Line Charts and Sparklines

Line Charts

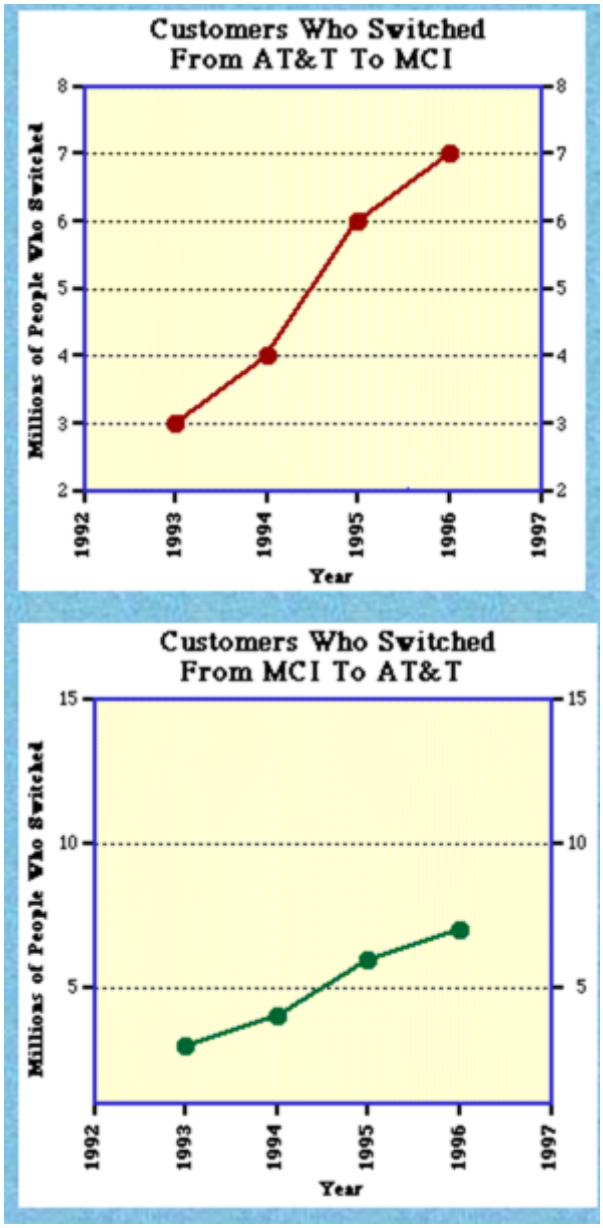
Line charts are an effective chart candidate when you want to show comparisons or trends. For example, the price of a stock and how it changes over the course of a day would likely be depicted as a line chart. If you have a quantitative independent variable and a quantitative dependent variable, then a line chart can be a great way to display them.

It is easy to see how one variable affects another as it increases, making it easy to spot trends. Users can also look at a line chart and predict future results.

As we have all heard you can make the data tell any story you want. Well, with line graphs one thing to be on the lookout for to see if you are being manipulated is whether they have used inconsistent scales on the axes, meaning that the value in between each point along the axis may not be the same. Another misrepresentation to look for is the comparison of two graphs that uses different scales on each to distort the takeaway. Another trick you will see presents charts that don't start their axis at zero, in essence zooming in one part of the graph making a change look enormous.

Below is a great example that reveals how just changing the axis can make you think a ton more people are switching from AT&T to MCI than from MCI to AT&T

(source: http://mste.illinois.edu/courses/ci330ms/youtsey/lineinfo.html)



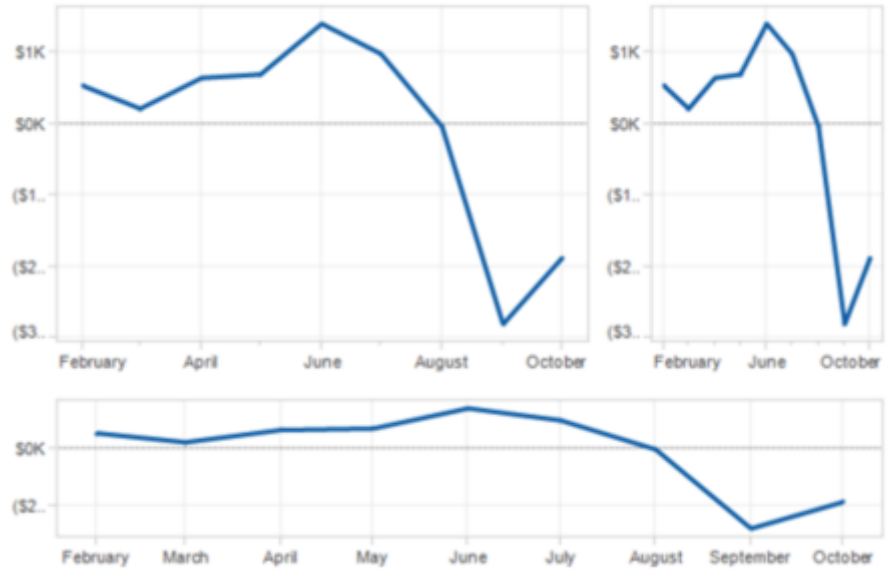
Here are a few tips on line charts

Don't use a legend but rather label the lines directly so it is a lot less work for the viewer and doesn't rely on you having to use different line types to distinguish what each line represents.
Only emphasize what is important. For example, if you are presenting three different series and you want to highlight a portion of one of them, consider adding color to that line or part of the line for emphasis. Too often designers use color for aesthetics and it only detracts from the data. Varying the lines' intensity rather than hue is the way to go. You will see in Stephen Few's book a chart example where they used shades of grey to differentiate the lines.

Another tip is to remove gridlines. Most users are interested in the trend line not in every specific data point; foregoing the gridlines removes clutter and lets the data shine.

If you want to emphasize the trend in your line chart you can consider shading the area below it.
Take into consideration the aspect ratio of the line in the chart. The slope of a line chart should be close to 45 degrees for the best perception. Robert Kosara has a great summary of this practice that was first proposed by Bill Cleveland. Go to this link to read about it: https://eagereyes.org/basics/banking-45-degrees

Here are the examples given by Kosara:



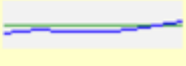
This is the same data presented in three different ways in the charts above. The aspect ratio or scales used on the two axes affects the perception of the slope.

What are sparklines?

According to Wikipedia, "A sparkline is a very small line chart, typically drawn without axes or coordinates. It presents the general shape of the variation (typically over time) in some measurement, such as temperature or stock market price, in a simple and highly condensed way. "
Tufte describes it in the following way:

> "A sparkline is a small intense, simple, word-sized graphic with typographic resolution. Sparklines mean that graphics are no longer cartoonish special occasions with captions and boxes, but rather sparkline graphics can be everywhere a word or number can be: embedded in a sentence, table, headline, map, spreadsheet, graphic. Data graphics should have the resolution of typography." (See Edward Tufte, Beautiful Evidence, 46-63.)

Here is a common example of their use that I found at http://www.buyupside.com/articles_stocks/marketsummary12510.php.

		Market Summary		
ETF	**Price Quote & Dividend**	**1-Year Price Chart**	**2-Year Price Chart**	**5-Year Price Chart**
NASDAQ Composite	^IXIC			
S&P 500	^GSPC			

Their invention is often credited to Tufte but it seems to have been used first by some programmers in the 90's. Tufte definitely coined the term and popularized its use. You will find a nice collection of examples of

the use of sparklines on this webpage, including one on the apple watch: http://www.edwardtufte.com/bboard/q-and-a-fetch-msg?msg_id=0001OR

As Tufte might say there is very little "chart junk" and its "data to ink" ratio is high. These terms describe some of his key principles. Sparklines can be used in compact spaces anywhere a word or a number can be used. That is why we often see these nifty line charts in tables. They easily convey a trend without having to compare all the numbers in a row.