

%TREND: A Macro to Produce Maximally Informative Trend Charts with SAS/GRAPH®, SAS®, and ODS for the Web or Hardcopy

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Abstract

Graphs accelerate decision-making, numbers assure reliable decision-making. Axis tick-marks and values are no substitute for annotation of trend plot points. The POINTLABEL option on the SYMBOL statement provides PROC GPLOT annotation, but labels may overlay the line. The %TREND macro not only more often provides collision-free annotation, but also supports optional sparse annotation, which is focused, communication-effective annotation of y-values only for start, end, and any intermediate minimum and/or maximum of the trend. For a dense jagged plot, even %TREND may suffer line-label collisions if you need full annotation, rather than sparse. For the web, %TREND provides flyover text for all intermediate points, instead of permanent annotation. Unfortunately, flyover text is non-printable, and “annotates” only one point at a time. For the web, %TREND also supports drill-down to a printable macro-generated table, with the row for the clicked point highlighted. Essential for hardcopy when the plot is too dense for full annotation, %TREND optionally produces a sparsely annotated plot above with a table below, and the page can be output to a PDF file or an HTML file. %TREND is operating-system-independent, and was developed using Release 8.2 of SAS.

Introduction

This paper provides a design and a tool optimized for trend line presentation in several ways: (a) online via the web; (b) in a hardcopy paper or report (e.g., with MS Word), or in a PowerPoint presentation; and (c) for same-image-everywhere display or print with Acrobat Reader. There are options for web plot with flyover text and drill-down to a drill-point-highlighted table, or plot with companion table, or plot only.

If you wish to annotate a trend line without %TREND, you must consult the manual, study fifteen POSITION options for the Annotate facility, and program the plot. However, it may require numerous frustrating iterations where some of your annotated y-values intersect the line, until you assign the POSITION exactly right for every data point—at least for today’s data. Instead of doing that, you can use %TREND with any data, and expect a collision-free annotated trend line for every data point.

Technical and Design Aspects of the Macro and Its Output

Avoiding Collisions Between Annotation and the Plot Line.

For an example of the collisions that the POINTLABEL option can produce, see Figure 1. %TREND examines each sequence of three points and two segments to determine where to put the annotated value. The input data set used in this paper is designed to exercise %TREND with all thirteen possibilities for the slope of two successive segments: up, more steeply up; up, up with the same slope; up, up less steeply; up, flat; flat, up; down; down, flat; flat, flat; flat, down; down, more steeply down; down, down with the same slope; down, down less steeply; down, up. Also, %TREND puts the value for the starting point to the left of the line, and the value for the ending point to the right. Figure 2 shows that %TREND works. In the SAS log, there is a message about an error detected in the Annotate data set. It is caused by a trick used to annotate the plot starting point, and there is no defect in the output.

Sparse Annotation. (See Figure 3.) Annotation of only the start, end, minimum, and maximum y values never suffers collisions with the trend line, no matter how jagged or dense it may be. For the macro output options that do not include provision of a table, full annotation is always an option.

Dynamic Detail Access on the Web. (See Figures 4A and 4B.) Flyover text and drill-down rely on the html= option on the PLOT statement. html= references a variable that contains the href= assignment for hyperlinks and the alt= assignments for flyover text. Return to the plot page from any drill-down table page relies on the link= option in the FOOTNOTE statement. Rather than using a shared drill-down table, each plot point links to a separate table of the same data, with the drilled row highlighted. Highlighting uses custom-built “background color formats” and the background= assignment on the VAR statement in PROC PRINT.

Coding and Usage Differences for a PDF. The PDF plot-table composite imbeds the plot as an ODS “preimage” in the table output area. (See Figure 5.) The plot is built with SAS/GRAPH, using either the jpeg, png, or gif driver. If the ODS-internal graphic driver for PDF output were used, the graph could be located only below the table, inverting the normal presentation order for a graph plus table.

ODS PDF output files in Version 8.2 are huge. (In Version 9, the files will be compressed.) With the gif driver, files are more than twice as big as with the jpeg or png driver. The jpeg and png drivers are limited to creating images 3.631 inches high and 6.474 inches wide—impractical for complex graphs.

Though the graph can use the TrueType fonts that are also available for web (html) tables, an ODS PDF table and its titles and footnotes are limited to Windows fonts listed in a certain SAS registry (see macro invocation comments in Appendix 1). In Version 9, ODS PDF will be able to use TrueType fonts.

ODS Style Used for Web and PDF. The macro automatically builds the authors’ recommended “styles.our_trend_style” and “styles.pdfimagefortable”. There is no style override feature in the macro. The user can easily modify the macro source code to use any user-preferred style (see comments in the macro code).

How To Use the Macro

The %TREND macro works with *typical* trend data, which has only one value of y for any x. It is not for a “Step Chart”. A use of the macro other than those shown here requires testing for suitability and reliability. To use the macro, you must specify your data (data=), an x variable (x=) and y variable (y=) with their labels (xlabel= and ylabel=), and formats (xformat= and yformat=), remembering that the format for the x variable must produce fixed width output. Also, you must specify:

- the kind of annotation (annotype=), which can be *sparse* (annotation for only the start, end, minimum, and maximum y values) or *full* (annotation for all y values)
- the method of supplying detail (method=):
dynamic: a sparsely annotated plot with flyover text and drill-down links to drill-point highlighted tables
composite: sparsely annotated plot and table on one page

onlyanno: a sparsely or fully annotated plot and no table environment for which you wish to create the output (target=), which can be the web (html files), a PDF file, or an EMF file

- the folder (path=) where the macro will save the output
- the file name for the trend file (trendfile=), without the extension that is supplied by the macro.

Conclusions

%TREND reliably and communication-effectively provides trend image and detail, for important media: (a) hardcopy papers and reports published with MS Word, or MS PowerPoint presentations; (b) information published via Internet or Intranet; and (c) appearance-preserving PDF publication for display and print with Adobe Acrobat. Annotation is collision-resistant when fully annotated, and collision-proof when sparsely annotated. And there is the macro option of a static plot-table composite.

Related Reading

The %TREND web functions derive from joint work by the authors, published in these Proceedings as “Show Your Graphs and Tables at Their Best on the Web with ODS”. %TREND uses design principles enunciated by Bessler in a long series of papers, and in these Proceedings in “Inform and Influence with Image and Data: Communication-effective Web Design for ODS, SAS, and SAS/GRAPH”. For technical software details, see the vendor-provided hardcopy and online documentation. See, also, the vendor’s “Books By Users” series, which includes “Output Delivery System: The Basics” by Lauren Haworth and “Annotate: Simply the Basics” by Art Carpenter, and books on macros, one by Art Carpenter, the other by Michele M. Burlew.

How To Contact the Authors

Your comments, questions, and suggestions are welcome.

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Appendix 1. Macro Source Code and Example Invocations

```
%macro TREND(data=,
x=, y=, xlabel=, ylabel=, yformat=, xformat=,
annotype=sparse, /* option of FULL if target=EMF */
annofont='Verdana', annosize=1.00, annocol=CX000000,
annofmt=2., annolen=2,
plt_ttlfoot_font=Georgia, plt_ttlfoot_size=14 pt,
tbl_ttlfoot_font=Georgia, tbl_ttlfoot_size=10 pt,
tbl_heading_font=Georgia, tbl_heading_size=10 pt,
```

```
tbl_data_font =Georgia, tbl_data_size =10 pt,
tablespacing=3, /* the SAS-shipped default is 7 */
tableframe=void, /* set =box to get a frame */
titleend=, /* optional ending text for TITLE1.
start of TITLE1 is macro-built from xlabel & ylabel*/
ttl2text=, /* text for optional TITLE2 */
showallx=, /* YES to force tickmark values for all x,
otherwise only for start,end,min,max y */
target=,
emfgopts=, /* recommend you supply hsize, vsize, hpos,
vpos when target=EMF (see example invocation code) */
pdfgraphtype=jpg, /* specification of jpg, png, or gif
is MANDATORY when target=PDF */
/* following three options available when target=PDF */
pdfauthor=, pdfsubject=, pdfkeywords=,
method=,
/* if target=WEB, method= DYNAMIC or COMPOSITE;
if target=PDF, method=COMPOSITE is forced;
if target=EMF, method=ONLYANNO is forced. */
xpixels=563, ypixels=422, /* when using target=WEB with
1024 X 768 display resolution, these are good values */
path=,
trendfile=,
bodyttl=); /* optional: use for WEB (title in top left
corner of browser frame) or PDF (PDF title info) */

%let annotype = %upcase(&annotype);
%let target = %upcase(&target);
%let showallx = %upcase(&showallx);
%let method = %upcase(&method);
%let pdfgraphtype = %upcase(&pdfgraphtype);
%if &target eq PDF %then %do;
%let method = COMPOSITE;
%let annotype = SPARSE;
%let showallx = YES;
%end;
%if &target eq WEB %then %do;
%let annotype = SPARSE;
%let showallx = YES;
%end;
%if &method eq COMPOSITE %then %let tableframe = box;
%let errorflg = N;
%if "%substr(&annofont,1,1)" ne "" %then %do;
%if %upcase(%substr(&annofont,%length(&annofont),1))
eq U %then %do;
%put ERROR: Uniform SAS/GRAPH Software Fonts NOT
SUPPORTED by TREND Macro;
%let basefont =
%substr(&annofont,1,%eval(%length(&annofont)-1));
%put ERROR: ANNOFONT value &annofont interpreted as
uniform version of font &basefont;
%let errorflg = Y;
%end;
%end;
proc sort data=&data
out=y_vs_x(rename=(&x=x &y=y));
by &x; run;
data _null_;
retain prevy prevx;
set y_vs_x;
if _N_ gt 1 then do;
if x eq prevx then do;
put 'ERROR: More than one y value for an x value
NOT SUPPORTED by TREND Macro';
put 'ERROR: For ' x= 'TRENDANO Macro found '
prevy= ' and ' y=;
call symput('errorflg','Y');
stop;
end;
end;
prevy=y; prevx=x;
run;
%if &errorflg eq Y %then %goto macexit;
%if (&target eq WEB) or (&target eq PDF) %then %do;
/* if you do not like our trend style,
delete or change this PROC TEMPLATE code */
proc template;
edit styles.default as styles.our_trend_style;
style fonts /
'TitleFont' = ("&tbl_ttlfoot_font", &tbl_ttlfoot_size)
/* font for table titles & footnotes */
'headingFont' = ("&tbl_heading_font", &tbl_heading_size)
/* font for row & column labels */
'docfont' = ("&tbl_data_font", &tbl_data_size);
/* font for data */
style color_list /
```

```

'fga2' = CX000000 /* BLACK row & column labels */
'fga1' = CX000000 /* BLACK data, BLACK divider between
labels & data, BLACK outer frame for table */
'fga' = CX000000 /* BLACK titles & footnotes */
'bgA3' = CXFFFFFF /* WHITE backgrd for table data */
'bgA2' = CXFFFFFF /* WHITE bkgrd for row/col labels */
'bgA' = CXFFFFFF /* WHITE frame (& background
if no systemtitle background set) for titles,
WHITE frame & background for titles footnotes */
style colors /
'link2' = CX0000FF /* BLUE links not yet visited */
'link1' = CXFF0000; /* RED visited links */
style output from container /
rules = none /* line between table labels & data */
frame = &tableframe /* box for on, void for off */
borderwidth = 1 /* box thickness, same as default */
%if &target eq WEB %then %do;
bordercolor = CXCCCCC
/* light gray, overrides default use of 'fgA1' */
%end;
cellpadding = &tablespacing /* controls cell size.
7 is default value. */
cellspacing = 0; /* space between cells:
if zero, grid is not visible */
style body /
pagebreakhtml=undef /* suppress rule between
successive PROC outputs to get them on same page */
background = CXFFFFFF; /* WHITE web page background:
all background not otherwise specified */
style systemtitle /
background = CXFFFFFF; /* title background
(overrides use of 'bgA' for inside the title frame) */
end;
run; quit;
%if &target eq PDF %then %do;
/* if you do not like our_trend_style, edit the base
style you prefer below & adjust topmargin= if needed */
proc template;
edit styles.our_trend_style as styles.pdfimagefortable;
style body from document / topmargin=1.00 in;
style table from output /
/* preimage is located below the titles, */
/* and above the table, and is centered. */
preimage = "%path.\CanBeDeleted.&pdfgraphtype";
end;
run; quit;
%end;
%let textlen = %eval(&annolen + 1);
%if %upcase(&annofont) eq NONE
%then %let extra_leading_space = NO;
%else %do;
%let extra_leading_space = YES;
%let textlen = %eval(&textlen + 1);
%end;
/* create the ANNOTATE data set */
data annodata
(drop=b4prevy prevy b4prevx prevx holdy holdx
shftleft);
length b4prevy prevy b4prevx prevx holdy holdx 8;
retain b4prevy prevy b4prevx prevx 0;
format y &annofmt;
length text $ &textlen;
length style $ 40 function color $ 8 size 3
position xsys ysys hsys when $ 1;
retain function 'label' style "&annofont" color
"&annocol" size &annosize
xsys ysys '2' hsys '4' when 'a';
set y_vs_x end=lastobs;
if _N_ eq 1 then do;
call symput('first_x',trim(left(x)));
prevx=x; prevy=y;
end;
else
if _N_ eq 2 then do;
holdx=x; holdy=y;
position = '4'; text = put(prevy,&annofmt);
xsys='1'; hval=prevx; x=-1; y=prevy;
output;
xsys='2'; b4prevx=prevx; b4prevy=prevy;
prevx=holdx; prevy=holdy;
end;
else do;
holdx=x; holdy=y;
if _N_ gt 2 then do;
shftleft = 'Y';
if
b4prevy eq prevy eq y
then position='2'; /* flat-flat */
else if b4prevy eq prevy gt y
then position='3'; /* flat-down */
else if b4prevy gt prevy gt y then do;
/* down-down */
if (prevy-b4prevy)/(prevx-b4prevx)
ge (y-prevy)/(x-prevx)
then do; position='3'; shftleft='N'; end;
else position='7';
end;
else if b4prevy gt prevy lt y
then position='8'; /* down-up */
else if b4prevy lt prevy lt y then do;
/* up-up */
if (prevy-b4prevy)/(prevx-b4prevx)
le (y-prevy)/(x-prevx)
then do; position='9'; shftleft='N'; end;
else position='1';
end;
else if b4prevy lt prevy gt y
then position='2'; /* up-down */
else if b4prevy gt prevy eq y
then position='7'; /* down-flat */
else if b4prevy eq prevy lt y
then position='9'; /* flat-up */
else if b4prevy lt prevy eq y
then position='1'; /* up-flat */
if shftleft eq 'Y'
then text=trim(left(put(prevy,&annofmt)));
else text=' ' || put(prevy,&annofmt);
hval=prevx; x=prevx; y=prevy;
output;
if lastobs then do;
call symput('last_x',trim(left(holdx)));
call symput('nmbrhtks',trim(left(_N_)));
hval=holdx; x=holdx; y=holdy;
position = '6';
/* now shift end label to right from line end-point */
text=
%if &extra_leading_space eq YES %then %do;
' ' ||
%end;
' ' || put(y,&annofmt);
output;
end;
end;
b4prevx=prevx; b4prevy=prevy; prevx=holdx;
prevy=holdy;
end;
run;
proc means data=annodata noprint min max;
var y; output out=minmax min=ymin max=ymax;
run;
%if &annotype eq SPARSE %then %do;
%let anoinsid = N;
data xtoanno (keep=x);
set annodata end=lastobs;
if _N_ eq 1 then set minmax;
if ((_N_ eq 1 or lastobs) and y ne ymin and y ne ymax)
or ((y eq ymin or y eq ymax) and _N_ ne 1 and not
lastobs)
then do;
output;
if _N_ ne 1 and not lastobs
then call symput('anoinsid','Y');
end;
run;
proc sort data=xtoanno nodupkey; by x; run;
data annovals;
merge annodata xtoanno (in=doit); by x; if doit; run;
data forhtks;
length anno $ 3;
merge y_vs_x (in=plotpt rename=(x=hval))
annovals (in=annopt);
by hval;
if plotpt;
call symput('hord' || left(_N_),hval);
if annopt then anno = 'YES'; else anno = 'NO';
run;
data _null_;
set forhtks end=lastobs;
if ("&showallx" eq 'YES') or (anno eq 'YES') or
(_N_ eq 1) or (lastobs) or ("&anoinsid" eq 'N')
then call symput('htk' || left(_N_),put(hval,&xformat));
else call symput('htk' || left(_N_),' ');

```

```

run;
%end;
%else
%if %annotype eq FULL %then %do;
data annovals; set annodata; run;
%end;
%if %method eq DYNAMIC %then %do;
data _null_;
set y_vs_x end=lastobs;
call
symput('x' || trim(left(_N_)), trim(left(put(x, &xformat)))
);
call
symput('y' || trim(left(_N_)), trim(left(put(y, &yformat)))
);
if lastobs;
seqno = _N_;
call symput('ptcount', trim(left(seqno)));
run;
data y_vs_x(keep=x y xdrill);
length xdrill $ 60;
set y_vs_x end=lastobs;
if (_N_ eq 1) or lastobs then
xdrill =
'href="HighlightTable.' || put(x, &xformat) || '.html"';
else
xdrill = 'href="HighlightTable.' || put(x, &xformat) ||
'.html" alt=" ' || put(y, &yformat) || ' ' ';
run;
%macro colfmts; /* for highlight color in table */
%do i = 1 %to %ptcount;
proc format;
value $x&i.col
%do j = 1 %to %ptcount;
"$$$&j" =
%if %j eq %i %then %do;
'CXFFFF00'
%end;
%else %do;
'CXFFFFFF'
%end;
%end;
%end;
run; quit;
%end;
%mend colfmts;
%colfmts; run;
ods listing close; ods noresults;
%macro trndtbls; /* for highlighted trend tables */
%do i = 1 %to %ptcount;
ods html path = "&path" (url=none)
body = "HighlightTable. $$$&i...html"
(title="&bodyttl")
style = styles.our_trend_style;
title1 "Table by &xlabel of &ylabel &titleend";
%if %length(&ttl2text) ne 0 %then %do;
title2 "&ttl2text";
%end;
footnotel link="&trendfile.html"
'Return to Trend Plot';
proc print data=y_vs_x noobs split='_';
var x / style=[background=$x&i.col.];
var y;
format x &xformat y &yformat;
label x="&xlabel" y="&ylabel";
run;
ods html close;
%end;
%mend trndtbls;
%trndtbls; run;
%end;
%let roundval = %str();
%let posofdot = %index(&yformat, .);
%let lenoffmt = %length(&yformat);
%if %posofdot lt %lenoffmt
%then %do;
%let numzeros =
%eval(%substr(&yformat, %eval(%posofdot + 1),
%eval(%lenoffmt - %posofdot)) - 1);
%let zeroes = %str();
%do i = 1 %to %numzeros;
%let zeroes = &zeroes.0;
%end;
%let roundval = .&zeroes.1;
%end;
data _null_;
set minmax;
call symput('realminy', ymin);
call symput('realmaxy', ymax);
call symput('range_y', (ymax - ymin));
%if %roundval gt 0 %then %do;
ymin = round(ymin, &roundval);
ymax = round(ymax, &roundval);
%end;
call symput('tickminy', trim(left(put(ymin, &yformat))));
call symput('tickmaxy', trim(left(put(ymax, &yformat))));
run;
%macro varlist(varprfx=, varcount=); /* for order= */
%do i = 1 %to %varcount %by 1;
&&varprfx&i
%end;
%mend varlist;
%macro varlistq(varprfx=, varcount=); /* for value= */
%do i = 1 %to %varcount %by 1;
"$$$&varprfx&i"
%end;
%mend varlistq;
goptions reset=all;
axis1 label=none minor=none major=none style=0
offset=(1 PCT, 1 PCT)
%if %annotype eq SPARSE %then %do;
order=(%varlist(varprfx=hord, varcount=&nmbbrhtks))
%end;
value=(font=&annofont height=&annosize
color=&annocol
%if %annotype eq SPARSE %then %do;
%varlistq(varprfx=htk, varcount=&nmbbrhtks)
%end;
);
axis2 label=none minor=none major=none style=0
%if %target eq PDF %then %do;
offset=(4 cells, 1 cells)
%end;
%else %do;
offset=(2 cells, 1 cells)
%end;
order = &realminy to &realmaxy by &range_y
value = (c=CXFFFFFF f=&annofont h=&annosize
"&tickminy" "&tickmaxy");
symbol1 v=dot i=join c=CX000000;
symbol2 v=none i=none c=CXFFFFFF;
title1 f=&plt_ttlfoot_font h=&plt_ttlfoot_size "Plot "
%if %method eq COMPOSITE %then %do;
"and Table "
%end;
"by &xlabel of &ylabel &titleend";
%if %length(&ttl2text) ne 0 %then %do;
title2 f=&plt_ttlfoot_font h=&plt_ttlfoot_size
"&ttl2text";
%end;
%if %target eq WEB %then %do;
/* Prevent graphic catalog entry name conflicts. Causes
harmless message "ERROR: Memname GSEG is unknown." for
first invocation of %TREND during the SAS session. */
proc greplay igout=work.gseg nofs; delete _all_; run;
quit;
%if %method eq DYNAMIC %then %do;
footnotel font=&plt_ttlfoot_font
height=&plt_ttlfoot_size c=CX0000FF
"Rest mouse on any intermediate point for &ylabel at
That &xlabel";
footnote2 font=&plt_ttlfoot_font
height=&plt_ttlfoot_size c=CXFF0000
"Click any point for Table of &ylabel with That &xlabel
Highlighted";
%end;
ods listing close;
ods noresults;
ods html path = "&path" (url=none)
body = "&trendfile.html" (title="&bodyttl")
style=styles.our_trend_style gtitle gfootnote;
goptions device=gif xpixels=&xpixels ypixels=&ypixels;
%end;
%else
%if %target eq PDF %then %do;
%if %pdfgraphtype eq JPG
%then %let devtype = jpeg;
%else %let devtype = %pdfgraphtype;
goptions device=&devtype gsfname=replace gsfname=gsf;
filename gsf "&path.\CanBeDeleted.&pdfgraphtype";
title ' '; footnote h=0.50 in ' ';
ods listing; ods results;

```



```

%end;
%else
%if &target eq EMF %then %do;
goptions device=emf gsfmode=replace gsfname=gsf;
filename gsf "&path.\&trendfile.emf";
%if %length(&emfgopts) ne 0 %then %do;
goptions &emfgopts;
%end;
ods listing; ods results;
%end;
proc gplot data=y_vs_x anno=annovals;
plot y*x=1 / noframe haxis=axis1 vaxis=axis2
%if &target eq WEB %then %do;
%if &method eq DYNAMIC %then %do;
html=xdrill name="link2tbl"
%end;
%else %do;
name="plotwtbl"
%end;
%end;
plot2 y*x=2 / noframe haxis=axis1 vaxis=axis2;
run; quit;
%if &target eq PDF %then %do;
ods listing close; ods noreresults;
ods pdf startpage=never notoc
style =styles.pdfimagefortable
file ="&path.\&trendfile.pdf"
title ="&bodyttl" author ="&pdfauthor"
subject="&pdfsubject" keywords="&pdfkeywords";
options nodate nonumber;
%end;
%if &method eq COMPOSITE %then %do;
%if &target eq PDF %then %do;
title1
"Plot and Table by &xlabel of &ylabel &titleend";
%if %length(&ttl2text) ne 0 %then %do;
title2 "&ttl2text";
%end;
%end;
%else %do;
title1;
%end;
footnotel;
proc print data=y_vs_x noobs split='_';
var x y;
format x &xformat y &yformat;
label x="&xlabel" y="&ylabel";
run;
%end;
ods _all_ close;
%macroexit;
%mend TREND;

/* Make Figure 2: Fully Annotated EMF */
%TREND(data=allways,x=xvalue,xformat=Z2.,xlabel=Day,
y=yvalue,yformat=2.,ylabel=Price,annofont='Verdana',
annosize=1.00,annocol=BLACK,annofmt=2.,annolen=2,
titleend=%str(for Shares in April),
ttl2text=%str(Fig. 2: Full Annotation with Macro),
target=emf,emfgopts=
%str(hpos=37 vpos=31 hsize=3.25 in vsize=2.75 in),
method=onlyanno,annotype=full,
path=c:\TrendPlt\emf,trendfile=FullAnnoTrendPlot)
run;

/* Make Figure 3: Sparsely Annotated EMF */
%TREND(data=allways,x=xvalue,xformat=Z2.,xlabel=Day,
y=yvalue,yformat=2.,ylabel=Price,annofont='Verdana',
annosize=1.00,annocol=BLACK,annofmt=2.,annolen=2,
titleend=%str(for Shares in April),
ttl2text=%str(Fig. 3: Sparse Annotation with Macro),
target=emf,emfgopts=
%str(hpos=37 vpos=31 hsize=3.25 in vsize=2.75 in),
method=onlyanno,annotype=sparse,
path=c:\TrendPlt\emf,trendfile=SparseAnnoTrendPlot)
run;

/* Make Figures 4A & 4B: Web-Linked Plot & Table */
/* If your web browser does not have text size set to
"Medium", these web pages when viewed may be counter to
design. (Check by clicking View and then Text Size.) */
%TREND(data=allways,x=xvalue,xformat=Z2.,xlabel=Day,
y=yvalue,yformat=2.,ylabel=Price,annofont='Verdana',
annosize=1.00,annocol=BLACK,annofmt=2.,annolen=2,

```

```

titleend=%str(for Shares in April),
ttl2text=%str(Figs. 4: Web Interlinked Plot & Tables),
tbl_ttlfoot_size=11 pt,
tbl_heading_size=8 pt,tbl_data_size=8 pt,
target=web,method=dynamic,xpixels=563,ypixels=422,
path=c:\TrendPlt\html,trendfile=DrillableTrendPlot,
bodyttl=Trend Plot with Flyover Text and Highlighted
Drill-Down Tables)
run;

```

```

/* Make Figure 5: Web-published Plot-Table Composite */
/* Reduce ypixels to 211 for the plot
to avoid having to scroll to see the full table */
%TREND(data=allways,x=xvalue,xformat=Z2.,xlabel=Day,
y=yvalue,yformat=2.,ylabel=Price,annofont='Verdana',
annosize=1.00,annocol=BLACK,annofmt=2.,annolen=2,
titleend=%str(for Shares in April),
ttl2text=%str(Fig. 5: Composite Static Web Page),
tbl_ttlfoot_size=14 pt,
tbl_data_font=Verdana,tbl_data_size=5 pt,
target=web,method=composite,xpixels=563,ypixels=211,
path=c:\TrendPlt\html,trendfile=StaticTrendPlot+Table,
bodyttl=Static Trend Plot with Companion Table)
run;

```

```

/* Make Plot-Table Composite PDF (Figure Not Shown */
/* If creating a PDF with %TREND in Version 8.2, the
fonts you can use must be among those in a special
registry. Find them in SAS by selecting Solutions ->
Accessories -> Registry Editor -> CORE -> PRINTING ->
PSL -> FONTS. For parts of the PDF built with a
SAS/GRAPH driver, you must assign such a font inside
quotation marks (e.g., 'Times'). */
%TREND(data=allways,x=xvalue,xformat=Z2.,xlabel=Day,
y=yvalue,yformat=2.,ylabel=Price,annofont='Times',
annosize=1.50,annocol=BLACK,annofmt=2.,annolen=2,
titleend=%str(for Shares in April),
ttl2text=%str(Fig. 6: Composite Static PDF Page),
tbl_ttlfoot_font=Times,tbl_ttlfoot_size=14 pt,
tbl_heading_font=Times,tbl_heading_size=9 pt,
tbl_data_font =Times,tbl_data_size =9 pt,
target=pdf,pdfgraphtype=jpeg,
path=c:\TrendPlt\pdf,trendfile=TrendPlot+TablePDF,
bodyttl=Trend Plot (jpeg) with Companion Table,
pdfauthor=%str(LeRoy Bessler & Francesca Pierri))
run;

```

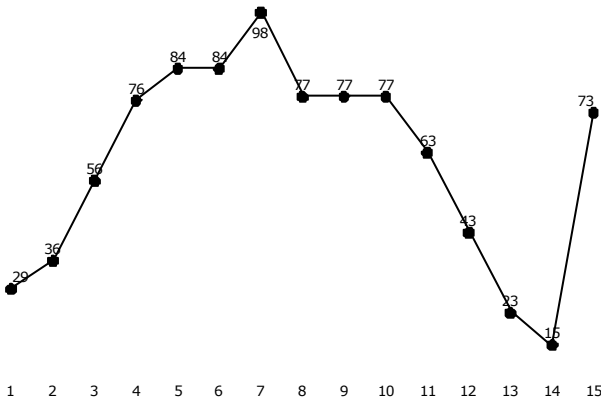
```

/* Make Figure 1: Using the SAS POINTLABEL Option */
ods listing; goptions reset=all;
goptions device=emf gsfmode=replace gsfname=gsf;
filename gsf 'c:\TrendPlt\emf\TrendWithPointLabel.emf';
goptions hpos=37 vpos=31 hsize=3.25 in vsize=2.75 in;
axis1 label=none major=none minor=none style=0
value=(font='Verdana' color=CX000000 height=1);
axis2 label=none major=none minor=none style=0
value=none;
symbol1 c=black h=1.00 v=dot i=join
pointlabel=(f='Verdana' c=CX000000 h=1.00 "#y");
title1 f='Georgia' h=14 pt
'Fig. 1: Trend Using POINTLABEL Option';
title2 f='Georgia' h=14 pt
'All Possible 3-Point/2-Segment Changes';
proc gplot data=allways;
format xvalue 2. yvalue 2.;
plot yvalue*xvalue / haxis=axis1 vaxis=axis2;
run; quit;

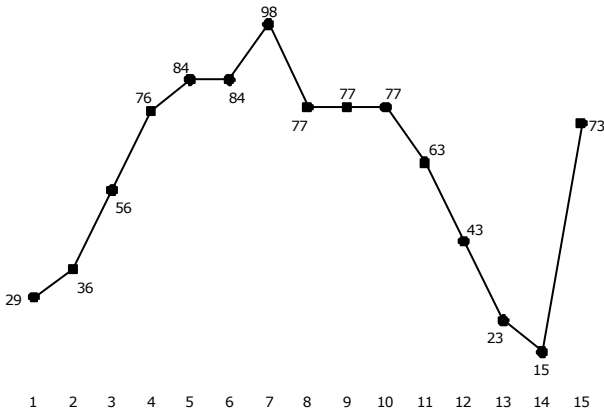
```

Appendix 2. Illustrations

Fig. 1: Trend Using POINTLABEL Option
All Possible 3-Point/2-Segment Changes



Plot by Day of Price for Shares in April
Fig. 2: Full Annotation with Macro



Plot by Day of Price for Shares in April
Fig. 3: Sparse Annotation with Macro

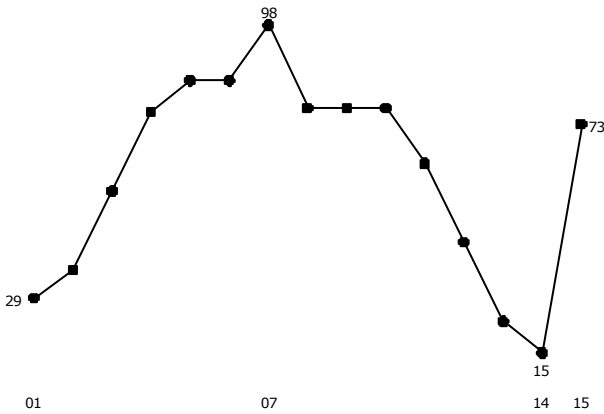


Fig. 4A: Web Trend Plot with Flyover Text (not shown by screen capture) & Drill-down

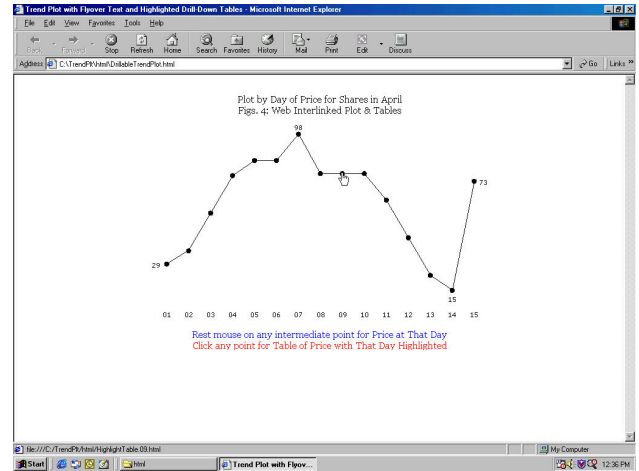


Fig. 4B: Web Drill-down HighlightedTable

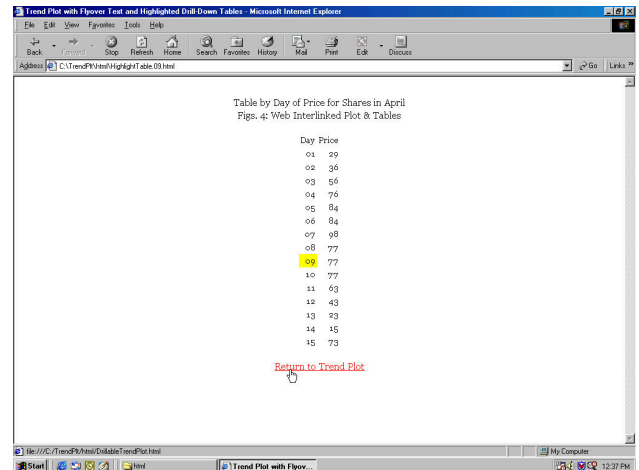


Fig. 5: Web Composite of Trend Plot & Table (PDF output is similar in appearance)

