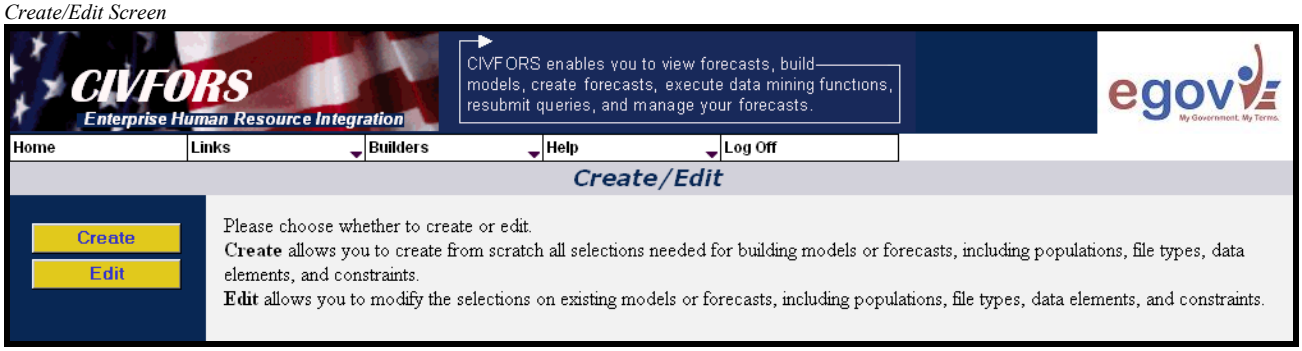
Create allows you to create from scratch all selections needed for building models or forecasts, including populations, file types, data elements, and constraints.

Edit allows you to modify the selections on existing models or forecasts, including populations, file types, data elements, or constraints.

Section 4.1 discusses the process for creating a new model from scratch**. Section 4.2** discusses the process for editing a single model aspect. **Section 4.3** further discusses the process for editing multiple model aspects.

4.1 Create

Create/Edit Screen



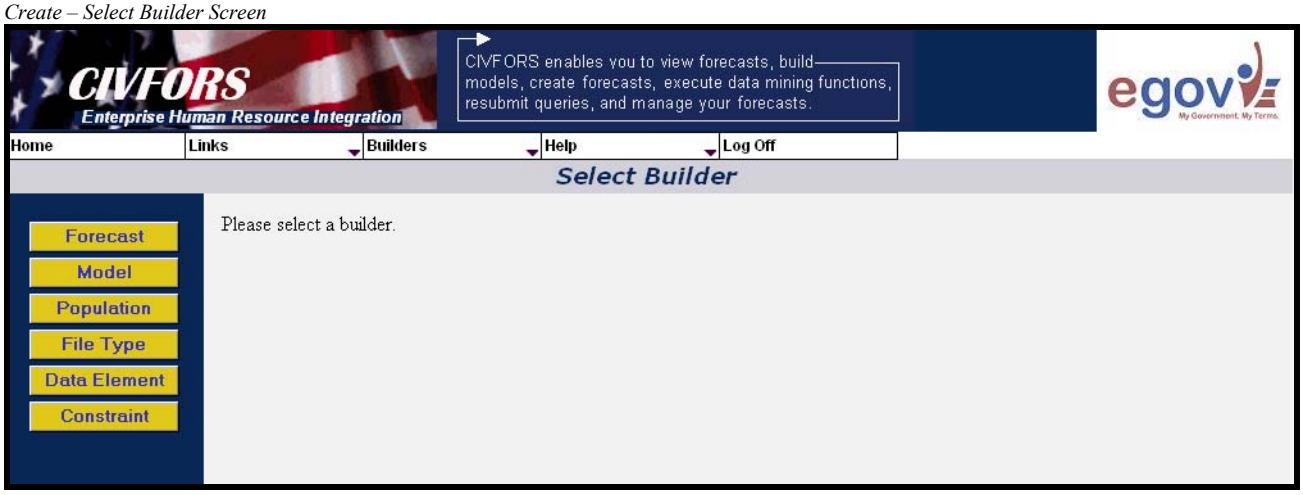
Create allows you to create from scratch all selections needed for building models or forecasts, including populations, file types, data elements, and constraints.

Menu Instructions

Click ***Create*** to create a model from scratch. The *Select Builder* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

Create – Select Builder Screen



Once *Create* has been selected from the *Create/*Edit screen, the next screen to appear is the *Select Builder* screen. This menu lists all the CIVFORS components you can create.

The **Forecast** builder allows you to create and run a projection of your population based on a selected model and additional parameters that you supply.

The **Model** builder allows you to create and run a model of your population that will ultimately establish the basis for your projection forecast. This builder's purpose is essentially to consolidate components formulated in the data element, file type, and population builders into a single representation of the workforce.

The **Population** builder allows you to establish the subset of your entire workforce that identifies the Population Group in your model.

The **File Type** builder allows you to establish file types that represent transactions (or events) in your model (such as gain, loss, and migration categories). A file type is typically generated by grouping base-level transactions (e.g., NOA codes) or changes to base data elements (e.g., Grade) into groups.

The **Data Element** builder allows you to create new data elements (or dimensions) from base data elements, and in the process, regroup the data element values in a manner that is more concise and/or more meaningful in your model.

The **Constraint** builder allows you to establish limits on strength or file type activities for a given "goal" (or targeted) model. These limits are defined by lower, upper or fixed bounds, with associated costs for not achieving these values.

If you select **Model** to build your model first, you can then optionally proceed to the *Forecast Builder* to create your forecast from the *Model Builder Summary* screen. Or, if the model has already been created, you can select **Forecast** directly from this menu.

If you are only interested in creating an underlying component of the model then you may use the shortcuts for the particular area. You may create a **Population, File Type, Data Element**, or **Constraint**. Select *Population* to define the population for your model. Select *File Type* to group Nature of Action (NOA) codes or data element changes to define your personnel actions. Select *Data Element* to create the data element value groupings used in your model. Select *Constraint* to create bounds for your goal models.

Menu Instructions

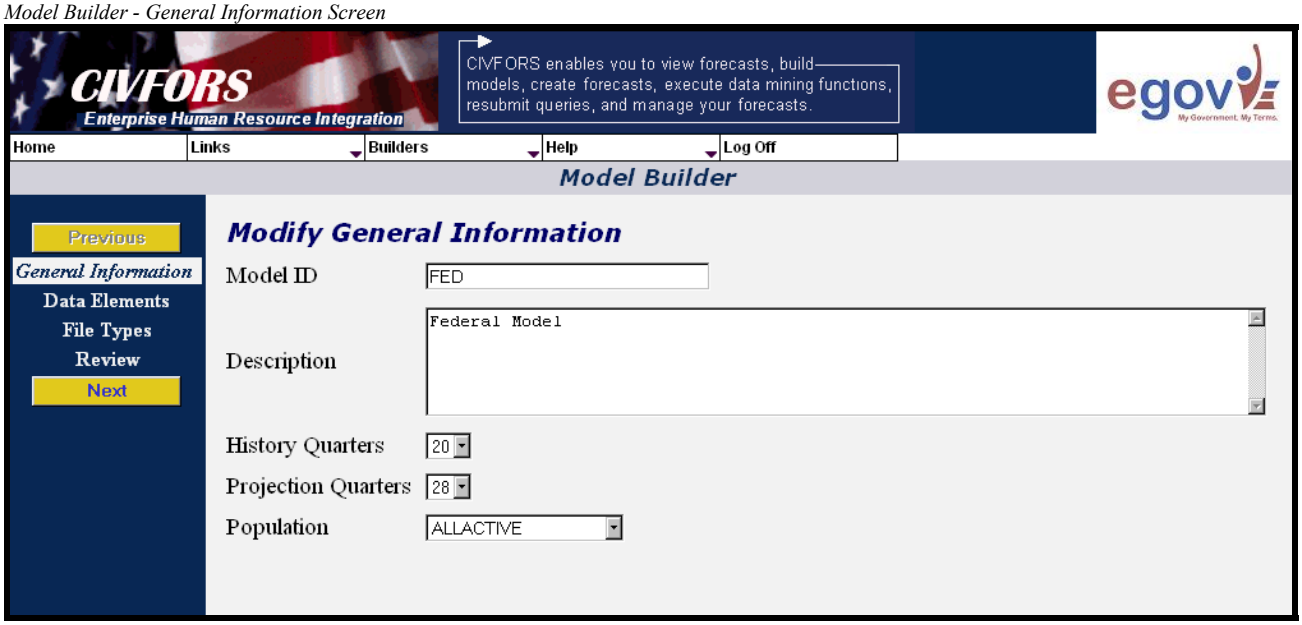
Click any **Component** that you would like to create. The *General Information* screen for that particular component appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.1 Create Model

4.1.1.1 General Information

Model Builder - General Information Screen



If you select the ***Model*** button, the first screen to appear is the *General Information* screen of the Model Builder. The *Model Builder* allows you to create and run a model of your population that will ultimately establish the basis for your projection forecast. This builder's purpose is essentially to consolidate components formulated in the data element, file type, and population builders into a single representation of the workforce.

In the **Model ID** box, enter a maximum of 14 characters to name your model. The Model ID must begin with a letter and contain only letters, numbers, and underscores. The name must also be unique (i.e., if you are going to make your model private, you may not have another private model by the same name OR if you are going to make your model public, there may not be another public model by that name). We recommend that you provide a name containing text that will help you to readily identify the model at a later date in the event you need to retrieve it through the edit function. All Model ID's default to upper case.

In the **Description** box, you may enter a brief description of your model. Entry of a description is optional. There are no limitations on the character set or case that you may use. The description is a maximum of 500 characters.

Select the **History Quarters** for your model through use of the drop down menu. The history quarters are the number of quarters of historical data used to generate the projections.

Select the **Projection Quarters** for your model through use of the drop down menu. The projection quarters are the number of future quarters to generate a projection

Select the **Population** for your model through use of the drop down menu. If you consider all your data (i.e., all your records), any subset of this set of records is called a Population. Populations are created in the *Population Builder*.

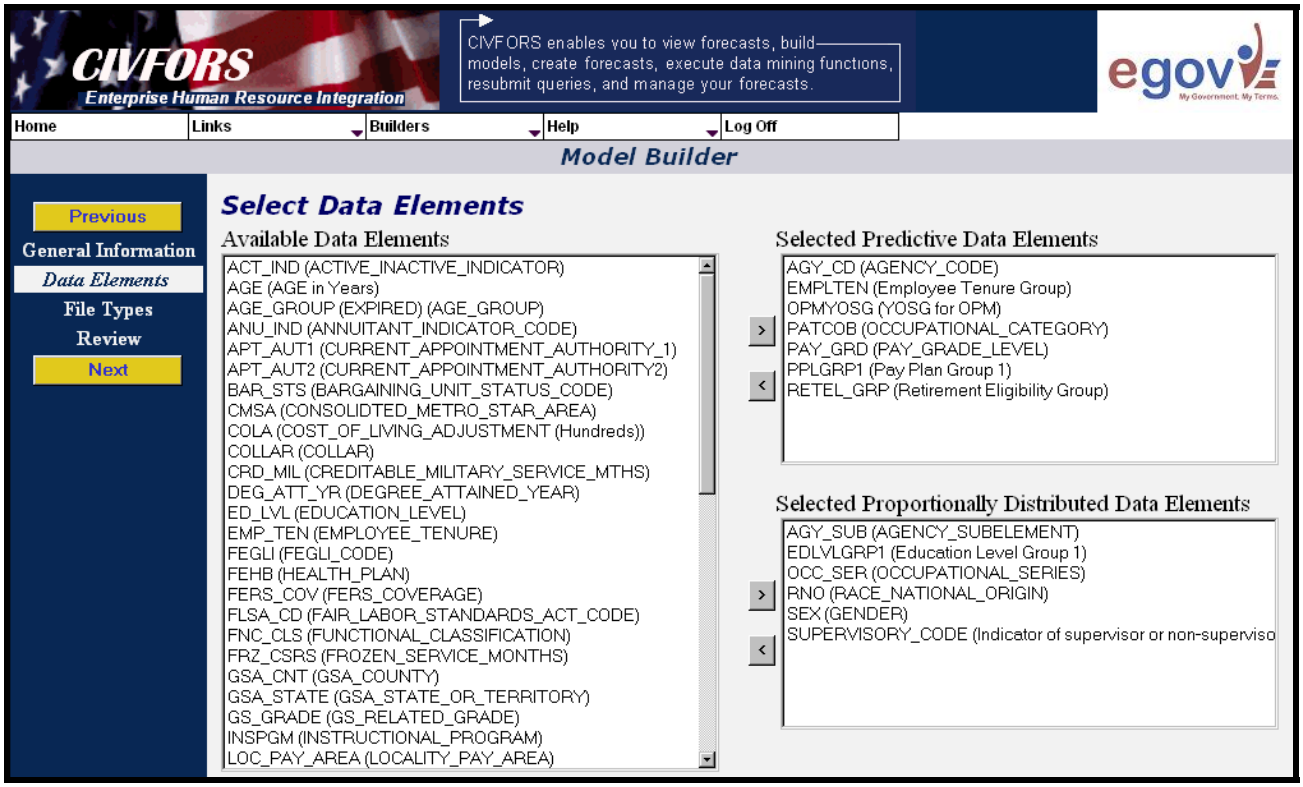
Menu Instructions

Click ***Next*** after entering your data and making your selections. The *Data Elements* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.1.2 Data Elements

Model Builder - Data Elements Screen



The next screen to appear is the *Data Elements* screen. The *Data Elements* screen enables you to identify both the Predictive Data Elements and Proportionally Distributed Data Elements in the model.

Predictive Data Elements values are typically established by applying historical rates to future projected strength. You can use the Data Mining functions to help determine the best set of predictors for your model.

Proportionally Distributed Data Elements values are typically established by applying historical factors to either projected strengths or file types. In other words, these projections are based on proportionality (e.g., if 10% of your gender distributed data element for your workforce is female then 10% of the forecasted information will be for females).

Choose the Data Elements you would like to include as either Predictive or Proportionally Distributed Data Elements by selecting them from the *Available Data Elements* on the left side of the screen and clicking the right arrow to move them to the appropriate **Selected Data Elements** box.

To *deselect* a data element from either of the **Selected Data Elements** boxes, click the data element from the right side of the screen you would like to remove and click the left arrow to return it to the left side of the screen.

To move multiple elements in either direction, hold down the **Ctrl** key (for non-contiguous elements) or **Shift** key (for contiguous elements) before clicking on the elements.

Important Note: You must choose at least two Predictive Data Elements before you will be allowed to proceed to the next screen. However, you are not required to choose any Proportionally Distributed Data Elements.

Menu Instructions

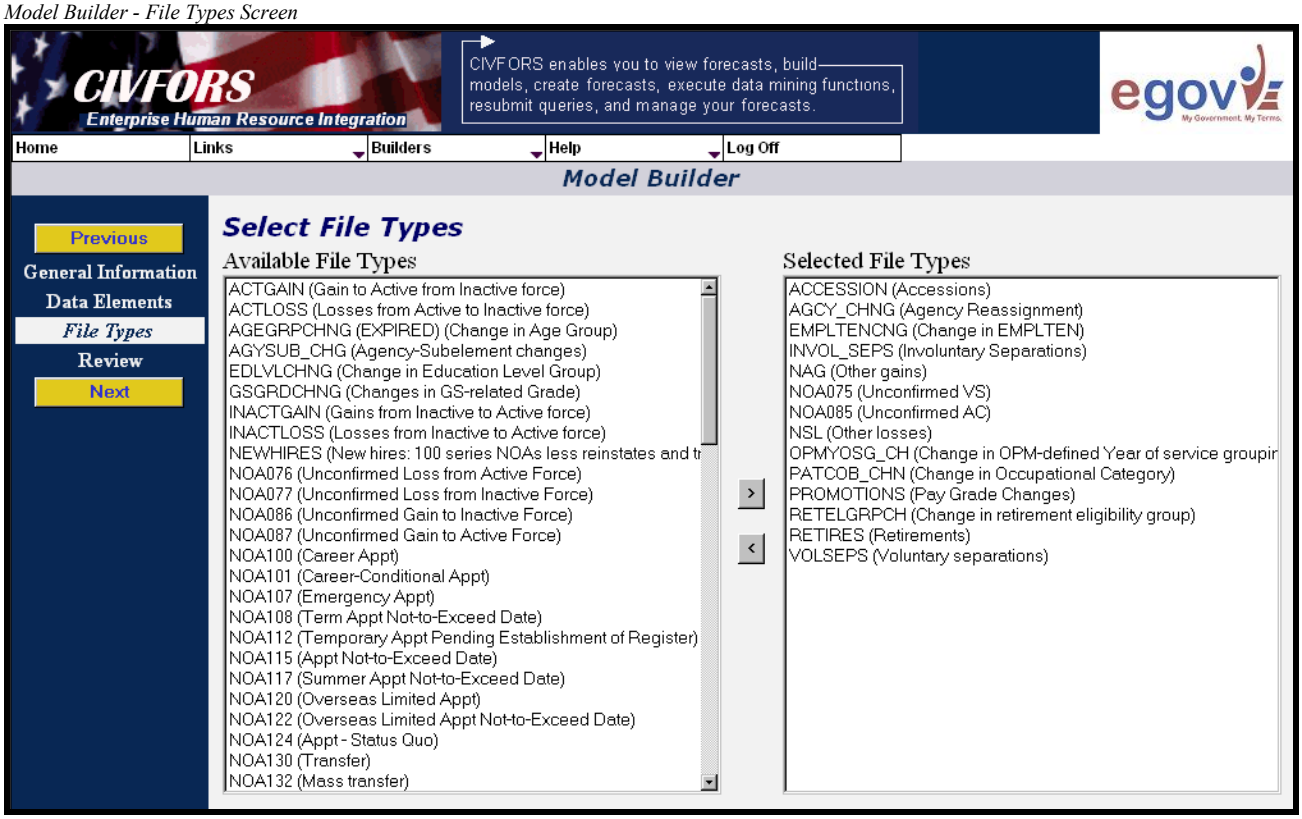
Click ***Next*** after making your selections. The *File Types* screen appears.

Click ***Previous***. The *General Information* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.1.3 File Types

Model Builder - File Types Screen



The next screen to appear is the *File Types* screen. The *File Types* screen enables you to identify the specific file type data elements that are included in the model. File types that may be included in the model are: (a) base file types; and (b) user generated file types you have created using the File Type Builder.

Choose the File Types you would like to include in your projection by selecting them from the *Available File Types* on the left side of the screen and clicking the right arrow to move them to the **Selected File Types** box.

To *deselect* a file type from the *Selected File Types* box, click the file type you would like to remove from the right side of the screen and click the left arrow to return it to the left side of the screen.

To move multiple file types in either direction, hold down the **Ctrl** key (for non-contiguous elements) or **Shift** key (for contiguous elements) before clicking on the file types.

Important Note: You must choose file types that account for all available gain and loss NOA transaction codes exactly once. You will receive an error message if a NOA code is not accounted for or if it is accounted for in more than one file type, and you will not be allowed to proceed.

Menu Instructions

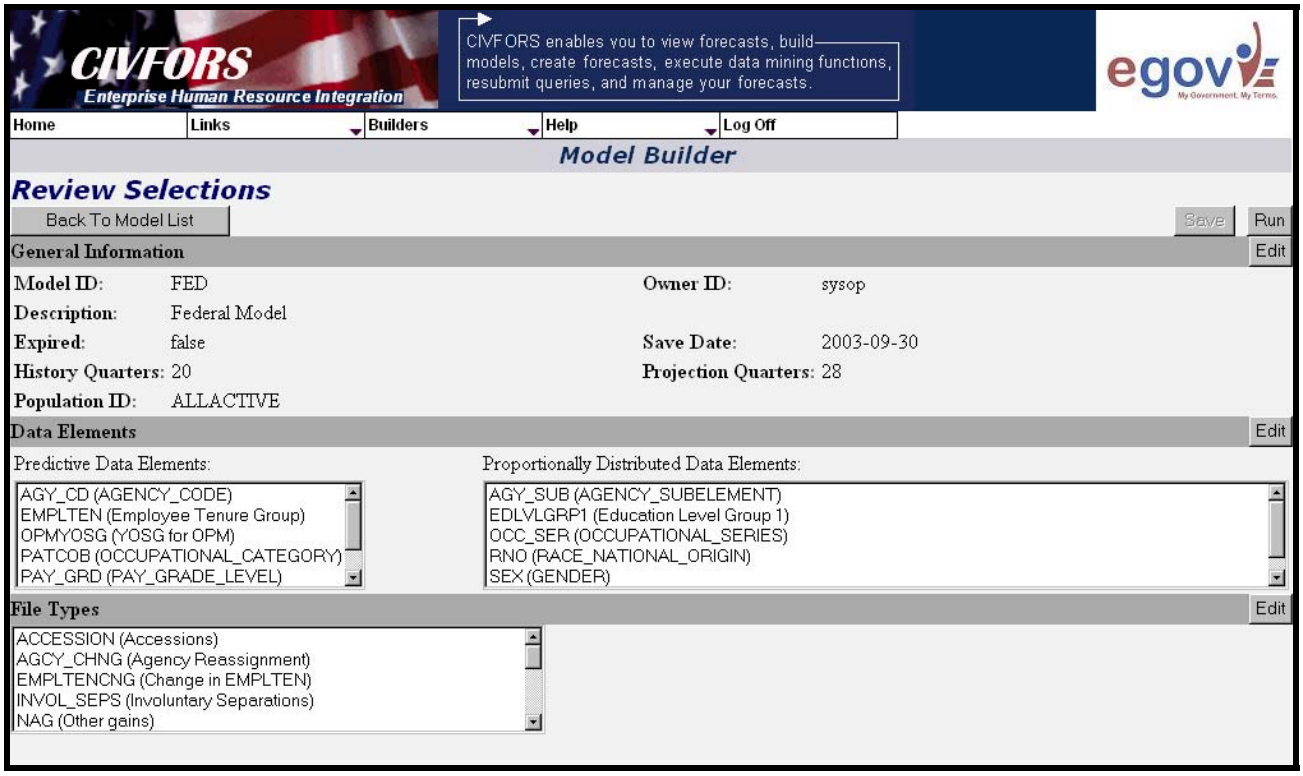
Click ***Next*** after making your selections. The *Review Selections* screen appears.

Click ***Previous***. The *Data Elements* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.1.4 Review Selections

Model Builder - Review Selections Screen



The next screen to appear is the *Review Selections* screen. The *Review Selections* screen enables you to review all of your selections for the Model. It is comprised of three sections - one for each step of the process. If you wish to edit any of these sections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

The **General Information** section of the *Review Selections* screen provides a summary of the general information for your Model. This includes the *Model ID, Owner ID, Description, Expired, Save Date, History Quarters, Projection Quarters and Population ID* fields. If you would like to change any of the information, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *General Information* screen and click ***Next***, you will return to the *Data Elements* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Data Elements** section of the *Review Selections* screen provides a summary of the Predictive and Proportionally Distributed Data Elements you selected for the model. If you would like to change any of the data elements, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Data Elements* screen and click ***Next***, you will return to the *File Types* screen. You must continue clicking **Next** (or making changes as required) until you return to the *Review Selections* screen.

The **File Types** section of the *Review Selections* screen provides a summary of the File Types you selected for the model. If you would like to change any of the selected file types, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *File Types* screen and click ***Next***, you will return to the *Review Selections* screen.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information, Data Elements,* and *File Types* selections.

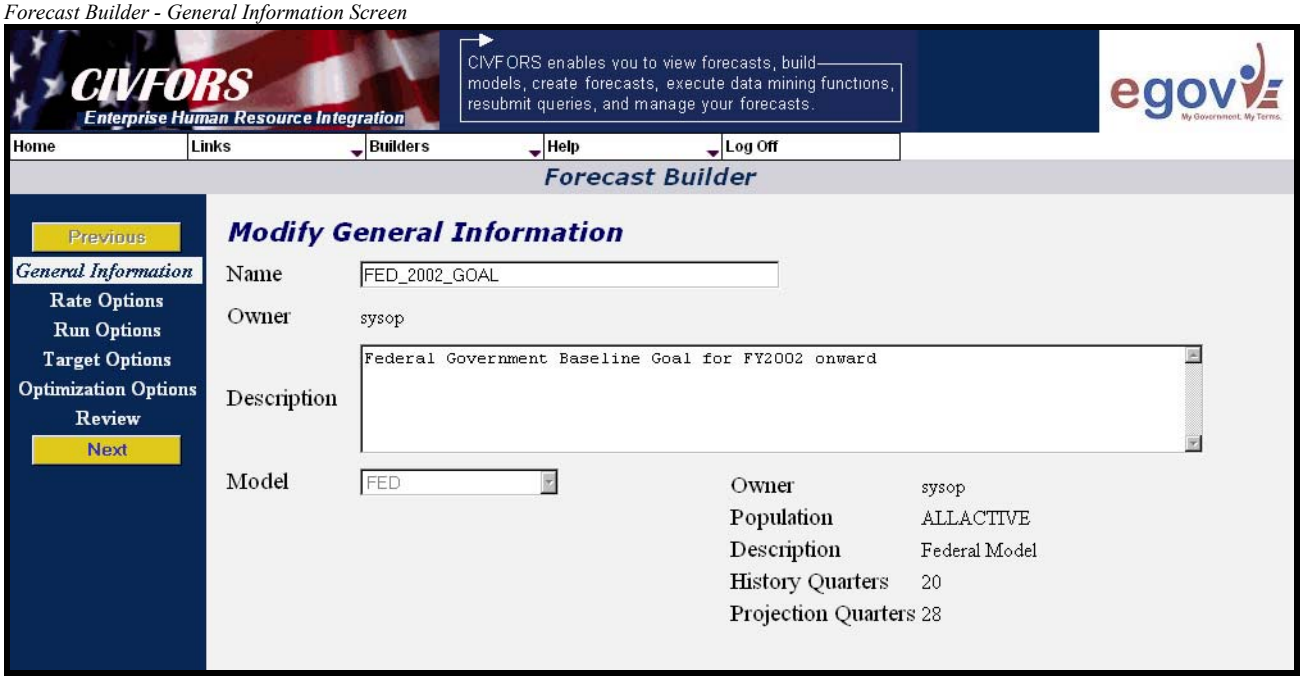
Click ***Run*** if you wish to not only save the model, but also to proceed directly to the Forecast Builder.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.2 Create Forecast

4.1.2.1 General Information

Forecast Builder - General Information Screen



If you selected ***Forecast*** from the *Select Builder* screen, the first screen to appear is the *General Information* screen of the *Forecast Builder*. You can also get to this screen if you selected ***Model*** from the *Select Builder* screen, created, saved and run a new model. The *Forecast Builder* allows you to create and run a projection of your population based on a selected model and additional parameters that you supply.

In the **Name** box, enter a maximum of 30 characters to name your forecast. The Forecast name must begin with a letter and contain only letters, numbers, and underscores. The name must also be unique (i.e., there may not be another forecast by that name). We recommend that you provide a name containing text that will help you to readily identify the Forecast at a later date in the event you need to retrieve it through the edit function. All Forecast names default to upper case.

The **Owner** box will automatically display your username as the owner of the forecast.

In the **Description** box, you may enter a brief description of your forecast. Entry of a description is optional. There are no limitations on the character set or case that you may use. The description is a maximum of 500 characters.

Select the **Model** for your Forecast using the drop down menu. Once the model has been selected, information about the model will automatically be provided. This includes the *Owner, Population, Description, Historical Quarters and Projection Quarters.*

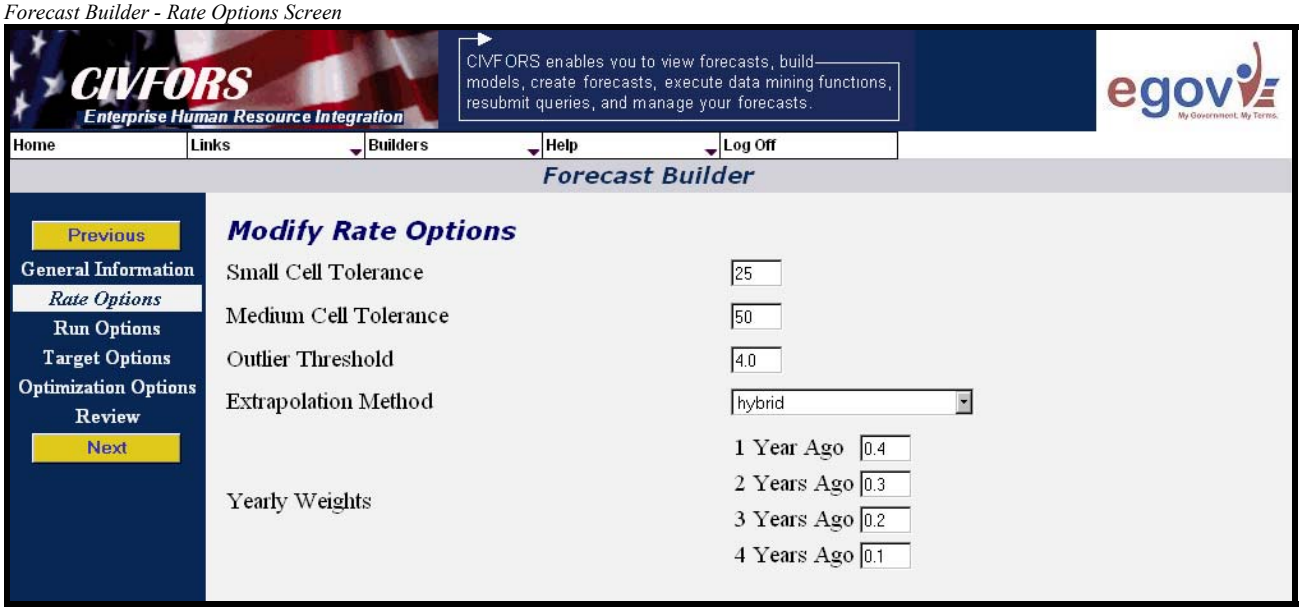
Menu Instructions

Click ***Next*** after making your selections. The *Rate Options* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.2.2 Rate Options

Forecast Builder - Rate Options Screen



The next screen to appear is the *Rate Options* screen. The *Rate Options* screen allows you to identify key parameters associated with the rates that are generated to support your projection.

Enter a number in the **Small Cell Tolerance** box (default is 25). This value defines the threshold for the application of "small cell size" rules imbedded in the rate processor. Editing of this field without further knowledge of the rate processing code is not recommended.

Enter a number in the **Medium Cell Tolerance** box (default is 50). This value defines the threshold for the application of "medium cell size" rules imbedded in the rate processor. Editing of this field without further knowledge of the rate processing code is not recommended.

Enter a number in the **Outlier Threshold** box (default is 4.0). This value defines the threshold used when evaluating outliers in the rate processor. Editing of this field without further knowledge of the rate processing code is not recommended.

Select the **Extrapolation Method** from the drop down menu. Hybrid is the recommended method, but Repeat Last Year, Seasonal Weighted-Average, Weighted-Average and Winters are also available options. The features of each rate technique are shown in the following tables:

Technique	User Weights	Seasonal	Rate Blending	Trend	Outlier	Smoothing
Hybrid	*	*	*	*	*	*
Repeat Last Year		*	*			*
Seasonal Weighted Average	*	*				
Weighted Average	*					
Winters		*	*	*		*

Features:

User Weights	Rates utilize historical year weights supplied by you in the Forecast Builder. Default values are provided in the GUI, and vary depending on the number of years of history. Following are the default values (weights are listed from most recent year to most distant year): 1 year of history (1.00); 2 years of history (.75, .25); 3 years of history (.60, .30, .10); 4 years of history (.40, .30, .20, .10); 5 years of history (.40, .25, .15, .10, .10). You may elect to alter these values to suppress excessively turbulent periods of history, or to emphasize periods thought to be more representative of the future.
Seasonal	Rates are established and vary by seasonal quarter. The seasonal equations segregate the historical rates into four time-series, one for each quarter (i.e., December, March, June, and September), meaning that each initial seasonal rate is based on one to five data points (depending on the number of years chosen).
Rate Blending	Rates utilize weights provided by the weight generator analytic executed in S-PLUS. The analytic procedure establishes the key predictive data elements for each rate type, and assigns weights to each level of aggregation. Rates are calculated based on a hierarchical procedure that seeks to produce rates based on sufficient data, thus minimizing the effects of small cells.
Trend	Rates consider historical trend. The 'Winters' method extends this trend throughout the entire projection time horizon, while the 'Hybrid' method extends the trend only for a projected time period equal to the length of the historical time-series used to establish the rates.
Outlier	Rates consider an outlier exclusion algorithm that measures the initial historical time-series rates against a range established by: (a) the product of the median rate value and a user-supplied parameter and (b) the quotient of the median rate value divided by the same user-supplied parameter. Historical data points identified as outliers are removed from the extrapolation procedure (to include the calculation of trend), and the weights provided to the remaining data points are normalized to compensate for the removed data.
Smoothing	Projected rates are smoothed to remove any residual outlier values. There are three key differences between this feature and the outlier feature. First, the smoothing algorithm is applied to the projected rates after they have been extrapolated. As a result, smoothing does not influence the initial calculation of trend. Second, the procedure does not remove outlier points completely; it simply dampens (or caps) their influence. Third, the outlier identification parameters for smoothing are fixed in the code, and cannot be modified by you.

If you have selected an option that requires this information (Hybrid, Seasonal Weighted Average or Weighted Average), enter the **Yearly Weights** in the boxes provided. The weights are used to establish the emphasis given to each year of historical data in the establishment of rates. The weights must be numeric

and sum to 1.0. A value of 0.0 for a given cell is acceptable if you wish to completely suppress the influence the data from that particular historical year would have on your projection.

Menu Instructions

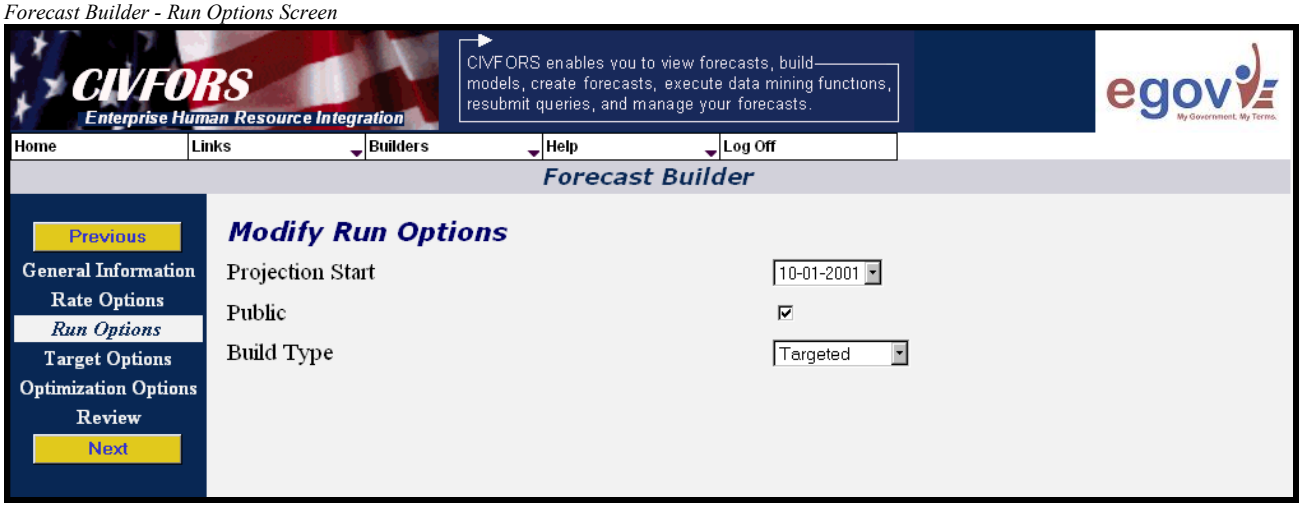
Click ***Next*** after making your selections. The *Run Options* screen appears.

Click ***Previous***. The *General Information* screen appears.

Click **Help** to access CIVFORS online Help instructions.

4.1.2.3 Run Options

Forecast Builder - Run Options Screen



The next screen to appear is the *Run Options* screen. The *Run Options* screen allows you to identify additional parameters associated with the projection.

Select the **Projection Start Date** from the drop down menu. The Projection Start Date is typically the first day of the quarter following the last quarter of history. For instance, if history ends in September, the projection start data would be the October 1st.

Click the **Public** checkbox if you wish to make your forecast public (i.e., available for use by other CIVFORS users). All CIVFORS users will be able to view the forecast results. If you do not elect to make your forecast public, it will be created as a private forecast that subsequently may be retrieved for review/edit only by you. You may change a private forecast to a public forecast at a later time if desired.

Select the **Build Type** from the drop down menu options of *Targeted* or *Non-Targeted*. The targeted build type indicates that workforce organization-level goals will be specified for the future and models will aim to meet these targets. The non-targeted build type does not have workforce organization level-goals and the future is based on strictly history.

Menu Instructions

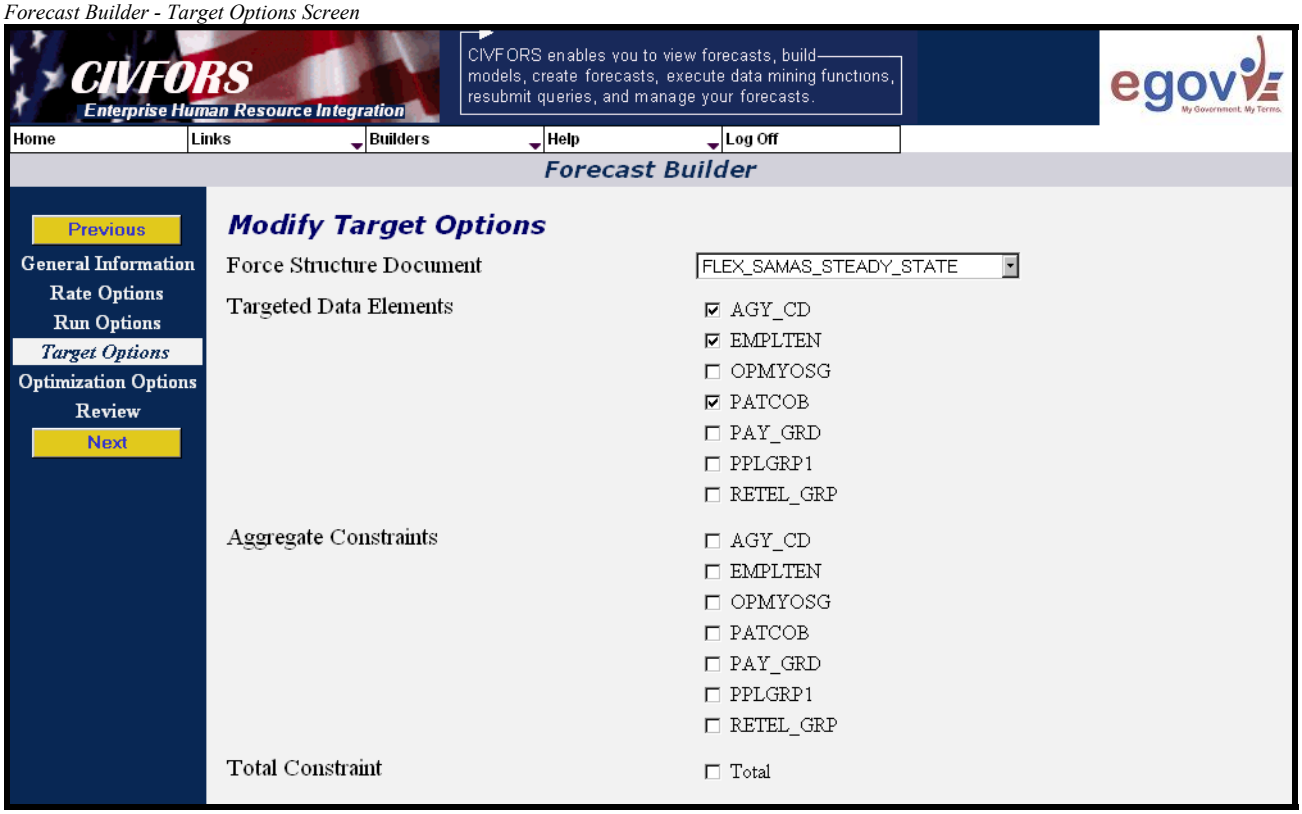
Click ***Next*** after making your selections. If your Build Type is *Targeted*, the *Target Options* screen appears. If your Build Type is *Non-Targeted*, the *Review Selections* screen appears.

Click ***Previous***. The *Rate Options* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.2.4 Target Options

Forecast Builder - Target Options Screen



The next screen to appear is the *Target Options* screen. The *Target Options* screen appears only when you select a Targeted Build Type. It enables you to define those parameters associated with establishing your projected strength goals.

Select the **Force Structure Document** from the drop down menu. These documents typically represent official or notional job requirements. However, a "STEADY_STATE" option exists which will establish targets based on a "straight-line" projection of your existing workforce.

Select the **Targeted Data Elements** by placing a check mark in the box next to one or more of the available Predictive Data Elements. These selections will define the level-of-detail for the targets. For example, if Gender and Grade are selected, targets (for each time period) will be generated for each combination of gender and grade.

Optionally identify any **Aggregate Constraints** by placing a check mark in the box next to one or more of the Available Predictive Data Elements. Each data element selected will establish additional constraints rolled up to the level of detail represented by that data element. For example, if Gender and Grade are selected, separate aggregate targets by gender and by grade (for each time period) will be established.

Optionally select **Total Constraints** by placing a check mark in the box next the label Total. If selected, an aggregate target across all data elements (for each time period) will be established.

If Aggregate or Total Constraints are established, you will also need to establish an allowable slack percentage in the activated Bound boxes to the right of the data elements. Default values of 2% are provided, but you may choose any numeric value between 0 and 50.

Menu Instructions

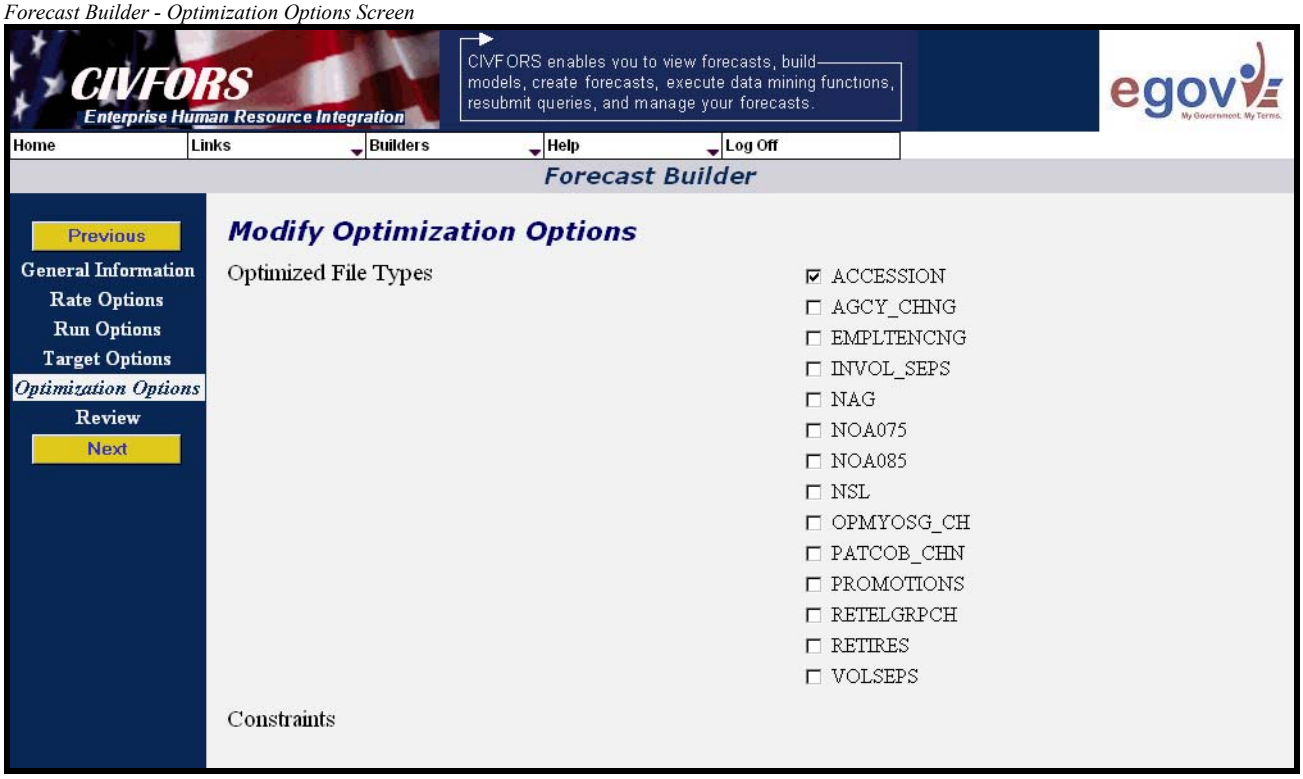
Click ***Next*** after making your selections. The *Optimization Options* screen appears.

Click ***Previous***. The *Run Options* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.2.5 Optimization Options

Forecast Builder - Optimization Options Screen



The next screen to appear is the *Optimization Options* screen. The *Optimization Options* screen enables you to define the file type(s) to be optimized and any constraints that should apply to your forecast.

The goal of the optimization is to have strength and targets as close together as possible. The first task in optimization is to examine projected strengths against targets. If there is a delta between projected strength and targets, **Optimized File Types** (Accessions, Promotions, etc.) are used to fill the gap. Since Accessions (unlike Losses) are routinely "managed", this file type is often selected as the Optimized File Type. Select the **Optimized File Types** by placing a check mark next to the appropriate file types.

A **Constraint** is an equation that places limits on variable sets in the linear program formulation. Constraints are established in the Constraint Builder. Place a check mark next to each constraint that you wish to implement. If no constraints have been built for this model, then no constraints will be displayed.

Menu Instructions

Click ***Next*** after making your selections. The *Review Selections* screen appears.

Click ***Previous***. The *Target Options* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.2.6 Review Selection

Forecast Builder - Review Selections Screen

The next screen to appear is the *Review Selections* screen. The *Review Selections* screen enables you to review all of your selections for the Forecast. It is comprised of either three (for a Non-Targeted run) or five sections (for a Targeted Run) - one for each step of the process. If you wish to edit any of these sections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

The **General Information** section of the *Review Selections* screen provides a summary of the general information for your Forecast. This includes the *Forecast Name, Owner ID, Forecast ID, Forecast Description, Model, Model Owner ID, Model Description, History Quarters, Projection Quarters,* and *Population* fields. If you would like to change any of the information, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *General Information* screen and click ***Next***, you will return to the *Rate Options* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Rate Options** section of the *Review Selections* screen provides a summary of the parameters used to establish your rates. This includes the *Small Cell Tolerance, Extrapolation Method, Medium Cell Tolerance, Yearly Weights,* and *Outlier Threshold* fields. If you would like to change any of the Rate Options, click the **Edit** button in the upper right hand corner. Once you have made the desired changes to the *Rate Options* screen and click Next, you will return to the *Run Options* screen. You must continue clicking **Next** (or making changes as required) until you return to the *Review Selections* screen.

The **Run Options** section of the *Review Selections* screen provides a summary of the additional parameters used to establish your forecast. This includes the *Build Type, Public,* and *Projection Start Date* fields. If you would like to change any of the Run Options, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Run Options* screen and click ***Next***, you will return to either the *Target Options* or *Review Selections* screen (depending upon the Build Type). If the Build Type is "Targeted", you must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Target Options** section of the *Review Selections* screen provides a summary of your target selections. This includes the *Force Structure Document, Targeted Data Elements, Aggregate Constraints,* and *Total Constraint* fields. If you would like to change any of the Target Options, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Target Options* screen and click ***Next***, you will return to the *Optimization Options* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Optimization Options** section of the *Review Selections* screen provides a summary of your optimizations selections. This includes the *Optimized File Types,* and *Constraints* fields. If you would like to change any of the Optimization Options, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Optimization Options* screen and click ***Next***, you will return to the *Review Selections* screen.

You may choose to run only a portion of the Forecast and then manipulate the rates and/or targets that are generated before producing the final projection output. To do this, return to this screen after the appropriate stages are complete and click on the ***Rates Editor*** button in the upper right hand corner of the screen.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information, Rate Options, Run Options, Target Options,* and *Optimization Options* selections.

Click ***Run*** if you wish to not only save the forecast, but also begin execution of this forecast.

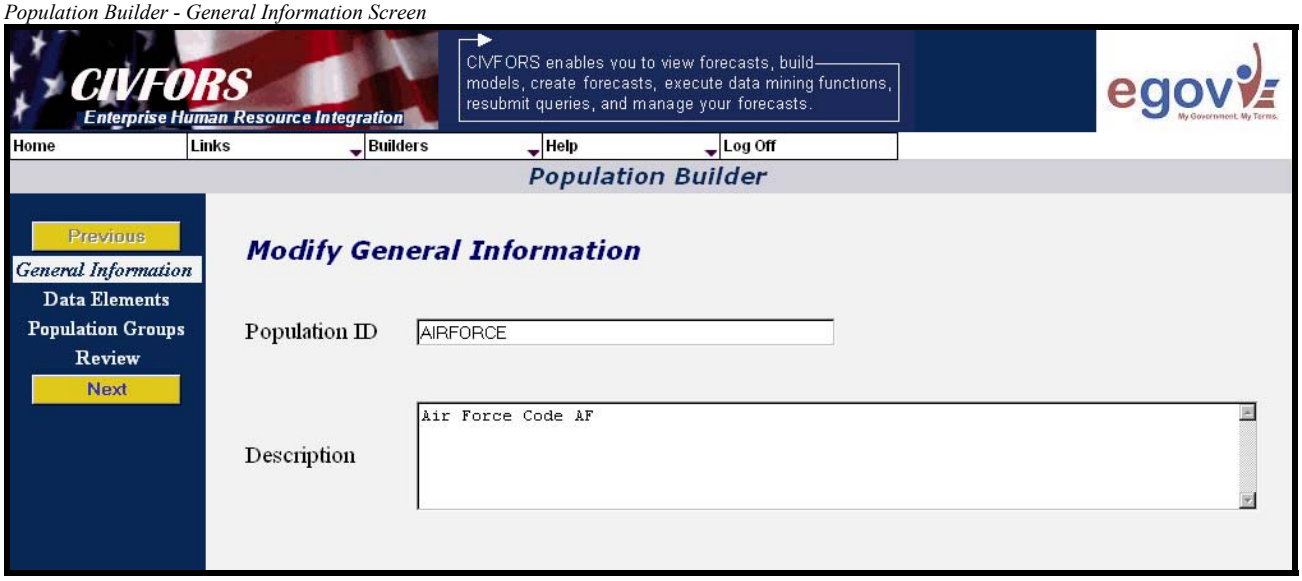
Click ***Back to Forecast List*** to return to the *Select Forecasts* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.3 Create Population

4.1.3.1 General Information

Population Builder - General Information Screen



If you selected the ***Population*** button from the *Select Builder* screen, the first screen to appear is the *General Information* screen of the *Population Builder*. The *Population Builder* allows you to establish the subset of your entire workforce that identifies the Population Group in your model. A Population Group is created by identifying data element values used to screen the population in selections referred to as *filter groups*.

In the **Population ID** box, enter a maximum of 30 characters to name your population. The Population ID must begin with a letter and contain only letters, numbers, and underscores. The name must also be unique (i.e., there may not be another population group by that name). We recommend that you provide a name containing text that will help you to readily identify the population at a later date in the event you need to retrieve it through the edit function. All Population names default to upper case.

In the **Description** box, you may enter a brief description of your population. Entry of a description is optional. There are no limitations on the character set or case that you may use. The description is a maximum of 500 characters.

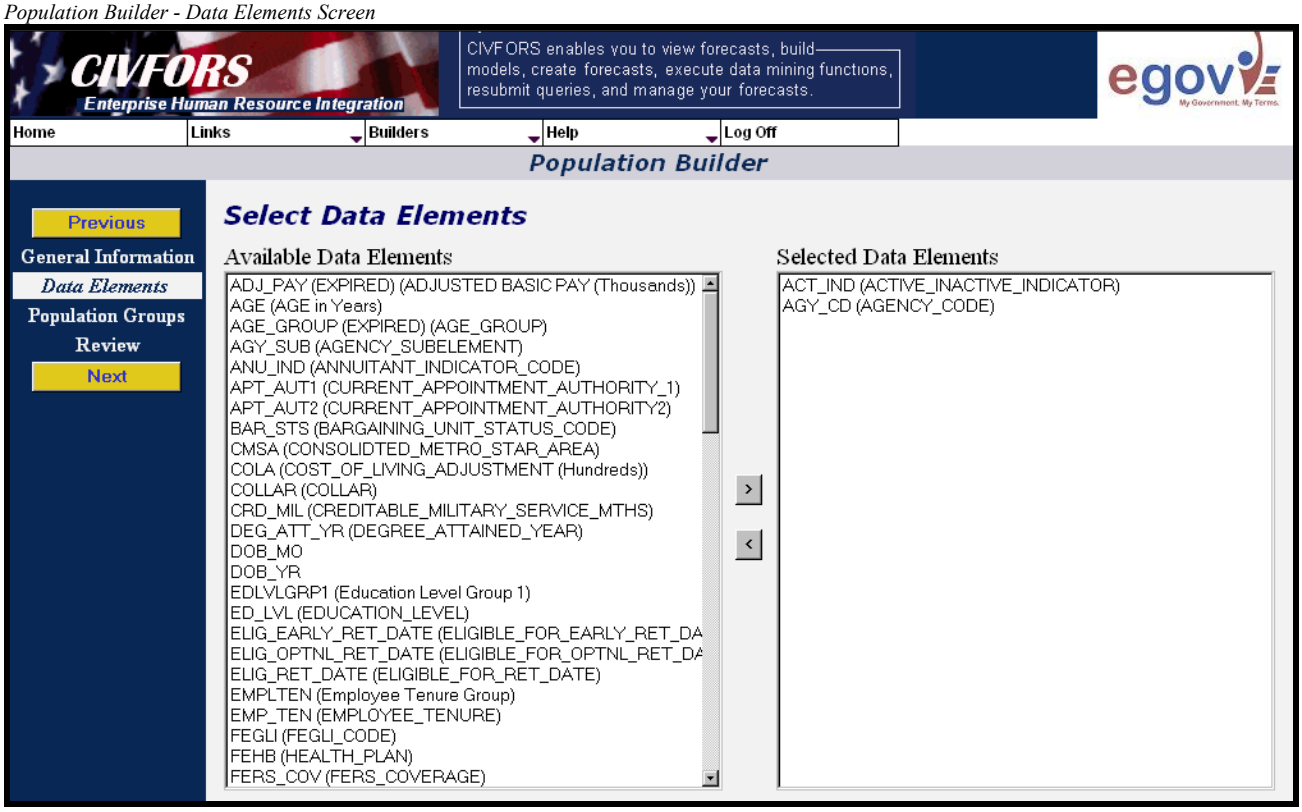
Menu Instructions

Click ***Next*** after entering your data. The *Data Elements* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.3.2 Data Elements

Population Builder - Data Elements Screen



The next screen to appear is the *Data Elements* screen. The *Data Elements* screen enables you to identify those elements that will be used to define your population group filter(s).

Choose the **Data Elements** you would like to include in defining your population by selecting them from the *Available Data Elements* on the left side of the screen and clicking the right arrow to move them to the **Selected Data Elements** box.

To *deselect* a data element from the *Selected Data Elements* box, click the data element from the right side of the screen you would like to remove and click the left arrow to return it to the left side of the screen.

To move multiple data elements in either direction, hold down the **Ctrl** key (for non-contiguous elements) or **Shift** key (for contiguous elements) before clicking on the elements.

Menu Instructions

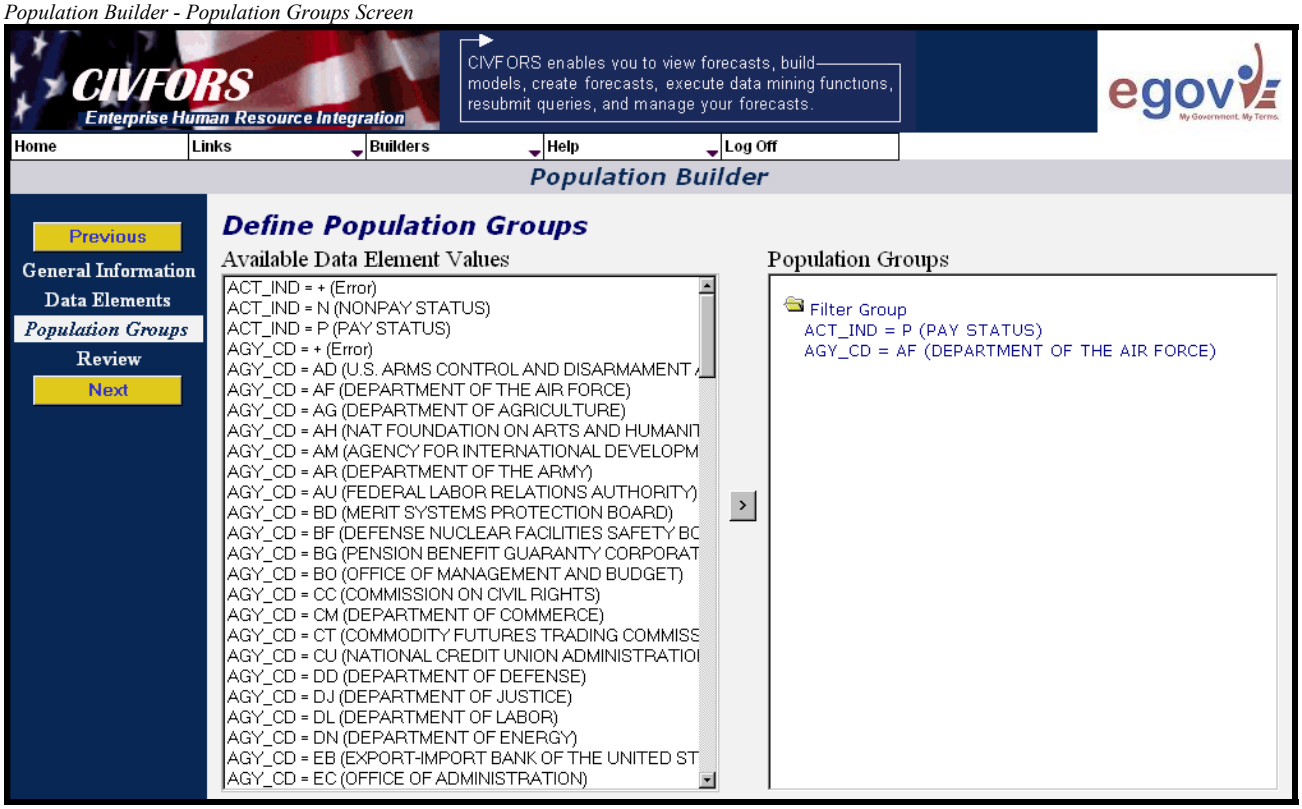
Click ***Next*** after making your selections. The *Population Groups* screen appears.

Click ***Previous***. The *General Information* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.3.3 Population Groups

Population Builder - Population Groups Screen



The next screen to appear is the *Population Groups* screen. The *Population Groups* screen enables you establish filter groups, which consist of one or more values from the list of available data elements values. These filter groups are used by the model to define the population.

To *select* the **Data Element Values** that establish each filter group, click on all of the values desired in your population from the **Available Data Element Values** box on the left side of the screen, and clicking on the right arrow to replicate these values as a filter group in the *Population Groups* box.

To select multiple values, hold down the **Ctrl** key (for non-contiguous elements) or **Shift** key (for contiguous elements) before clicking on the values.

To *deselect* filter groups from the **Population Groups** box, simply click on their *Filter Group* label.

Important Note: The filter group folders are joined in the model by "or" conditions. For data element values to be joined by "and" conditions, they must be contained in the same folder. For example, if the Population Group consists of two folders, one containing a value of "Sex=Male" and the other containing a value of "Collar=Blue", then the population would consist of workers who are *either* male *or* blue collar. On the other hand, if the Population Group consists of only one folder containing both the values of "Sex=Male" and "Collar=Blue", then the population would consist of workers who are *both* male *and* blue collar.

Menu Instructions

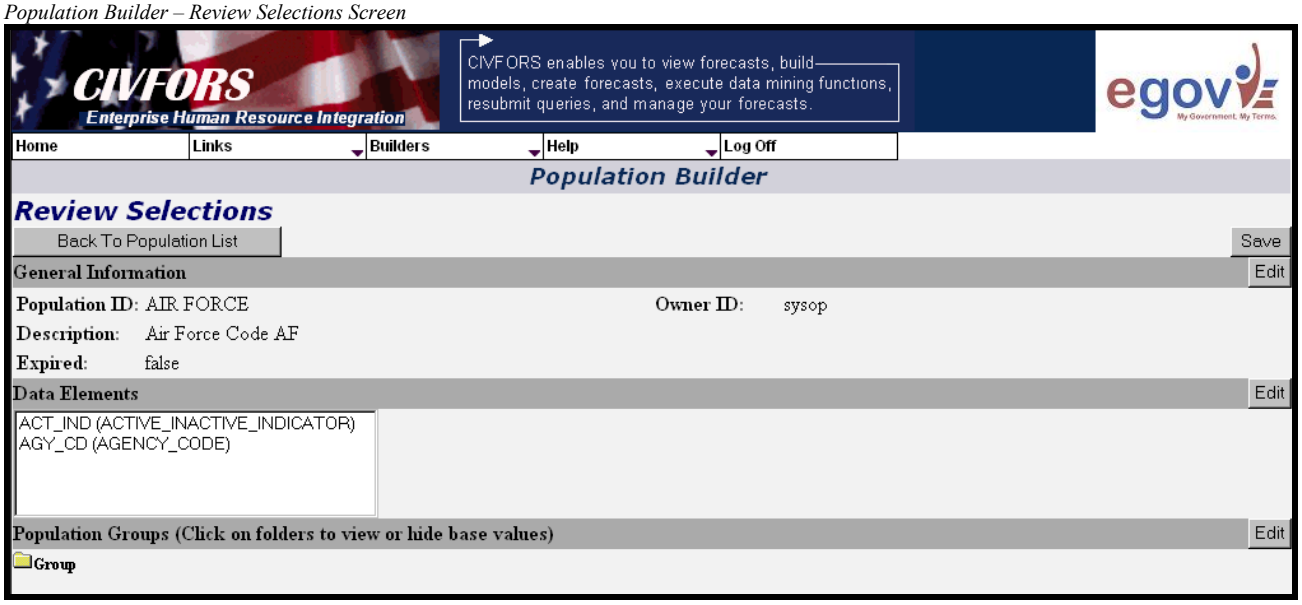
Click ***Next*** after making your selections. The *Review Selections* screen appears.

Click ***Previous***. The *Data Elements* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.3.4 Review Selections

Population Builder – Review Selections Screen



The next screen to appear is the *Review Selections* screen. The *Review Selections* screen enables you to review all of your selections for the Population Group. It is comprised of three sections - one for each step of the process. If you wish to edit any of these sections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

The **General Information** section of the *Review Selections* screen provides a summary of the general information for your Population Group. This includes information on the *Population ID, Owner ID, Description,* and *Expired* fields. If you would like to change any of the information, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the General Information screen and click ***Next***, you will return to the *Data Elements* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Data Elements** section of the *Review Selections* screen provides a summary of the data elements used to establish the filter groups for your population. If you would like to change any of the data elements, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Data Elements* screen and click ***Next***, you will return to the *Population Groups* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Population Groups** section of the *Review Selections* screen provides a summary of the data elements values you selected for your filter groups. If you would like to change any of the selected data element values, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Populations Groups* screen and click ***Next***, you will return to the *Review Selections* screen.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information, Data Elements,* and *Population Group* selections.

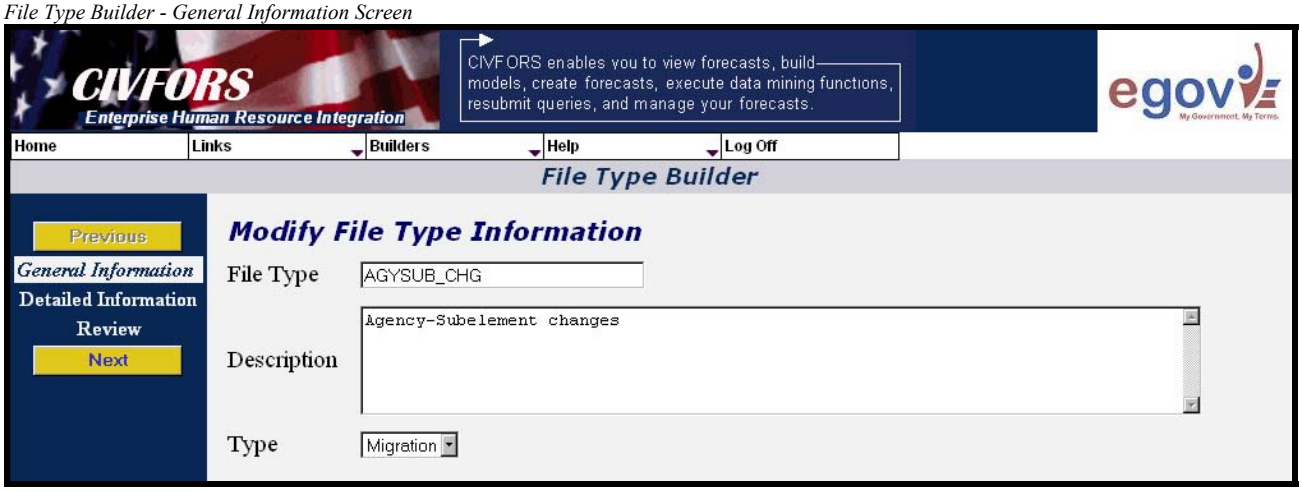
Click ***Back to Population List*** to return to the *Select Population* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.4 Create File Type

4.1.4.1 General Information

File Type Builder - General Information Screen



If you selected the ***File Type*** button from the *Select Builder* screen, the first screen to appear is the *General Information* screen of the *File Type Builder*. The *File Type Builder* allows you to establish file types that represent transactions (or events) in your model (such as gain, loss, and migration categories). A file type is typically generated by grouping base-level transactions (e.g., NOA codes) or changes to base data elements (e.g., Grade) into groups.

In the **File Type** box, enter a maximum of 10 alphanumeric characters to name your file type. The File Type must begin with a letter and contain only letters, numbers, and underscores. The name must also be unique (i.e., there may not be another file type by that name). We recommend that you provide a name containing text that will help you to readily identify the file type at a later date in the event you need to retrieve it through the edit function. All File Type names default to upper case.

In the **Description** box, you may enter a brief description of your file type. Entry of a description is optional. There are no limitations on the character set or case that you may use. The description is a maximum of 500 characters.

Select the **Type** of file you would like to build from the drop down menu.

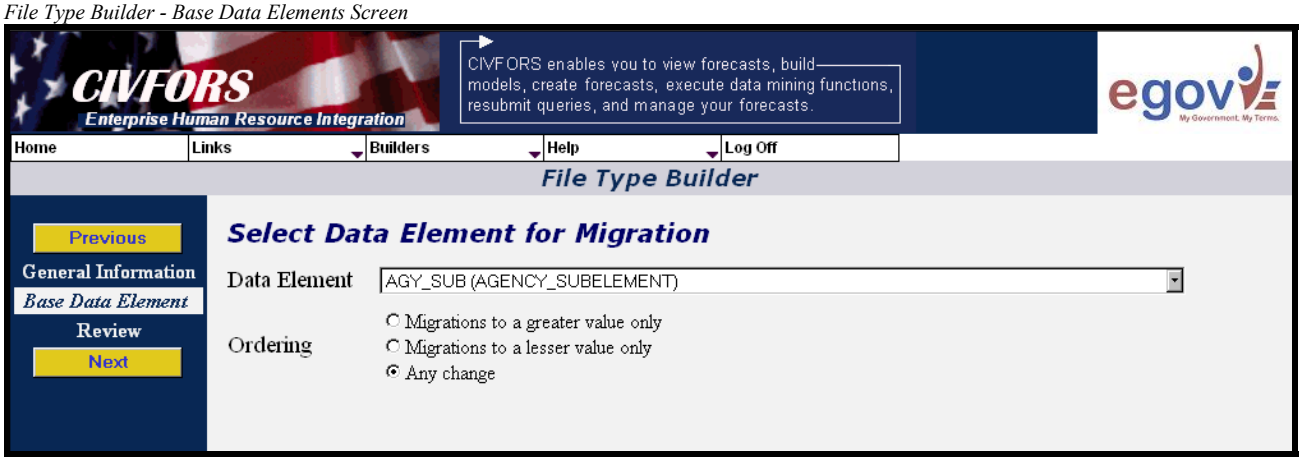
Menu Instructions

Click ***Next*** after entering your data and making your selection. If the Type is *Gain* or *Loss*, the *Base File Types* screen appears. If the Type is *Migration*, the *Base Data Elements* screen appears.

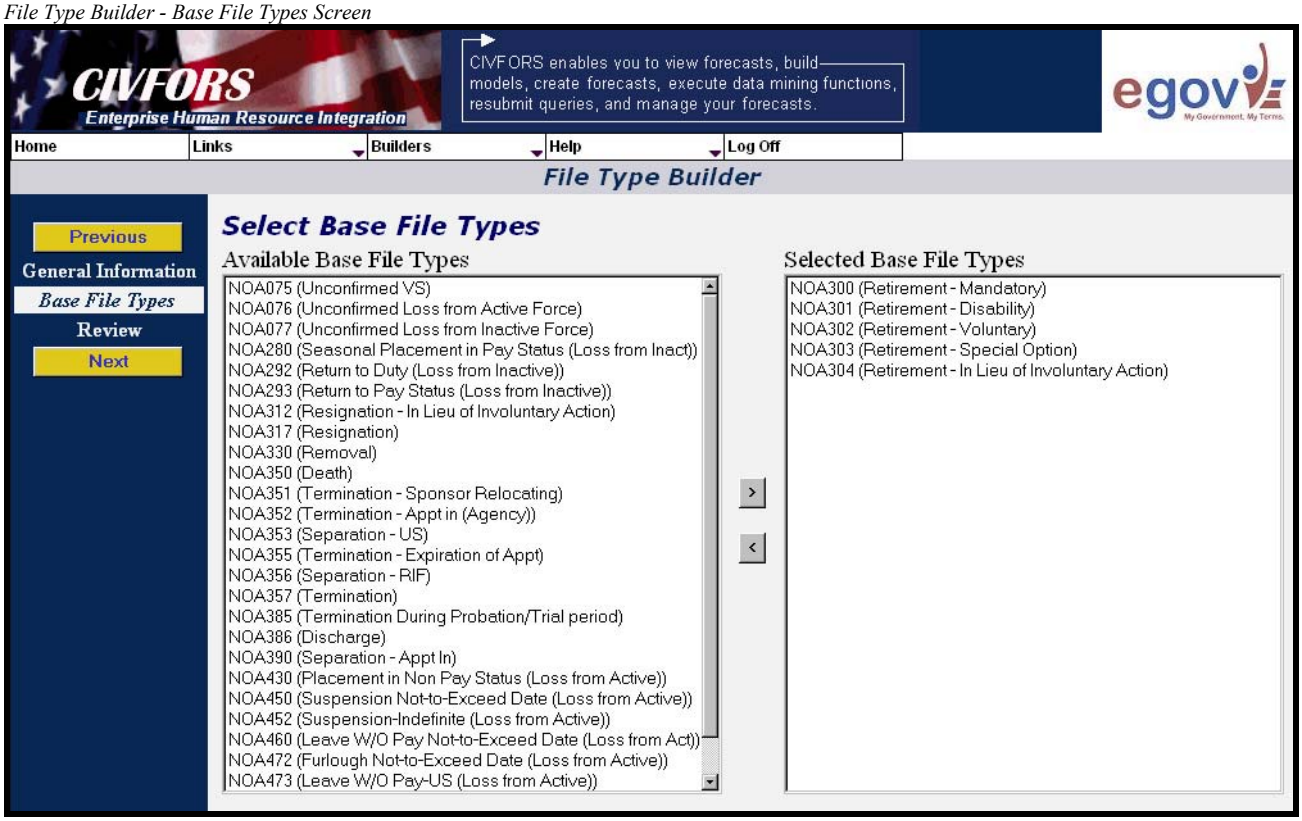
Click ***Help*** to access CIVFORS online Help instructions.

4.1.4.2 Base File Types/Base Data Elements

File Type Builder - Base Data Elements Screen



File Type Builder - Base File Types Screen



The next screen to appear is the *Base Data Elements* or *Base File Types* screen. The *Base Data Elements* and *Base File Types* screens enable you to identify those base data elements or file types that will be used to define your new gain, loss, or migration file type.

The screen is displaying in one of two forms:

1. If *Gain* or *Loss* was chosen as the Type on the *General Information* screen, then the *Base File Types* screen will be displayed:

Choose the **Base File Type(s)** you would like to include in your file type by selecting them from the *Available Base File Types* on the left side of the screen and clicking the right arrow to move them to the **Selected Base File Types** box.

To *deselect* a file type from the **Selected Base File Types** box, click the file type from the right side of the screen you would like to remove and click the left arrow to return it to the left side of the screen.

To move multiple elements in either direction, hold down the **Ctrl** key (for non-contiguous elements) or **Shift** key (for contiguous elements) before clicking on the elements.

2. If *Migration* was chosen as the Type on the *General Information* screen, then the *Base Data Elements* screen will be displayed:

Choose a **Data Element** from the dropdown list identifying the underlying element for the migration category (e.g., grade for the promotion file type). If the element has a numeric sequence, identify in the **Ordering** field whether you wish track *Migrations to a greater values only*, *Migrations to a lesser value only*, or *Any change*. (Note: for all other elements, leave the selection as the default value of *Any change*.)

Menu Instructions

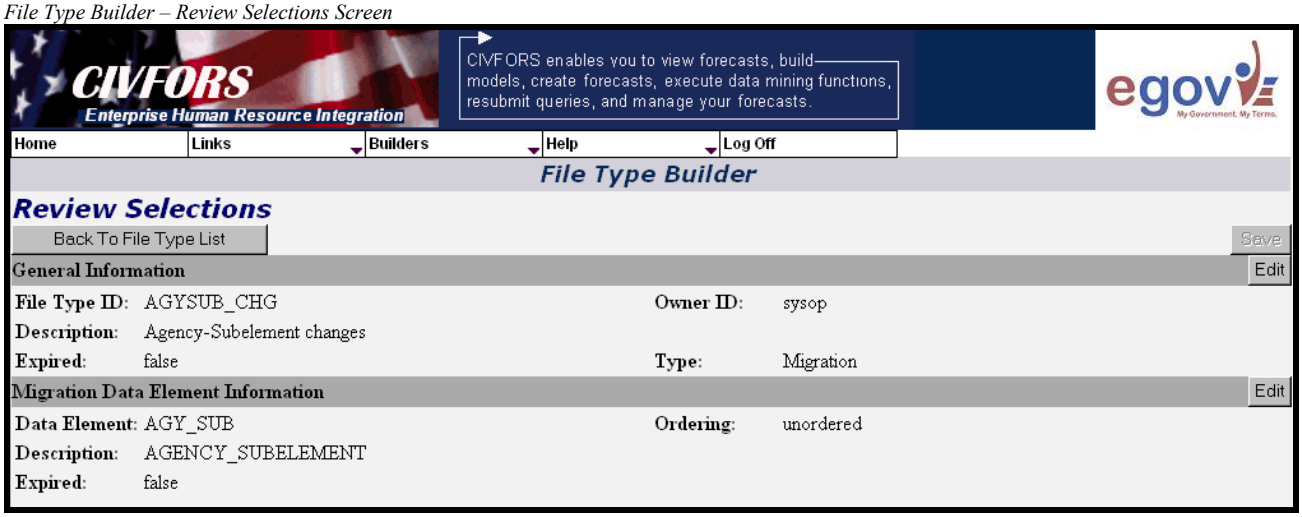
Click ***Next*** after making your selections. The *Review Selections* screen appears.

Click ***Previous***. The *General Information* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.4.3 Review Selections

File Type Builder – Review Selections Screen



The next screen to appear is the *Review Selections* screen. The *Review Selections* screen enables you to review all of your selections for the File Type. It is comprised of two sections - one for each step of the process. If you wish to edit either of these sections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

The **General Information** section of the *Review Selections* screen provides a summary of the general information for your File Type. This includes information on the *File Type ID, Owner ID, Description, Expired,* and *Type* fields. If you would like to change any of the information, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *General Information* screen and click ***Next***, you will return to the *Base File Types / Base Data Elements* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Base File Types / Data Elements** section of the *Review Selections* screen provides the base file types or base data elements you selected for your query. If you would like to change any of the base file types or base data elements, click the ***Edit*** button in the upper right hand corner. Once you make the desired changes to the *Base File Types* / *Data Elements* screen and click ***Next***, you will return to the *Review Selections* screen.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information* and *Base File Types / Data Elements Options* selections.

Click ***Back to File Type List*** to return to the *Select File Type* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.5 Create Data Element

4.1.5.1 General Information

Data Element Builder – General Information Screen

If you selected the ***Data Elements*** button from the *Select Builder* screen, the first screen to appear is the *General Information* screen. The *Data Element Builder* allows you to create new data elements from base data elements, and in the process, regroup the data element values in a manner that is more concise and/or more meaningful in your model. For example, "age", which has a cardinality (or span) of approximately 75 years, can be regrouped into a new value called "age group", which could include only three values - i.e., young (16-39), middle (40-59), and senior (60+). By regrouping values, models can be made significantly smaller, which in turn may have positive impacts on both performance and projection accuracy. The CIVFORS data mining tools can be helpful in making determinations on how to best regroup data elements.

In the **Data Element** box, enter a maximum of 30 characters to name your data element. The Data Element name must begin with a letter and contain only letters, numbers, and underscores. The name must also be unique (i.e., there may not be another data element by that name). We recommend that you provide a name containing text that will help you to readily identify the Data Element at a later date in the event you need to retrieve it through the edit function. All Data Element names default to upper case.

In the **Description** box, you may enter a brief description of your Data Element. Entry of a description is optional. There are no limitations on the character set or case that you may use. The description is a maximum of 500 characters.

If you wish to **Treat as an Ordered Data Element,** place a check mark in this box. You would typically do this when the Data Element you are creating has an inherent numeric ordering (such as age group, which increases from young to middle to senior).

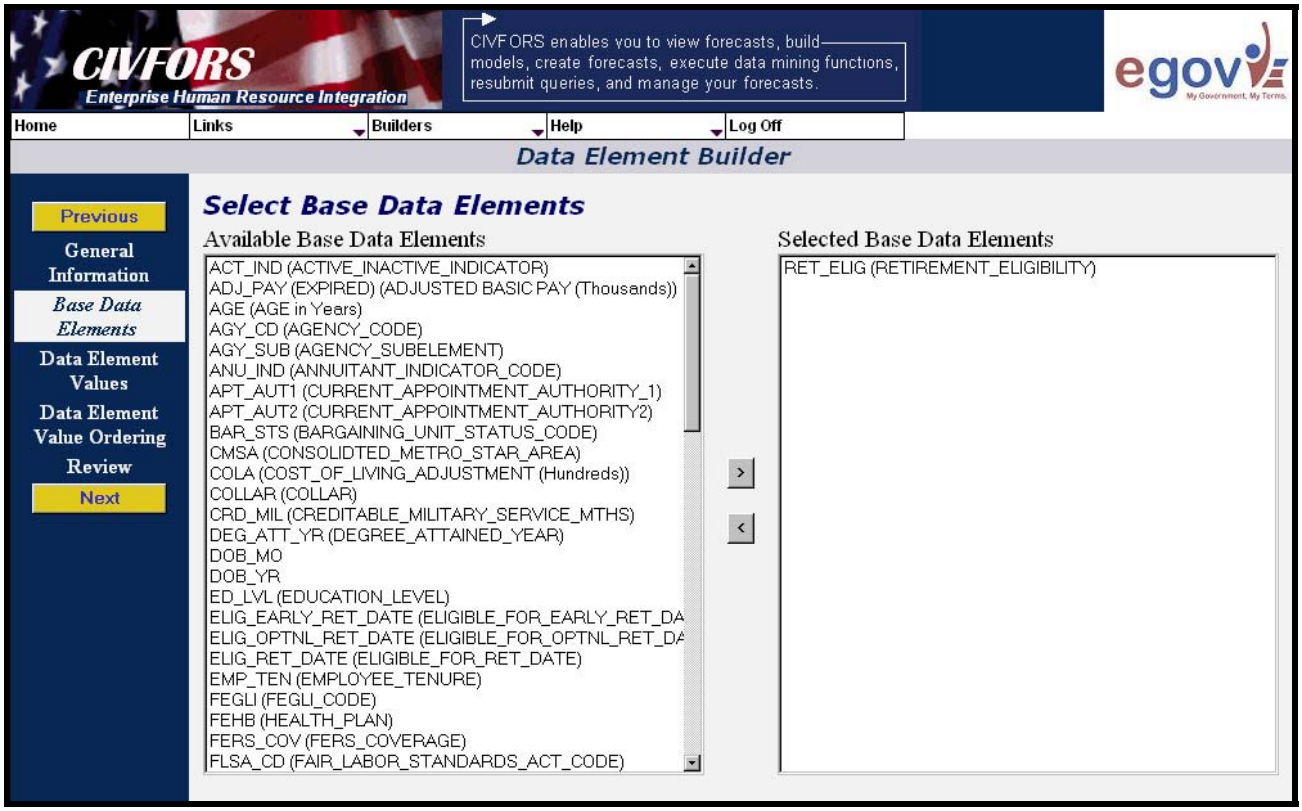
Menu Instructions

Click ***Next*** after entering your data and making your selection. The *Base Data Elements* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.5.2 Base Data Elements

Data Element Builder – Base Data Elements Screen



The next screen to appear is the *Base Data Elements* screen. The *Base Data Elements* screen enables you to identify those element(s) that will be used to establish your new Data Element.

Choose the **Base Data Elements** you would like to include in your data element by selecting them from the *Available Base Data Elements* on the left side of the screen and clicking the right arrow to move them to the **Selected Base Data Elements** box.

To *deselect* a base data element from the **Selected Base Data Elements** box, click the base data element from the right side of the screen you would like to remove and click the left arrow to return it to the left side of the screen.

To move multiple base data elements in either direction, hold down the **Ctrl** key (for non-contiguous elements) or **Shift** key (for contiguous elements) before clicking on the elements.

Menu Instructions

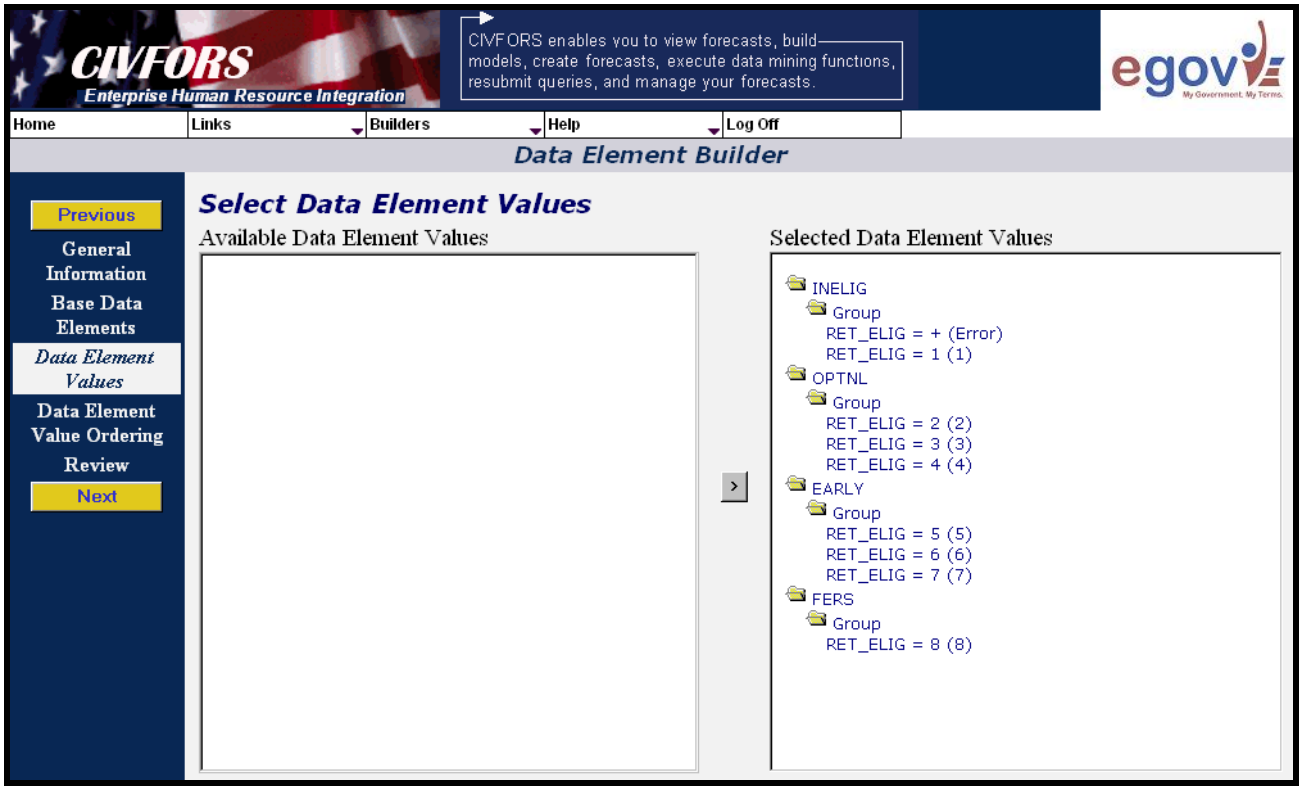
Click ***Next*** after making your selections. The *Data Element Values* screen appears.

Click ***Previous***. The *General Information* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.5.3 Data Element Values

Data Element Builder - Data Element Values Screen



The next screen to appear is the *Data Element Values* screen. This screen lists the *Data Element Values* (sub-groups of the population you wish to view your forecast by). If you want specific values, click the folder to expand to the details. You can then select the specific value or the entire folder.

Choose the **Data Elements Values** you would like to group together by clicking on the *Available Data Element Values* from the left side of the screen and clicking the right arrow to move to the **Selected Data Element Values** box.

To move multiple element values, hold down the **Ctrl key** (for non-contiguous elements) or **Shift** key (for contiguous elements) before clicking on the elements.

When you click on the arrow key, a dialog box will appear asking you to provide the new value a name. The **Data Element Value Name** must begin with a letter and contain only letters, numbers, and underscores. It must also be unique, and cannot exceed six characters. After providing this name, click on the ***OK*** button to complete the move and establish a new data element values group.

To *deselect* a data element values group from the **Selected Data Element Values** box, simply click on its *Group* label.

Important Note: ALL base data element values must be regrouped before you will be allowed to proceed from this screen.

Menu Instructions

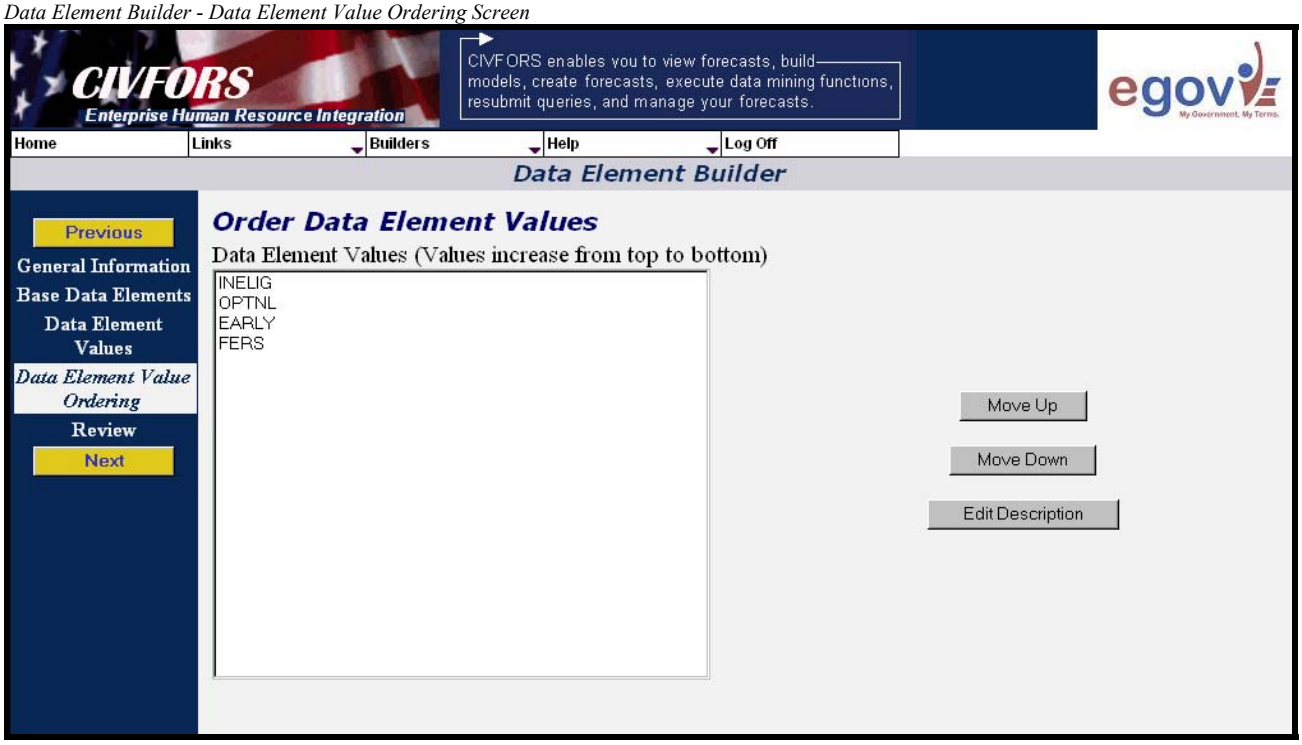
Click ***Next*** after making your selections. The *Data Element Value Ordering* screen appears.

Click ***Previous***. The *Base Data Element* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.5.4 Data Element Value Ordering

Data Element Builder - Data Element Value Ordering Screen



The next screen to appear is the *Data Element Value Ordering* screen. The *Data Element Value Ordering* screen allows you to order the data element values in a logical sequence. If ordering is unimportant, you may simply continue to the next screen.

Order the data element values by clicking on the data element value and then using the ***Move Up*** and ***Move Down*** buttons on the right side of the screen. Numeric values should be ordered such that they increase in value from top to bottom.

Optionally, you can add (or edit) a description of the new data element values by clicking the ***Edit Description*** button on the right side of the screen. There are no limitations on the character set or case that you may use. The description is a maximum of 100 characters.

Menu Instructions

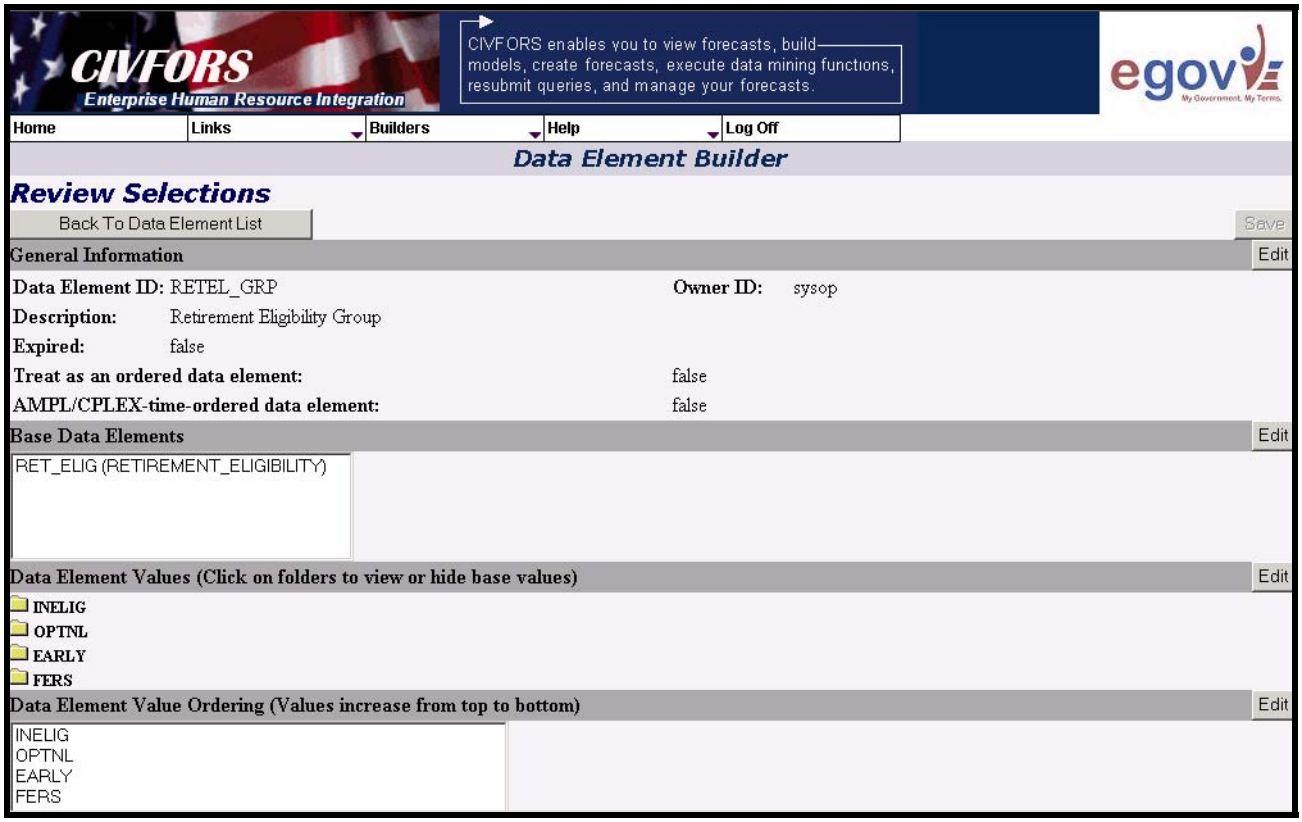
Click ***Next*** after making your selections. The *Review Selections* screen appears.

Click ***Previous***. The *Data Element Values* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.5.5 Review Selections

Data Element Builder - Review Selections Screen



The next screen to appear is the *Review Selections* screen. The *Review Selections* screen enables you to review all of your selections for the Data Element. It is comprised of four sections - one for each step of the process. If you wish to edit any of these sections, click the ***Edit*** button next to the appropriate section. It will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

The **General Information** section of the *Review Selections* screen provides a summary of the general information for your Data Element. This includes information on the *Data Element ID, Owner ID, Description, Expired, Treat as an Ordered Data Element,* and *AMPL/CPLEX Time-Ordered Data Element* fields. If you would like to change any of the information, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *General Information* screen and click ***Next***, you will return to the *Base Data Elements* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the Review Selections screen.

The **Base Data Elements** section of the *Review Selections* screen provides a summary of the base data element(s) used to establish the new data element. If you would like to change any of the data elements, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Base Data Elements* screen and click ***Next***, you will return to the *Data Element Values* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Data Elements Values** section of the *Review Selections* screen provides a summary of the base data element values used to establish the new data element groups. If you would like to change any of the base

data elements values, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Data Elements Values* screen and click ***Next***, you will return to the *Data Element Value Ordering* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Data Element Value Ordering** section of the *Review Selections* screen provides a summary of the ordering and descriptions of your new data element values. If you would like to change the ordering or descriptions, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Data Element Value Ordering* screen and click ***Next***, you will return to the *Review Selections* screen.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information, Base Data Elements, Data Element Values, and Data Element Value Ordering* selections.

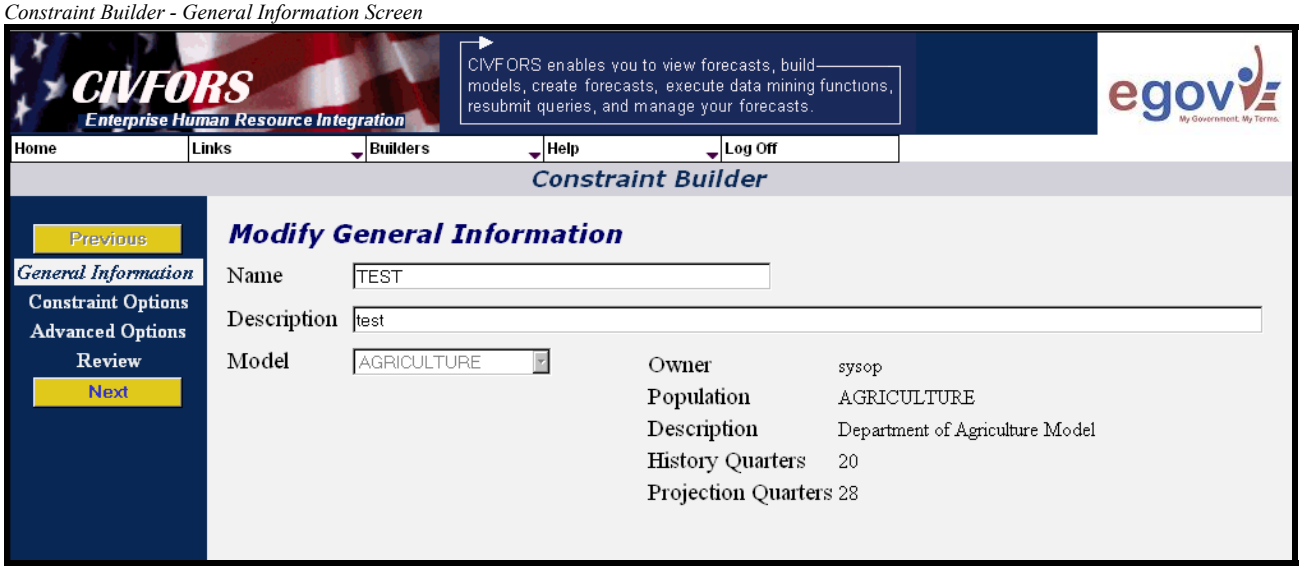
Click ***Back to Data Element List*** to return to the *Select Data Elements* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.6 Create Constraint

4.1.6.1 General Information

Constraint Builder - General Information Screen



If you selected the ***Constraint*** button on the *Select Builder* screen, the first screen to appear is the *General Information* screen of the *Constraint Builder*. The *Constraint Builder* allows you to establish limits on strength or file type activities for a given "goal" (or targeted) model. These limits are defined by lower, upper or fixed bounds, with associated costs for not achieving these values.

In the **Name** box, enter a maximum of 30 characters to name your constraint. The name must begin with a letter and contain only letters, numbers, and underscores. The name must also be unique (i.e., there may not be another constraint by that name). We recommend that you provide a name containing text that will help you to readily identify the constraint at a later date in the event you need to retrieve it through the edit function. All constraint names default to upper case.

In the **Description** box, you may enter a brief description of your constraint. Entry of a description is optional. There are no limitations on the character set or case that you may use. The description is a maximum of 60 characters.

Select the **Model** your constraint will apply to using the drop down menu. Once the model has been selected, information about the model will be automatically displayed in the *Owner, Population, Description, History Quarters, and Projection Quarters* fields.

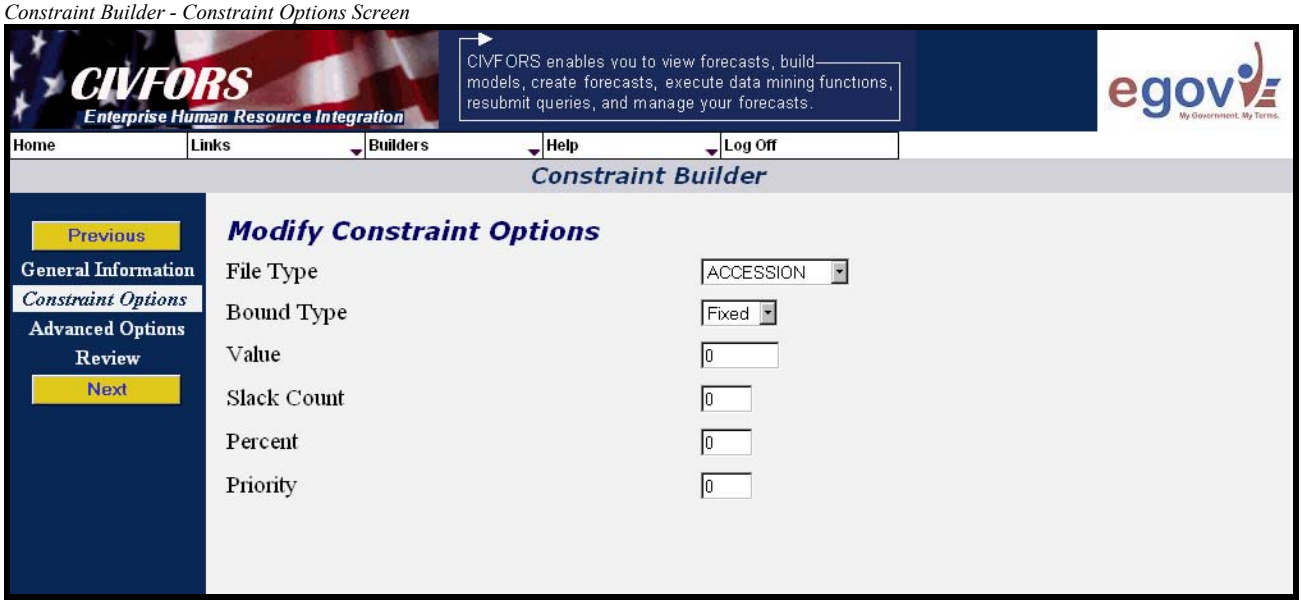
Menu Instructions

Click ***Next*** after entering your data and making your selection. The *Constraint Options* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.6.2 Constraint Options

Constraint Builder - Constraint Options Screen



The next screen to appear is the *Constraint Options* screen. The *Constraint Options* screen allows you to identify key parameters associated with your constraint.

Select the **File Type** you wish to constrain from the drop down menu. This list is established from the available file types in the model you selected, and also includes a variable labeled strength, which is the resulting product of the model activities.

Select the **Bound Type** you wish to use from the drop down menu. Upper means that the strength or file type activity should not exceed your constraint. Lower means that the strength or file type activity should not drop below your constraint. Fixed means that the strength or file type activity should equal your constraint**.**

Enter the **Value** you wish to associate with your bound. For example, this number might be an accession or end strength value. This number must a non-negative integer between 0 and 9999999 and should not include commas.

Enter a **Slack Count** defining the number of slacks associated with your constraint. Slacks allow the bounds to be missed, but usually only at a high cost. This number must a non-negative integer between 0 and 9. If the slack count is set to 0, the slack activity is unbounded, and the system uses a default priority cost.

Enter a **Percent** defining the width of each slack zone. For example, establishing a percent of 5 with a lower bound of 100 will allow the activity to dip as low as 95. Establishing a percent of 5 with an upper bound of 100 will allow the activity to increase to as high as 105. Establishing a percent of 5 with a fixed bound of 100 will allow the activity to fall between 95 and 105.

Enter the **Priority** defining the cost associated with your first slack. The second through nth slack are assigned a cost equal to the ordinal rank of the slack times the priority (e.g., if the cost on the first slack is 10, then the cost on the second slack is 20, the cost on the third slack is 30, and so forth.). The priority must be a non-negative integer between 0 and 999, and will only be used if the Slack Count value is greater than

0. If the Priority is set to 0 and the Slack Count is set to something greater than 0, the slack cost would be set to zero and the constraint will be nullified.

Menu Instructions

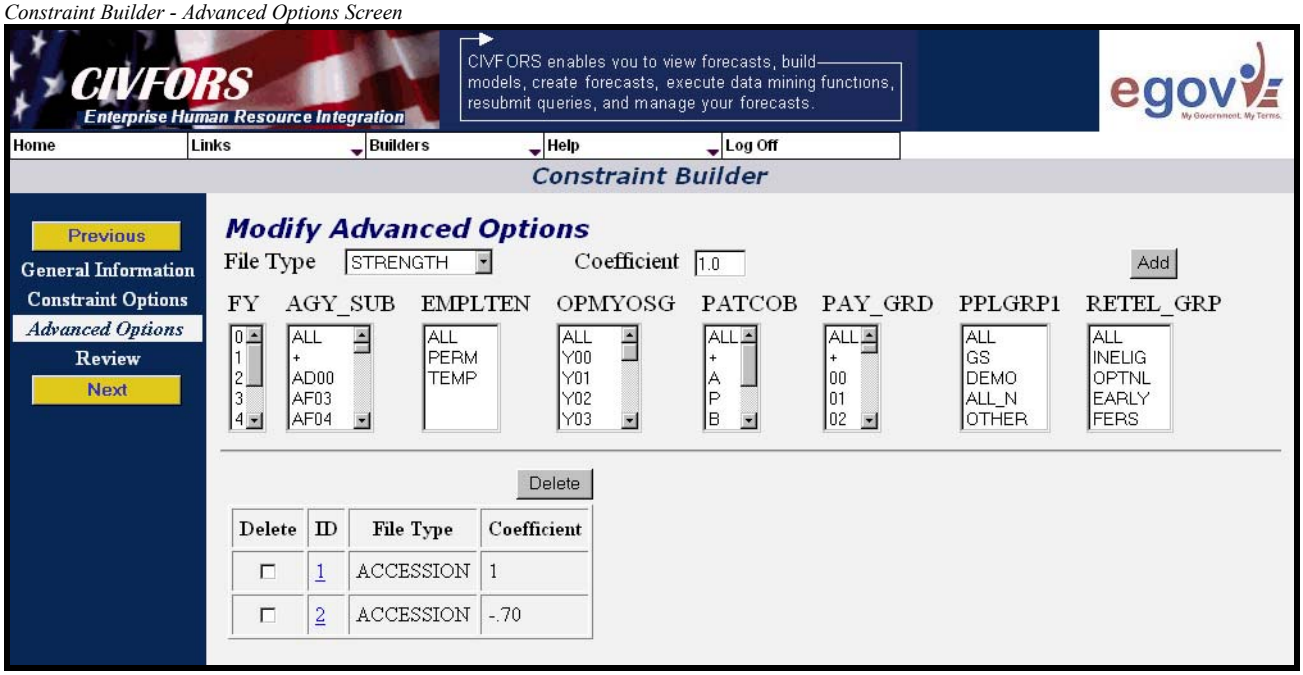
Click ***Next*** after entering your data and making your selections. The *Advanced Options* screen appears.

Click ***Previous***. The *General Information* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.6.3 Advanced Options

Constraint Builder - Advanced Options Screen



The next screen to appear is the *Advanced Options* screen. The *Advanced Options* screen allows you to establish more sophisticated constraints for selected time periods or data element value groups within your forecast.

When a constraint is established on the constraint options screen, it generates something referred to as a "constraint row". By default, the constraint applies to *each* Fiscal Year and across *all* data elements and data element values. The *Advanced Options* screen enables you to add additional rows to your constraint to target specific fiscal years or data element values.

Select the **File Type** for each row you wish to add to your constraint. Generally speaking, this file type will be the same as the file type for the initial row. However, you do have the capability to create a constraint that compares multiple file types (e.g., gains must equal losses).

Enter a **Coefficient**. This value is essentially used to define the relative size of each population or activity. It must be a numeric value, and it may contain a sign or a decimal.

Select one or more values from each **FY** (fiscal year) and **Dimension** column. These values define the scope of the constraint row. Selecting *ALL* in a given column will sum the strengths or activities across all values for that data element. Selecting multiple values in a given column (using the CTRL or SHIFT key in connection with your selection) will apply the constraint to *each* occurrence in the list.

When you have made all of your selections, click on the ***Add*** button. Your new row will appear in the lower section of the screen. The values for each row in the lower section can be viewed by clicking on the ID number. Clicking in the appropriate delete check boxes and clicking on the ***Delete*** button can also delete Rows in the lower section.

In the forecast, the rows you have defined for your constraint are added together and then compared (using an operator defined by the constraint bound type) to the constraint value (defined on the *Constraint Options* screen.) For example, if you defined a Bound Type of "Fixed" and a Value of "1000", and then established two rows on the *Advanced Options* screen, the equation would essentially be: Row1 + Row2 = 1000.

Menu Instructions

Click ***Next*** after making your selections. The *Review Selections* screen appears.

Click ***Previous***. The *Constraint Options* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.1.6.4 Review Selections

Constraint Builder - Review Selections Screen

The next screen to appear is the *Review Selections* screen. The *Review Selections* screen enables you to review all of your selections for the Constraint. It is comprised of three sections - one for each step of the process. If you wish to edit any of these sections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

The **General Information** section of the *Review Selections* screen provides a summary of to the general information for your Constraint. This includes the *Name, Description, Model ID, Model Owner ID, Model Description, History Quarters, Projection Quarters,* and *Population ID* fields. If you would like to change any of the information, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *General Information* screen and click ***Next***, you will return to the *Constraint Options* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Constraint Options** section of the *Review Selections* screen provides a summary of the parameters used to define your constraint. If you would like to change any of the file type or constraint parameters, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Constraint Options* screen and click ***Next***, you will return to the *Advanced Options* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Advanced Options** section of the *Review Selections* screen provides a summary of the rows that that further define your constraint. This includes the *Term ID, File Type and Coefficient* fields. If you would like to change any of the constraint parameters, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Advanced Options* screen and click ***Next***, you will return to the *Review Selections* screen.

Menu Instructions

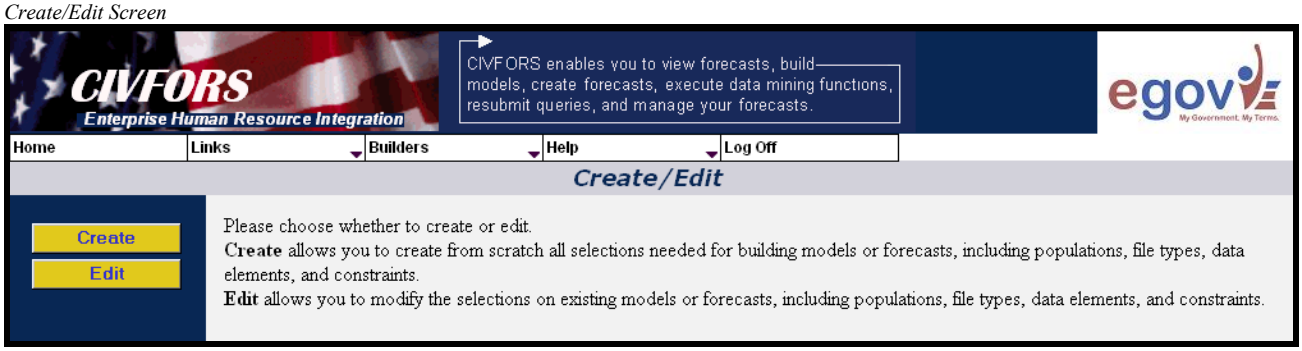
Click ***Save*** when you are satisfied with the *General Information, Constraint Options, and Advanced Options* selections.

Click ***Back to Constraint List*** to return to the *Select Constraint* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.2 Edit

Create/Edit Screen



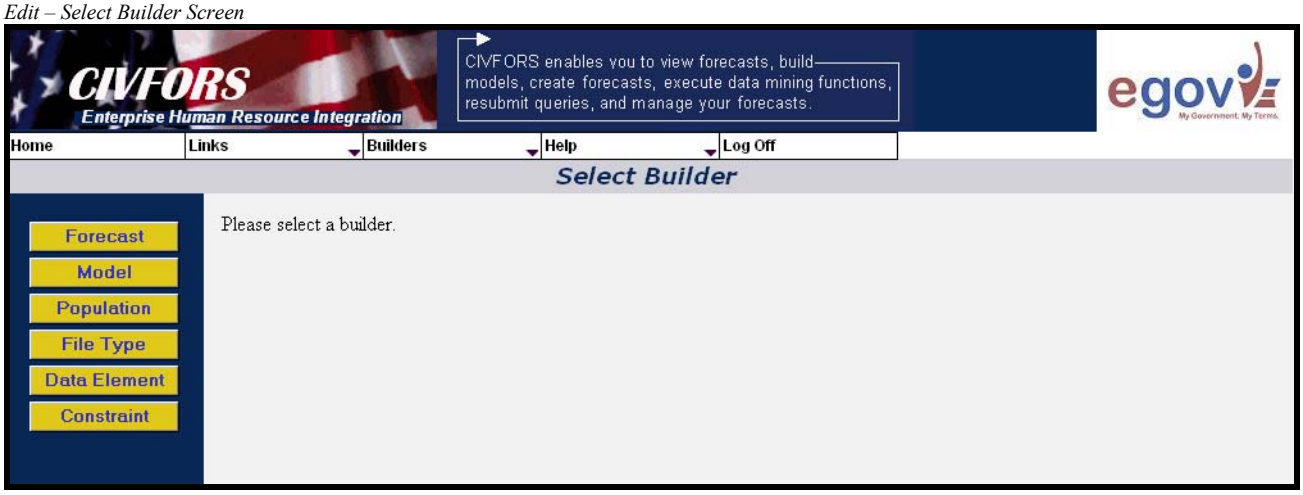
Edit allows you to modify the selections on existing models or forecasts, including populations, file types, data elements, or constraints.

Menu Instructions

Click ***Edit*** to modify an existing model, forecast, or forecast component. The *Select Builder* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

Edit – Select Builder Screen



Once *Edit* has been selected from the *Create/Edit* screen, the next screen to appear is the *Select Builder* screen. This menu lists all the CIVFORS components you can edit.

The **Forecast** builder allows you to create and run a projection of your population based on a selected model and additional parameters that you supply.

The **Model** builder allows you to create and run a model of your population that will ultimately establish the basis for your projection forecast. This builder's purpose is essentially to consolidate components formulated in the data element, file type, and population builders into a single representation of the workforce.

The **Population** builder allows you to establish the subset of your entire workforce that identifies the Population Group in your model.

The **File Type** builder allows you to establish file types that represent transactions (or events) in your model (such as gain, loss, and migration categories). A file type is typically generated by grouping base-level transactions (e.g., NOA codes) or changes to base data elements (e.g., Grade) into groups.

The **Data Element** builder allows you to create new data elements (or dimensions) from base data elements, and in the process, regroup the data element values in a manner that is more concise and/or more meaningful in your model.

The **Constraint** builder allows you to establish limits on strength or file type activities for a given "goal" (or targeted) model. These limits are defined by lower, upper or fixed bounds, with associated costs for not achieving these values.

Menu Instructions

Click any **Component** that you would like to edit. The *Select <Component>* screen for the particular component appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.1 Edit Model

4.2.1.1 Select Model

Model Builder - Select Model Screen

The first screen to appear once you have selected to edit the *Model* is the *Select Model* screen of the *Model Builder*. This screen gives you the listing of the available *Models* to edit.

Checking the box next to the model in the **Delete** column and clicking the ***Delete*** button in the upper right hand corner can delete a model. You can only delete those models you created and that are not being referenced in another builder.

The **Edit** column provides the names of each model that you (or the system administrator) have created. Click on the name to edit the particular model.

The **Description** column provides a brief description that was supplied during the creation of each model.

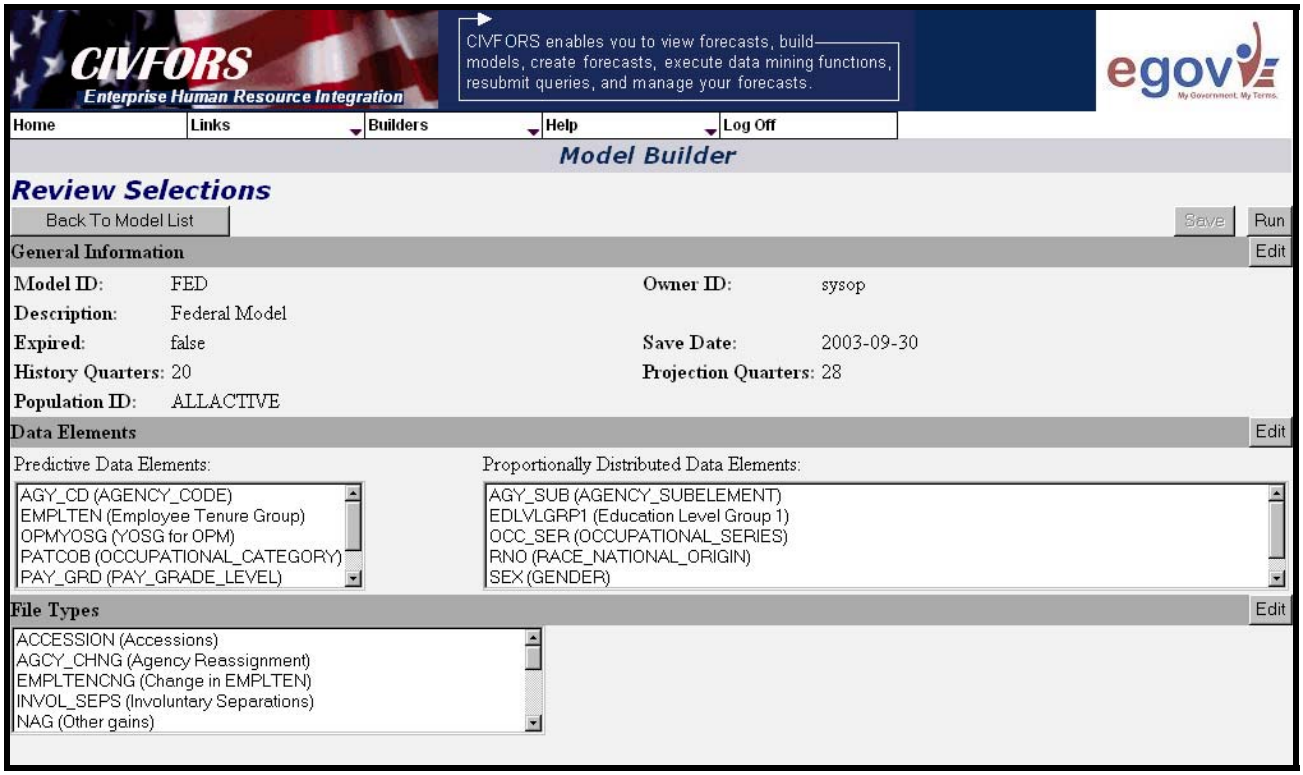
Menu Instructions

Click on a **Model** that you would like to edit. The *Review Selections* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.1.2 Review Model Selections

Model Builder - Review Selections Screen



Once you have selected the *Model* you wish to edit, the *Review Selections* screen appears, displaying all the aspects in the *Model* you selected.

From here, navigation is identical to the procedures described in the Model create process (see Section 4.1.3.4, Review Selections). To edit any of the selections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

Please note that you MUST change the name in the **Model ID** field on the *General Information* screen if this model is already being referenced by a forecast. If you fail to do so, the ***Save*** button will not be active.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information, Data Elements,* and *File Types* selections.

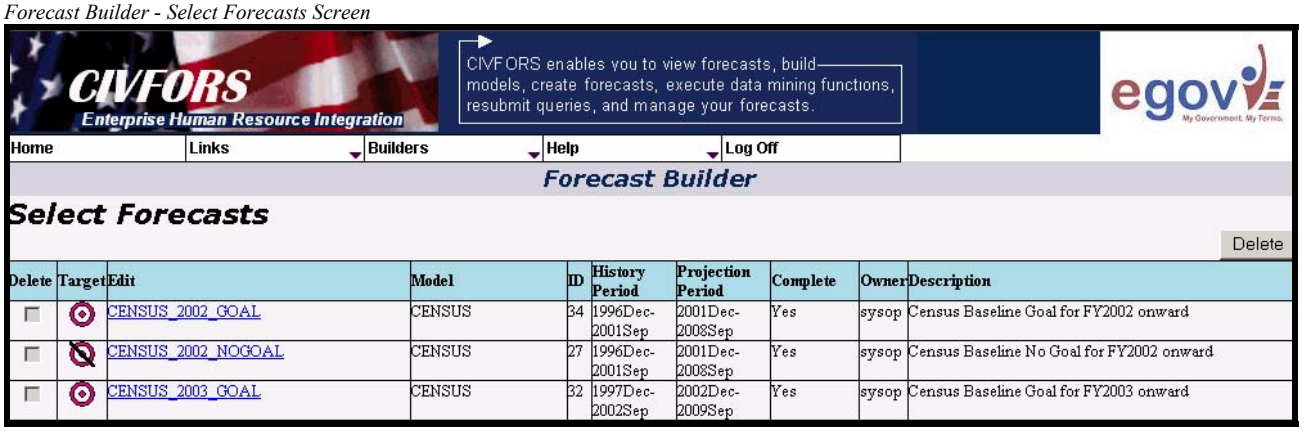
Click ***Back to Model List*** to return to the *Select Model* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.2 Edit Forecast

4.2.2.1 Select Forecast

Forecast Builder - Select Forecasts Screen



Delete	Target	Edit	Model	ID	History Period	Projection Period	Complete	Owner	Description
☐	◎	CENSUS_2002_GOAL	CENSUS	34	1996Dec-2001Sep	2001Dec-2008Sep	Yes	sysop	Census Baseline Goal for FY2002 onward
☐	⊘	CENSUS_2002_NOGOAL	CENSUS	27	1996Dec-2001Sep	2001Dec-2008Sep	Yes	sysop	Census Baseline No Goal for FY2002 onward
☐	◎	CENSUS_2003_GOAL	CENSUS	32	1997Dec-2002Sep	2002Dec-2009Sep	Yes	sysop	Census Baseline Goal for FY2003 onward

The first screen to appear once you have selected to edit the *Forecast* is the *Select Forecast* screen of the *Forecast Builder*. This screen gives you the listing of the available *Forecasts* to edit.

Checking the box next to the forecast in the **Delete** column and clicking the ***Delete*** button in the upper right hand corner can delete a forecast. You can delete any of the forecasts that you own.

The **Target** column indicates whether the forecast is *Targeted* or *Non–Targeted. Targeted* forecasts have workforce manpower level goals specified into the future and are represented by the target symbol. *Non-Targeted* forecasts have NO workforce manpower level goals and simply project the future based on history. They are represented by the target symbol crossed out with a diagonal line. Generally, targeted and non-targeted forecasts pertaining to the same model and period of forecast are selected together so that you can see what is likely to happen if history repeats vs. meeting targets.

The **Edit** column provides the name of each forecast.

The **Model** column provides the name of the model associated with each forecast.

The **ID** column displays the forecast ID assigned to each forecast.

The **History Period** column provides the date range of historical data for each forecast.

The **Projection Period** column provides the date range of the projected data for each forecast.

The **Complete** column contains 'Yes' if the forecast has been run successfully and 'No' if it has not. If it has not been run successfully a brief message explaining the error also appears.

The **Owner** column provides the username of the owner of each forecast.

The **Description** column provides a brief description that was supplied during the creation of each available forecast.

A forecast can be **edited** by simply clicking on the forecast name. This will take you to the *Review Selections* screen, where you can then navigate to the various *Forecast Builder* screens.

Menu Instructions

Click on a **Forecast** that you would like to edit. The *Review Selections* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.2.2 Review Forecast Selections

Model Builder – Review Selections Screen

Once you have selected the *Forecast* you wish to edit, the *Review Selections* screen appears, displaying all the aspects of the *Forecast* you selected.

From here, navigation is identical to the procedures described in the Forecast create process (see Section 4.1.2.4, Review Selections). To edit any of the selections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information, Rate Options, Run Options, Target Options (if applicable),* and *Optimization Options (if applicable)* selections.

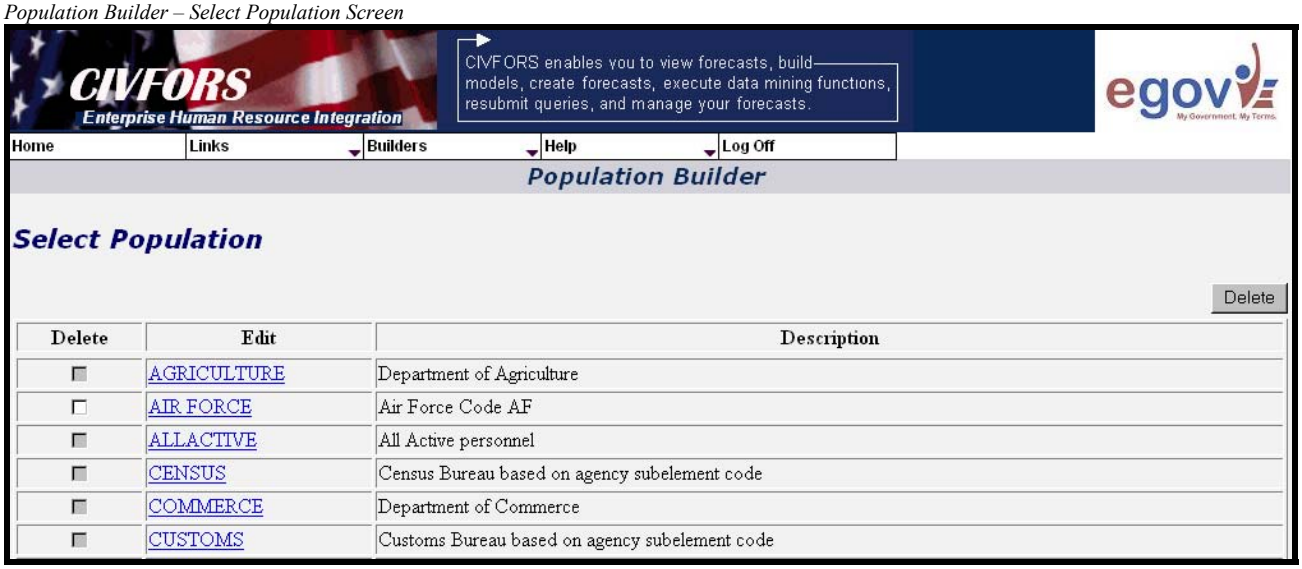
Click ***Back to Forecast List*** to return to the *Select Forecast* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.3 Edit Population

4.2.3.1 Select Population

Population Builder – Select Population Screen



The first screen to appear once you have selected to edit a *Population* is the *Select Population* screen of the *Population Builder*. This screen gives you the listing of the available *Populations* to edit.

Checking the box next to the population in the **Delete** column and clicking the ***Delete*** button in the upper right hand corner can delete a population. You can only delete those populations you created and that are not being referenced in another builder.

The **Edit** column provides the names of each population that you (or the system administrator) have created. Click on the name to edit the particular population.

The **Description** column provides a brief description that was supplied during the creation of each available population.

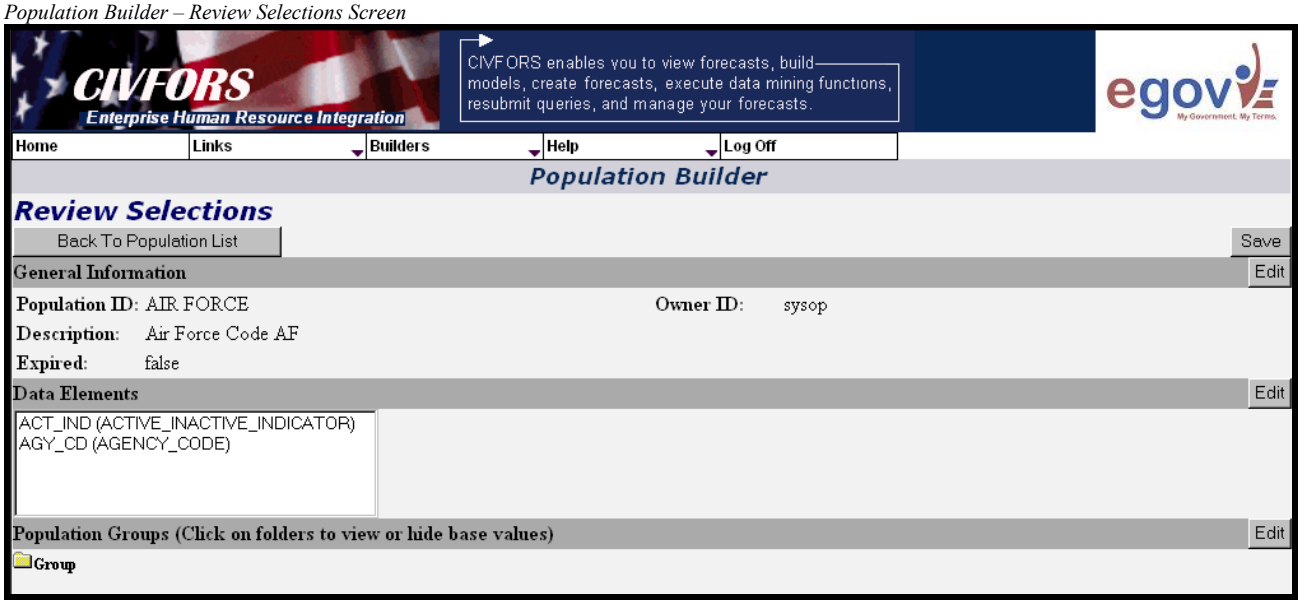
Menu Instructions

Click on a **Population** that you would like to edit. The *Review Selections* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.3.2 Review Population Selections

Population Builder – Review Selections Screen



Once you have selected the *Population* you wish to edit, the *Review Selections* screen appears, displaying all the aspects in the *Population* you selected.

From here, navigation is identical to the procedures described in the Population create process (see Section 4.1.3.4, Review Selections). To edit any of the selections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

Please note that you MUST change the name in the **Population ID** field on the *General Information* screen if any model is using this population. If you fail to do so, the ***Save*** button will not be active.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information, Data Elements,* and *Population Group* selections.

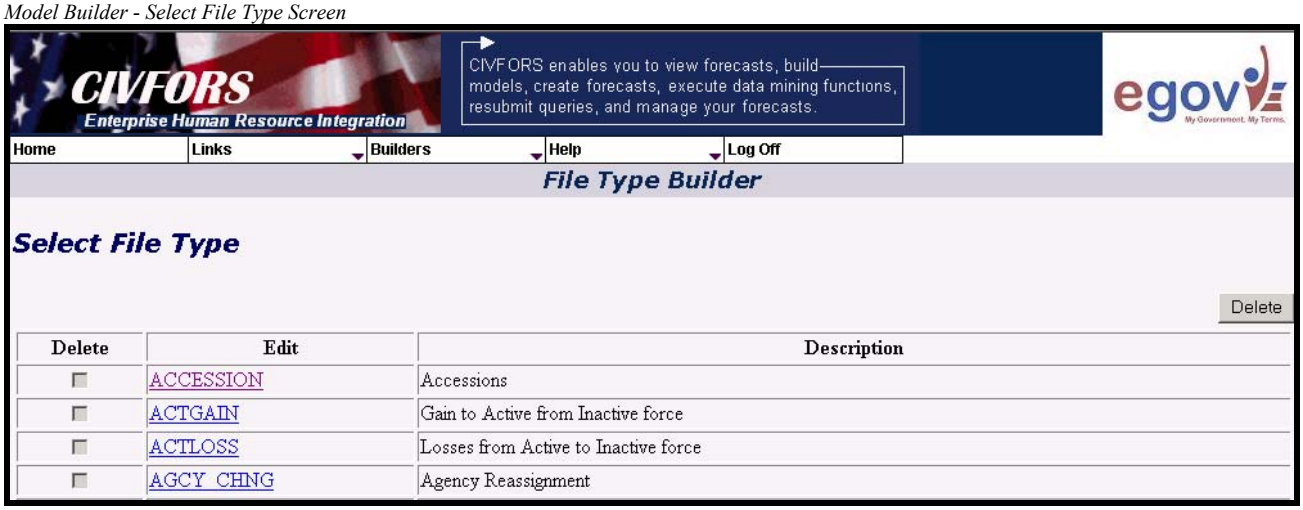
Click ***Back to Population List*** to return to the *Select Population* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.4 Edit File Type

4.2.4.1 Select File Type

Model Builder - Select File Type Screen



The first screen to appear once you have selected to edit a *File Type* is the *Select File Type* screen of the *File Type Builder*. This screen gives you the listing of the available *File Types* to edit.

Checking the box next to the file type in the **Delete** column and clicking the ***Delete*** button in the upper right hand corner can delete a file type. You can only delete those file types you own and that are not being referenced in another builder.

The **Edit** column provides the names of each file type that you (or the system administrator) have created. Click on the name to edit the particular file type.

The **Description** column provides a brief description that was supplied during the creation of each available file type.

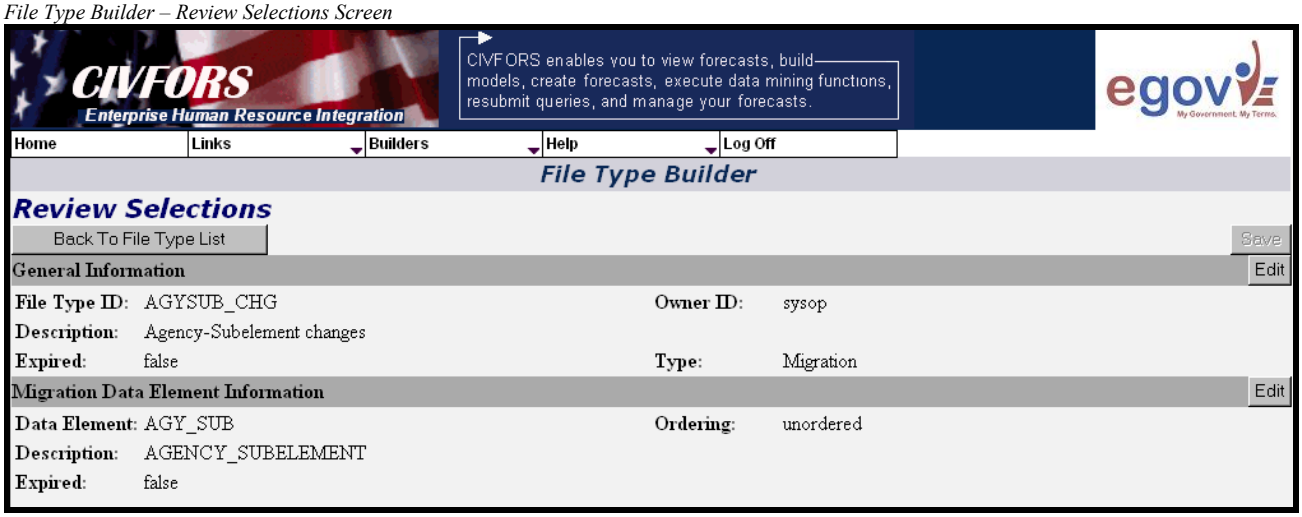
Menu Instructions

Click on a **File Type** that you would like to edit. The *Review Selections* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.4.2 Review Selections

File Type Builder – Review Selections Screen



Once you have selected the *File Type* you wish to edit, the *Review Selections* screen appears, displaying all the aspects in the *File Type* you selected.

From here, navigation is identical to the procedures described in the File Type create process (see Section 4.1.4.4, Review Selections). To edit any of the selections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

Please note that you MUST change the name in the **File Type ID** field on the *General Information* screen if any model is using this file type. If you fail to do so, the ***Save*** button will not be active.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information* and *Base File Types / Base Data Elements* selections.

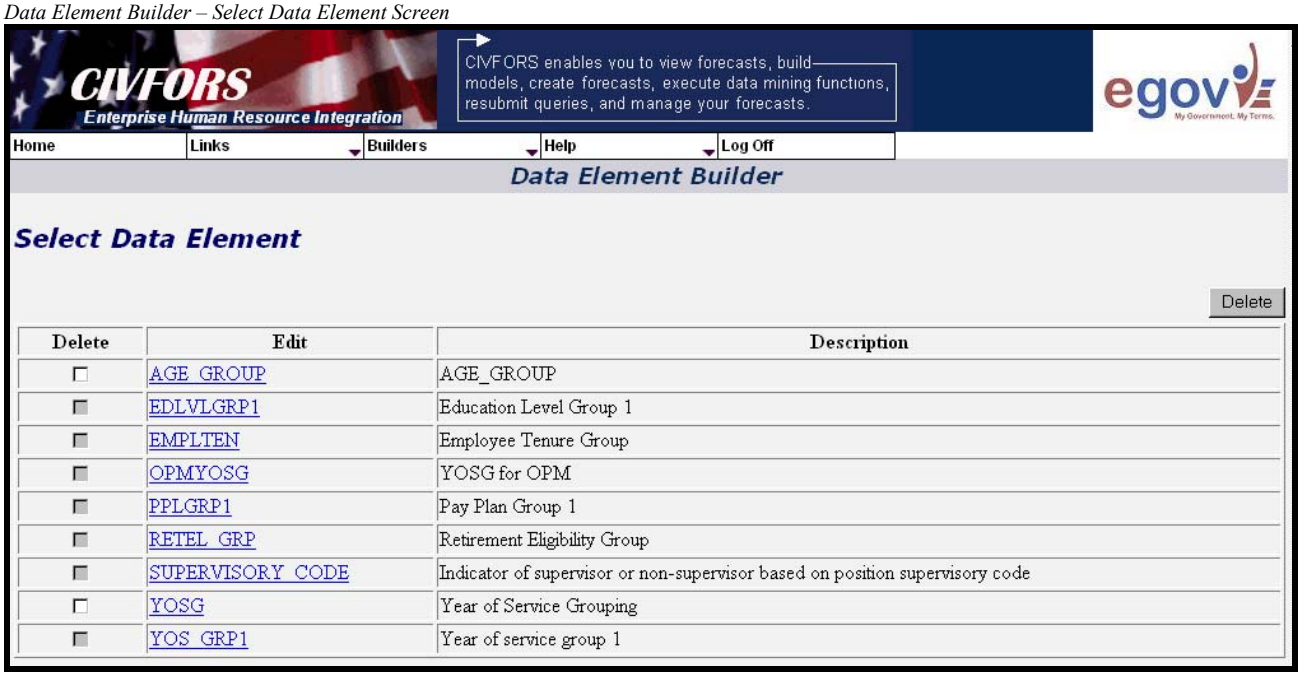
Click ***Back to File Type List*** to return to the *Select File Type* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.5 Edit Data Element

4.2.5.1 Select Data Element

Data Element Builder – Select Data Element Screen



The first screen to appear once you have selected to edit a *Data Element* is the *Select Data Element* screen of the *Data Element Builder*. This screen gives you the listing of the available *Data Elements* to edit.

Checking the box next to the data element in the **Delete** column and clicking the ***Delete*** button in the upper right hand corner can delete a data element. You can only delete those data elements you created and that are not being referenced in another builder.

The **Edit** column provides the names of each data element that you (or the system administrator) have created. Click on the name to edit the particular data element.

The **Description** column provides a brief description that was supplied during the creation of each available data element.

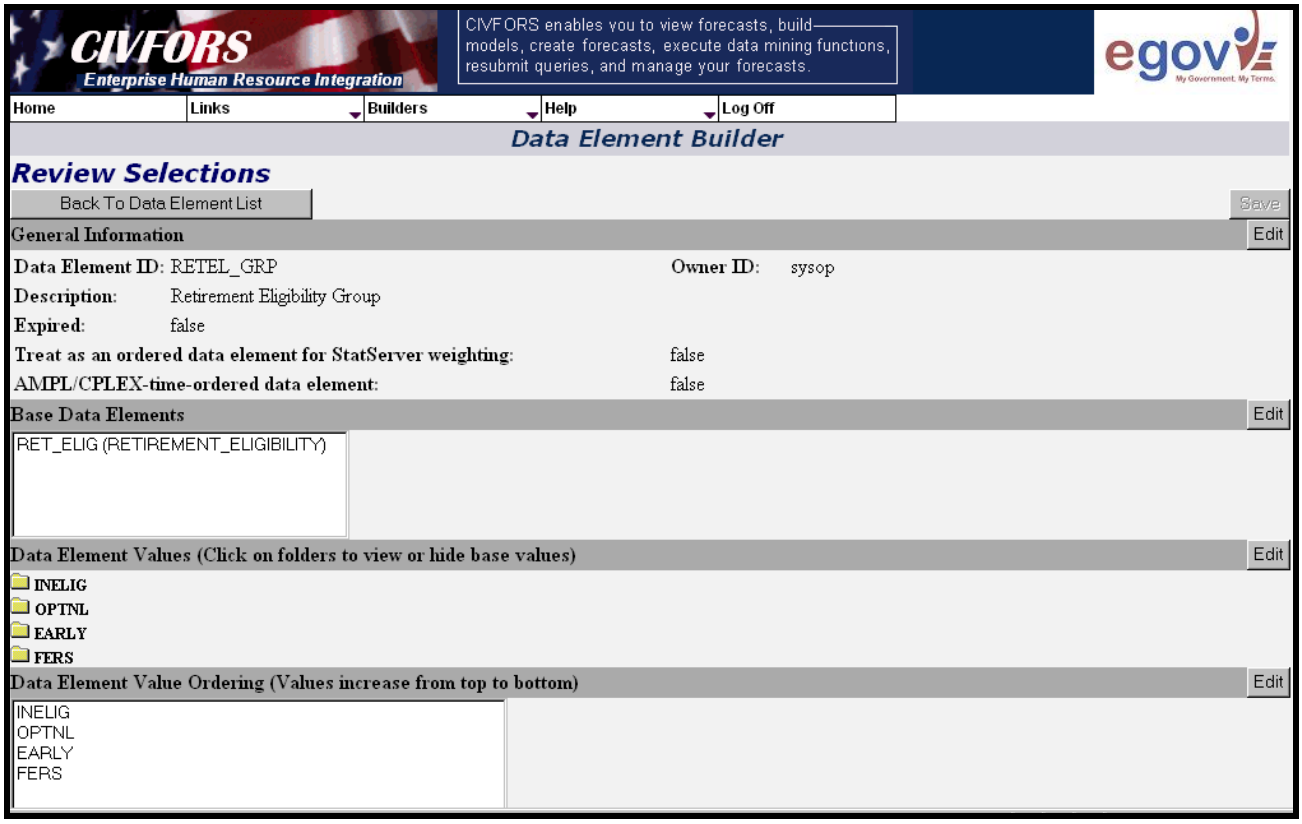
Menu Instructions

Click on a **Data Element** that you would like to edit. The *Review Selections* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.5.2 Review Data Element Selections

Data Element Builder - Review Selections Screen



Once you have selected the *Data Elements* you wish to edit, the *Review Selections* screen appears, displaying all the aspects of the *Data Element* you selected.

From here, navigation is identical to the procedures described in the Data Element create process (see Section 4.1.5.4, Review Selections). To edit any of the selections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

Please note that you MUST change the name in the **Data Element ID** field on the *General Information* screen if any model is using this population. If you fail to do so, the ***Save*** button will not be active.

Menu Instructions

Click ***Save*** when you are satisfied with the *General Information, Base Data Elements, Data Element Values* and *Data Element Value Ordering* selections.

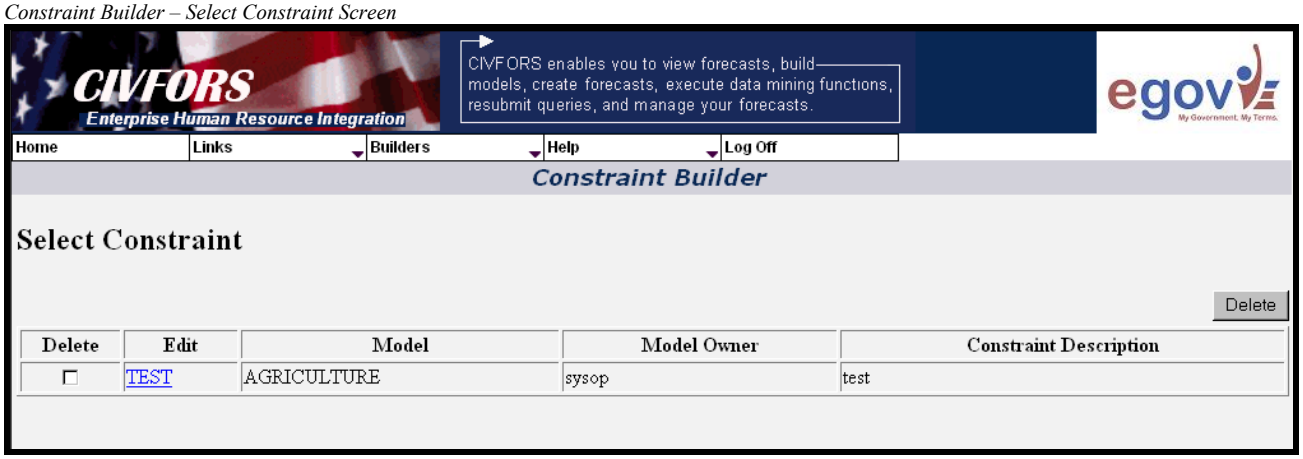
Click ***Back to Data Element List*** to return to the *Select Data Element* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.6 Edit Constraint

4.2.6.1 Select Constraint

Constraint Builder – Select Constraint Screen



The first screen to appear once you have selected to edit a *Constraint* is the *Select Constraint* screen. This screen gives you the listing of the available *Constraints* to edit.

Checking the box next to the constraint in the **Delete** column and clicking the ***Delete*** button in the upper right hand corner can delete a constraint. You can only delete those constraints you created and that are not being referenced in another builder.

The **Edit** column provides the names of each constraint that you (or the system administrator) have created. Click on the name to edit the particular constraint.

The **Model** column provides the name of the model associated with each constraint.

The **Model Owner** column provides the username of the owner of the model.

The **Constraint Description** column provides a brief description that was supplied during the creation of each available constraint.

Menu Instructions

Click on a **Constraint** that you would like to edit. The *Review Selections* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.6.2 Review Constraint Selections

Constraint Builder - Review Selections Screen

Once you have selected the *Constraint* you wish to edit, the *Review Selections* screen appears, displaying all the aspects in the *Constraint* you selected.

From here, navigation is identical to the procedures described in the Constraint create process (see Section 4.1.6.4, Review Selections). To edit any of the selections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

Please note that you MUST change the name in the **Name** field on the *General Information* screen if any model is using this constraint. If you fail to do so, the ***Save*** button will not be active.

Menu Instructions

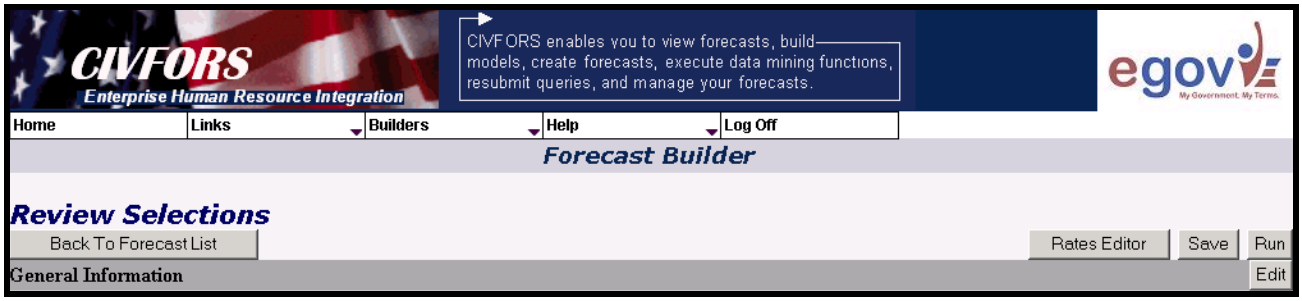
Click ***Save*** when you are satisfied with the *General Information, Constraint Options,* and *Advanced Options* selections.

Click ***Back to Constraint List*** to return to the *Select Constraint* screen.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.7 Rates Editor

Forecast Builder - Review Selections Screen



The ***Rates Editor*** allows you to modify the rates or targets associated with your forecast. This capability allows you to adjust your forecast to capture anticipated behavior or policy changes.

You can access this capability by clicking on the ***Rates Editor*** button on the *Review Selections Screen* of the Forecast Builder. Please note that the ***Rates Editor*** button will only be active for a Non-Targeted run if you have processed the Rates module, and for a Targeted run if you have processed both the Rates and Target modules.

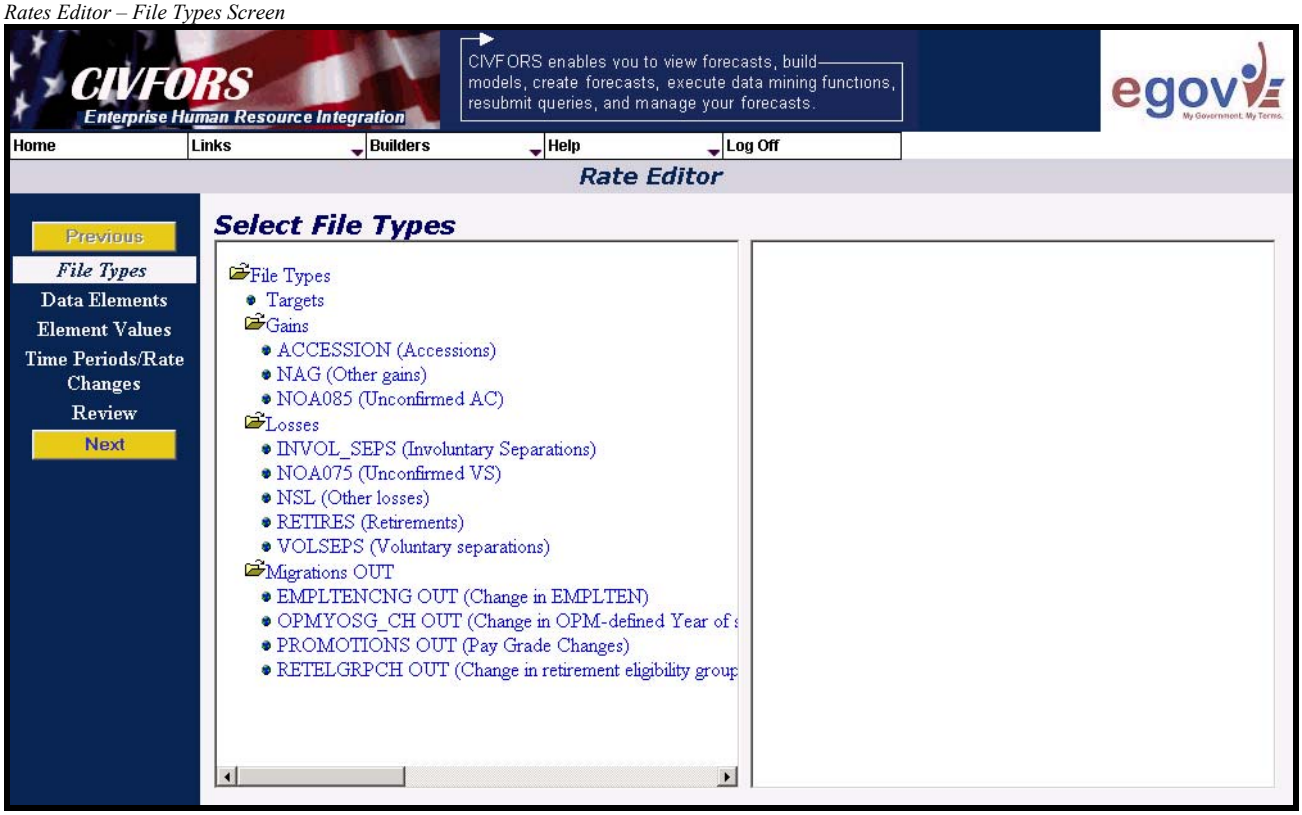
Menu Instructions

Click ***Rates Editor*** to edit rates or targets. The *File Types* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.7.1 File Types

Rates Editor – File Types Screen



The next screen to appear is the *File Types* screen. The *File Types* screen enables you to identify those specific file types for which you want to edit the rates (or targets).

Choose the **File Type(s)** for which you would like to edit rates by selecting them from the file types on the left side of the screen to move them to the right side of the screen.

To *deselect* a file type from the **Selected File Types** box, click the file type from the right side of the screen you would like to remove. It will return to the left side of the screen. (You can also select all File Types within the folder by simply clicking on the folder.)

Please note that you cannot combine target, incoming, and outgoing file types. In other words, your selections must be limited to one or more files types within a given folder.

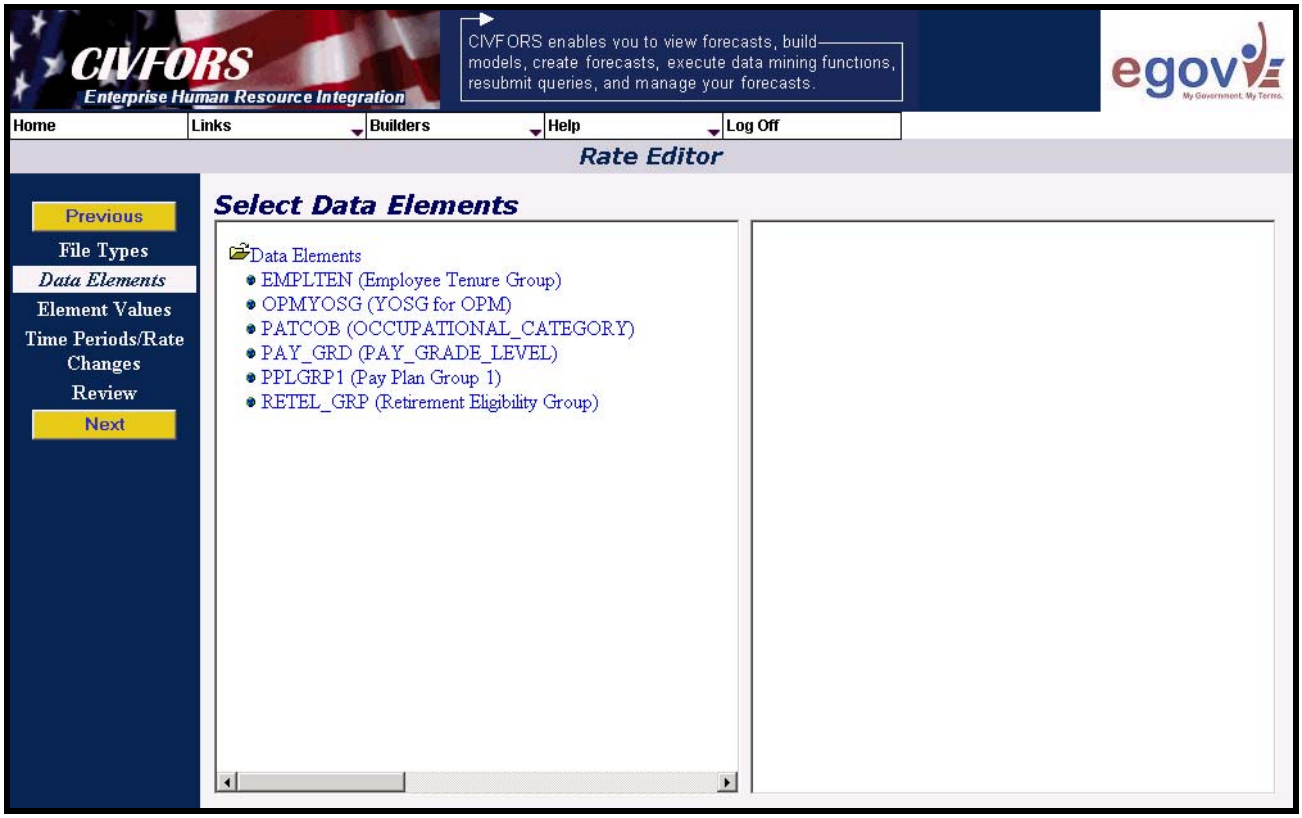
Menu Instructions

Click ***Next*** after making your selections. The *Data Elements* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.7.2 Data Elements

Rates Editor – Data Elements Screen



The **Data Elements** screen enables you to identify those specific data elements for which you want to edit the rates (or targets).

Choose the **Data Element(s)** for which you would like to edit rates by selecting them from the data elements on the left side of the screen to move them to the right side of the screen. If you choose none, the system will assume that you want to edit all data elements and data element values.

To *deselect* a data element from the **Selected Data Elements** box, click the data element from the right side of the screen you would like to remove. It will return to the left side of the screen. (You can also select all Data Elements within the folder by simply clicking on the folder.)

Menu Instructions

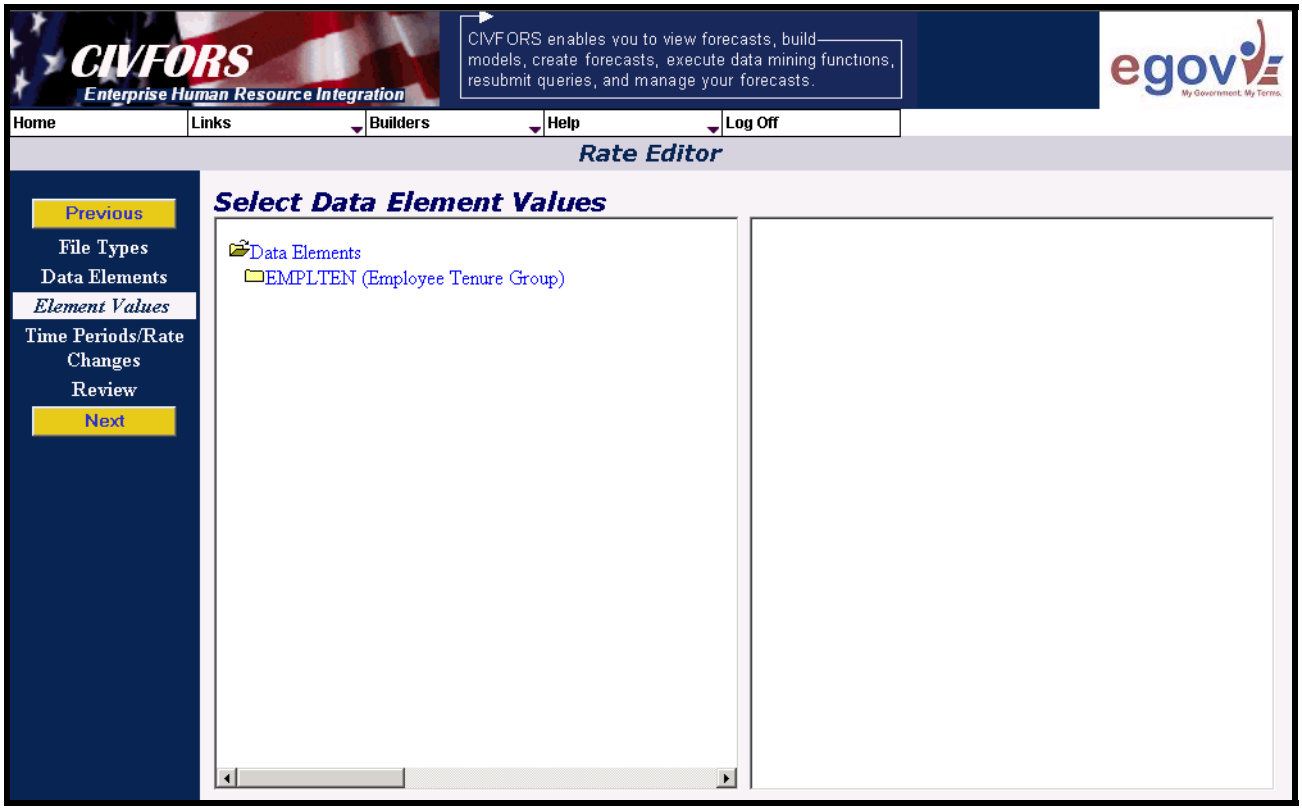
Click ***Next*** after making your selections. If you chose one or more data elements, the *Element Values* screen appears. If you chose no data elements, the *Time Periods/Rate Changes* screen appears.

Click ***Previous***. The *File Types* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.7.3 Data Element Values

Rates Editor –Element Values Screen



The *Element Values* screen enables you to identify those specific data element values for which you want to edit the rates (or targets).

Choose the **Data Element Value(s)** for which you would like to edit rates by selecting them from the data elements value folders on the left side of the screen to move them to the right side of the screen.

To *deselect* a data element value from the **Selected Data Element Values** box, click the data element value from the right side of the screen you would like to remove. It will return to the left side of the screen. (Note: To select a specific value, you must first expand the folder by clicking on the folder symbol. You can also select all Data Elements Values within the folder by simply clicking on the label next to the folder.)

Menu Instructions

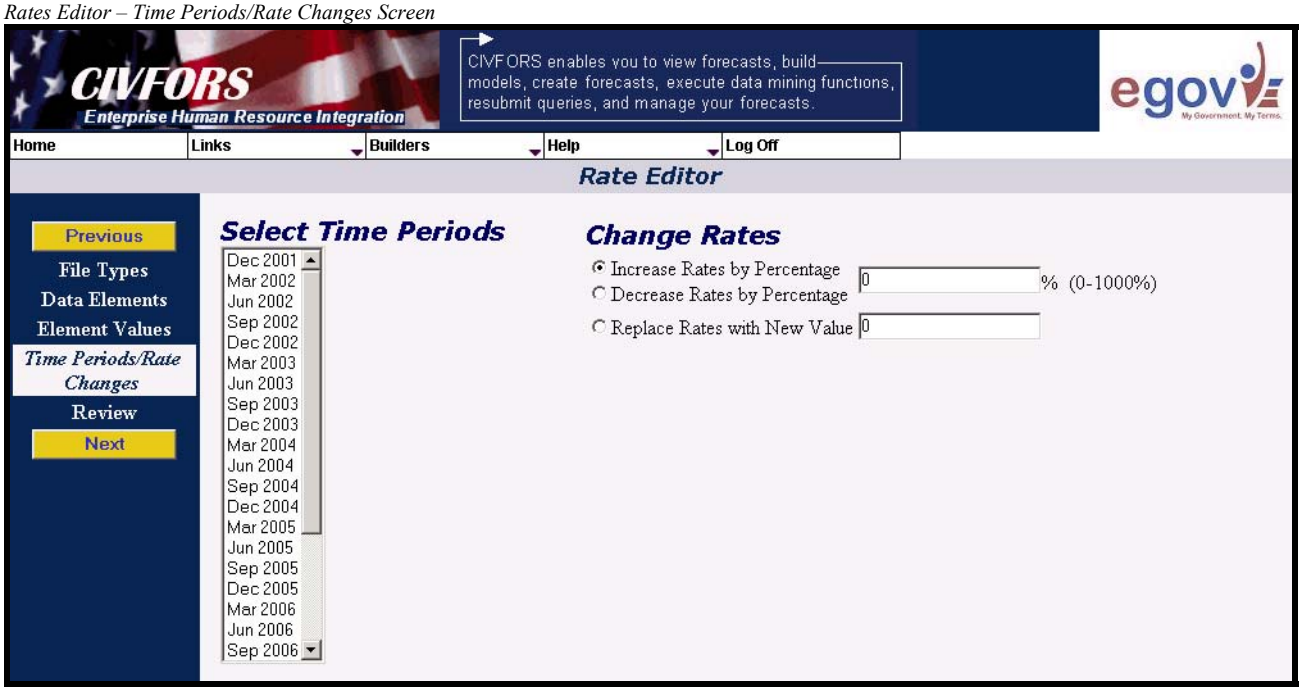
Click ***Next*** after making your selections. The *Time Periods/Rate Changes* screen appears.

Click ***Previous***. The *Data Element* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.7.4 Time Periods/Rate Changes

Rates Editor – Time Periods/Rate Changes Screen



The *Time Periods/Rate Changes* screen enables you to select the applicable time period(s) for your changes, and identify the change criteria.

Select the projected **Time Periods** for which you would like to change rates from the selection list. To select multiple time periods, hold down the **Ctrl** key (for non-contiguous time periods) or **Shift** key (for contiguous time periods) before clicking on the time periods.

Select the change criteria you want to use to change your rates by clicking on one of the radio buttons under **Change Rates**. You may **Increase Rates by Percentage**, **Decrease Rates by Percentage**, or **Replace Rates with New Value**.

If you choose either of the percentage options, enter a number value between 0 and 1000 in the upper data entry box (where 100 is 100%). If you choose the value option, enter a value greater than or equal to 0.0 in the lower data entry box.

Menu Instructions

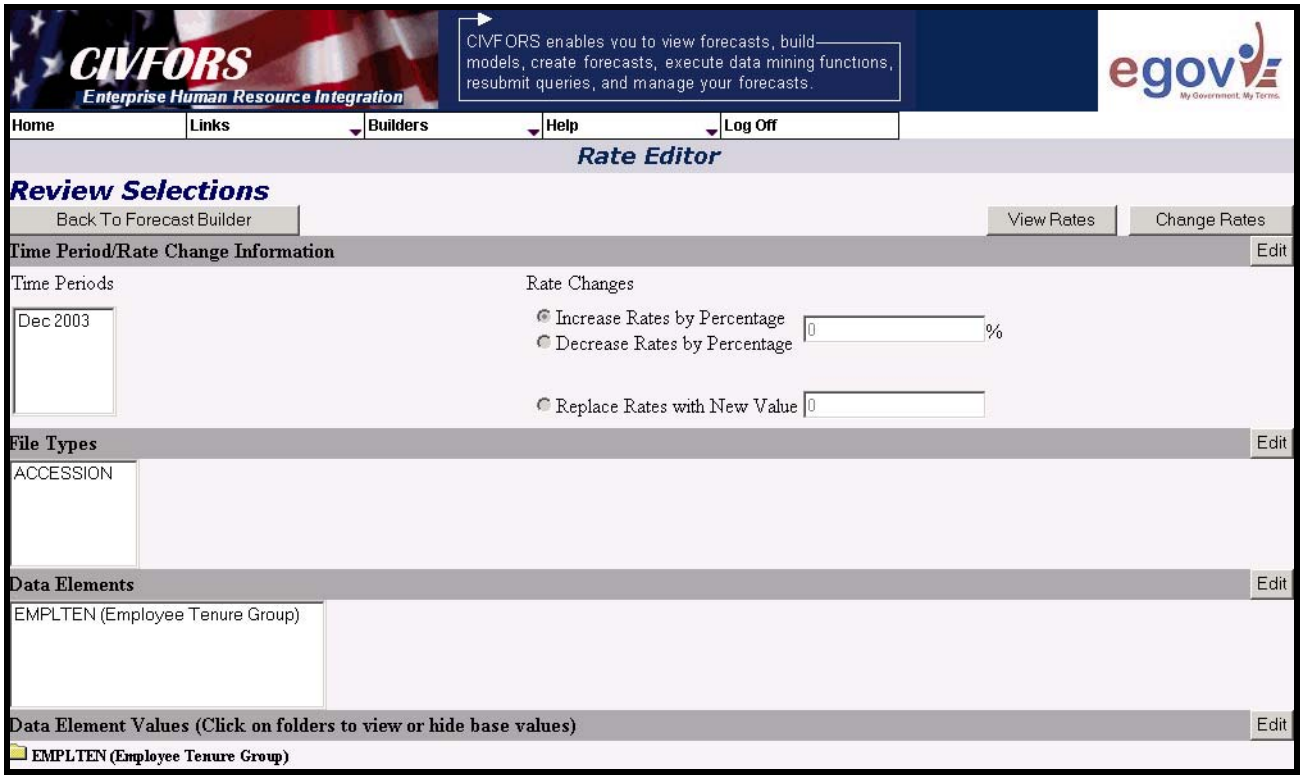
Click ***Next*** after entering your data and making your selections. The *Review Selections* screen appears.

Click ***Previous***. The *Element Values* screen appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.7.5 Review Selections

Rates Editor – Review Selections Screen



The *Review Selections* screen enables you to review all of your selections for the Rate Editor. It is comprised of four sections - one for each step of the process. If you wish to edit any of these sections, click the ***Edit*** button next to the appropriate section and it will take you to the specific area for changes. You can then page forward by clicking ***Next*** (and making changes as appropriate) to return to the *Review Selections* screen.

The **Time Period/Rate Change Information** section of the *Review Selections* screen provides a summary of key rate change parameters. This includes information on the *Time Period* and *Rate Changes* fields. If you would like to change any of the information, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Time Period/Rate Change* screen and click ***Next***, you will return to the *Review Selections* screen.

The **File Types** section of the *Review Selections* screen provides a summary of the file types being edited. If you would like to change any of the file types, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *File Types* screen and click ***Next***, you will return to the *Data Elements* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Data Element** section of the *Review Selections* screen provides a summary of the data elements being edited. If you would like to change any of the data elements, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Data Elements* screen and click ***Next***, you will return to either the *Element Values* or *Time Periods/Rate Changes* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

The **Data Element Values** section of the *Review Selections* screen provides a summary of the data element values being edited. If you would like to change any of the data element values, click the ***Edit*** button in the upper right hand corner. Once you have made the desired changes to the *Element Values* screen and click ***Next***, you will return to the *Time Periods/Rate Changes* screen. You must continue clicking ***Next*** (or making changes as required) until you return to the *Review Selections* screen.

Menu Instructions

Click on ***View Rates*** (either before or after you modify the rates) to view all rates meeting your selection criteria. The *View Rates* screen appears.

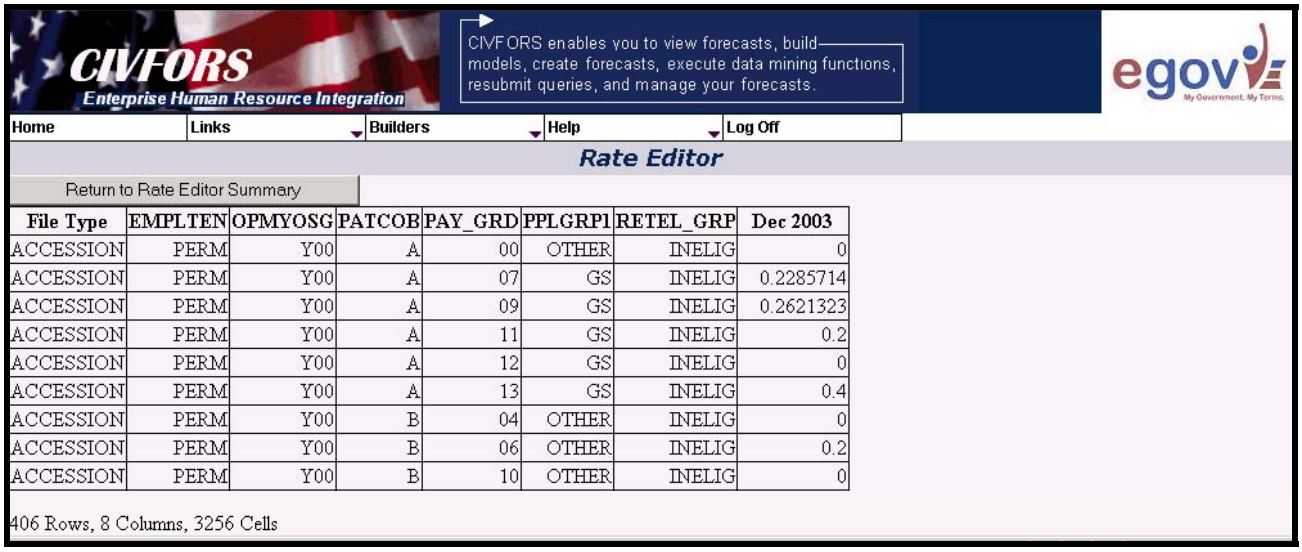
Click on ***Change Rates*** to make the specified changes.

Click ***Back to Forecast Builder*** to return to the *Review Selections* screen of the Forecast Builder.

Click ***Help*** to access CIVFORS online Help instructions.

4.2.7.6 View Rates

Rates Editor – View Rates Screen



File Type	EMPLTEN	OPMYOSG	PATCOB	PAY_GRD	PPLGRP1	RETEL_GRP	Dec 2003
ACCESSION	PERM	Y00	A	00	OTHER	INELIG	0
ACCESSION	PERM	Y00	A	07	GS	INELIG	0.2285714
ACCESSION	PERM	Y00	A	09	GS	INELIG	0.2621323
ACCESSION	PERM	Y00	A	11	GS	INELIG	0.2
ACCESSION	PERM	Y00	A	12	GS	INELIG	0
ACCESSION	PERM	Y00	A	13	GS	INELIG	0.4
ACCESSION	PERM	Y00	B	04	OTHER	INELIG	0
ACCESSION	PERM	Y00	B	06	OTHER	INELIG	0.2
ACCESSION	PERM	Y00	B	10	OTHER	INELIG	0

406 Rows, 8 Columns, 3256 Cells

The *View Rates* screen displays the current values of the rates that you have elected to edit. The information is read-only, and will either reflect the before or after status of the rates, depending on whether or not you have changed the rates.

This screen also identifies the number of rows, columns, and cells that are displayed.

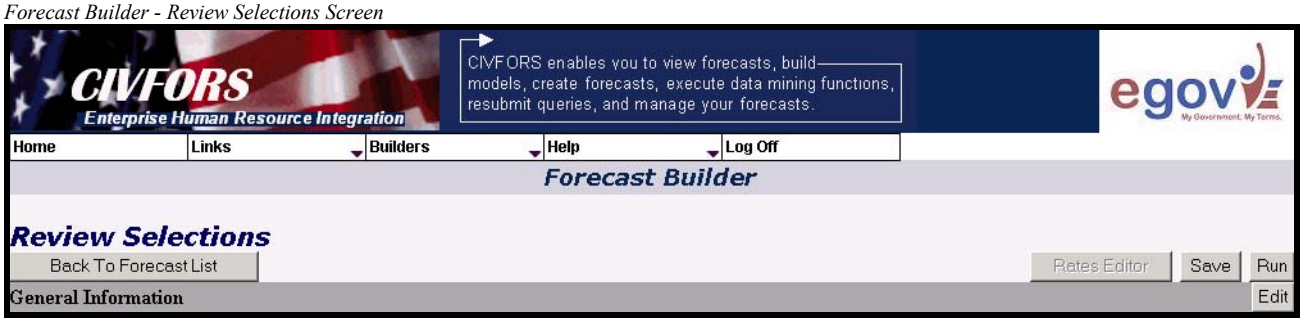
Menu Instructions

Click ***Return to Rate Editor Summary***. The *Review Selections* screen of the Rate Editor appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.3 Run Forecast

Forecast Builder - Review Selections Screen



When you have completed building your Model Components, Model, and Forecast, you are ready to launch the execution of that forecast. To begin this process, click on the ***Run*** button on the *Review Selections* screen of the Forecast Builder.

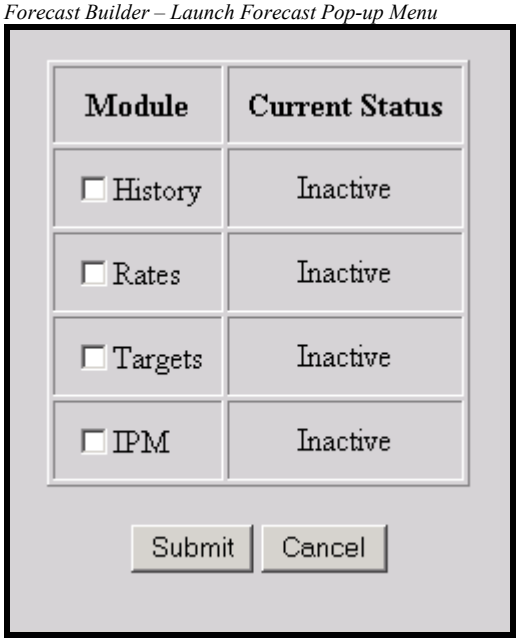
Menu Instructions

Click ***Run***. The *Launch Forecast* pop-up menu appears.

Click ***Help*** to access CIVFORS online Help instructions.

4.3.1 Submitting Forecasts to Run

Forecast Builder – Launch Forecast Pop-up Menu



The *Launch Forecast* pop-up menu appears. From here, select the processing components that you want to execute by clicking the appropriate checkboxes.

For *Goal* runs, all four checkboxes shown above will be active. For *No Goal* runs, the **Targets** check box will be disabled, since the execution of this component is not required.

Note that you may select any number of components to execute. However, you must run all components (that have not already been executed) in sequential order. Thus, *History* must be run before *Rates*, *Rates* must be run before *Targets* (or the *IPM* for a No Goal run), and the *IPM* must be run last. Failure to run the components in sequential order will cause a processing error. While you will frequently submit all four components for execution at the same time, you may alternatively want to submit the IPM separately so that you can edit the rates or targets before producing your final output.

Menu Instructions

Click ***Submit*** to launch the execution of your forecast once you have made your selections. The processing will begin, and you will be automatically returned to the Forecast Builder.

Click ***Cancel*** to abort your job submission. You will be automatically returned to the Forecast Builder.

4.3.2 Monitoring Component Execution

When a forecast is submitted for execution, it could take anywhere from less than an hour to several days to run, depending on the size and complexity of your model and forecast. Once your forecast has been completed, you will be able to select the forecast in the Forecast Viewer. However, prior to completion, the forecast will not be selectable, and you may want to monitor its execution by reviewing its **Current Status** codes.

The **Current Status** codes for your forecast can be monitored in either (a) the *Launch Forecast* pop-up menu in the *Forecast Builder* or (b) the *Job Queue*, which can be selected from the *Links* drop-down menu.

Current Status codes are listed in the table below:

Inactive	The component has not yet been submitted for processing.
Active	The component has been submitted for processing but has not yet been executed.
Running	The component has been submitted for processing and is currently executing.
Error	The component was submitted for processing but encountered an error condition.
Completed	The component was submitted for processing and successfully completed.

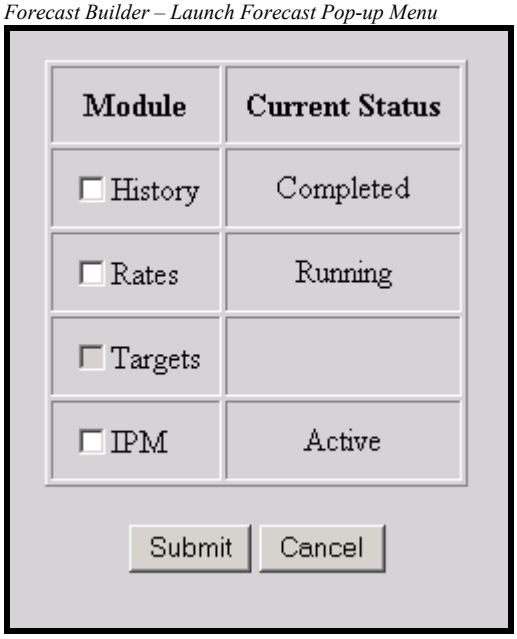
Menu Instructions

Click ***Run*** on the *Review Selections* Screen of the Forecast Builder. The *Launch Forecast* pop-up menu appears.

Click ***Job Queue*** from the *Links* drop-down menu. The Job Queue screen appears.

4.3.2.1 Launch Forecast Pop-up Menu

Forecast Builder – Launch Forecast Pop-up Menu



If you selected the first option to monitor component execution, the *Launch Forecast* pop-up menu appears. From here, you can review the **Current Status** codes.

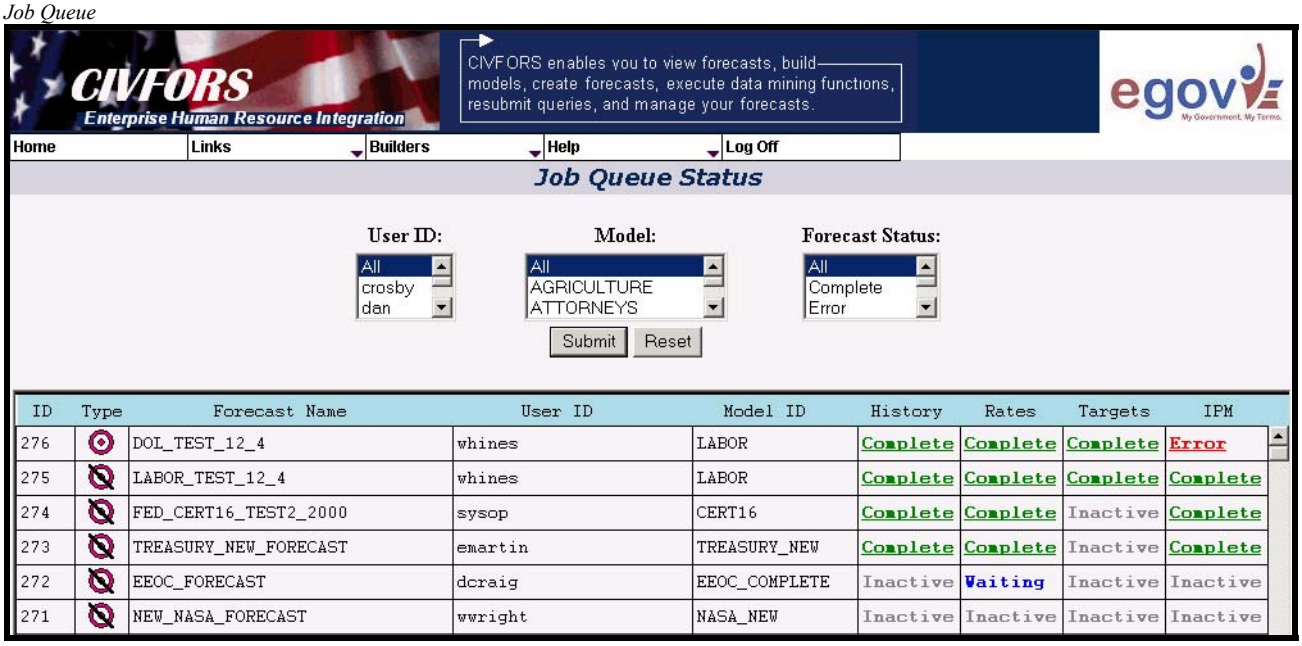
In the example above, the *History* component successfully completed, the *Rates* component is currently executing, the *Target* component is inactive (meaning that this was a "No Goal" run), and the *IPM* has been submitted for processing but has not yet been executed

Menu Instructions

Click ***Cancel***. The *Review Selections* Screen of the Forecast Builder will appear.

4.3.2.2 Job Queue

Job Queue



If you selected the second option to monitor component execution, the *Job Queue* screen appears. From here, you can review the **Current Status** codes under the component column headings for all forecasts (or any selected forecasts) in the system.

To limit the forecasts being displayed, select values from the **User ID**, **Model**, and **Forecast Status** selection boxes, and click on **Submit**. Only the result rows meeting your selection criteria will be displayed. To reset each value to "All", click on **Reset**, and then click on the ***Submit*** button again.

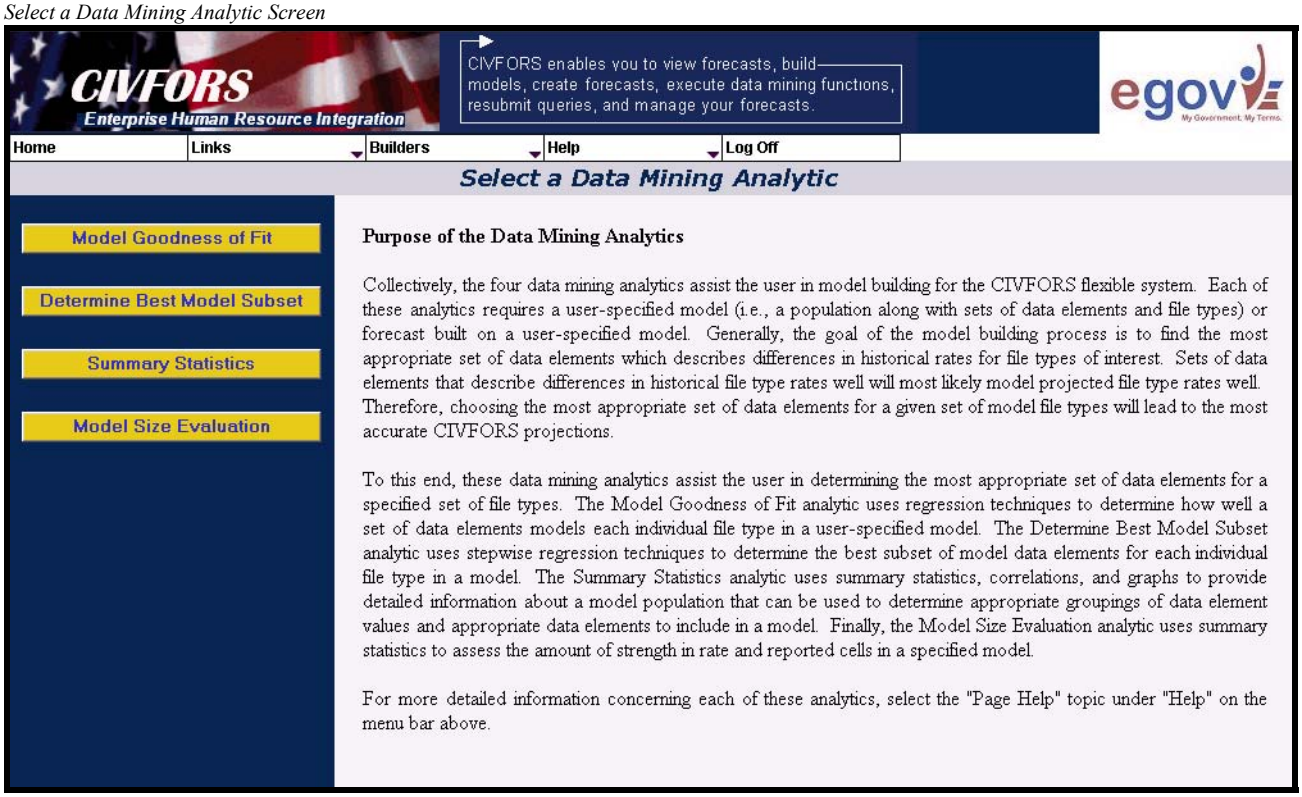
Menu Instructions

Click any other function from the drop-down menus to exit this screen. The entry screen associated with the selected function will appear.

Section 5.0 Data Mining

The CIVFORS data mining analytics can be accessed by clicking the ***Data Mining*** button on the *Select a CIVFORS Function* screen, or by selecting Data Mining from the Links dropdown menu.

Select a Data Mining Analytic Screen



The *Select a Data Mining Analytic* screen will appear where you can select from one of four analytics.

Collectively, the four data mining analytics assist you in model building for the CIVFORS flexible system. Each of these analytics requires a user-specified model (i.e., a population along with sets of data elements and file types) or forecast built on a user-specified model. Generally, the goal of the model building process is to find the most appropriate set of data elements, which describes differences in historical rates for file types of interest. Sets of data elements that describe differences in historical file type rates well will most likely model projected file type rates well. Therefore, choosing the most appropriate set of data elements for a given set of model file types will lead to the most accurate CIVFORS projections.

The ***Model Goodness of Fit*** analytic determines the statistical validity for a specified model. For each file type chosen from the model, a Poisson regression model is created, with the file type count serving as the dependent variable, and the data elements serving as independent variables. Poisson regression is a type of general linear model (GLM) that is most appropriate when the response (dependent) variable is a count, with large outcomes being rare events. This type of regression is also used as part of the methodology in generating historical file type rates in the CIVFORS system. The output from this analytic will indicate how well the set of data elements in the specified model describe the differences in file type counts for each file type.

The ***Determine Best Model Subset*** analytic determines the best subset of model data elements for modeling user-specified file types. For each file type chosen from the model, a stepwise regression model is created

with the file type count serving as the dependent variable, and the data elements serving as candidates to enter the regression model as independent variables. The stepwise regression approach utilized here is based on minimization of the Akaike Information Criterion (AIC) statistic at each step of the model building process. The result is a determination of the best data element subset for modeling each individual file type. The results of this analytic should be used to determine the appropriate set of model data elements on which to build a new CIVFORS forecast, given the set of desired model file types.

The ***Summary Statistics*** analytic allows you to perform various data exploration tasks. For example, you may choose to compute summary statistics for specified model data elements and file types. These summary statistics will include the mean, median, maximum, minimum, and total number of records in the model population for each ordered data element and file type. Those data elements that are unordered will report frequency counts for each data element value. This information will assist you in determining the distribution of values (counts) for each data element (file type) in the model population.

You may also choose to compute pair-wise correlation coefficients for model data elements. Only data elements with numeric, ordered values will be included in the correlation matrix. Non-numeric and/or non-ordered data elements will not be included in the correlation matrix, but will instead be used to report frequency counts for each data element value (summary statistics).

Finally, you may choose to produce two-dimensional graphs that compare file type rates for different data element values. For one specified file type, a graph will be created for each user-specified model data element. On each graph, data element values will appear on the x-axis, and file type rates will be shown on the y-axis. These graphs should be used to compare file type rates for different data element values, so that appropriate groupings of data element values for a given file type can be determined.

The ***Model Size Evaluation*** analytic assesses the amount of strength in rate and reported cells in a specified model. The analytic reports statistics for both the zero and non-zero cells, and provides a "rough order" assessment of projection quality based on these cell strengths.

When each analytic finishes running, output is sent directly to your registered e-mail account. For the Model Goodness of Fit, Determine Best Model Subset, and Model Size Evaluation analytics, the output is sent in the form of an html (*.html) file attached to the e-mail. For the Summary Statistics analytic, the output includes the attached html file containing summary statistics and correlation output, along with a separate *.jpg attachment for each graph produced. At the bottom of the attached html file for the Summary Statistics analytic output, you will find descriptions of each *.jpg attachment, identifying the graph associated with each attachment.

Before any of the four analytics are submitted for processing, you may choose the option to wait for results to appear in the web browser once the analytic finishes. Note that analytic output will always be sent via e-mail, regardless of your choice to wait for results in the browser. If you choose to wait for results, a screen will appear with a notification that the analytic is processing. Processing may take several minutes depending on the size of the model population, the number of data elements and file types chosen, and other options specified by you. Once this has completed, the output will appear in the web browser window, and the e-mail output will be sent to you. The option to wait for results in the browser is only made available if the model history has previously been created by either running a data mining analytic with the same model or running a CIVFORS scenario based on this model.

5.1 Model Goodness of Fit Analytic

5.1.1 Description

The Model Goodness of Fit Analytic determines the statistical validity for a specified model. For each file type chosen from the model, a Poisson regression model is created, with the file type count serving as the dependent variable, and the data elements serving as independent variables. Poisson regression is a type of general linear model (GLM) that is most appropriate when the response (dependent) variable is a count, with large outcomes being rare events. This type of regression is also used as part of the methodology in generating historical file type rates in the CIVFORS system.

To run this analytic, you will select a model along with subsets of the model's data elements and file types. Once this analytic has been constructed and submitted, a data table will be built containing file type counts for each file type selected. This data table will contain file type counts for each set of data element values in each historic time period. In order to evaluate the "goodness of fit" for each Poisson regression model, a chi-square (deviance) test will be performed at the 95% significance level. The output will indicate how well the set of data elements in the specified model describe the differences in file type counts for each file type.

This output -- which you can optionally wait for, but which will always be sent as an attachment to his or her email address -- can be in one of two forms. If you check the **Executive Summary** box, the output will contain very straightforward output identifying the "goodness of fit" of each model without the full statistical output. Otherwise, the output will contain the full statistical output along with the interpretation of results.

5.1.2 Theory

What is Poisson regression and why is it used in this analytic?

Poisson regression is a type of nonlinear regression very similar to logistic regression in terms of its use. Logistic regression is most often used to model data with a binary response. For our purposes, a binary response can be viewed as the incidence or non-incidence of a file type taking place in a given quarter for a particular individual. Regression techniques like logistic and Poisson regression can be time-consuming to use with data containing a large number of records. Therefore, in order to perform these computations more efficiently, popular statistical packages including S-PLUS and SAS support logistic regression models with a response variable in the form of a rate, i.e., between 0 and 1. This allows the statistician to "roll-up" data records by groups of individuals so that fewer records are needed to perform these types of regressions.

Poisson regression is preferred to logistic regression in cases where the response variable is a count, with large counts being rarities. In other words, one should use Poisson regression in cases where response rates are expected to be relatively low (less than 20%). Generally, file type rates (e.g., voluntary separations, retirements) for groups of individuals (e.g., males, clerical workers, U.S. citizens) are relatively low. Therefore, Poisson regression is the technique that is used in the *Model Goodness of Fit* and *Determine Best Model Subset* Analytics for regression model fitting.

Details of Logistic Regression

Let p = probability that the file type occurs given that a model group has data element values **x**.

$$\log(p/(1-p)) = ß_0 + \mathbf{ß x}$$

where $ß_0$ is the model intercept, **ß** is the vector of slope parameters, and **x** is the vector of data element values. Here, log(p/(1-p)), called the logit function, is the "link" function used in this form of logistic regression. The equation above may be transformed to determine p:

$$p = \exp(ß_0 + \mathbf{ß x})/(1 + \exp(ß_0 + \mathbf{ß x}))$$

Details of Poisson Regression Models

Let Y = number of file type incidences for a given model group with data element values x in a specified time unit.

Let Pr(Y) = probability that Y file types occur for a given model group with data element values x in a specified time unit.

Let t = strength count for a given model group with data element values x in the same time unit.

$$Pr(Y) = [\exp(-t*\log(\mathbf{ß x}))*(t*\log(\mathbf{ß x}))^{Y}] / Y!$$

where **ß** is the vector of slope parameters, **x** is the vector of data element values, and Y! (read "Y factorial") = $Y(Y-1) \cdot \cdot \cdot 3 \cdot 2 \cdot 1$.

Here, note that the strength count t is used in this model so that groups with larger strength may be compared to groups with smaller strength. This accounts for the fact that larger groups are more likely to have more

file type incidences than smaller groups. Correct implementation of Poisson regression in S-PLUS requires declaring log(t) as an "offset" variable and subtracting 1 from the model to eliminate the intercept term.

References:

1. Neter, Kutner, Nachtsheim and Wasserman, Applied Linear Statistical Models (4th ed.), Irwin, Chicago, 1996, pp. 567-616.
2. Venables, W.N., and Ripley, B.D., Modern Applied Statistics with S-PLUS (3rd ed.), Springer-Verlag, New York, 1999, pp. 211-228, 269-270.
3. SAS/STAT User's Guide, Version 6, Volume 2 (4th ed.), SAS Institute Inc., Cary, NC, 1990, pp. 1071-1076, 1086-1095.
4. S-PLUS 2000 Guide to Statistics, Volume 1, Data Analysis Products Division, MathSoft, Seattle, 1999, pp. 301-307, 315-325.

5.1.3 Instructions

Follow the following steps to run the Model Goodness of Fit Analytic:

1. Select the **Model** to analyze from the list of available models.
2. Select a subset of the model **Data Elements** to be used as independent variables in the regression models. Choose the data elements you would like to include by selecting them from the Available Data Elements on the left side of the screen and clicking the right arrow to move them to the **Selected Data Elements** box.
3. Click the ***Next*** button to advance to the File Types page.
4. Select a subset of the model **File Types** to be used as dependent variables in the regression models. Choose the file types you would like to include by selecting them from the Available File Types on the left side of the screen and clicking the right arrow to move them to the **Selected File Types** box.
5. Click the ***Next*** button to advance to the General Information page.
6. If you want to create a new model with the set of data elements and file types selected along with the associated history, type the new model name in the **Model ID** box. You can also change the description of this model by entering new text in the **Description** box.
7. Click on the **Executive Summary** box to produce simplified output. This will remove the Analysis of Deviance Table from your output.
8. Click on the **Wait for Results** box (if available) if you want the results displayed in your browser. This will bring the results back to your screen, in addition to sending them as an email attachment to your email account. [Note: This option will only be available if an archived history table already exists for this model and the last month of history in this table corresponds with the most recently loaded month of history.]
9. Click the ***Next*** button to advance to the *Review Selections* screen. The *Review Selections* screen enables you to review all of your selections for the Model Goodness of Fit Analytic. It is comprised of three sections - one for each step of the process.
10. Click the ***Run*** button to submit the analytic.

5.1.4 Output Interpretation

The Model Goodness of Fit Analytic determines the statistical validity for a specified model. For each file type chosen from the model, a Poisson regression model is created with the file type count serving as the dependent variable and the data elements serving as independent variables. The outputs of these models identify the ability of the selected data elements to describe differences in file type rates for each file type. Each file type is treated separately so that you may determine the appropriateness of a given set of data elements for modeling individual file types. In addition, p-values for each data element in the output may be used to identify data elements that lack significance in individual Poisson regression models.

The output for the Model Goodness of Fit Analytic is broken down into one or more sections, with each section representing the output for a given file type. These output sections are in the following format (where *file_type_name* is the name of the file type and *data_element_list* is the list of data elements selected):

Model for *file_type_name* personnel action

Poisson regression model equation:

file_type_name ~ offset(log(STRENGTH)) + *data_element_list* – 1

Analysis of Deviance Table						
	Df	Deviance	Residual.Df	Residual.Dev	ChiSq.PVal	Significant
NULL	NA	NA	108	491.572	NA	NA
data_element_list(1)	10	27.685	98	463.887	0.002	YES
...	...	...	...	...	...	...
data_element_list(n)	8	422.057	90	41.830	0.000	YES

Observed chi-squared statistic (deviance): 41.83
Critical chi-squared statistic with 9294 degrees of freedom (alpha=.05): 113.145
P-value for the test: 1

Because the critical chi-squared statistic is greater than the observed chi-squared statistic, we conclude that this model IS an appropriate fit at the 95% confidence level.

From this output, we see that the Poisson regression model is *file_type_name* ~ offset(log(STRENGTH)) + *data_element_list* - 1, where *file_type_name* is the file type count, offset(log(STRENGTH)) is S-PLUS terminology indicating that the log of the strength count is used as an offset variable, and *data_element_list* represents the list of data elements which are appropriately handled independent variables in the model. Note that the "-1" is included to eliminate the intercept from the model, which is necessary when using an offset variable.

In the Analysis of Deviance Table (which is produced only if the **Executive Summary** box is not checked), the following should be noted:

1. "Df" represents the degrees of freedom. Data elements that are non-numeric or non-ordered often have multiple degrees of freedom, corresponding to the different levels of data element values.

2. "Deviance" is a measure of model fit for a generalized linear model. The deviance statistic compares the log-likelihood of the fitted model to the log-likelihood of a "perfect" model. This statistic is not of utmost importance for our purposes.
3. "Residual.Df", or residual degrees of freedom, is equal to the total degrees of freedom (number of records - 1) under "NULL" minus the cumulative number of degrees of freedom for the data elements in the model.
4. "Residual.Dev", or residual deviance, shows the step-by-step decreases in deviance as additional data elements are added to the model.
5. "ChiQq.PVal", or chi-square p-value, is the p-value for the test for determining significance for an individual data element in the model. P-values less than 0.05 indicate data elements that are individually significant in the Poisson regression model at the 95% confidence level.
6. "Significant" is a YES/NO flag value that indicates whether the P-value for the given data element is less than 0.05. Note that while individual data elements may be significant, that does not necessarily guarantee that the model as a whole will be an appropriate fit at the 95% confidence level. In fact, the model may require additional, or even different, data elements to achieve this goal. However, when a given data element consistently displays a flag of NO across all (or most) file types being tested, this is an indication that the element should probably be removed from the model.

After the Analysis of Deviance Table, the observed and critical chi-squared statistics, along with the p-value, are given for the Deviance Goodness of Fit Test. This test determines the quality of the model fit as a whole. Following these statistics, a conclusion is included indicating whether or not the model is an appropriate fit at the 95% confidence level.

A separate section at the end of the output summarizes the findings for each model by identifying the file types for which the set of data elements represents an appropriate model (i.e., good fit), and file types for which the set of data elements does not represent an appropriate model (i.e., poor fit).

For more information regarding Poisson regression model fitting, the deviance statistic, and the Deviance Goodness of Fit Text, please refer to Neter, Kutner, Nachtsheim and Wasserman, Applied Linear Statistical Models (4th ed.), Irwin, Chicago, 1996, pp. 586-615.

5.2 Determine Best Model Subset Analytic

5.2.1 Description

This analytic determines the best subset of model data elements for modeling user-specified file types. For each file type chosen from the model, a stepwise regression model is created with the file type count serving as the dependent variable, and the data elements serving as candidates to enter the regression model as independent variables. The stepwise regression approach utilized here is based on minimization of the Akaike Information Criterion (AIC) statistic at each step of the model building process. The result is a determination of the best data element subset for modeling each individual file type. The results of this analytic should be used to determine the appropriate set of model data elements on which to build a new CIVFORS scenario, given the set of desired model file types.

To run this analytic, you will select a model along with subsets of the model's data elements and file types. Once this analytic has been constructed and submitted, a data table will be built containing file type counts for each file type selected. This data table will contain file type counts for each set of data element values in each historic time period. The output will indicate the best subset of data elements for each file type individually. You can then use this output to subjectively determine the most appropriate "overall" model for all file types.

This output -- which you can optionally wait for, but which will always be sent as an attachment to his or her email address -- can be in one of two forms. If you check the **Executive Summary** box, the output will contain very straightforward output identifying the best data element subset for each file type without the full statistical output. Otherwise, the output will contain the full statistical output along with the interpretation of results.

5.2.2 Theory

How is stepwise regression used in this analytic?

In an ideal situation, a statistical routine that considered every possible subset of independent variables (data elements) could be used to determine the best data element subset for model file types. However, the computational complexity involved in this process, which exceeds space and time limitations, requires an automatic stepwise regression technique to be utilized instead. Stepwise regression is a technique in which independent variables are added to or eliminated from a regression model one-by-one until the "best" model is found according to the results of statistical tests (typically F-tests). Many types of stepwise regression methods have been proposed and utilized in statistical model building. Forward stepwise regression begins with no variables in the model (called the "null" model) and adds variables to the model until no variables remain that would improve the fit of the regression model if they were added. Backward stepwise regression begins with all variables in the model (called the "full" model) and removes variables from the model until no variables remain that would improve the fit of the regression model if they were removed. There are also variations on these two types of stepwise regression which run additional statistical tests at each step of the model building process to discard variables in the model which become insignificant after changes to the model.

In the Determine Best Model Subset Analytic, forward stepwise regression is used to find the best model, and hence, the best data element subset for specified model file types. The "stepAIC" stepwise regression routine, written by W.N. Venables and B.D. Ripley for the MASS library addition to S-PLUS, is used to automate stepwise regression here. We utilize a forward stepwise regression approach here, with a fitted Poisson regression model serving to start the model building process. The stepAIC function is advantageous, because it allows non-quantitative regressors and uses the Akaike Information Criterion (AIC) as the test statistic for determining model significance at each step of the model building process. AIC can be computed as follows:

$$AIC = n \log(SSR/n) + 2p + constant$$

where n is the number of observations, SSR is the residual sum of squares for a model, and p is the number of parameters. Therefore, AIC is a statistic based on the number of observations, number of parameters, and quality of the model fit (SSR/n). Because a model with a lower value of AIC is preferable, one can deduce that smaller values for SSR and p result in "better models" according to the AIC criterion.

Implementation of forward stepwise regression using stepAIC in the Determine Best Model Subset Analytic follows this algorithm:

1. Begin with an empty Poisson regression model (containing only the necessary offset variable to account for strength of each model group).
2. Determine the data element that reduces the model AIC the most when added to the model. Add this data element to the Poisson regression model.
3. Repeat step 2 until no candidate data element reduces the model AIC when added to the model, or until all data elements have been added.

References:

1. Neter, Kutner, Nachtsheim and Wasserman, Applied Linear Statistical Models (4th ed.), Irwin, Chicago, 1996, pp. 331-354, 585-586.

2. Venables, W.N., and Ripley, B.D., Modern Applied Statistics with S-PLUS (3rd ed.), Springer-Verlag, New York, 1999, pp. 183-188, 222-228.
3. S-PLUS 2000 Guide to Statistics, Volume 1, Data Analysis Products Division, MathSoft, Seattle, 1999, pp. 179-188.

5.2.3 Instructions

Follow the following steps to run the Determine Best Model Subset Analytic:

1. Select the **Model** to analyze from the list of available models.
2. Select a subset of the model **Data Elements** to be used as candidates for independent variable inclusion in the regression models. Choose the data elements you would like to include by selecting them from the Available Data Elements on the left side of the screen and clicking the right arrow to move them to the **Selected Data Elements** box.
3. Click the ***Next*** button to advance to the File Types page.
4. Select a subset of the model **File Types**, where each file type selected will represent a stepwise regression model. Choose the file types you would like to include by selecting them from the Available File Types on the left side of the screen and clicking the right arrow to move them to the **Selected File Types** box.
5. Click the ***Next*** button to advance to the General Information page.
6. If you want to create a new model with the set of data elements and file types selected along with the associated history, type the new model name in the **Model ID** box. You can also change the description of this model by entering new text in the **Description** box.
7. Click on the **Executive Summary** box to produce simplified output. This will remove the Analysis of Deviance Table from your output.
8. Click on the **Wait for Results** box (if available) if you want the results displayed in your browser. This will bring the results back to your screen, in addition to sending them as an email attachment to your email account. [Note: This option will only be available if an archived history table already exists for this model and the last month of history in this table corresponds with the most recently loaded month of history.]
9. Click the ***Next*** button to advance to the *Review Selections* screen. The *Review Selections* screen enables you to review all of your selections for the Determine Best Model Subset Analytic. It is comprised of three sections - one for each step of the process.
10. Click the ***Run*** button to submit the analytic.

5.2.4 Output Interpretation

The Determine Best Model Subset Analytic uses stepwise regression model building to determine the best subset of data elements for modeling each selected file type. You specify a list of candidate data elements that may be considered for each model. For each selected file type, the output indicates the subset of the candidates which best describe differences among file type rates in the model population. This information can be used to determine appropriate sets of data elements for modeling individual file types, and therefore, to determine which data elements collectively model all file types of interest.

The output for the Determine Best Model Subset Analytic is broken down into several distinct parts. For each file type, the best Poisson regression model found via stepwise regression is reported. Each section of the Determine Best Model Subset Analytic output represents the output for one file type. These output sections are in the following format (where *file_type_name* is the name of the file type, *data_element_list* is the list of candidate data elements you selected, and *selected_data_elements* is the subset of data elements from the *data_element_list* which are chosen in the best model for the *file_type_name*):

****

Model for *file_type_name* personnel action

Possible data elements to be added to the model:
data_element_list

Stepwise Regression Model Building Results:

Using stepwise Poisson regression, these data elements are included in the best model for *file_type_name* file types:
selected_data_elements

Analysis of Deviance Table

	Df	Deviance	Resid. Df	Resid. Dev	Pr(Chi)
NULL	NA	NA	9301	18063.95	NA
data_element_list(1)	1	11552.45	9300	6511.50	0.0003
...	...	...	...	...	...
data_element_list(n)	6	568.06	9288	4723.28	0.0123

Observed chi-squared statistic (deviance): 4723.289
Critical chi-squared statistic with 9294 degrees of freedom: 9519.386
P-value for the test: 1

Because the critical chi-squared statistic is greater than the observed chi-squared statistic, we conclude that this model IS an appropriate fit at the 95% confidence level.

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From this output, we see that the subset of data elements from *data_element_list* included in the best model for *file_type_name* is *selected_data_elements*. Therefore, the form of the final Poisson regression model for *file_type_name* is thus:

$$file_type_name \sim \text{offset}(\log(\text{STRENGTH})) + selected_data_elements - 1$$

where *file_type_name* is the file type count, offset(log(STRENGTH)) is S-PLUS terminology indicating that the log of the strength count is used as an offset variable, and *selected_data_elements* represents the list of data elements included in the best model for this file type. Note that the "-1" is included to eliminate the intercept from the model, which is necessary when using an offset variable.
The Analysis of Deviance Table, similar to that in the output for the Model Goodness of Fit Analytic, comprises these components:

1. "Df" represents the degrees of freedom. Data Elements that are non-numeric or non-ordered often have multiple degrees of freedom, corresponding to the different levels of data element values.
2. "Deviance" is a measure of model fit for a generalized linear model. The deviance statistic compares the log-likelihood of the fitted model to the log-likelihood of a "perfect" model. This statistic is not of utmost importance for our purposes.
3. "Resid. Df", or residual degrees of freedom, is equal to the total degrees of freedom (number of records - 1) under "NULL" minus the cumulative number of degrees of freedom for the data elements in the model.
4. "Resid. Dev", or residual deviance, shows the step-by-step decreases in deviance as additional data elements are added to the model.
5. "Pr(Chi)", or chi-square p-value, is the p-value for the test for determining significance for an individual data element in the model. P-values less than 0.05 indicate data elements that are individually significant in the Poisson regression model.

After the Analysis of Deviance Table, the observed and critical chi-squared statistics, along with the p-value, are given for the Deviance Goodness of Fit Test. This test determines the quality of the model fit as a whole. Following these statistics, a conclusion is included indicating whether or not the model is an appropriate fit at the 95% confidence level.

A separate section at the end of the output summarizes the findings in this analytic by identifying the data elements contained in the final accepted Poisson regression model for each file type.

For more information regarding stepwise regression model fitting and using the "stepAIC" S-PLUS function, please refer to the references below.

References:

1. Neter, Kutner, Nachtsheim and Wasserman, Applied Linear Statistical Models (4th ed.), Irwin, Chicago, 1996, pp. 331-354, 585-586.
2. Venables, W.N., and Ripley, B.D., Modern Applied Statistics with S-PLUS (3rd ed.), Springer-Verlag, New York, 1999, pp. 183-188, 222-228.
3. S-PLUS 2000 Guide to Statistics, Volume 1, Data Analysis Products Division, MathSoft, Seattle, 1999, pp. 179-188.

5.3 Summary Statistics Analytic

5.3.1 Description

This analytic allows you to perform three separate data exploration tasks:

Summary Statistics

You may choose to compute summary statistics for specified model data elements and file types. These summary statistics will include the mean, median, maximum, minimum, and total number of records in the model population for each ordered data element and file type count. Those data elements that are unordered will report frequency counts for each data element value. This information will assist you in determining the distribution of values (counts) for each data element (file type) in the model population. This output will be included in the html output sent to you via e-mail.

Correlations

You may choose to compute pair-wise correlation coefficients for model data elements. Only data elements with numeric, ordered values will be included in the correlation matrix. Non-numeric and/or non-ordered data elements will not be included in the correlation matrix, but will instead be used to report frequency counts for each data element value (summary statistics). This output will be included in the html output sent to you via e-mail.

Graphing

You may choose to produce two-dimensional graphs that compare file type rates for different data element values. For one specified file type, a graph will be created for each user-specified model data element. On each graph, data element values will appear on the x-axis, and file type rates will be shown on the y-axis. These graphs should be used to compare file type rates for different data element values, so that appropriate groupings of data element values for a given file type can be determined. Each graph will appear as an attachment to the e-mail output sent to you. The html output will have additional information regarding the graphical attachments.

You may choose to run any or all of these exploratory analyses. Only one e-mail attachment will be sent for summary statistics and correlations. However, if you choose the graphical analysis, additional e-mail attachments will be sent in the form of .jpg files. Each attachment should be relatively small in size.

5.3.2 Theory

How are the summary statistics calculated and how should they be interpreted?

For each ordered, numeric data element selected, summary statistics (i.e., mean, median, minimum, maximum, and total count) are computed based on historical data for the most recent time period in which data is currently available in the CIVFORS system database. For non-ordered and/or non-numeric data elements, frequency tables are reported which list population strength counts for each data element value in the most recent historical time period. All summary statistics and frequency tables are computed ONLY for the population identified by the user-specified model.

The summary statistics and frequency tables should be used subjectively to determine the data element values represented most often in the model population, the distribution of data element values in the model population, and potentially how base data element values may be grouped effectively in a user-created model data element.

How are the correlations calculated and how should they be interpreted?

A matrix of correlation coefficients is produced for all ordered, numeric data elements selected. These correlation coefficients are computed based on the model population for the most recent time period in which data is currently available. As is the case with summary statistics, correlations cannot be computed for data elements which are either non-ordered or non-numeric. Therefore, frequency tables are reported for these data elements.

The correlation coefficients may be used to determine data elements that are highly correlated. In most cases where regression techniques are involved, it is unwise to use highly correlated data elements as covariates in a regression model. Therefore, highly correlated data elements most likely should not be chosen for a single CIVFORS model.

How are the graphs produced and how should they be interpreted?

For each data element selected for analysis, a graph is produced showing the differences in file type rates (for one user-specified file type) across different data element values. These graphs are scatterplots, weighted by the strength count represented by each point. All points on the graphs are boxes, with box widths varying directly with the number of people represented by the points. The data element values appear on the x-axis, and the file type rates appear on the y-axis. In addition, the mean file type rate for each data element value is notated on each graph by an "x".

This graphing functionality in the Summary Statistics analytic enables you to view the differences in file type rates across different data element values. From these graphs, one can determine which data element values occur most often in the model population, which data element values have similar file type rate characteristics and may be grouped together, and which data elements have little or no impact on file type rates.

5.3.3 Instructions

Follow the following steps to run the Summary Statistics Analytic:

1. Select the **Model** to analyze from the list of available models.
2. Select a subset of the model **Data Elements** to be used in the data exploration tools. Choose the data elements you would like to include by selecting them from the Available Data Elements on the left side of the screen and clicking the right arrow to move them to the **Selected Data Elements** box.
3. Click the ***Next*** button to advance to the File Types page.
4. Select a subset of the model **File Types** to be used to report summary statistics, if the summary statistics box is selected. Choose the file types you would like to include by selecting them from the Available File Types on the left side of the screen and clicking the right arrow to move them to the **Selected File Types** box.
5. Click the ***Next*** button to advance to the General Information page.
6. If you want to create a new model with the set of data elements and file types selected along with the associated history, type the new model name in the **Model ID** box. You can also change the description of this model by entering new text in the **Description** box.
7. Click on the **Executive Summary** box to produce simplified output.
8. Click on the **Summary Statistics** box to obtain summary statistics for each data element and file type selected.
9. Click on the **Correlations** box to obtain the correlation matrix for ordered, numeric model data elements.
10. Click on the **Graphing** box to obtain two-dimensional graphs relating a chosen file type rate to data element values.
11. If **Graphing** box is checked, select the file type of interest for the graphs in the **Graphing File Type** dropdown box.
12. Click on the **Wait for Results** box (if available) if you want the results displayed in your browser. This will bring the results back to your screen, in addition to sending them as an email attachment to your email account. [Note: This option will only be available if an archived history table already exists for this model and the last month of history in this table corresponds with the most recently loaded month of history.]
13. Click the ***Next*** button to advance to the *Review Selections* screen. The *Review Selections* screen enables you to review all of your selections for the Summary Statistics Analytic. It is comprised of three sections - one for each step of the process.
14. Click the ***Run*** button to submit the analytic.

5.3.4 Output Interpretation

The Summary Statistics Analytic uses summary statistics, frequency tables, correlation coefficients, and weighted scatter plot graphs to assist you in understanding the model population and determining how to group data element values appropriately. You choose which type(s) of data exploration to include in the analytic output: summary statistics, correlations, and/or graphing. The output, therefore, will vary depending on which of these are selected.

If you choose to wait on analytic output results to appear in the web browser, all outputs selected (i.e., summary statistics, correlation coefficients, and graphs) will be posted in the browser window after the analytic completes processing. An e-mail with all output will be sent to you via e-mail, regardless of the your choice to wait for results in the web browser. Summary statistics and correlations output will be found in a html file attachment to the e-mail. If you choose graphing, the e-mailed output will include a separate *.jpg attachment for each graph. These *.jpg files can be viewed either in a web browser or in a picture viewing application which supports *.jpg. In order to determine the contents of each graph without opening them, scroll to the bottom of the html output attachment to find a brief description of each *.jpg attachment.

Summary Statistics Output

Summary statistics output includes standard summary statistics (i.e., mean, median, maximum, minimum, total count) for numeric, ordered data elements. These are computed based on the most recent time period of history available for the model population. Frequency counts will be produced for data elements that are non-numeric or unordered. The summary statistics output is produced in the following format:

(NOTE: Here, *unordered_data element* is the name of an unordered or non-numeric data element, and *ordered_data element* is the name of an ordered, numeric data element.)

****

Frequency Table for unordered *unordered_data element* data element:

	unordered_data element	STRENGTH	Proportion
1	dim_value(1)	100	0.153
...	...	...	...
n	dim_value(n)	65	0.099

****

Summary statistics for ordered *ordered_data element* data element:

Mean: 5.787
Median: 8
Minimum: 1
Maximum: 15
Total Count: 969

Correlations Output

Correlations output includes a matrix of correlation coefficients for numeric, ordered data elements. These are computed based on the most recent time period of history available for the model population. Frequency counts will be produced for data elements that are non-numeric or unordered. The correlations output is produced in the following format:

(NOTE: Here, *unordered_data element* is the name of an unordered or non-numeric data element, *ordered_data_element_list* is the list of all ordered, numeric data elements in the model, and Corr(j,k) represents the pairwise correlation coefficient between *ordered_data_element_list*(j) and *ordered_data_element_list*(k).)

****

Frequency Table for unordered *unordered_data_element* data element:

	unordered_data element	STRENGTH	Proportion
1	dim_value(1)	100	0.153
...	...	...	...
n	dim_value(n)	65	0.099

****

Correlation Matrix for ordered numeric data elements:
ordered_data element_list

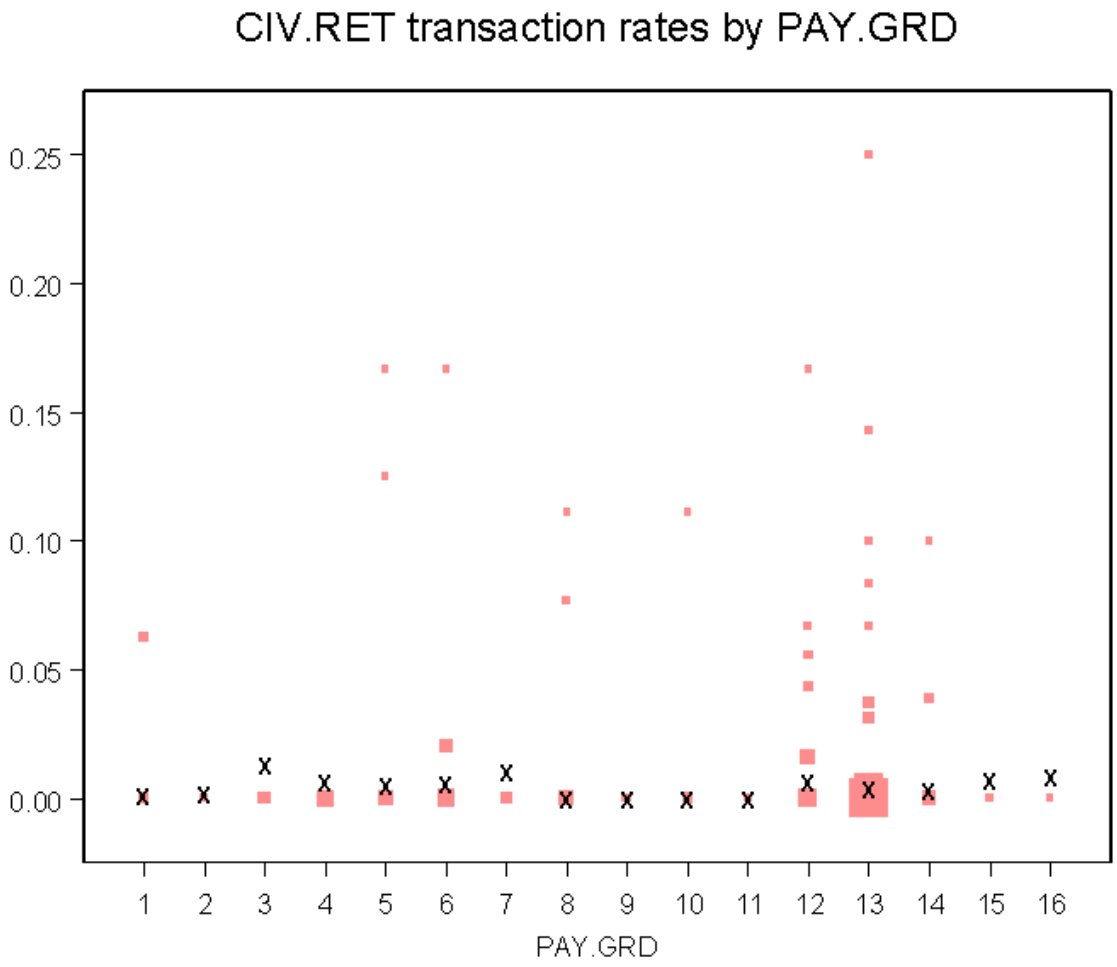
	Data element	*ordered_data_element_list*(1)	*ordered_data_element_list*(2)	...	*ordered_data_element_list*(n)
1	*ordered_data_element_list*(1)	Corr(1,1)	Corr(1,2)	...	Corr(1,n)
2	*ordered_data_element_list*(2)	Corr(2,1)	Corr(2,2)	...	Corr(2,n)
3	...	...	...	...	...
4	*ordered_data_element_list*(n)	Corr(n,1)	Corr(n,2)	...	Corr(n,n)

Graphing Output

Graphing output includes a separate graph relating file type rates for a user-specified file type to each of the selected data elements. These are computed based on the complete historical history associated with the model population. Each graph is a scatter plot with data element values on the x-axis, and file type rates on the y-axis. This scatter plot is weighted by STRENGTH so that points representing larger strength counts appear as larger boxes on the plot than those representing smaller strength counts. Records with strength counts less than 5 are not included on the graphs so that a more accurate view of the file type rates by data element value can be considered. By considering the size of the points on the graph, one can determine which data element values are most prevalent in the population, which data element values have similar file type rates, and which data elements values result in different file type rates in the population. In addition to the weighted scatterplot, the mean file type rate for each data element value is specified with an 'X' on the graphs. This allows you to compare mean file type rates for different data element values more easily.

The graphing output appears as follows:

(Note: The graph results below represent retirement file type rates plotted by pay grade for a specified model population.)



From the graph above, we find that the "PAY.GRD" data element has 16 values in the model population, with most individuals having PAY.GRD values between 12-14. The larger boxes for PAY.GRD values 12-14 indicate a larger number of people (higher strength counts) with these values. There are slightly higher mean "CIV.RET" file type rates for PAY.GRD values 3-7 than for most other PAY.GRD values in this population. Although these differences appear small in nature on this graph, one should note that the majority of CIV.RET rates are small for all individuals in this population. Therefore, the slightly higher mean CIV.RET rates for PAY.GRD values 3-7 should not necessarily be viewed as negligible.

Using these graphs to determine appropriate data element value groupings is a subjective process. From the graph above, it appears that an appropriate grouping of PAY.GRD values for this population might be as follows:

PAY.GRD group level	PAY.GRD values
1	1,2
2	3,4,5,6,7
3	8,9,10,11

4	12,13,14
5	15,16

However, another user might decide to use a different grouping scheme.

Note also that points representing strength counts of less than 5 are not included in these graphs. Therefore, it is entirely possible to have situations where the mean file type rate for a particular data element value is greater than the file type rates for all of the data points on the graph (see mean file type rate for PAY.GRD value 3 above).

5.4 Model Size Evaluation Analytic

5.4.1 Description

The Model Size Evaluation Analytic assesses the amount of strength in rate and reported cells in a specified model. The analytic reports statistics for both the zero and non-zero cells, and provides a "rough order" assessment of projection quality based on these cell strengths.

To run this analytic, you will simply select a forecast from which the analytic will identify the model and associated data element. Once this analytic has been constructed and submitted, a data table will be built containing strength counts for the most recent fiscal year end date. The analytic will then perform the statistical tests, and return an assessment to you.

You can optionally wait for this output by checking the **Wait for Results** box. Regardless, the results will always be sent as an attachment to his or her email address.

5.4.2 Instructions

Follow the following steps to run the Model Size Evaluation Analytic:

1. Select the **Forecast** to analyze from the list of available forecasts.
2. Click on the **Wait for Results** box (if available) if you want the results displayed in your browser. This will bring the results back to your screen, in addition to sending them as an email attachment to your email account. [Note: This option will only be available if an archived history table already exists for this model and the last month of history in this table corresponds with the most recently loaded month of history.]
3. Click the ***Run*** button to submit the analytic.

5.4.3 Output Interpretation

What Is A "Cell"?

A cell is a unique combination of data element values for which CIVFORS forecasts the future for a given model. For example, if a model contains two data elements – e.g., SEX and AGE – then the combined value "Male, Age 30" would be a cell, as would "Female, Age 31".

What Does "Mean Strength Per Cell" Indicate?

The Mean Strength Per Cell is calculated as the Total Strength divided by the Total Number of Cells. Large values for Mean Strength (Rate: >25, All: >15) indicate models that will likely yield high quality projections, because there is sufficient data for the algorithms embedded in CIVFORS. Small values for Mean Strength (Rate: <5, All: <3) indicate models that may have too many data elements. Having too many rate data elements may lead to problems involving the determination of appropriate file type rates. Having too many reported data elements may lead to boot-lacing problems.

What do "Total Number of Zero Cells" and "Total Number of Nonzero Cells" indicate?

The Total Number of Zero and Nonzero Cells indicates the proportion of cells that have strengths of zero and greater than zero in the last quarter of history, respectively. For Rate Data Elements, large proportions of Zero Cells (proportions of at least 25%) indicate models that may experience projection quality problems, as forecasted file type rates may potentially be inappropriate for many cells. For All Data Elements, large proportions of Zero Cells (proportions of at least 50%) indicate models that may experience boot-lacing problems.

How should I use the information from the "Strength Statistics" sections?

The "Strength Statistics" sections display how historical strength is distributed for both the Total Cells and Nonzero Cells in the model. The purpose of these sections is to show how evenly distributed the strength is among all cells. When strength in not well distributed (i.e., when most of the strength occurs in only 20% of the cells, resulting in low average strength counts in the other 80% of cells), forecast quality might be poor, since many cells will use file type rates that may potentially be inappropriate and the models may experience boot-lacing problems.

Each "Strength Statistics" section consists of two tables – one containing "Mean Statistics" and the other containing "Median Statistics". These tables divide the cells into five segments, called quintiles. These segments each represent 20% of the cells in the model. The fifth quintile represents the top 20% of cells in terms of strength. Likewise, the first quintile represents the bottom 20% of cells in terms of strength. The values in these tables are mean and median strength counts per cell within the designated quintile. If the mean strength value in the fourth quintile is less than 25 for rate cells (15 for all cells), then the model likely has too many small cells. However, if the mean strength value in the fourth quintile is at least 25 for rate cells (15 for all cells) and the median strength value in the third quintile is at least 15 for rate cells (10 for all cells), then the model is likely to produce better forecasts.

These tables can also be used to compare median and mean strength counts by quintile. For a given quintile, if the mean strength count is much greater than the median strength count, then there are a few "very large" cells in the quintile that skew the mean strength value. In such cases, note that 50% of the cells within the quintile have strength values equal to or less than the median value. Alternatively, if the mean strength count is much less than the median strength count, then there are a few "very small" cells in the quintile that skew

the mean strength value. In such cases, note that 50% of the cells within the quintile have strength values that are equal to or greater than the median value.

What is the "Model Assessment"?

Based on the Mean Strength Per Cell, the proportion of Zero Cells, and strength distributions among Total and Nonzero cells, the Model Assessment determines if there are potential forecasting issues for the data elements chosen in the model. The assessment is provided using a simple Green-Yellow-Red scale, where Green indicates that no concerns regarding projection quality exist, Yellow indicates that moderate concerns exist, and Red indicates that strong concerns exist.

	Rate Cells			All Cells		
	Red	Yellow	Green	Red	Yellow	Green
Mean Strength	< 5	5-25	> 25	< 3	3-15	> 15
Proportion of Zero Cells	> 25%	n/a	0-25%	> 50%	n/a	0-50%
Total Cell Strength Distribution	Mean (Q4) < 25	Mean (Q4) >= 25 AND Median (Q3) < 15	Mean (Q4) >= 25 AND Median (Q3) >= 15	Mean (Q4) < 15	Mean (Q4) >= 15 AND Median (Q3) < 10	Mean (Q4) >= 15 AND Median (Q3) >= 10
Nonzero Cell Strength Distribution	Mean (Q4) < 25	Mean (Q4) >= 25 AND Median (Q3) < 20	Mean (Q4) >= 25 AND Median (Q3) >= 20	Mean (Q4) < 20	Mean (Q4) >= 20 AND Median (Q3) < 15	Mean (Q4) >= 20 AND Median (Q3) >= 15

In the Model Assessment Table above, Mean (Q4) refers to the mean strength value in the fourth quintile. Each quintile represents 20% of the cells in the model. The fourth quintile represents cells with strength values in the second largest segment, i.e., the 60-80th percentiles. Mean (Q4) can be found in the "Mean Statistics" table on the row labeled "4". Median (Q3) refers to the median strength value in the third quintile. The third quintile represents cells with strength values in the middle segment, i.e., the 40-60th percentiles. Median (Q3) can be found in the "Median Statistics" table on the row labeled "3".

Please note that these assessment "flags" do not necessarily validate or invalidate a given forecast. Instead, they simply provide an indication that the removal of one or more data elements from the rate or reported lists may produce a better forecast, or that additional elements might be added with little concern.