ABSTRACT
Finding daylight saving time is a common task for manipulating time series data. The date of daylight saving time changes every year. If SAS® programmers depend on manually entering the value of daylight saving time in their program; the maintenance of the program becomes tedious.

Using SAS function can easily find daylight saving time. This paper discusses several ways to capture and utilize daylight saving time.

INTRODUCTION
Analysts at Southern Company analyze a variety of electricity data to understand their customers’ electricity consumption. Often times, analysts will need to identify the Daylight Saving Time for a specific calculation. Daylight saving time (DST) is in effect from the second Sunday of March at 2 a.m. (local time) to the first Sunday of November at 2 a.m. (local time). It does not fall on a fixed calendar date.

The easiest way to code is for the user to input the date range for DST manually. This makes the programs extremely difficult to maintain. If the inexperienced user forgets to input the correct date range, the calculation results will be incorrect. The best solution is to use SAS program to identify date range of the DST without entering the dates manually.

DYNAMICALLY FINDING DAYLIGHT SAVING TIME
Function NWKDOM returns the date for the nth occurrence of a weekday for the specified month and year. Currently, daylight saving time in the United States begins at 2:00 a.m. on the second Sunday of March and ends at 2:00 a.m. on the first Sunday of November.

The following syntax shows how to use the function NWKDOM to find the daylight saving time is in the year 2017:

```
year=2017;

dst_beg= nwkdom(2, 1, 3, year);  \rightarrow DST begin date

dst_end= nwkdom(1, 1,11, year);  \rightarrow DST end date
```

STORE DAYLIGHT SAVING TIME IN DATA
The above code only works for a specific year. To make the program capable of identifying any given year, we can create a data set with a wide range of years:

```
data a;
  format dst_beg dst_end mmddyy10.;
do year=2000 to 2100;
  dst_beg= nwkdom(2, 1, 3, year);
  dst_end= nwkdom(1, 1,11, year);
output;
end;
run;
```

Table 1 shows the first five records of data A. This table can serve as a look-up table to inner join with the time series data.
Table 1. The First Five Records of Data A

<table>
<thead>
<tr>
<th>DST_BEG</th>
<th>DST_END</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/12/2000</td>
<td>11/05/2000</td>
<td>2000</td>
</tr>
<tr>
<td>03/10/2002</td>
<td>11/03/2002</td>
<td>2002</td>
</tr>
<tr>
<td>03/09/2003</td>
<td>11/02/2003</td>
<td>2003</td>
</tr>
<tr>
<td>03/14/2004</td>
<td>11/07/2004</td>
<td>2004</td>
</tr>
</tbody>
</table>

STORE DAYLIGHT SAVING TIME IN MACRO

Although programmers can use the data merge or SQL join with the time series data by date, there are other ways to identify DST without using the step of data join. One of them is to store the begin and end date of DST into macro variables. The following coding creates two macro variables, MAR_DST and NOV_DST:

```sas
proc sql noprint;
select dst_beg format=best16. into : mar_dst
   separated by ','
from a;
select dst_end format=best16. into : nov_dst
   separated by ','
from a;
quit;
```

I can use these two macro variables in the data step or a SQL query when I need to manipulate data for DST.

Following is an example that I use to calculate the mean of KW on the end date of DST:

```sas
proc sql;
create table novavg as
select meter_number, date, hour, mean(kw) as kw
from meter_reading
where date in (&nov_dst)          /* use macro variable NOV_DST */
group by meter_number, date, hour
order by meter_number, date, hour;
quit;
```

STORE DAYLIGHT SAVING TIME IN FORMAT

Besides using the macro variables to capture begin and end dates of DST, using SAS format is also a good option to bypass the data join.

The following code creates a data set called FMT. Variable START is the start date of DST in March. Variable END is the end date of DST in November. The value of variable LABEL is ‘.’ The last record is the value that does not fall in the range of START and END. By using PROC FORMAT CNTLIN option, format DST is created.

```sas
data fmt(drop=year);
   attrib hlo length=$1
   start end format=mmddyy10.;
   fmtname="dst";
   type="N";
   do year=2000 to 2100;
       start= nwkdom(2, 1, 3, year);
       end= nwkdom(1, 1, 11, year);
```
The last record has an ‘O’ for the variable HLO. This is for the date value not in the range of ‘START’ and ‘END.’

<table>
<thead>
<tr>
<th>HLO</th>
<th>START</th>
<th>END</th>
<th>FMTNAME</th>
<th>TYPE</th>
<th>LABEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/10/2097</td>
<td>11/03/2097</td>
<td>Dst</td>
<td>N</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>03/09/2098</td>
<td>11/02/2098</td>
<td>Dst</td>
<td>N</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>03/08/2099</td>
<td>11/01/2099</td>
<td>dst</td>
<td>N</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>03/14/2100</td>
<td>11/07/2100</td>
<td>dst</td>
<td>N</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td></td>
<td>dst</td>
<td>N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. The Last Five Records of Data FMT

If I want to have the time series data when DST is in effect, I can use a PUT statement to identify which records are within the date range of DST:

```sas
data dst_reading;
set meter_reading;
where put(date, dst.)='*';
run;
```

CONCLUSION

Finding the Daylight Saving Time used to be a chore. Thanks to many functions that SAS provides, programmers can now combine different techniques to make their programs more robust. Even though it will take more time to plan a well written code instead of entering the values manually, the end result is that a new program is created that can be easily maintained.

REFERENCES

Rick Wicklin, “Spring forward, fall back: Using SAS to compute the onset of daylight saving time” The DO Loop, Statistical programming in SAS with an emphasis on SAS/IML programs. Available at


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CONTACT INFORMATION

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