HIGH/LOW GRAPHS

Graphs for Ranges of Values

- Some of SGPLOT's plotting statements are for graphs that plot a range of values for each point.
- High-Low
  - Creates lines or bars that cover the spread of two values (nominally maximum and minimum values).
  - Can include two other values—named open and close.

- Band
  - Also plots a range of values for each point (lower and upper).
  - Creates a shaded, continuous area (or band) as a plot

- Either type can use the x or y-axis as the plotting range for the independent variable

Basic High-Low Plot

- The "traditional" arena for high-low plots is stock returns—SASHELP.STOCKS is set up directly for this type of plot. With a bit of sub-setting, here is code for a basic high-low plot:

```
proc sgplot data=sashelp.stocks;
     highlow x=date low=low high=high;
     where stock eq 'IBM' and date between '01JAN2000'd and '31DEC2005'd;
run;
quit;
```

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```

Exactly one of X or Y is required—this will be taken as the independent variable.

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```

Each of low and high must be specified from separate columns in the data. So the data must be pre-summarized; these are not computed.

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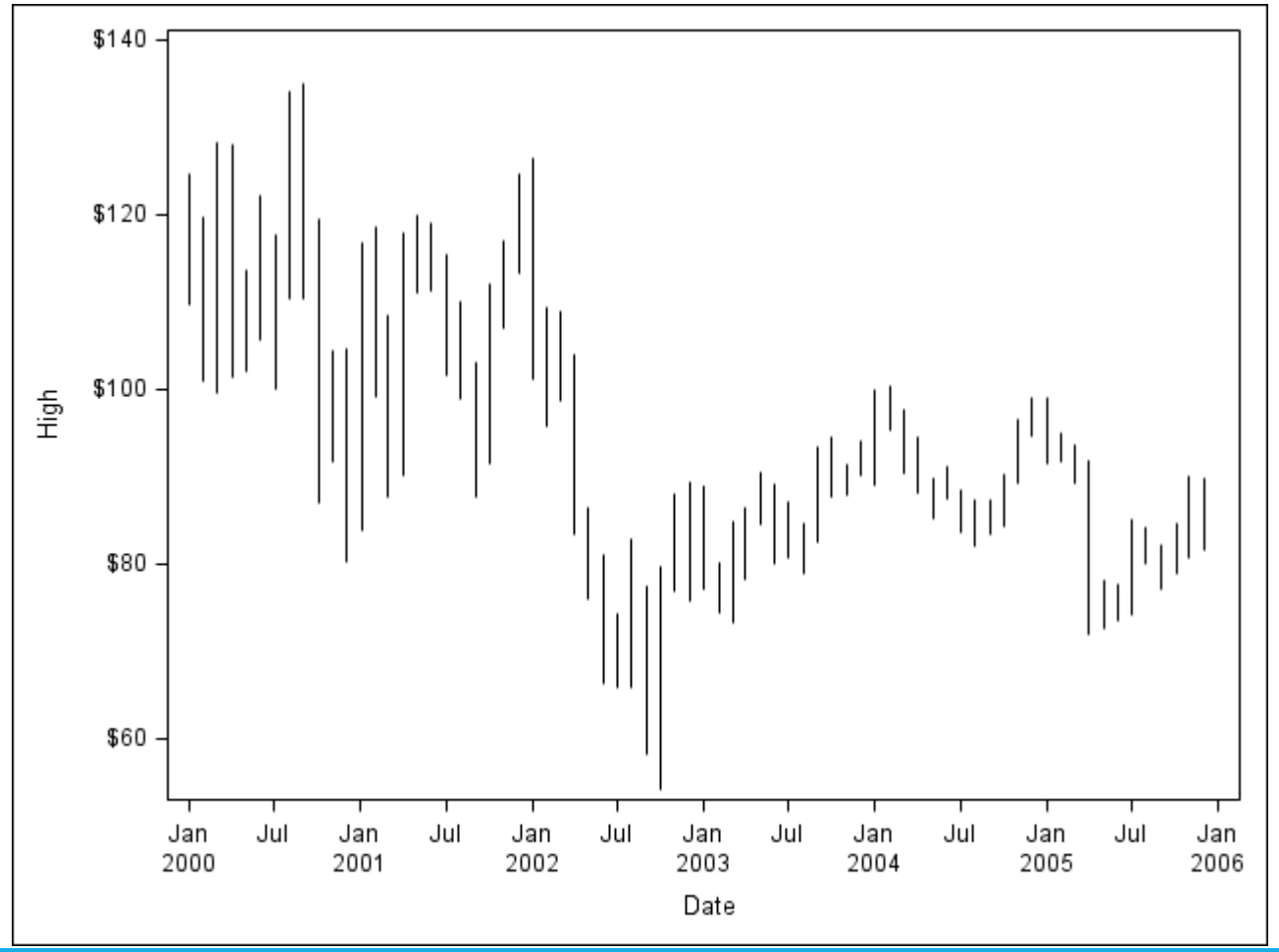
     highlow x=date low=low high=high;
     where stock eq 'IBM' and date between '01JAN2000'd and '31DEC2005'd;
run;
quit;
```

So the high and the low do not really need to be maximum and minimums, they simply need to establish a set that is reasonable as a range.

Basic High-Low Plot

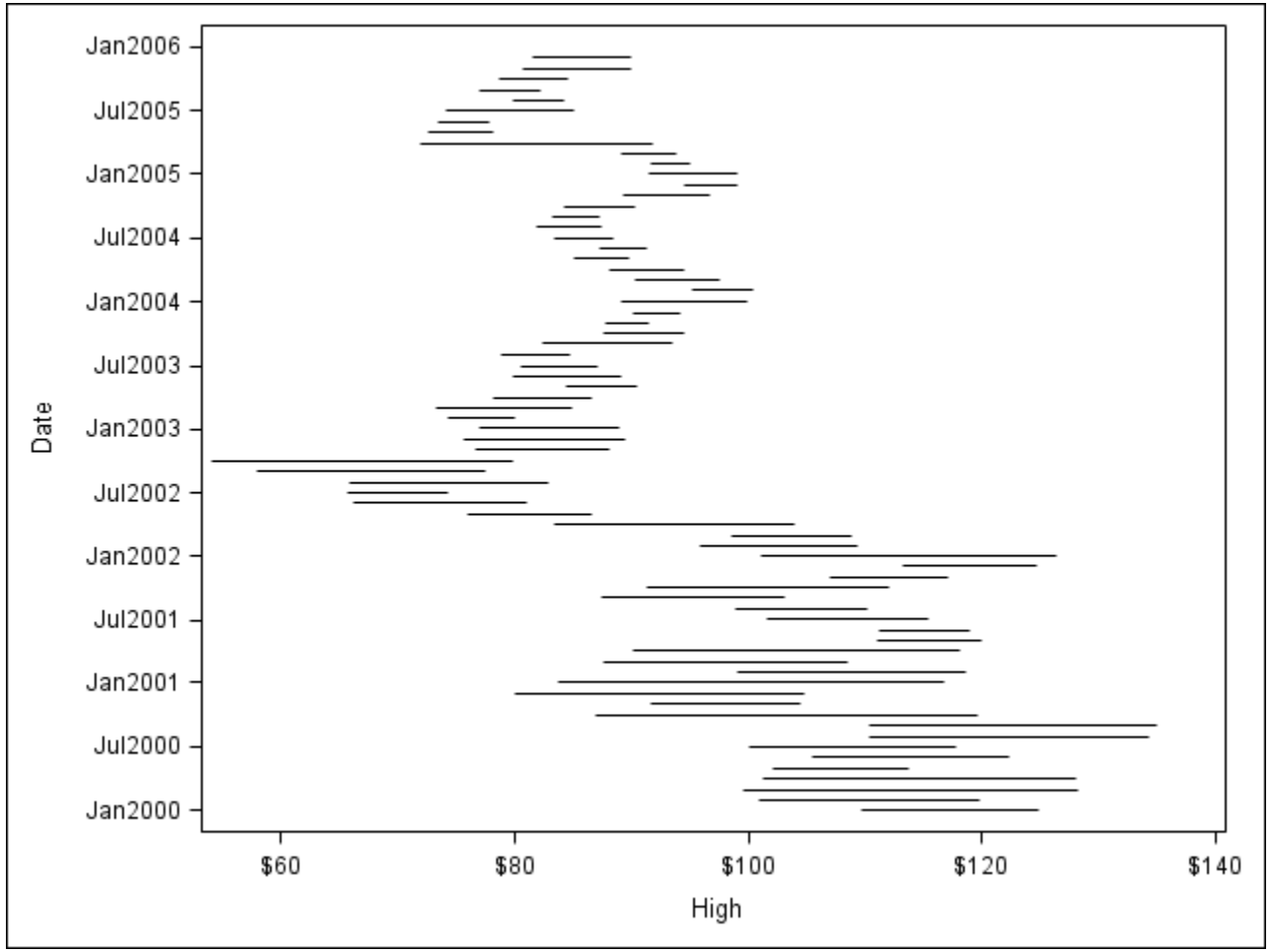


Basic High-Low Plot

- Swapping y in for x changes the orientation of the plot:

```
proc sgplot data=sashelp.stocks;
     highlow y=date low=low high=high;
     where stock eq 'IBM' and date between '01JAN2000'd and '31DEC2005'd;
run;
quit;
```

Basic High-Low Plot



Open and Close

- Given the relationship between this type of plot and stock data, options for opening and closing values are also included:

```
proc sgplot data=sashelp.stocks;
     highlow x=date low=low high=high/open=open close=close;
     where stock eq 'IBM' and date between '01JAN2000'd and '31DEC2005'd;
run;
quit;
```

Open and Close

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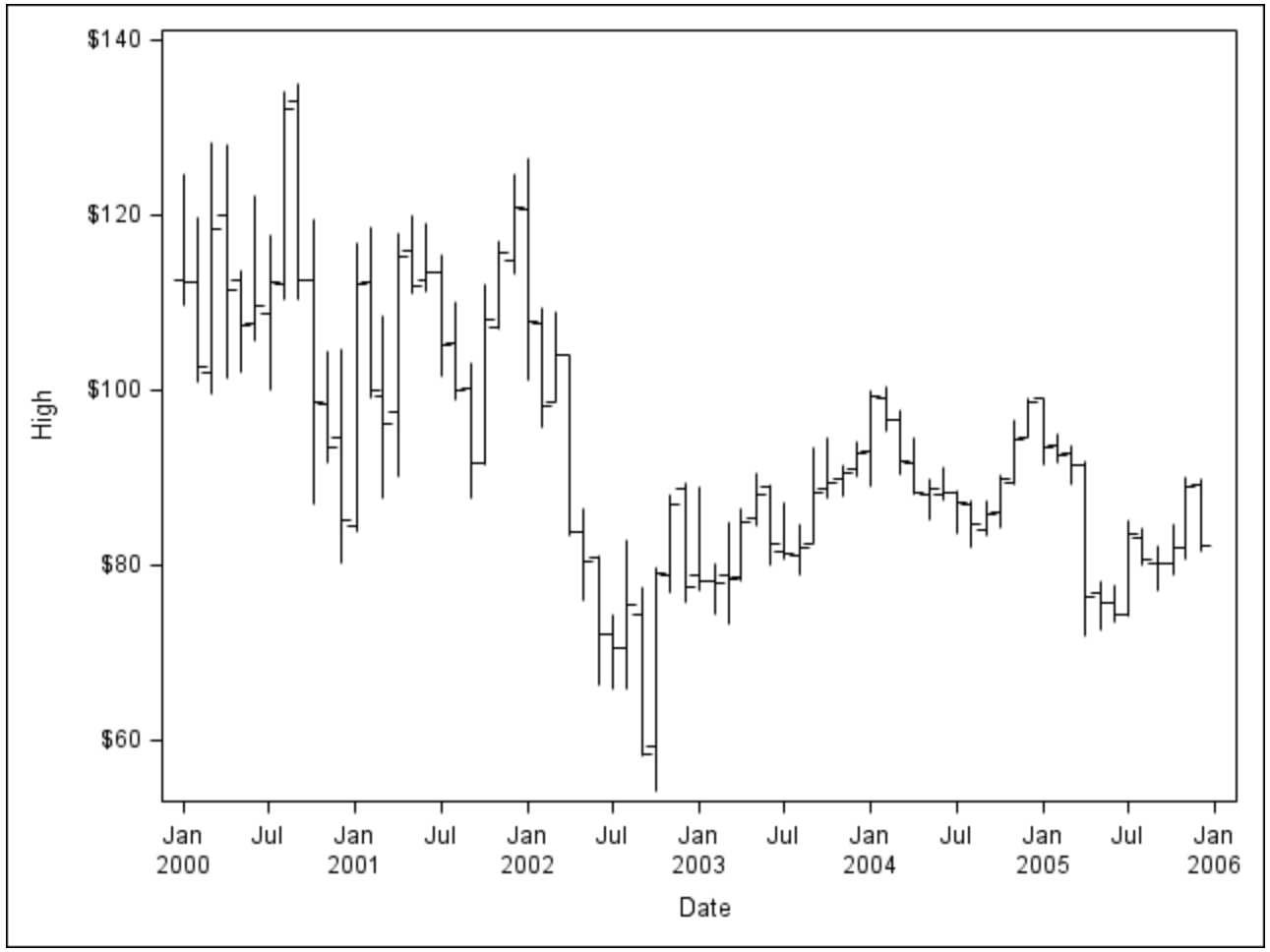
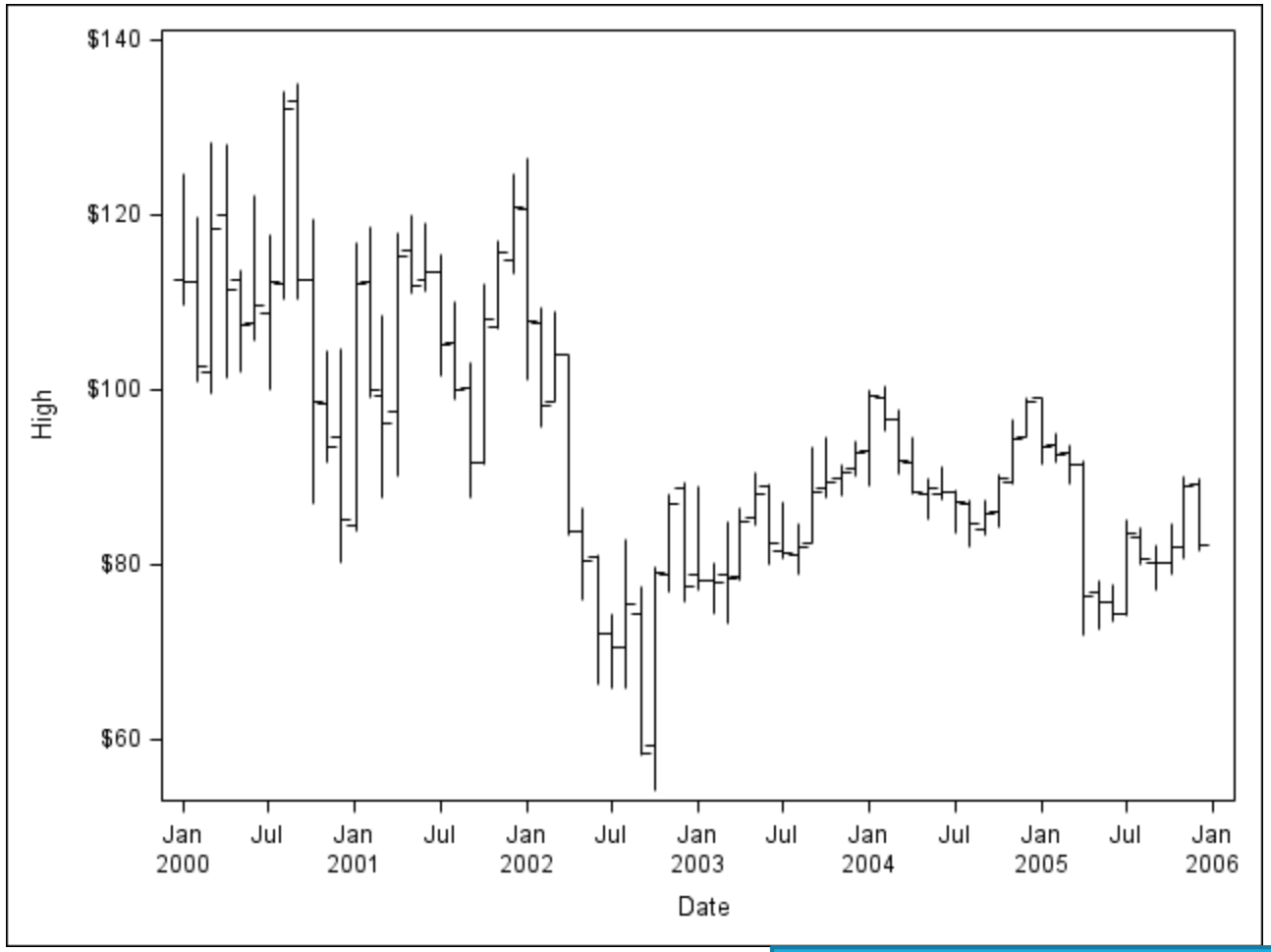
```
proc sgplot data=sashelp.stocks;
     highlow x=date low=low high=high/open=open close=close;
     where stock eq 'IBM' and date between '01JAN2000'd and '31DEC2005'd;
run;
quit;
```

While opening and closing values are often critical when looking at stock prices, for an arbitrary data set these can be basically any values you would like to highlight. Again, they must be columns in the data set.

Open and Close



Open and Close



Even in daily stock prices, due to after hours trading, these do not necessarily align.

Summarizing for a High-Low

- PROC MEANS, PROC SQL and others can be very helpful for setting up data for a high-low plot:

```
ods listing close;
proc means data=sashelp.cars min max mean median;
          class type;
          var mpg_city;
          ods output summary=cars;
run;
ods listing;
proc sgplot data=cars;
          highlow x=type low=mpg_city_min high=mpg_city_max
                    /open=mpg_city_mean close=mpg_city_median;
          yaxis label='MPG City';
          footnote j=left 'Left Hash: Mean; Right Hash: Median';
run;
quit;
```

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          highlow x=type low=mpg_city_min high=mpg_city_max
                    /open=mpg_city_mean close=mpg_city_median;
          yaxis label='MPG City';
          footnote j=left 'Left Hash: Mean; Right Hash: Median';
run;
quit;
```

MIN and MAX are obvious for low and high, but something like q1 and q3 would have been reasonable.

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          class type;
          var mpg_city;
          ods output summary=cars;
run;
ods listing;
proc sgplot data=cars;
          highlow x=type low=mpg_city_min high=mpg_city_max
                    /open=mpg_city_mean close=mpg_city_median;
          yaxis label='MPG City';
          footnote j=left 'Left Hash: Mean; Right Hash: Median';
run;
quit;
```

MEAN and MEDIAN are not a close analogy to open and close, but we can still make some use of them.

Summarizing for a High-Low

- PROC MEANS, PROC SQL and others can be very helpful for setting up data for a high-low plot:

```
ods listing close;

proc means data=sashelp.cars min max mean median;

          class type;

          var mpg_city;

          ods output summary=cars;

run;

ods listing;

proc sgplot data=cars;

          highlow x=type low=mpg_city_min high=mpg_city_max

                    /open=mpg_city_mean close=mpg_city_median;

          yaxis label='MPG City';

          footnote j=left 'Left Hash: Mean; Right Hash: Median';

run;

quit;
```

Using the naming conventions for MEANS, these variables can be established.

Summarizing for a High-Low

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```
ods listing close;

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          class type;

          var mpg_city;

          ods output summary=cars;

run;

ods listing;

proc sgplot data=cars;

          highlow x=type low=mpg_city_min high=mpg_city_max

                    /open=mpg_city_mean close=mpg_city_median;

          yaxis label='MPG City';

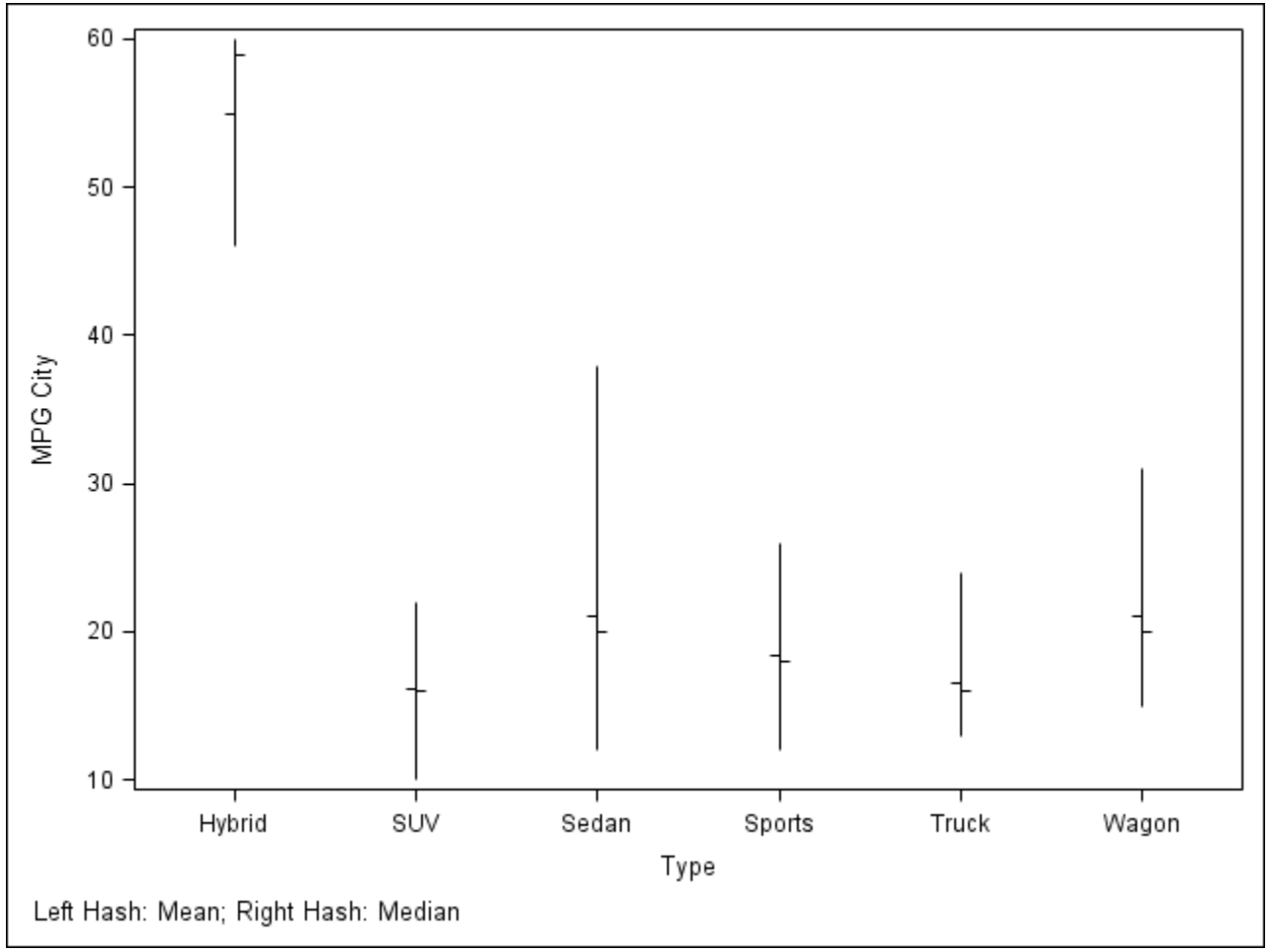
          footnote j=left 'Left Hash: Mean; Right Hash: Median';

run;

quit;
```

Since open and close are being used in a very different way, somehow that should be conveyed to the viewer.

Summarizing for a High-Low

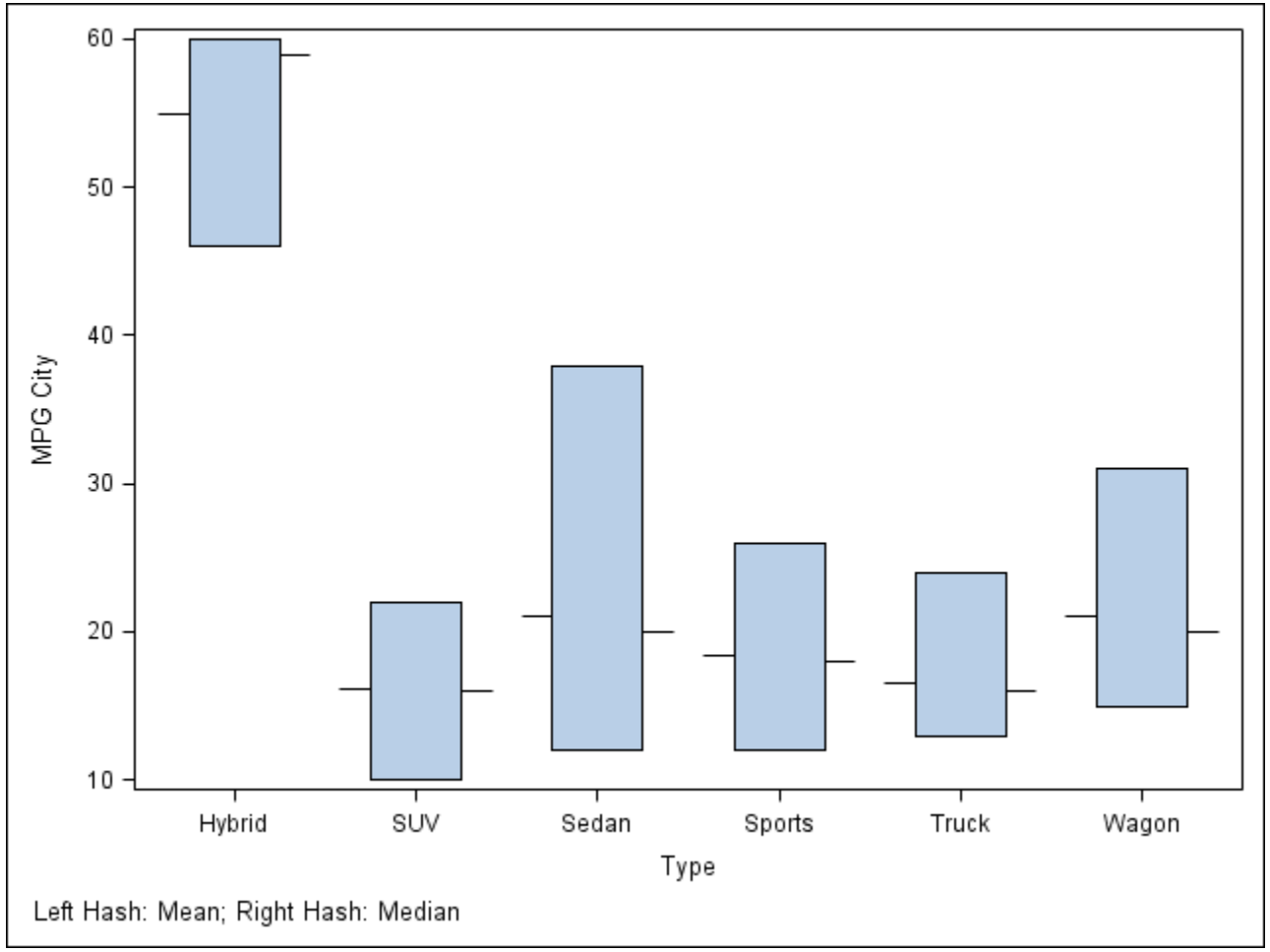


TYPE= Option

- Lines are traditional for this type of graph, but bars (or floating bars are possible, too):

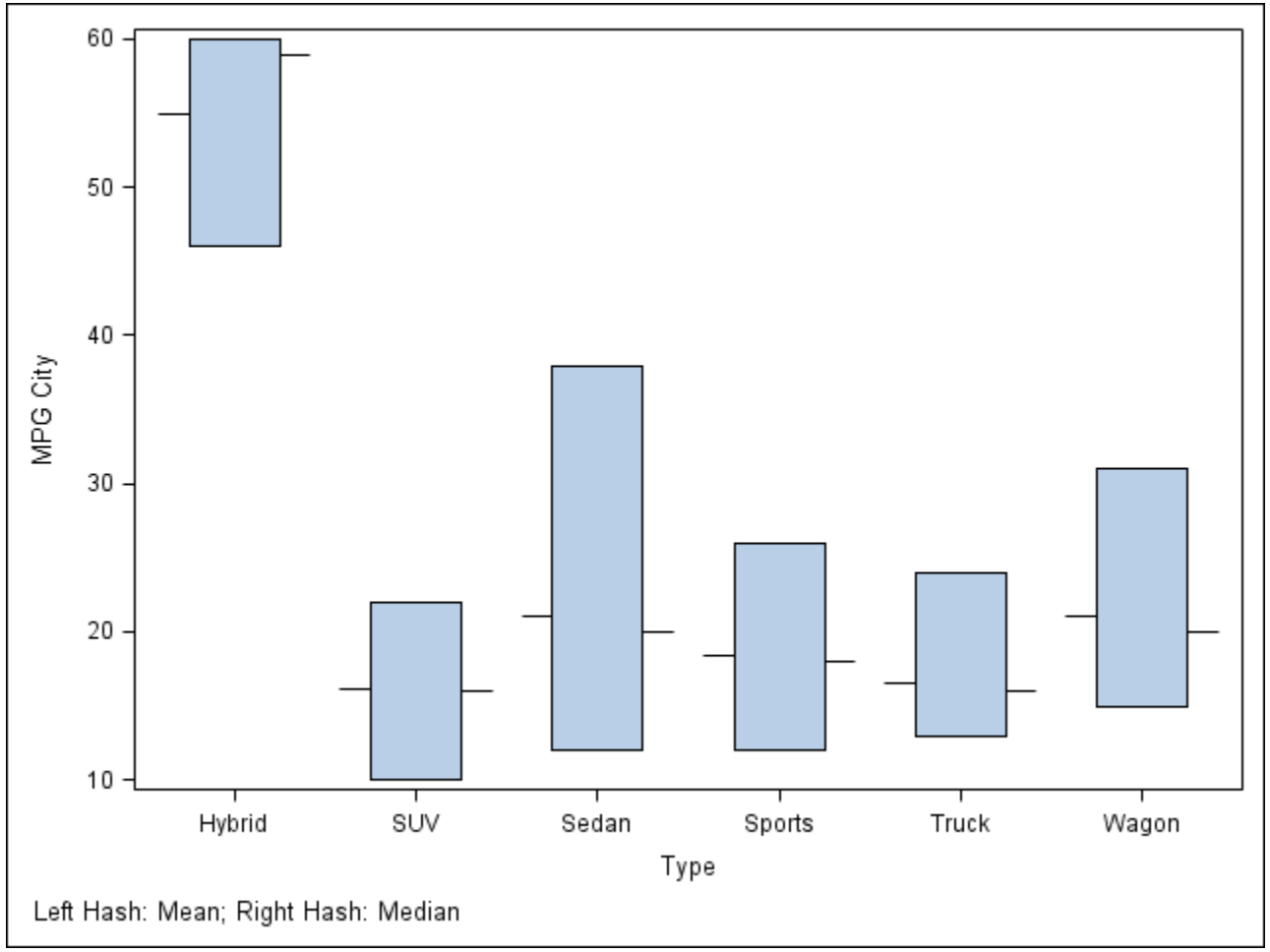
```
ods listing;
proc sgplot data=cars;
	highlow x=type low=mpg_city_min high=mpg_city_max
		/open=mpg_city_mean close=mpg_city_median  type=bar;
	yaxis label='MPG City';
	footnote j=left 'Left Hash: Mean; Right Hash: Median';
run;
quit;
```

TYPE= Option


60
50
40
30
20
10
MPG City
Hybrid
SUV
Sedan
Sports
Truck
Wagon
Type
Left Hash: Mean; Right Hash: Median

TYPE= Option

So some of the bar options discussed previously are available when TYPE=BAR.

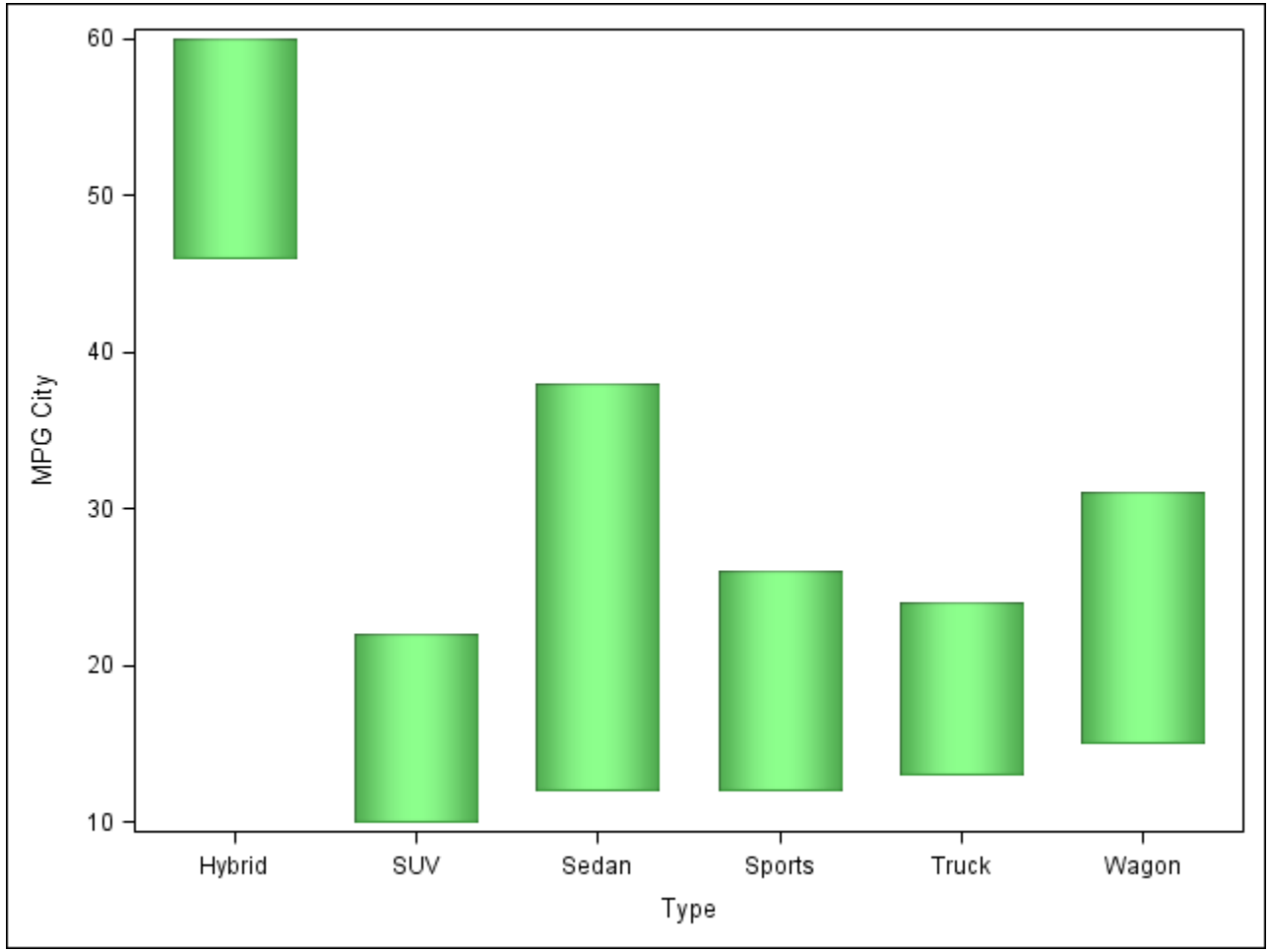


TYPE= Option

- Some previously used bar options:

```
ods listing;
proc sgplot data=cars;
      highlow x=type low=mpg_city_min high=mpg_city_max
            /type=bar dataskin=pressed fillattrs=(color=cx66FF66) barwidth=0.7;
      yaxis label='MPG City';
run;
quit;
```

TYPE= Option


60
50
40
30
20
10
MPG City
Hybrid
SUV
Sedan
Sports
Truck
Wagon
Type

Line Options

- When using the default (line) type, some basic attributes are controlled by lineattrs:

```
ods listing;

proc sgplot data=cars;

      highlow x=type low=mpg_city_min high=mpg_city_max

            /open=mpg_city_mean close=mpg_city_median lineattrs=(color=blue
                  thickness=1.5mm);

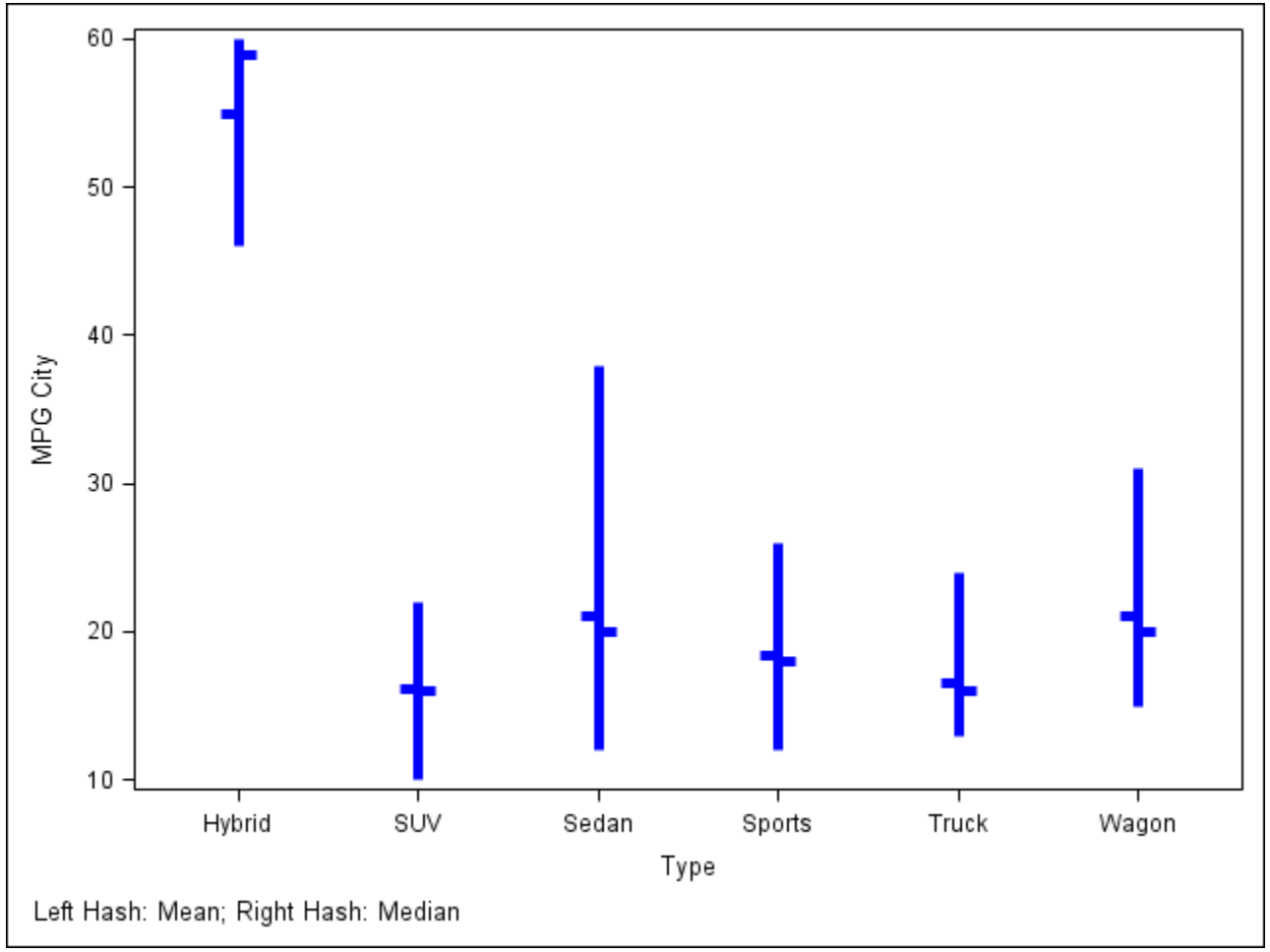
      yaxis label='MPG City';

      footnote j=left 'Left Hash: Mean; Right Hash: Median';

run;

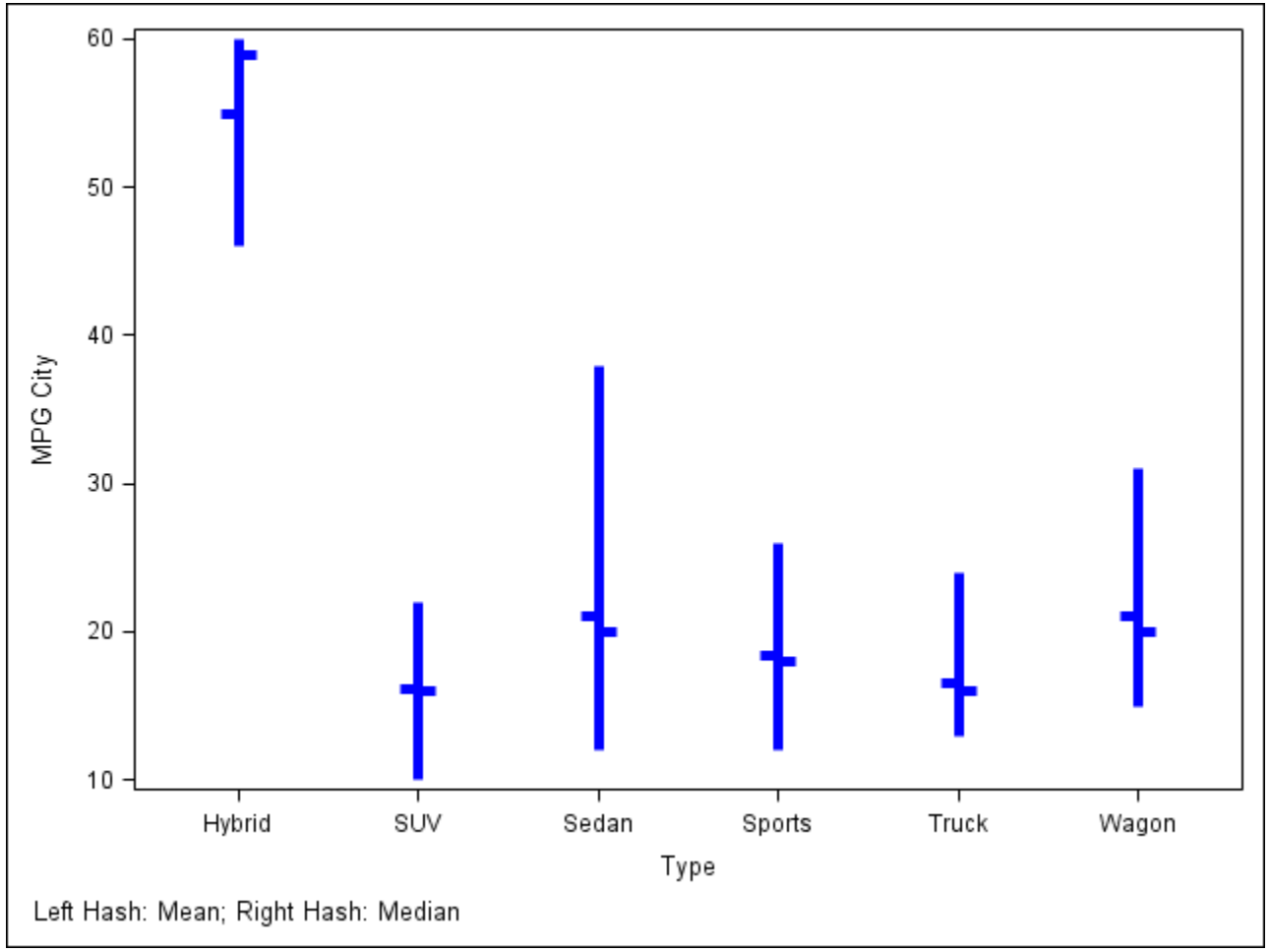
quit;
```

Line Options



Line Options

So if the open and close lines are used with the bars, lineattrs will still control those attributes.

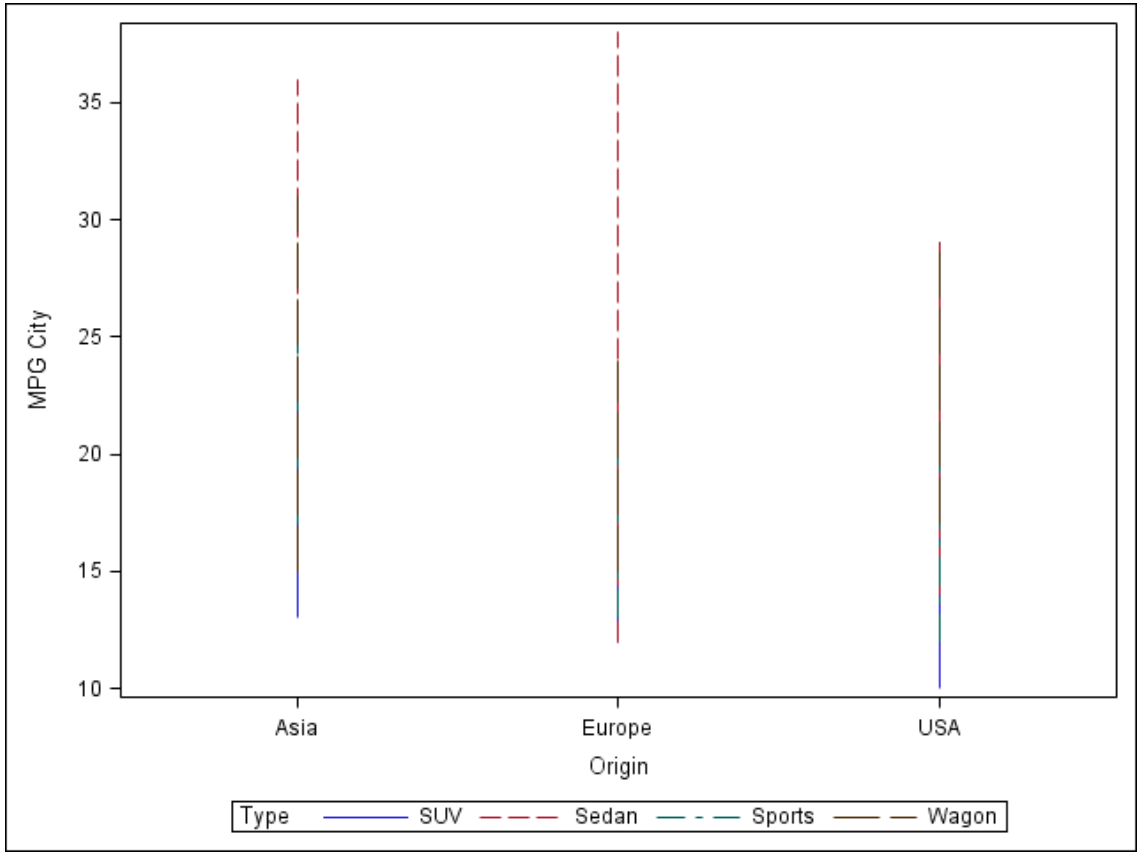


Grouping

- High-Low plots support grouping. Re-summarizing the cars data to include origin as a class:

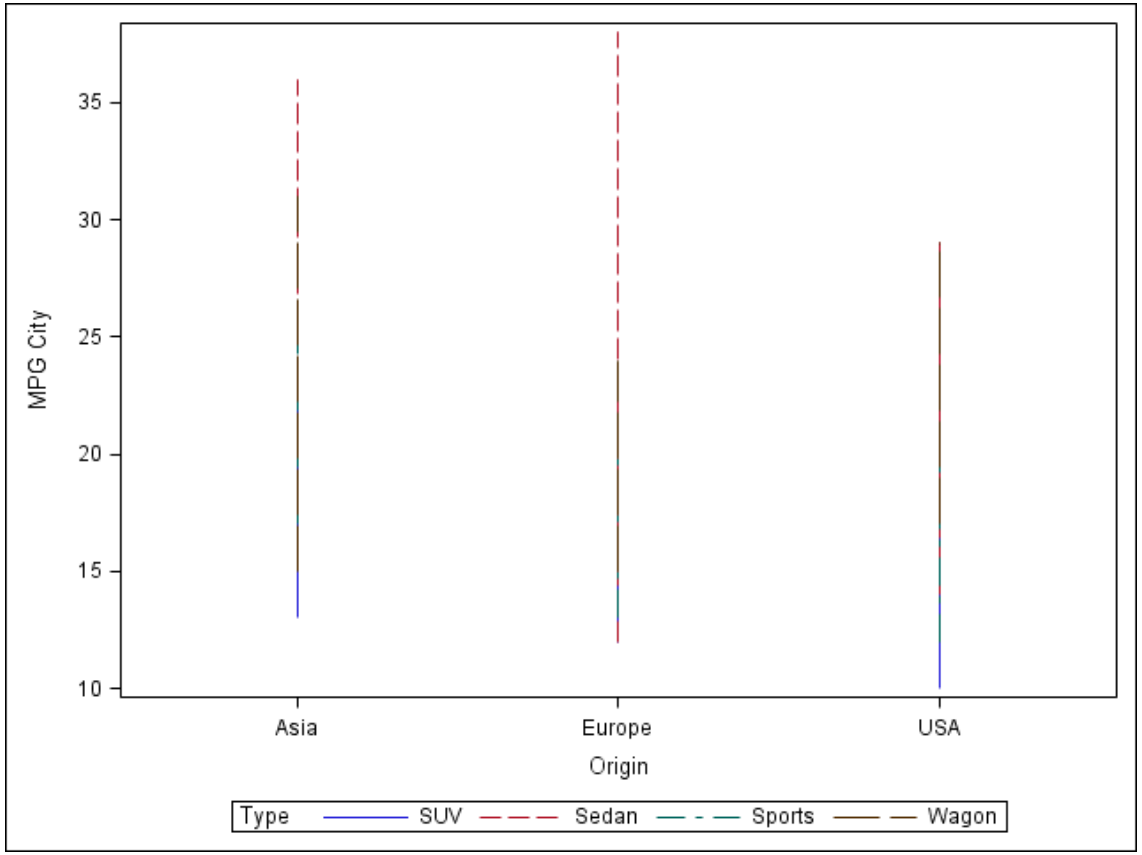
```
ods listing;
proc sgplot data=cars;
      highlow x=origin low=mpg_city_min high=mpg_city_max
            /group=type;
      yaxis label='MPG City';
      where type not in ('Hybrid','Truck');
run;
quit;
```

Grouping


35
30
25
20
15
10
MPG City
Asia
Europe
USA
Origin
Type
SUV
Sedan
Sports
Wagon

Grouping

Pretty awful—default is to stack these as it does for bar charts. Usually a bad idea.

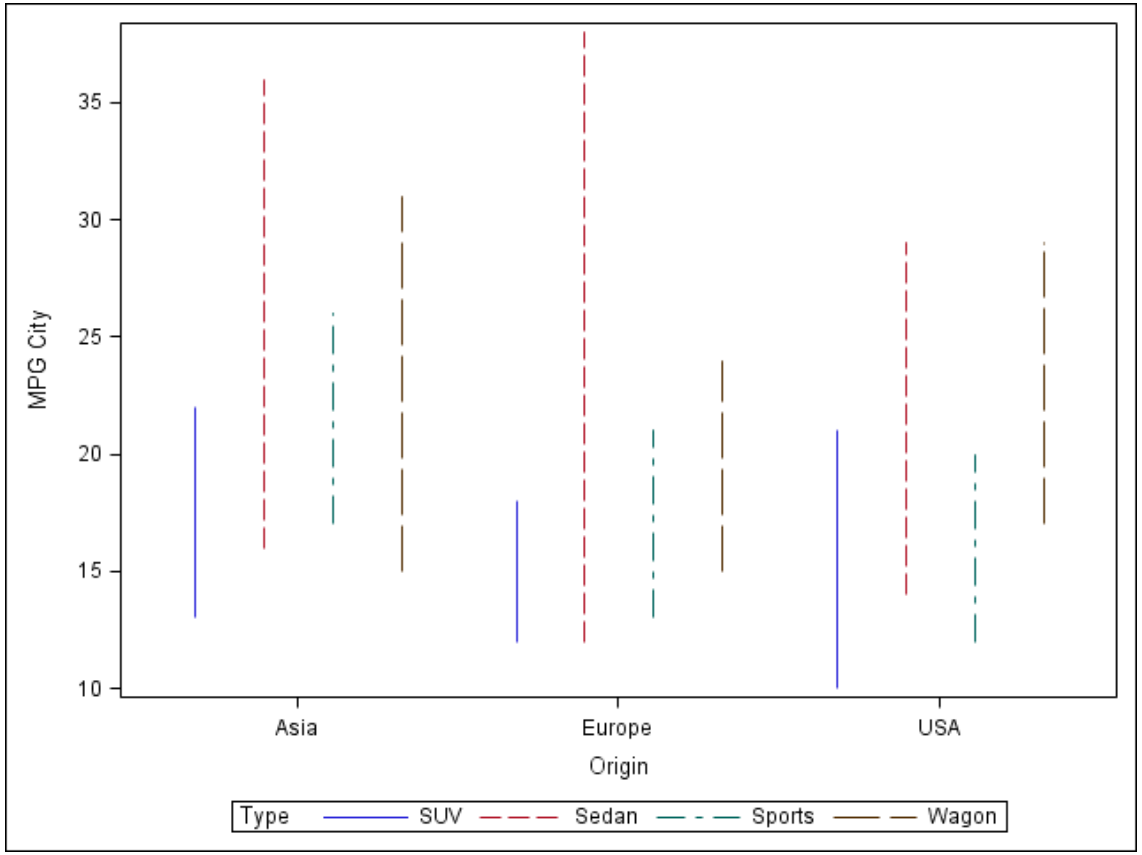


Grouping

- GROUPDISPLAY is available as an option again:

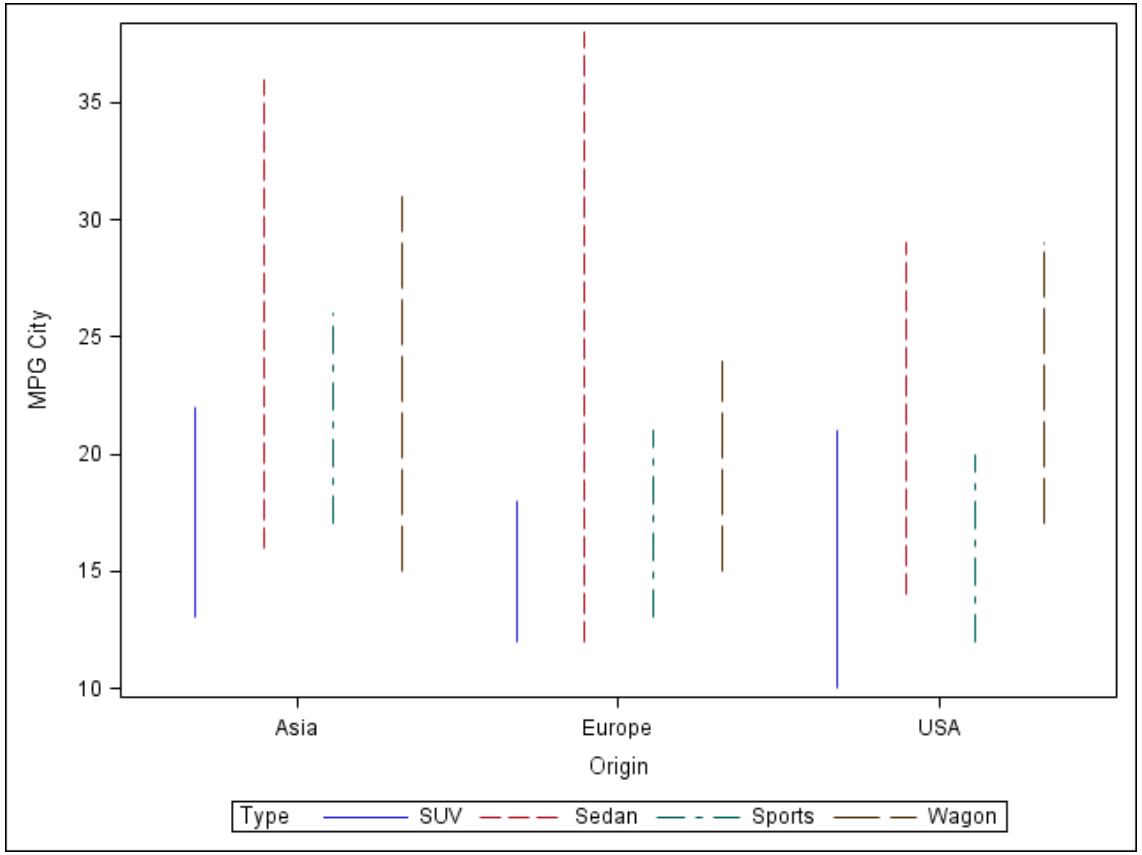
```
ods listing;
proc sgplot data=cars;
      highlow x=origin low=mpg_city_min high=mpg_city_max
            /group=type groupdisplay=cluster;
      yaxis label='MPG City';
      where type not in ('Hybrid','Truck');
run;
quit;
```

Grouping


MPG City
35
30
25
20
15
10
Asia
Europe
USA
Origin
Type
SUV
Sedan
Sports
Wagon

Grouping

Better, but…

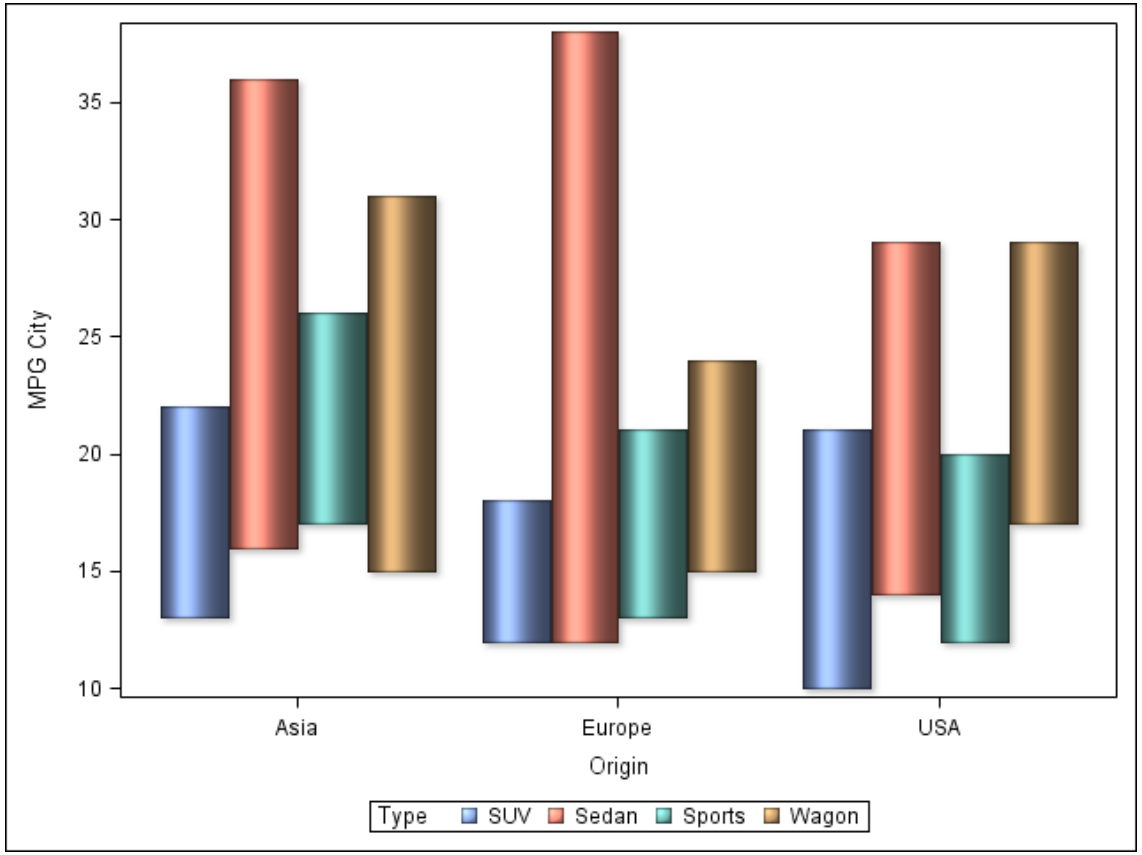


Grouping

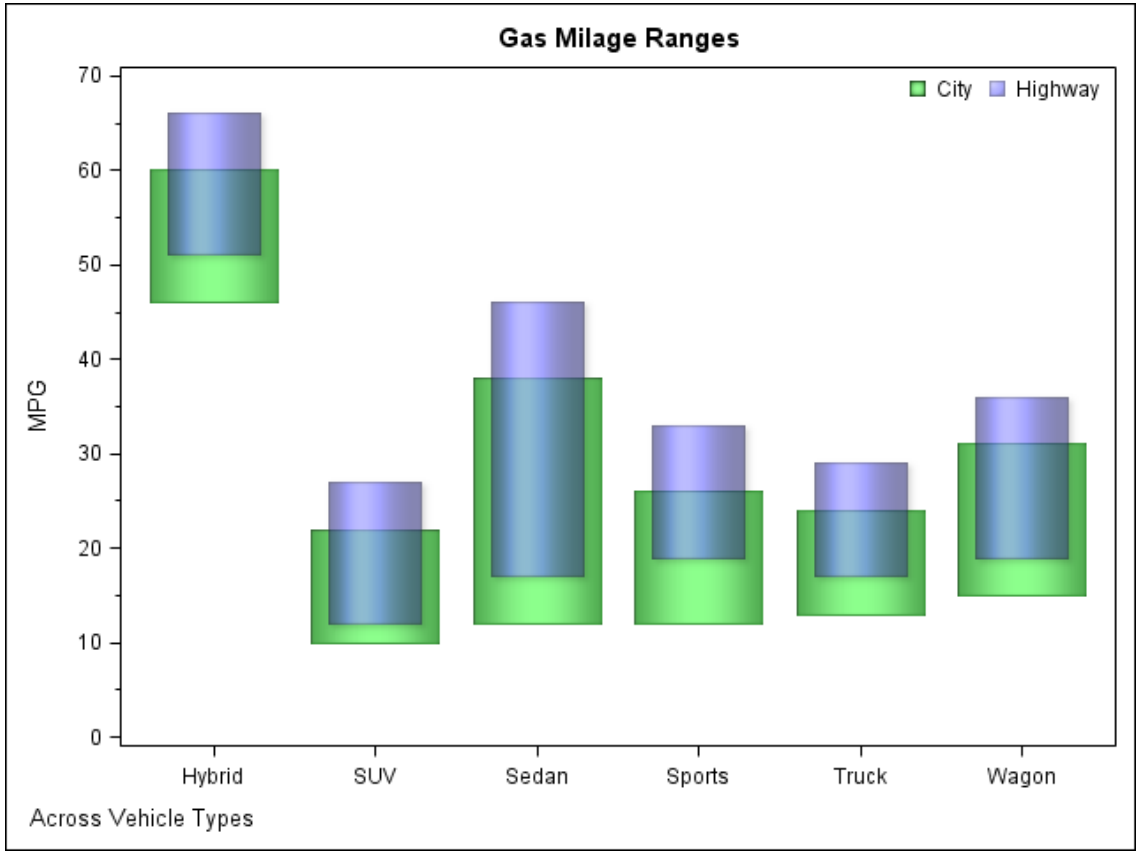
- Grouping works with bars, too:

```
ods listing;
proc sgplot data=cars;
      highlow x=origin low=mpg_city_min high=mpg_city_max
            /group=type groupdisplay=cluster type=bar dataskin=sheen;
      yaxis label='MPG City';
      where type not in ('Hybrid','Truck');
run;
quit;
```

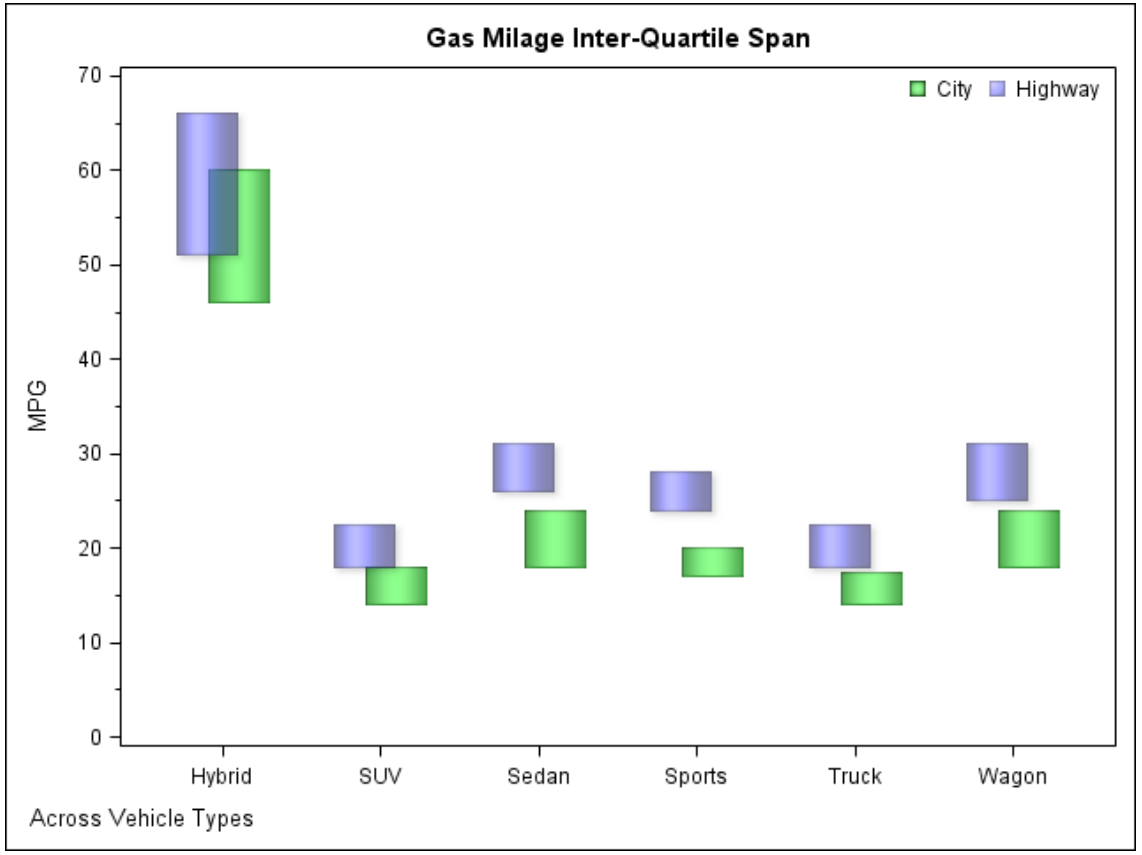
Grouping


MPG City
35
30
25
20
15
10
Asia
Europe
USA
Origin
Type
SUV
Sedan
Sports
Wagon

Exercise 1


Gas Milage Ranges
City
Highway
70
60
50
40
30
20
10
0
MPG
Hybrid
SUV
Sedan
Sports
Truck
Wagon
Across Vehicle Types

Exercise 2


Gas Milage Inter-Quartile Span
City
Highway
70
60
50
40
30
20
10
0
MPG
Hybrid
SUV
Sedan
Sports
Truck
Wagon
Across Vehicle Types