PSTAT 130

SAS BASE PROGRAMMING

- Lecture 2 -

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Objectives

- The PRINT Procedure
  - Syntax
  - Obs. column
  - Variable selection
  - Observation selection/Subset data
  - Column headers
  - Formats
  - Misc. options

The PRINT Procedure

- What is the purpose of the PRINT procedure?

The PRINT Procedure

- Simplest form

```
proc print;
run;
```

- Which data set does this procedure use?

- When do we use this?

The PRINT Procedure

- For a particular SAS data set

```
proc print data=stresstest;
run;
```

- Which data set does this procedure use?
- Does this produce any output?
- What if we modify the file name to `data1.stresstest`?

Default Properties

- Displays observation numbers
- Displays all variables contained in the data set
- Displays all observations contained in the data set
- Uses variables as column headers
- Displays variable values in their “native” format

Suppress the Obs. Column

- By default, `PROC PRINT` displays an observation column – i.e. row numbers on the left side of the report
- The `NOOBS` option suppresses this column
- General form of the `NOOBS` option:

```
PROC PRINT DATA=SAS-data-set NOOBS;
RUN;
```

Suppress the Obs. Column

- How do we suppress the observation column in the following report?

```
proc print data=data1.stresstest;
run;
```

Suppress the Obs. Column

- Specify the NOOBS option in the PROC PRINT statement, as seen below:

```
proc print data=data1.stresstest noobs;
run;
```

Variable Selection

- By default, `PROC PRINT` displays all variables in the data set
- The `VAR` statement gives you the power to change that – you can
  - Select the variables to include in the report
  - Define the order of the variables in the report
- General form of the `VAR` statement

```
VAR variable(s);
```

Variable Selection

- Let's take a look at the `stresstest` data set again
  - All Variables: `ID, Name, RestHR, MaxHR, RecHR, TimeMin, TimeSec, Tolerance, Date`
- Suppose we only want to display
  - `Name, MaxHR, RestHR`
- We could modify the code as follows

```
proc print data=data1.stresstest;
   var Name MaxHR RestHR;
run;
```

Variable Selection Example

- Example:
  - For the data set `empdata` (found in the library `data1`), print only the salary and last names of the employees (in that order).

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```
proc print data=data1.empdata;
  var Salary LastName;
run;
```

Observation Selection

- By default, `PROC PRINT` displays all the observations in the data set

- What if we only want a **subset** of data?
  - Ex: In the `stresstest` data set, suppose we are interested in finding individuals with a max heart rate of 170 or more

Observation Selection

- The `WHERE` statement
  - enables you to select observations that meet a certain condition
  - can be used with most SAS procedures

Observation Selection

- General form

```
WHERE where-expression;
```

  - `where-expression` is a sequence of operands and operators

Operands include

  - variables or constants

Operators include

  - comparison operators
  - logical operators
  - special operators
  - functions

Observation Selection

- Thus we can use the `WHERE` statement to control which observations are processed

- Previous example:
  - In the `stresstest` data set, we were interested in finding individuals with a max heart rate of 170 or more

Observation Selection

- Thus we can use the `WHERE` statement to control which observations are processed

- Previous example:
  - In the `stresstest` data set, we were interested in finding individuals with a max heart rate of 170 or more

```
proc print data=data1.stresstest noobs;
  where MaxHR>=170;
run;
```

Observation Selection Example

- Example:
  - For the data set `empdata` (in the library `data1`), print only employees who are Flight Attendants

Observation Selection Example

- Example:
  - For the data set `empdata` (in the library `data1`), print only employees who are Flight Attendants

```
proc print data=data1.empdata;
  var JobCode EmpID Salary;
  WHERE JobCode = 'FLTAT';
run;
```

Comparison Operators

Mnemonic Equivalent	Symbol	Definition	Example
EQ	=	equal to	where empnum eq 3374;
NE	^= ~= <>	not equal to	where status ne fulltime;
GT	>	greater than	where hiredate gt '01jun1982'd;
LT	<	less than	where empnum < 2000;
GE	>=	greater than or equal to	where empnum >= 3374;
LE	<=	less than or equal to	where empnum <= 3374;
IN		equal to one from a list of values	where state in ('NC','TX');

- Character comparisons are case-sensitive
- The IN operator allows commas or spaces to separate arguments

Observation Selection Examples

- Print only people under 40
  - `WHERE Age __ 40;`
  - `WHERE Age __ 40;`
  - `WHERE Age __ 39;`
  - `WHERE Age __ 39;`

Observation Selection Examples

- Print only adults
  - `WHERE Age __ 18;`
  - `WHERE Age __ 18;`
  - `WHERE Age __ 17;`
  - `WHERE Age __ 17;`

Observation Selection Examples

- Print only women
  - `WHERE sex __ 'F';`
  - `WHERE sex __ 'F';`
  - `WHERE sex __ 'M';`
  - `WHERE sex __ 'M';`

Logical Operators

- AND (&)
  - If both expressions are true, then the compound expression is true
  - Examples:

```
where JobCode='FLTAT' and Salary>50000;

where JobCode='FLTAT' & Salary>50000;
```

Logical Operators

- OR (|)
  - If either expression is true, then the compound expression is true
  - Examples:

```
where JobCode='PILOT' or JobCode='FLTAT';

where JobCode='PILOT' | JobCode='FLTAT';
```

Logical Operators

- NOT (^ or ~)
  - Can be combined with other operators to reverse the logic of a comparison
  - Examples:

```
where JobCode not in('PILOT','FLTAT');

where JobCode ^ in('PILOT','FLTAT');
```

Special Operators

- Additional special operators supported by the `WHERE` statement are
  - `BETWEEN - AND`
  - `CONTAINS (?)`
  - `LIKE`
  - `SOUNDS LIKE`
  - `IS MISSING` (or `IS NULL`)

Special Operators

- BETWEEN – AND
  - selects observations in which the value of the variable falls within a range of values, inclusively.

```
where Salary between 50000 and 70000;
```

⇔

```
where 50000 <= Salary <= 70000;
```

- CONTAINS (?)
  - selects observations that include the specified substring

```
where LastName ? 'LAM';
```

(LAMBERT, BELLAMY, and ELAM are selected)

  - Contrast **In** and **?**

Special Operators

- `LIKE` selects observations by comparing character values to specified patterns
- `LIKE` uses two "wildcard" symbols
  - a percent sign (`%`) replaces any number of characters
  - an underscore (`_`) replaces one character
- Example

```
where Code like 'E_U%';
```

  - Selects observations where the value of Code begins with an E, followed by a single character, followed by a U, followed by any number of characters

Special Operators

- The `SOUNDS LIKE (=*)` operator selects observations that contain spelling variations of the word or words specified.

```
where Name=*'SMITH';
```

  - Selects names like SYMTHE or SMITT

- `IS NULL` or `IS MISSING` selects observations in which the value of the variable is missing

```
where Flight is missing;
where Flight is null;
```

- You can use the `NOT` logical operator to select non-missing values.

Column Headers

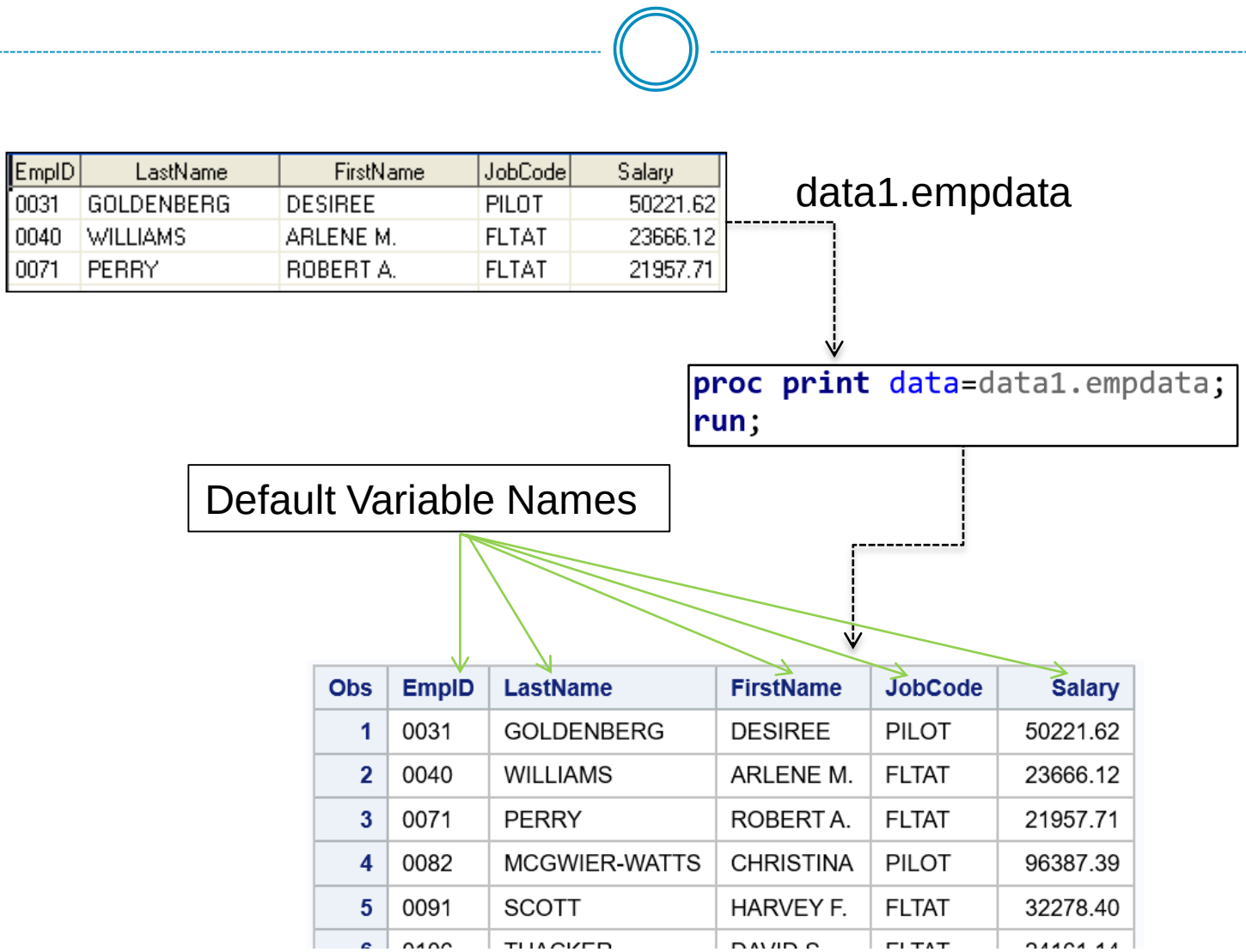
- By default, `PROC PRINT` uses variable names as column headers
- Assigning labels to variables replaces these variables as column headers
- General form of the `LABEL` statement

```
LABEL   variable1='label1'
        variable2='label2';
```

- Example

```
LABEL  Units='Number of Units'
       DOB='Date of Birth';
```

Assign Column Labels



Assign Column Labels

EmpID	LastName	FirstName	JobCode	Salary
0031	GOLDENBERG	DESIREE	PILOT	50221.62
0040	WILLIAMS	ARLENE M.	FLTAT	23666.12
0071	PERRY	ROBERT A.	FLTAT	21957.71

data1.empdata

```
proc print data=data1.empdata label;
        label LastName='Last Name'
              FirstName='First Name'
              Salary='Annual Salary';
run;
```

Obs	EmpID	Last Name	First Name	JobCode	Annual Salary
1	0031	GOLDENBERG	DESIREE	PILOT	50221.62
2	0040	WILLIAMS	ARLENE M.	FLTAT	23666.12
3	0071	PERRY	ROBERT A.	FLTAT	21957.71
4	0082	MCGWIER-WATTS	CHRISTINA	PILOT	96387.39
5	0091	SCOTT	HARVEY F.	FLTAT	32278.40
6	0106	THACKER	DAVID S.	FLTAT	24161.14

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data1.empdata

```
proc print data=data1.empdata split=' ';
        label LastName='Last Name'
              FirstName='First Name'
              Salary='Annual Salary';
run;
```

Obs	EmpID	Last Name	First Name	JobCode	Annual Salary
1	0031	GOLDENBERG	DESIREE	PILOT	50221.62
2	0040	WILLIAMS	ARLENE M.	FLTAT	23666.12
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6	0106	THACKER	DAVID S	FLTAT	24161.14

Non-native Formats

- By default, `PROC PRINT` displays variable values in their "native" formats

- What does this mean?
  - In the data set `stresstest`, the variable `date` had the mm/dd/yy format specified in the data set. Hence all the dates were displayed in that "native" format.

- How can we change this?
  - We will find out in the next lecture!

Request Column Totals

- The SUM statement produces column totals for numeric variables
- General form of the SUM statement

```
SUM variable(s);
```

- Example

```
proc print data=data1.empdata noobs;
    var JobCode EmpID Salary;
    sum Salary;
run;
```

(Note: the SUM statement also produces subtotals if you print the data in groups.)

Display Number of Observations

- The N option in PROC print allows you to
  - Print the number of observations in the data set
  - Specify explanatory text to print with the number

- General form of the N option

```
PROC PRINT … N<='explanatory text'>;
```

- Example

```
proc print data=data1.empdata N;
run;
```

Class Exercise 1

- Create a SAS data set called Stocks that contains the variables: Ticker, Open, Close, Volume (in millions)
- Use the following data:

  BAC 29.95 29.58 68.19
  FB 174.25 176.07 28.34
  GOOG 1028.10 1024.38 1.35
  HABT 10.20 10.25 0.64
  TSLA 298.57 301.15 8.82
  TWTR 30.00 30.55 22.48

- Output the data set – suppress the observation numbers

Class Exercise 2

- Create a report using the **`credit`** data set in the data1 folder.
  - Select the following variables
    - Name Transaction
  - Change the column headers as follows
    - `Name = 'Client Name'`
    - `Transaction = 'Transaction Amount'`
  - Suppress the observation numbers
- Aside: can we display the total transaction amount?