From datasets to resultssets in Stata

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Presented at the 10th UK Stata Users’ Group Meeting on 29 June 2004.

This presentation, including the handout and examples, can be downloaded from the conference website at
http://www.stata.com/support/meeting/10uk/
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- The term was coined by Nick Cox, who has used it a few times on Statalist.
- SAS users should note that Stata datasets do the job of SAS data sets, and Stata resultssets do the job of SAS output data sets.
- Stata resultssets may be saved to disk files, and/or written to the memory (overwriting any existing data), and/or simply listed to the Stata log and/or Results window.
Why resultssets?
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- The auto dataset has one observation per car model, and data on car attributes. The voter dataset has one observation per presidential candidate per income bracket, and data on numbers of votes.
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- To do this, they require datasets with one observation per table row, or per axis label, and usually produce them manually using spreadsheets.

- We will demonstrate alternative ways of producing such datasets in Stata.
Differences in mileage in the auto data (compared with US cars with a medium repair record of 3)

Car type:
- Domestic (n=48)
- Foreign (n=21)

Repair Record 1978:
- 1 (n=2)
- 2 (n=8)
- 3 (n=30)
- 4 (n=18)
- 5 (n=11)

Difference in mileage (mpg)
Differences in mileage in the auto data (compared with US cars with a medium repair record of 3)

- This confidence interval plot was created using the eclplot package.

![Confidence Interval Plot](image_url)
Differences in mileage in the auto data (compared with US cars with a medium repair record of 3)

- This confidence interval plot was created using the `eclplot` package.
- `eclplot` inputs a dataset with 1 observation per parameter, and data on estimates, confidence limits, and one more variable for the other axis.
Differences in mileage in the *auto* data (compared with US cars with a medium repair record of 3)

- This confidence interval plot was created using the *eclplot* package.
- *eclplot* inputs a dataset with 1 observation per parameter, and data on estimates, confidence limits, and one more variable for the other axis.
- It *cannot* create this plot directly using the original *auto* data.
Differences in mileage in the auto data (compared with US cars with a medium repair record of 3)

<table>
<thead>
<tr>
<th>Car group</th>
<th>Difference (mpg)</th>
<th>(95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car type:</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>(ref.)</td>
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</tr>
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<tr>
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<td>(−2.78, 6.62)</td>
<td>.42</td>
</tr>
<tr>
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<td>0.05</td>
<td>(−2.98, 3.07)</td>
<td>.98</td>
</tr>
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<tr>
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This table was produced using listtex, which produces TEX, HTML and Microsoft Word tables, and inputs a dataset with one observation per table row.
## Resultset-generating programs downloadable from SSC

The resultset contains:

<table>
<thead>
<tr>
<th>Program</th>
<th>one observation per...</th>
<th>and data on...</th>
</tr>
</thead>
<tbody>
<tr>
<td>descsave</td>
<td>variable</td>
<td>variable attributes</td>
</tr>
<tr>
<td>parmest</td>
<td>estimated parameter</td>
<td>parameter attributes</td>
</tr>
<tr>
<td>parmby</td>
<td>parameter per by-group</td>
<td>parameter attributes</td>
</tr>
<tr>
<td>xcollapse</td>
<td>by-group</td>
<td>basic summary statistics</td>
</tr>
<tr>
<td>xcontract</td>
<td>combination of variable values</td>
<td>frequencies and percentages</td>
</tr>
</tbody>
</table>

Official Stata resultset-generating programs include `collapse`, `contract`, `statsby`, `bootstrap`, `simulate`, and the utility `post`. 
example1.do: Demonstration of the resultsset-generating programs
descsave, parmby, xcollapse and xcontract
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- This example is one of a set, downloadable from the conference website at http://www.stata.com/support/meeting/10uk/ together with the overheads and the handout.
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- Each program inputs the auto dataset and writes a resultsset to the memory.
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together with the overheads and the handout.
- Each program inputs the auto dataset and writes a resultssset to the memory.
- We then describe the variables, and list the observations.
Common resultsset-destination options for resultsset-generating programs

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>list()</td>
<td>List the resultsset to the log or Results window</td>
</tr>
<tr>
<td>saving()</td>
<td>Save the resultsset to a disk file</td>
</tr>
<tr>
<td>norestore (or replace)</td>
<td>Write the resultsset to memory</td>
</tr>
<tr>
<td>fast</td>
<td>Fast version of norestore for programmers</td>
</tr>
<tr>
<td>flist()</td>
<td>Global macro accumulating saving() filenames</td>
</tr>
</tbody>
</table>

These options are not mutually exclusive.
Resultssets are frequently concatenated
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- The dsconcat package inputs a list of dataset files, and concatenates these datasets (or a subset of each dataset) into the memory.
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- This is very useful if we have multiple `parmby` resultssets for multiple models, and want to plot or tabulate the “interesting” parameters from all the models, discarding the “nuisance” parameters.
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- This ability is an advantage of the resultsset method over more “instant” complementary methods, using `estimates table`, `outreg` or `reformat`.
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- These complementary methods produce tables (but not plots) of results from a single model.
### Common resultsset-modifying options for resultsset-generating programs

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>rename()</td>
<td>Give variables in resultsset nondefault names</td>
</tr>
<tr>
<td>format()</td>
<td>Give variables in resultsset nondefault formats</td>
</tr>
<tr>
<td>idnum()</td>
<td>Value of numeric resultsset ID variable</td>
</tr>
<tr>
<td>idstr()</td>
<td>Value of string resultsset ID variable</td>
</tr>
<tr>
<td>by()</td>
<td>Specify by-groups</td>
</tr>
</tbody>
</table>

The `idnum()` and `idstr()` options are useful if multiple resultssets are concatenated. The `by()` option causes the resultsset to be “concatenated at birth”, with a “resultssubset” for each by-group.
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- Stata has the advantage over SAS of processing a whole dataset in memory.
- However, it can only do this with one dataset at a time.
- Therefore, Stata users who concatenate resultssets should know at least enough about macros to produce `tempfiles`.
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- We concatenate the files ‘`tf1`’ to ‘`tf9`’ into the memory to form a long resultsset, with one observation per variable per car type.
- We then `merge` in the `descsave` resultsset in ‘`tf0`’, adding variable labels.
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- I therefore developed the packages `sencode` and `sdecode` for string-numeric conversion, and `factext` and `factmerg` for string-factor conversion.
String-numeric conversion using sencode and sdecode
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- `sencode` and `sdecode` convert a single input variable to a single output variable, which may be *generated* as a new variable, or *replace* the input variable.
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- `sdecode` decodes a numeric variable to string, using value labels if possible and display formats otherwise.
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- Somers’ $D$ is related to the area $A$ under the sensitivity-specificity (or ROC) curve by the formula $D = 2A - 1$. 
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• We compare their performance as diagnostic predictors of the “condition” of non-US origin, using Somers’ $D$.

• Somers’ $D$ is related to the area $A$ under the sensitivity-specificity (or ROC) curve by the formula $D = 2A - 1$.

• The two performance measures are therefore equivalent, but Somers’ $D$ is positive for positive predictors, negative for negative predictors, and zero for non-predictors.
example3.do: Creating a plot and table using sencode and sdecode
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- We use somersd to estimate the Somers’ $D$ parameters, and save them in a parmby resultsset.
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- We use somersd to estimate the Somers’ $D$ parameters, and save them in a parmby resultsset.
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• We use somersd to estimate the Somers’ $D$ parameters, and save them in a parmby resultsset.

• This resultsset contains a variable label, containing the variable label of the predictor.

• Using sencode, we convert label to numeric, and produce a confidence interval plot.
example3.do: Creating a plot and table using sencode and sdecode

- We use `somersd` to estimate the Somers’ $D$ parameters, and save them in a `parmby` resultsset.
- This resultsset contains a variable `label`, containing the variable label of the predictor.
- Using `sencode`, we convert `label` to numeric, and produce a confidence interval plot.
- We then use `sdecode` to convert the confidence limits to string, and produce a confidence interval table.
String-factor conversion using factext and descsave
String-factor conversion using `factext` and `descsave`

- Many predictor variables are dummy variables for categorical factors, produced mainly by `xi`, with variable labels of the form "factor_name==value" which are stored in the label variable of `parmby` resultssets.
String-factor conversion using `factext` and `descsave`

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  "factor_name==value"
  which are stored in the `label` variable of `parmby` resultssets.

- `factext` inputs the `label` variable and generates a list of factors, with names from the left-hand side and values from the right-hand side.
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- `descsave` helps by writing a do-file to reconstruct the storage types, display formats, value labels, variable labels and characteristics of the variables described.

- `factext` runs this do-file to reconstruct the factors, which are then ready for use in confidence interval interval plots.
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- A multi-factor table, by contrast, usually has a *single* left column of row labels, containing information on all the factors.
- `factmerg` inputs a list of factors, and generates up to 3 string variables, containing the factors’ names, variable labels and string values.
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- A multi-factor table, by contrast, usually has a *single* left column of row labels, containing information on *all* the factors.
- `factmerg` inputs a list of factors, and generates up to 3 string variables, containing the factors’ names, variable labels and string values.
- These string variables can in turn be used to create row label variables for multi-factor tables. (Or for multi-factor plots.)
example4.do: Confidence interval plots using factext and factmerg
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• In the auto data, we use descsave to write a do-file to reconstruct the two factors foreign and rep78.

• We then fit a regression model predicting mpg from these two factors, storing the results in a parmby resultsset.
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- We then fit a regression model predicting mpg from these two factors, storing the results in a parmby resultssset.
- Using factext, we reconstruct these two factors in the resultssset, and draw a single-factor confidence interval plot.
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- In the auto data, we use descsave to write a do-file to reconstruct the two factors foreign and rep78.
- We then fit a regression model predicting mpg from these two factors, storing the results in a parmby resultsset.
- Using factext, we reconstruct these two factors in the resultsset, and draw a single-factor confidence interval plot.
- Using factmerg, we merge the two factors together, and draw a multi-factor confidence interval plot.
example4.do does not create this confidence interval plot
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- This plot has group frequencies as well as group names.
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- This plot has group frequencies as well as group names.
- It also has reference groups (US-made and medium-reliability cars).
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- This plot has group frequencies as well as group names.
- It also has reference groups (US-made and medium-reliability cars).
- It also has the factor names in gap rows, instead of repeating them.
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- This plot has group frequencies as well as group names.
- It also has reference groups (US-made and medium-reliability cars).
- It also has the factor names in gap rows, instead of repeating them.
- The first two improvements are enabled by xcontract, and the third by ingap.
example5.do: Creating the plot and table that we saw earlier
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- Our final example is an improved version of example4.do.
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- Before fitting the regression model, we create two xcontract resultssets, containing frequencies for the factors foreign and rep78.
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• Our final example is an improved version of example4.do.

• Before fitting the regression model, we create two xcontract resultssets, containing frequencies for the factors foreign and rep78.

• After fitting the regression model, we merge these two xcontract resultssets into the parmby resultsset.
example5.do: Creating the plot and table that we saw earlier

- Our final example is an improved version of example4.do.
- Before fitting the regression model, we create two xcontract resultssets, containing frequencies for the factors foreign and rep78.
- After fitting the regression model, we merge these two xcontract resultssets into the parmby resultsset.
- We generate the row label variable cargp (car group), this time using ingap to insert gap rows.
**Differences in mileage in the auto data (compared with US cars with a medium repair record of 3)**

<table>
<thead>
<tr>
<th>Car group</th>
<th>Difference (mpg)</th>
<th>(95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car type:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic (n=48)</td>
<td>0.00</td>
<td>(ref.)</td>
<td></td>
</tr>
<tr>
<td>Foreign (n=21)</td>
<td>3.56</td>
<td>(0.32, 6.80)</td>
<td>.032</td>
</tr>
<tr>
<td>Repair Record 1978:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (n=2)</td>
<td>1.92</td>
<td>(−2.78, 6.62)</td>
<td>.42</td>
</tr>
<tr>
<td>2 (n=8)</td>
<td>0.05</td>
<td>(−2.98, 3.07)</td>
<td>.98</td>
</tr>
<tr>
<td>3 (n=30)</td>
<td>0.00</td>
<td>(ref.)</td>
<td></td>
</tr>
<tr>
<td>4 (n=18)</td>
<td>0.81</td>
<td>(−2.06, 3.68)</td>
<td>.57</td>
</tr>
<tr>
<td>5 (n=11)</td>
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*example5.do* may seem a complicated way to create a small plot and table. *However*, economies of scale become important with large plots and tables, multiple plots and tables, or multiple versions of the same plots and tables.
From datasets to resultssets in Stata

In this survey, we have learned about:
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All these programs are downloadable from SSC. The overheads, handout and example do-files can be downloaded from the conference website at http://www.stata.com/support/meeting/10uk/