
How to break a scale

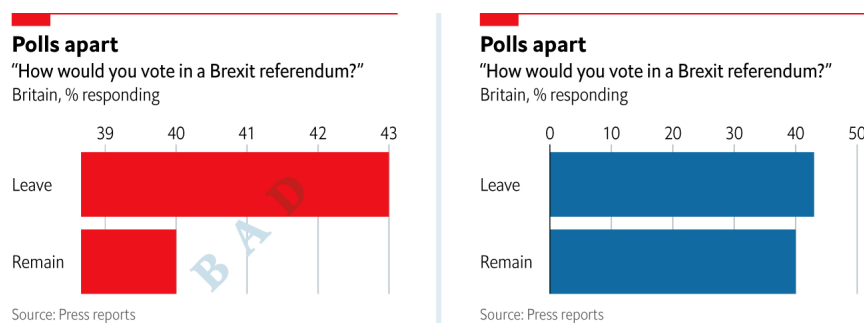
The Economist

Whether to break an axis—the practice of starting a numerical chart scale at a number other than zero—is one of the most contentious topics in data visualisation. Many consider it a cardinal sin. But at *The Economist* we often find ourselves breaking the scale and we think it can sometimes be good practice.

So where do you draw the line? Let's start by looking at some charts. Below I have sketched out some bad examples (in red) alongside some more sound designs (in blue).

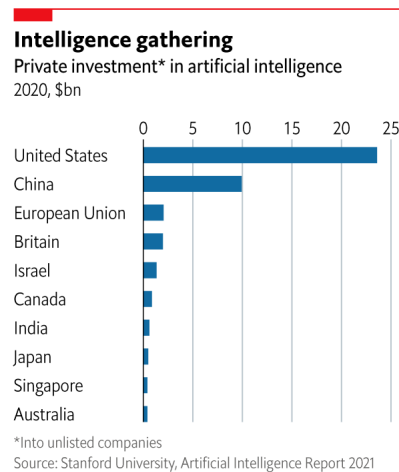
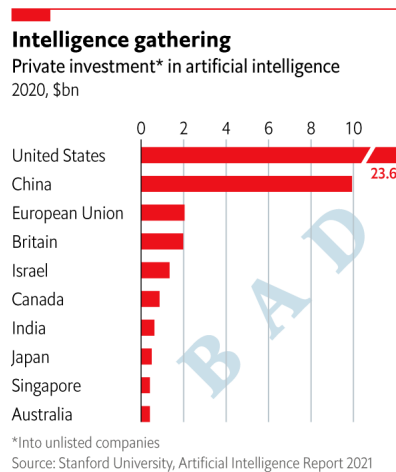
The bad

Data for which the zero mark is meaningful are particularly unsuitable to a broken axis. Ignoring zero exaggerates the difference between data points and makes comparison tricky. The example below is loosely based on an infamous chart from the Brexit era. On the left, the axis only starts at 39, overstating the lead of the Leave campaign. Starting the axis at zero, on the right, shows that the Remain campaign was really not that far behind. Using a bar chart makes this illusion even worse: the solid shape of the rectangle suggests a concrete beginning on the left edge—when, in reality, the start of data is *far* from where it appears to be.

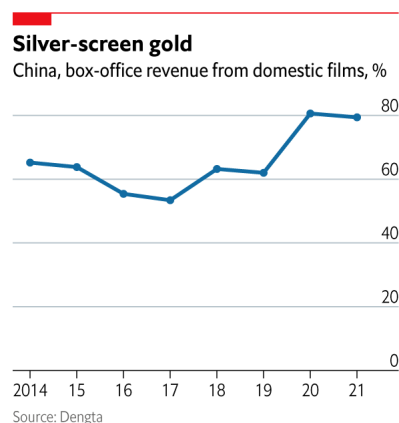
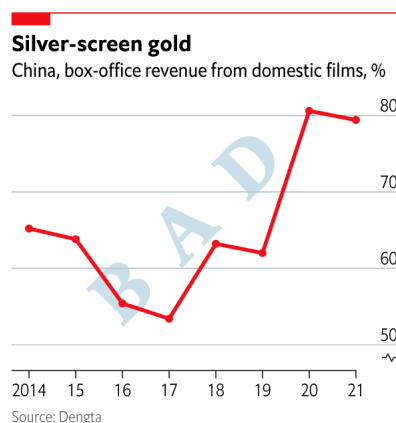


The next example is just as misleading but has the opposite effect: it breaks the scale to accommodate an outlier. In the chart below, the axis is interrupted to better show the difference between all other values. At

the same time it conceals the true extent of America's bar and makes the chart far less useful. If the outlier is the point of the chart, embrace it. If not, consider removing it—unless it's still important to the story. (And if all numbers are equally important, how about a table?)



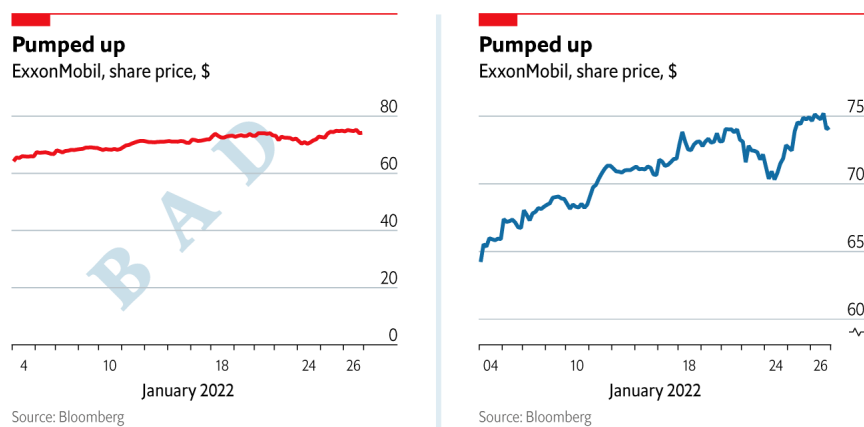
Sometimes it can be tempting to chop the scale to inflate the variation within the data. In most cases it is not necessary. The charts below show China's share of total box-office revenue that comes from domestic films. On the left, the axis starts at 50 and, at first glance, it almost appears as if the share has shot from zero to 100 in the past five years. The version on the right maintains the zero-baseline. The increase since 2017 is still easy to spot but the chart now also shows that the share of revenue from domestic films has always been high in China.



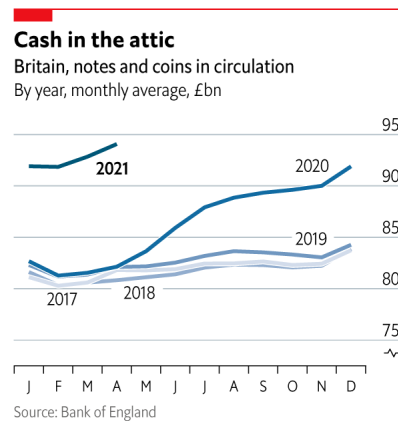
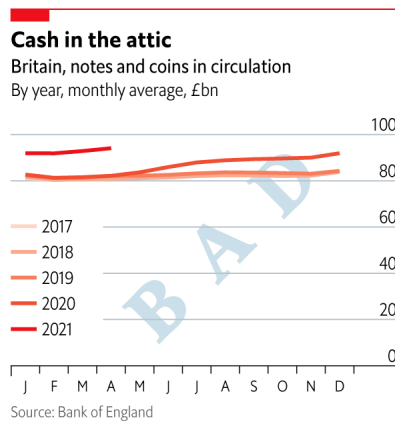
The good

Most of the time breaking the axis isn't the right way to go. But for some charts a broken axis is not only a good idea but even necessary. How do you know you've reached the breaking point?

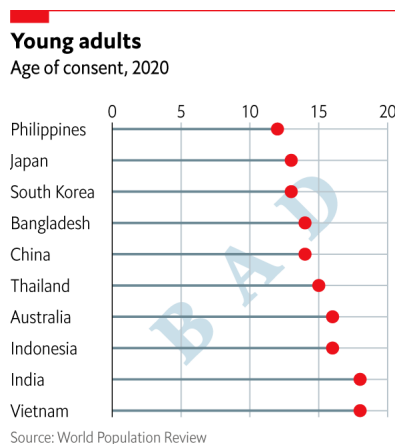
Sometimes zero is irrelevant. This is usually true for volatile data such as share prices or currency exchange rates, and always true for indexed data. In the share-price chart below it makes little sense to start the axis at zero. Starting the axis at 60 instead shows that ExxonMobil's share price hasn't flatlined. And leaving about a quarter of the chart underneath the lowest data point empty provides a visual cue that the axis does not go to zero. At *The Economist*, we also add a little symbol at the breaking point to indicate a broken axis.



Broken scales are also useful when the relationship between multiple series is more important than their relationship with zero. In the chart below we have plotted the total value of notes and coins in circulation in Britain by month and year. The point of the chart was to show that the figure surged in 2020 and that 2021 is almost beyond comparison. Plotting the chart to zero obscures the stark discrepancies that are so evident on the right-hand side. The subject matter also made the decision to cut the axis easy: it is unlikely that the amount of cash in circulation would get close to £0.



So far, the examples of sensible broken scales have used time-series data. Not all data can be shown using a line chart. But breaking bars is bad practice because the shape makes it impossible to interpret them, even with a trained eye. In cases like these, thermometer charts are our friend. Below we have charted the age of consent in various countries. Plotting to zero would have shown the variation among countries less well. By using a thermometer, the eye is drawn to the dot, rather than the starting point of a bar. And by starting at 11 rather than 12 we have left a bit of air on the left, giving a visual cue of a broken axis. We also add our little symbol as an indicator of a broken axis and remove the y-axis baseline.



I could go on—the reasons to debate a chart's axes are endless. But, for now, I will give you a break.

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