DATA TO INSIGHT: AN INTRODUCTION TO DATA ANALYSIS
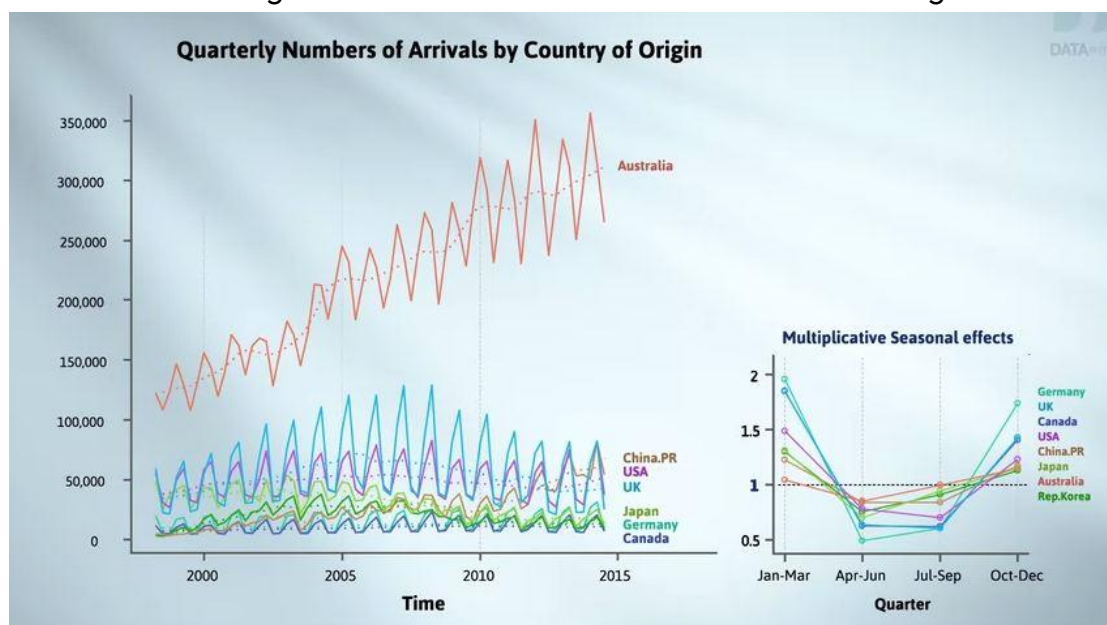## THE UNIVERSITY OF AUCKLAND

WEEK 8
COMPARING SEVERAL SERIES by Chris Wild

Welcome back.

So far we've been looking at each time-series on its own. It's very useful, and often much more interesting to be able to look at a set of related series together.


Here's the visitor arrivals series for all seven countries in the data set plotted on a single graph. It illustrates both the advantages and disadvantages of this type of graph.

The big advantage is that everything is on the same scale. So you can say at a glance who the big players are. The fact that Australia has by far the greatest number of arrivals jumps right out at us. As does the fact that Australian arrivals are growing strongly, while those from many other countries have been declining, especially in the period following about 2008.

We do see China and the US coming up over the last few years, overtaking the UK.

The big disadvantage is that information from all countries with a much smaller number of arrivals are all squashed down at the bottom. They also tend to sit on top of one another, making it very hard to see anything.
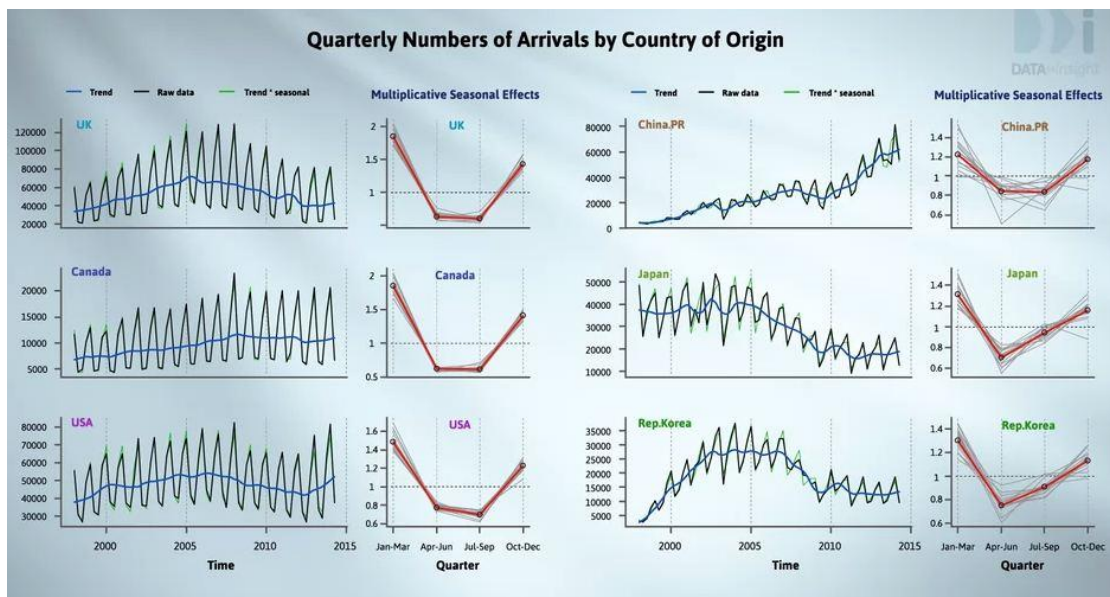

A complementary way of displaying the information gives each country its own graphs. Now we can see the trends for each country much more easily and compare the trends. But to tell anything about relative sizes we have to rely on the scales. There are very different trends.

The most extreme are (on the right) the booming growth in arrivals from China and almost steady decline from Japan. Looking a bit more carefully, this is a decline following the financial crisis, which hit in 2008. For China, this hit later, was minor, and very short lived. Whereas in Japan and Korea, it was longer, much bigger, and only stabilised over the last three years. Korea differs from Japan in their huge growth from 1998 to about 2003.

There has been good recent growth from USA. We'll give the UK individual attention later.

Differences in seasonal patterns are more subtle. We have to go to the scales to see that the seasonal swings are strongest for the UK and Canada, and weakest for China. Japan, and to a lesser extent Korea, tend to have a much stronger July to September quarter than the other countries, which I think is due to skiing.

Monthly Visitor Arrivals in NZ from the UK
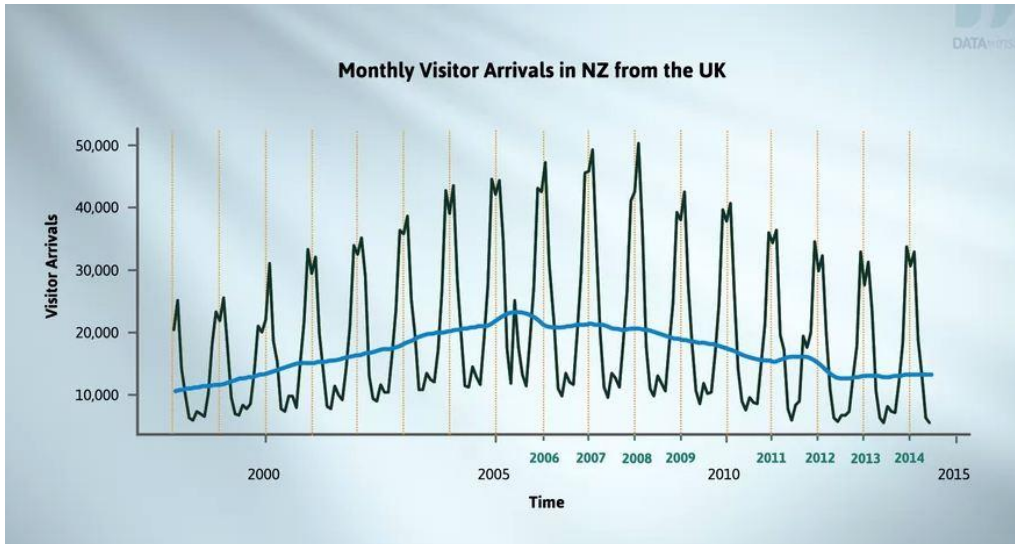
So what's with arrivals from the UK? Don't they like going to New Zealand anymore? Arrivals do seem to have flattened out, and probably even picked up a little over the last two years. First, I'm going to highlight oddities in 2005 and 2011 and then compare UK visitor arrivals with another very relevant series.

First, the oddities. Let's look along the bottom of this series. What happened there? It's 2005. It was big. Big enough to cause an upward bump in the trend. And then again over here in 2011, a bit later in the year this time, and again big enough to cause an upward bump in the trend.

Seasonal plot - Arrivals from the UK
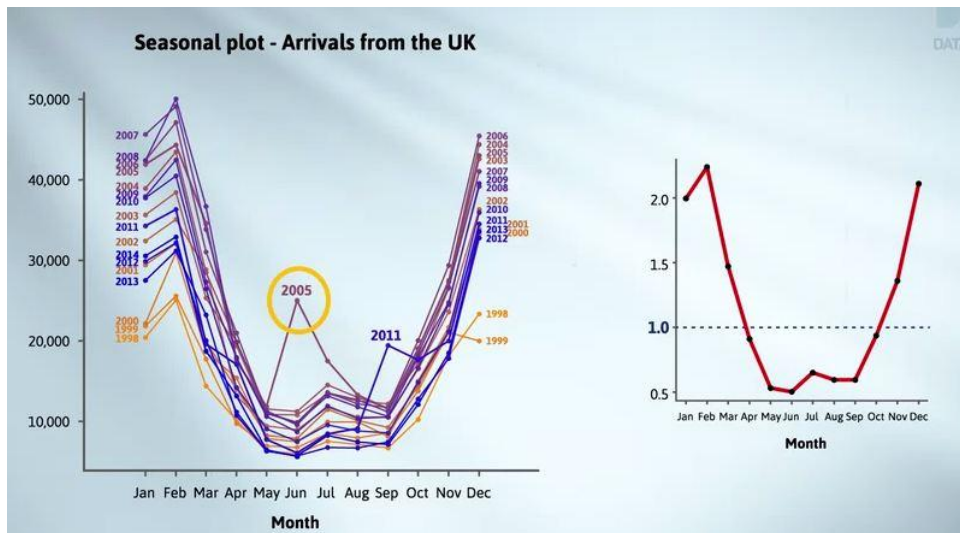
Looking at it another way, there's the 2005 one: a big jump in June spilling over a bit into July. And the 2011 one, September. What was going on? Both were rugby events. Not surprising with New Zealand, I guess. 2005 was the British Lions tour. And 2011 was the Rugby World Cup.

Now look at the right-hand plot and the size of the UK seasonal swings. There are four times as many visitors in February as in the southern winter months.
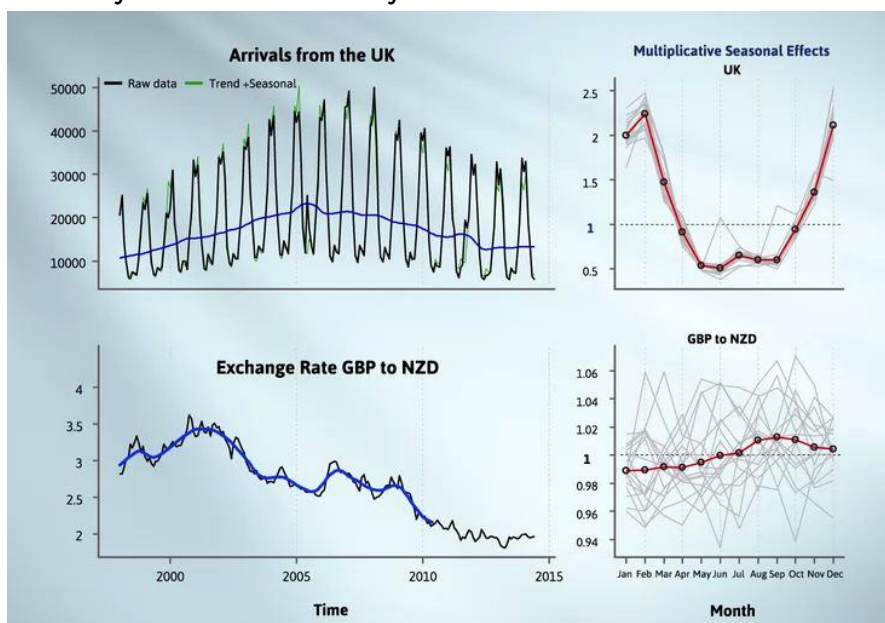
I promised another relevant series, and here it is. It's the exchange rate between the pound and the New Zealand dollar. If we ignore the 2005 Lions Tour bump, the fall in UK numbers really started with the financial crisis and it's probably been made much worse by the fall in the exchange rate, though both have shown a very slight increase over the last two years.

The exchange rate is also the first series you've seen that's not seasonal. Those grey lines on the right bottom panel are all over the place, unlike the one above it, which shows a strongly consistent seasonal pattern despite the two rugby tour anomalies.

This brings us to the end of the Week Eight videos. If you've done Week Eight early, I encourage you to go back and pick up the topics you might have missed. If you've nearly finished the course, I hope you've enjoyed it and seen some of the power of data analysis.

But even more, I hope you've developed a desire to learn more about statistics. You've covered a lot of ground over the past eight weeks, flying fast at a very high altitude. I hope you'll now want to go back to some of the details you've spotted down there. And perhaps even have an interest in pursuing statistics at a higher level. Good luck.