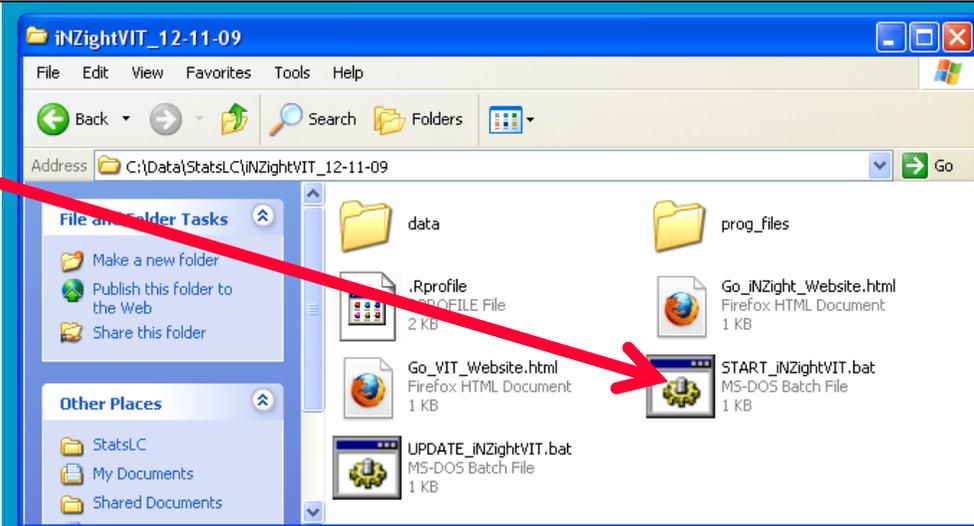


## Using iNZight for Time series analysis. A step-by-step guide.

iNZight can be downloaded from <http://www.stat.auckland.ac.nz/~wild/iNZight/index.html>

Step 1  
Click on START\_iNZightVIT.bat.



Step 2  
Click on Run iNZight.



Step 3  
Click on Data IN/OUT.

R iNZight (v20121109)

Data IN/OUT Filter Data Manipulate Variables Trash

Advanced

View Data Set View Variables

Row.names: empty

1
---

Variable 1 : Drop name here Clear

Variable 2 : Drop name here Clear

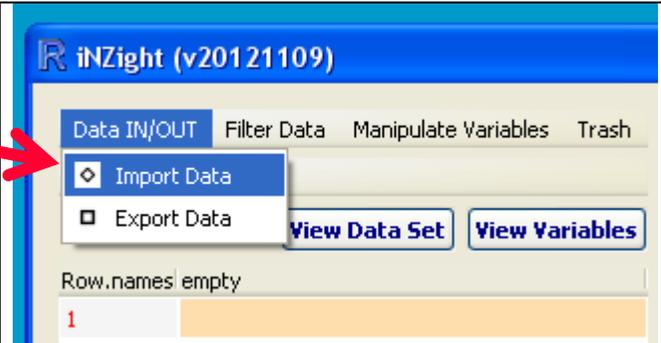
subset by : Drop name here Clear

subset by : Drop name here Clear

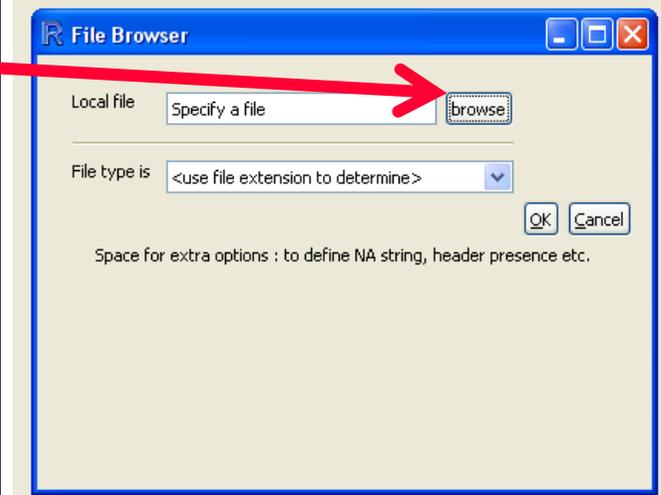
Get Summary Get Inference

newplot rename refresh save close Add to Plot Remove Additions Inference Information

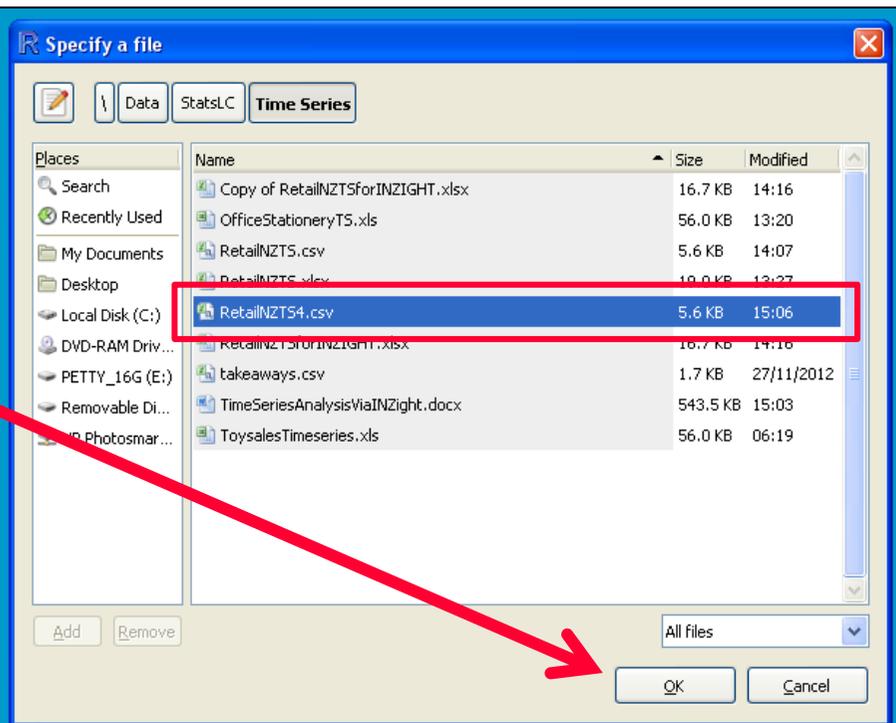
Step 4a  
Click on Import Data.



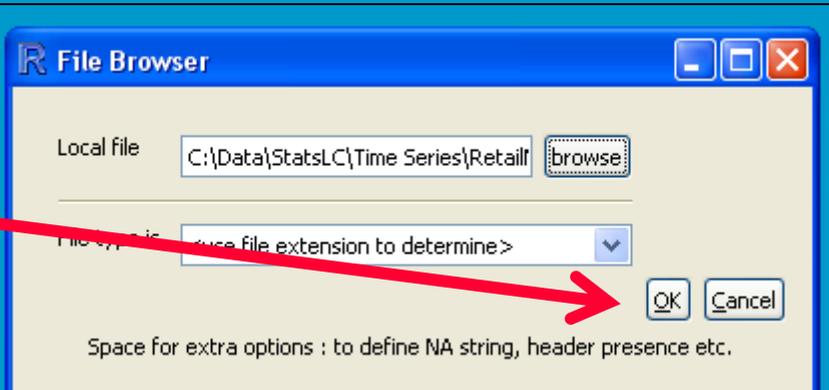
Step 4b  
Click on browse to find the file.



Step 4c  
Select the file, in this case RetailNZTS4.csv,  
then click OK.



Step 4d  
As the file has a .csv extension, the program will be able to  
work out what to do.  
Click OK.



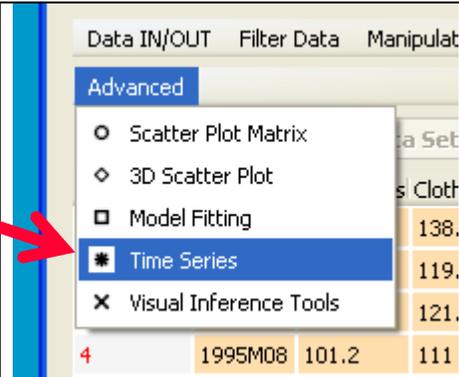
The data should appear in the window on the left.

Step 5a  
Click on Advanced.

The screenshot shows the iNZight (v20121109) software interface. The window title is "iNZight (v20121109)". The main menu includes "Data IN/OUT", "Filter Data", "Manipulate Variables", and "Trash". The "Advanced" tab is selected, showing a "View Data Set" button and a "View Variables" button. A table of data is displayed with the following columns: "Row.names", "Time", "Rec\_goods", "Clothing", "Footwear", and "Ch". The data rows are numbered 1 to 12. A large red "Data set" watermark is overlaid on the table. Below the table, there are four "Drop name here" fields with "Clear" buttons, labeled "Variable 1", "Variable 2", "subset by", and "subset by". At the bottom, there are buttons for "Get Summary" and "Get Inference", and a toolbar with icons for "newplot", "rename", "refresh", "save", "close", "Add to Plot", "Remove Additions", and "Inference Information". A red arrow points from the text "Click on Advanced." to the "Advanced" tab in the software interface.

Row.names	Time	Rec_goods	Clothing	Footwear	Ch
1	1995M05	103.2	138.2	24.6	85
2	1995M06	95.9	119.6	20.6	89
3	1995M07	98	121.1	20.2	84
4	1995M08	101.2	111	16.6	91
5	1995M09	103.6	109.4	17	87
6	1995M10	106.1	109.3	19	87
7	1995M11	129.1	121.1	21.1	89
8	1995M12	201.1	159.7	27.1	11
9	1996M01	121.4	109.7	21.2	89
10	1996M02	116.5	102.5	17.8	86
11	1996M03	120.3	121	20.5	84
12	1996M04	105.7	124.6	22.1	83

Step 5b  
Select Time Series.



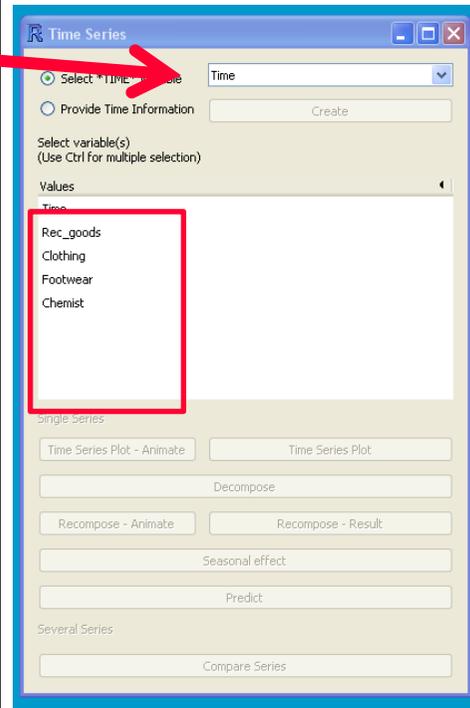
The program has already selected the \*TIME\* variable. You can now select one of the other variables to analyse. They are the monthly retail sales in millions of dollars for various categories of goods in New Zealand.

Rec\_goods is recreational goods, and includes sport and camping equipment, toys and games, books and stationery, photographic equipment and marine equipment.

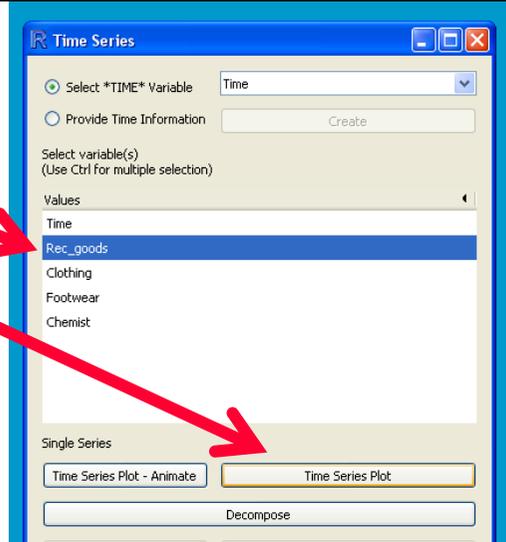
Clothing is clothing and softgoods retailing, and includes clothing and Manchester.

Footwear and Chemist are as stated.

The dataset was downloaded from <http://www.stats.govt.nz/infoshare/Default.aspx> on 5 December 2012, and formatted for importing into iNZight.

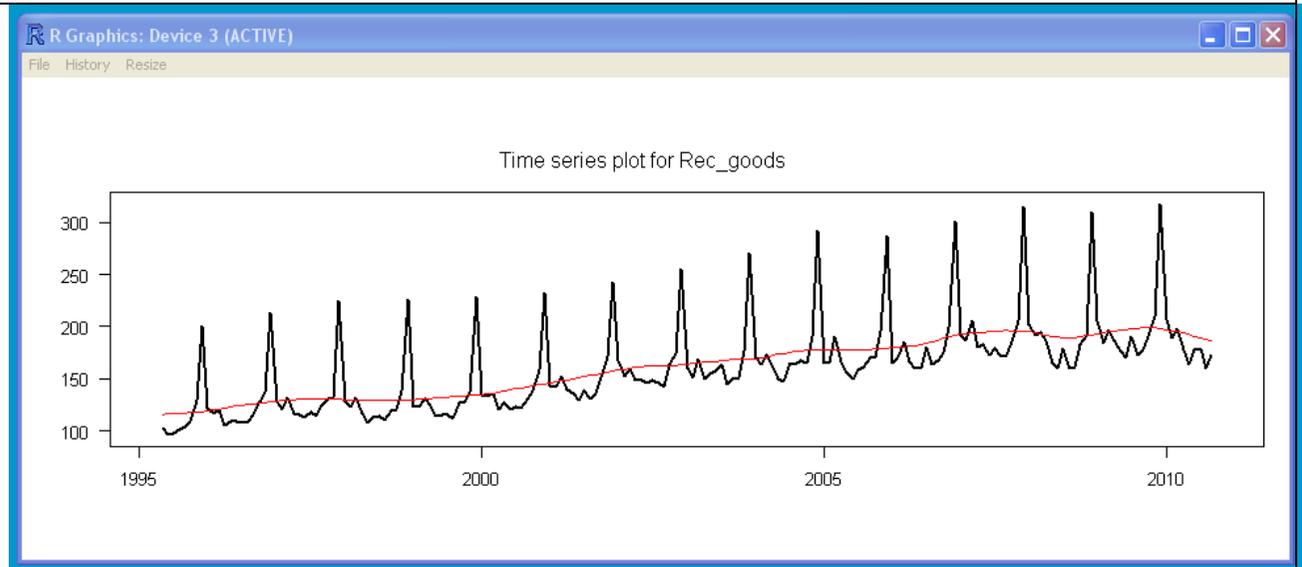


Step 6  
Select Rec\_goods.  
Click on Time Series Plot.



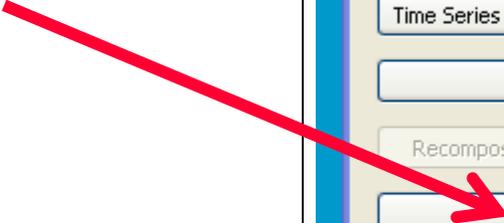
You should see a graph that looks like this.  
The jagged black line is the actual series, and the red line is the smoothed line showing the deseasonalised trend.

You can see that the trend is going up gradually, and then levelling out.  
The actual series has a very regular pattern to it. There is one month of the year where the sales are almost double the other months.  
Think about which month that will be.



Step 7

This regular pattern is called “seasonality”. You can see it better by clicking on Seasonal effect.



Single Series

Time Series Plot - Animate      Time Series Plot

Decompose

Recompose - Animate      Recompose - Result

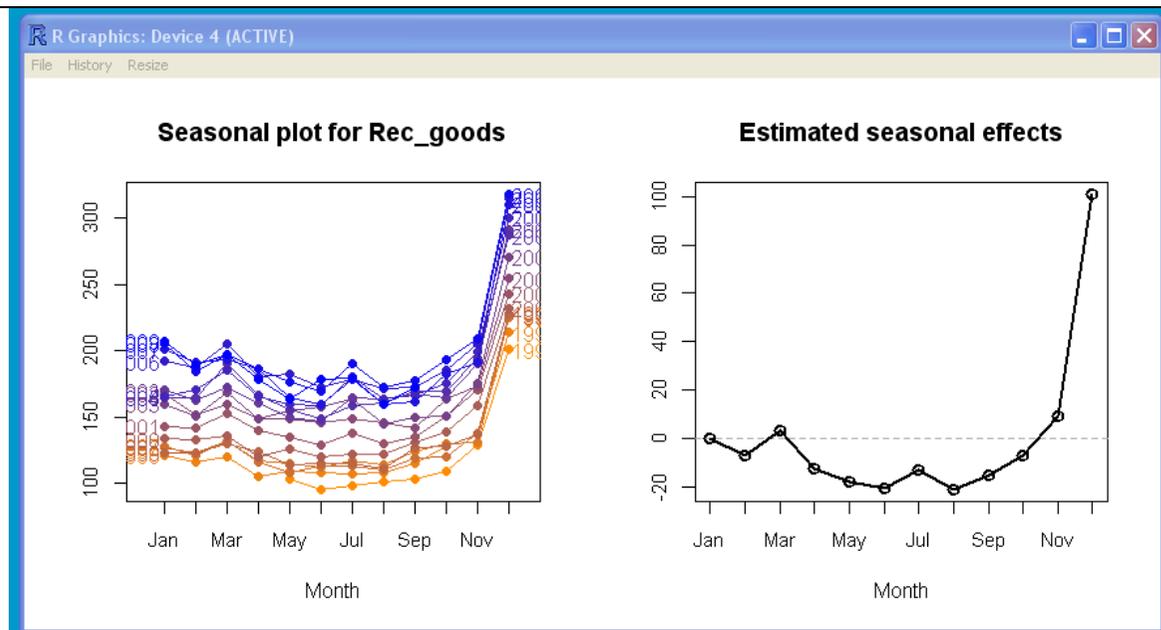
**Seasonal effect**

Predict

This is what should appear.

You can resize the window to get a better look at each of the graphs.

You can also Copy to the clipboard using the File command.



Then paste into a document.

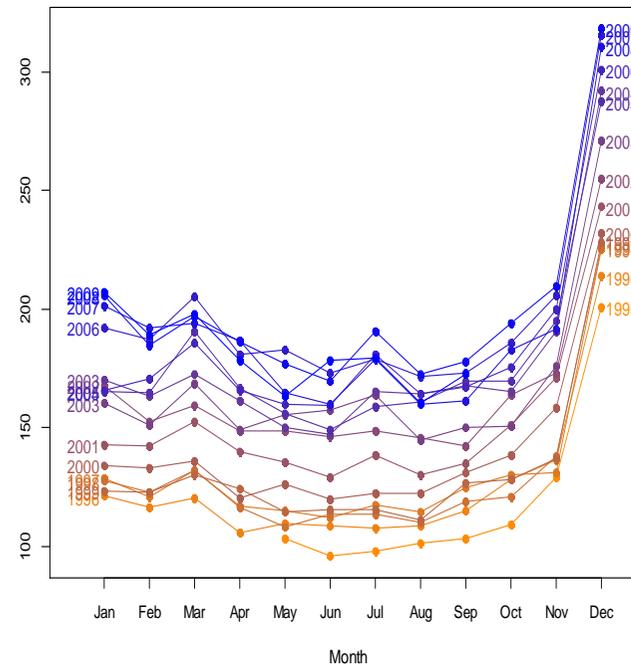
The picture on the right has been copied and pasted as a Metafile, whereas the earlier pictures are all screenshots. I've also cropped it, so we can look at the graphs individually.

What does this graph tell us?

The plot on the left has the entire series, but stacked up by year. The earlier years are orange, and they gradually change to blue.

You can see that the seasonal pattern is quite similar from year to year, and that the sales are gradually going up. If they weren't, the lines would be on top of each other (all mushed together.)

Seasonal plot for Rec\_goods

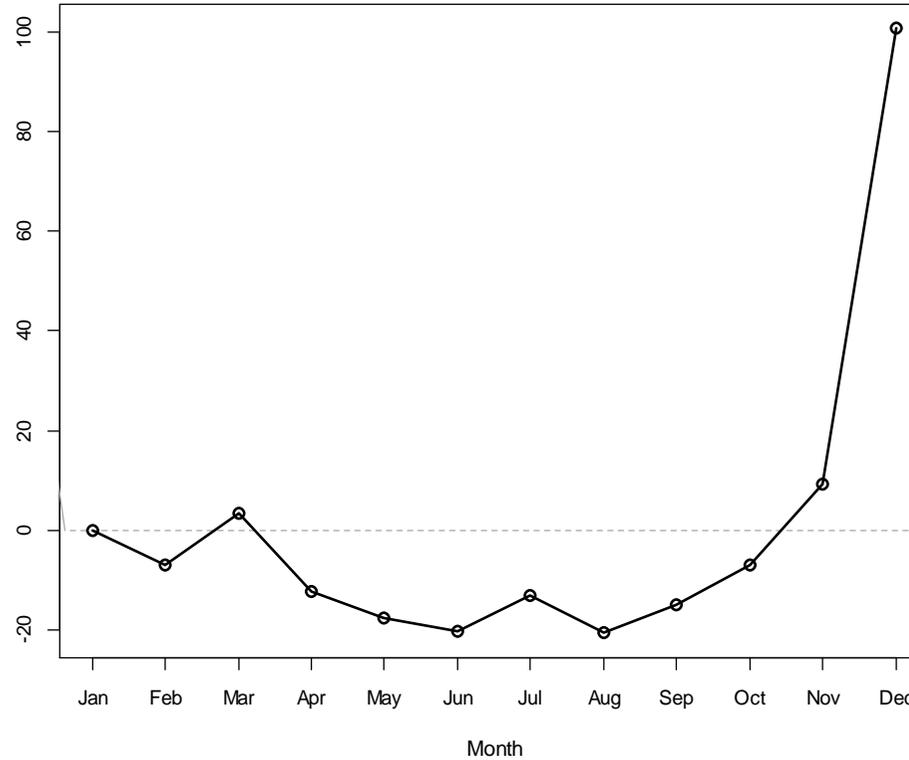


The plot on the right shows the estimated seasonal effects. This tells a bit of a story. There is a definite increase in December, which would be due to people buying Christmas presents. This is already starting in November.

There is an interesting little bump in March and in July. Can you think of any reason for these? I wonder if they occur in sales of other categories of goods. In New Zealand, the end of our financial year falls on 31<sup>st</sup> March, so sometimes businesses spend up then, and some businesses have sales to reduce the amount of inventory (stock) they are holding. You could ask some retailers what they think may cause this.

Should a person selling retail recreational goods compare their sales in January with the previous month or the January of the previous year?

Estimated seasonal effects



Step 8

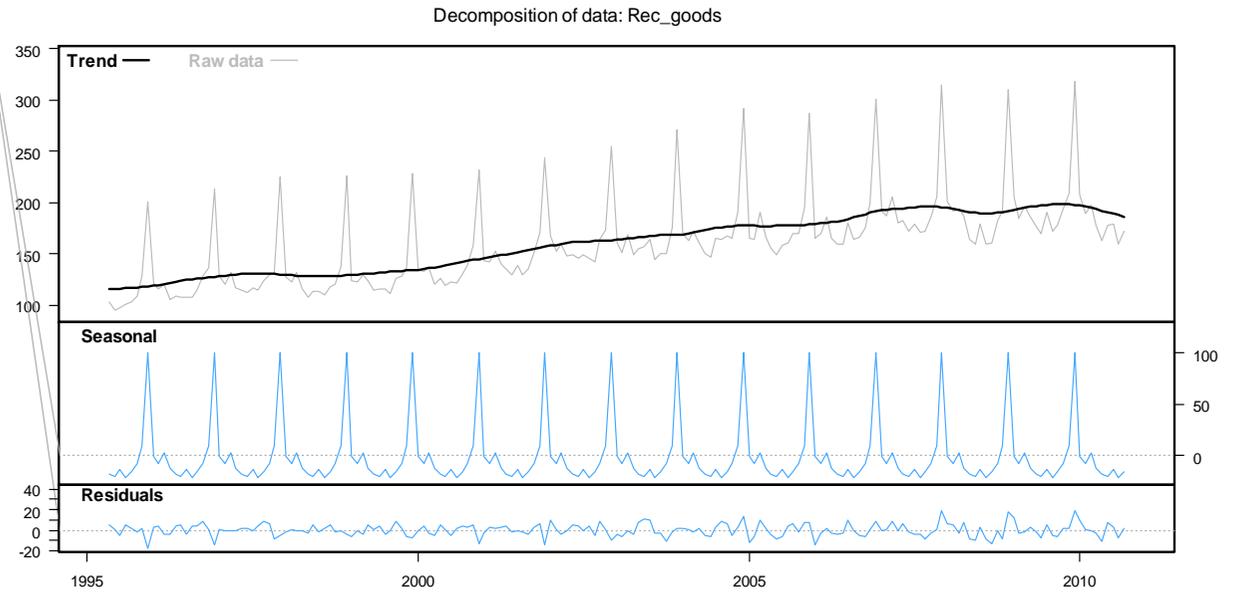
It is a good idea to see how much of the series is trend, how much is seasonality, and how much is random variation, or "noise". Click on Decompose to see this.

Time Series Plot - Animate      Time Series Plot

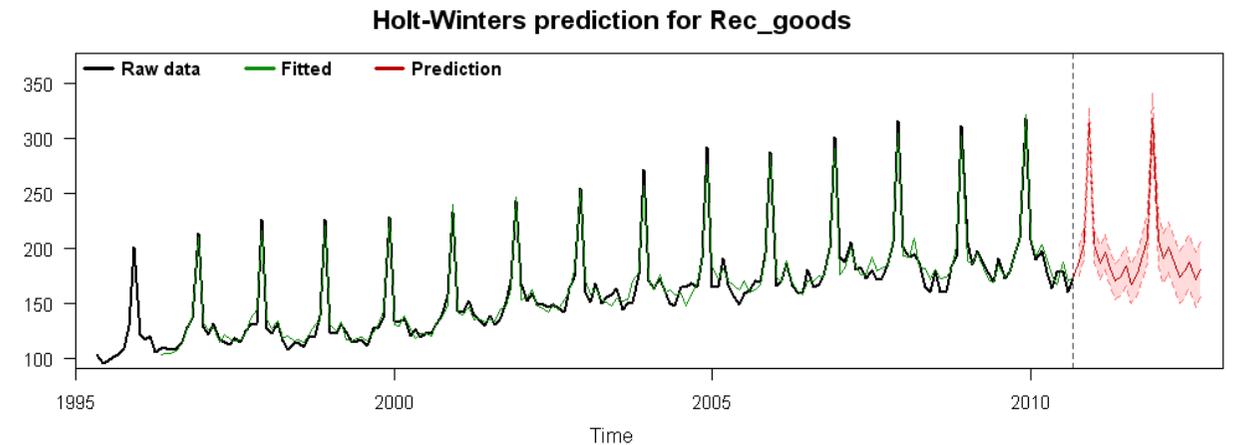
Decompose

The top graph is the original series, with the trend line.  
The middle graph shows the estimated seasonality, repeated.  
The bottom graph shows the Residuals. This is the variation that is not explained by trend or seasonality.

It is important to look at the scales of the graphs when comparing the relative effects.



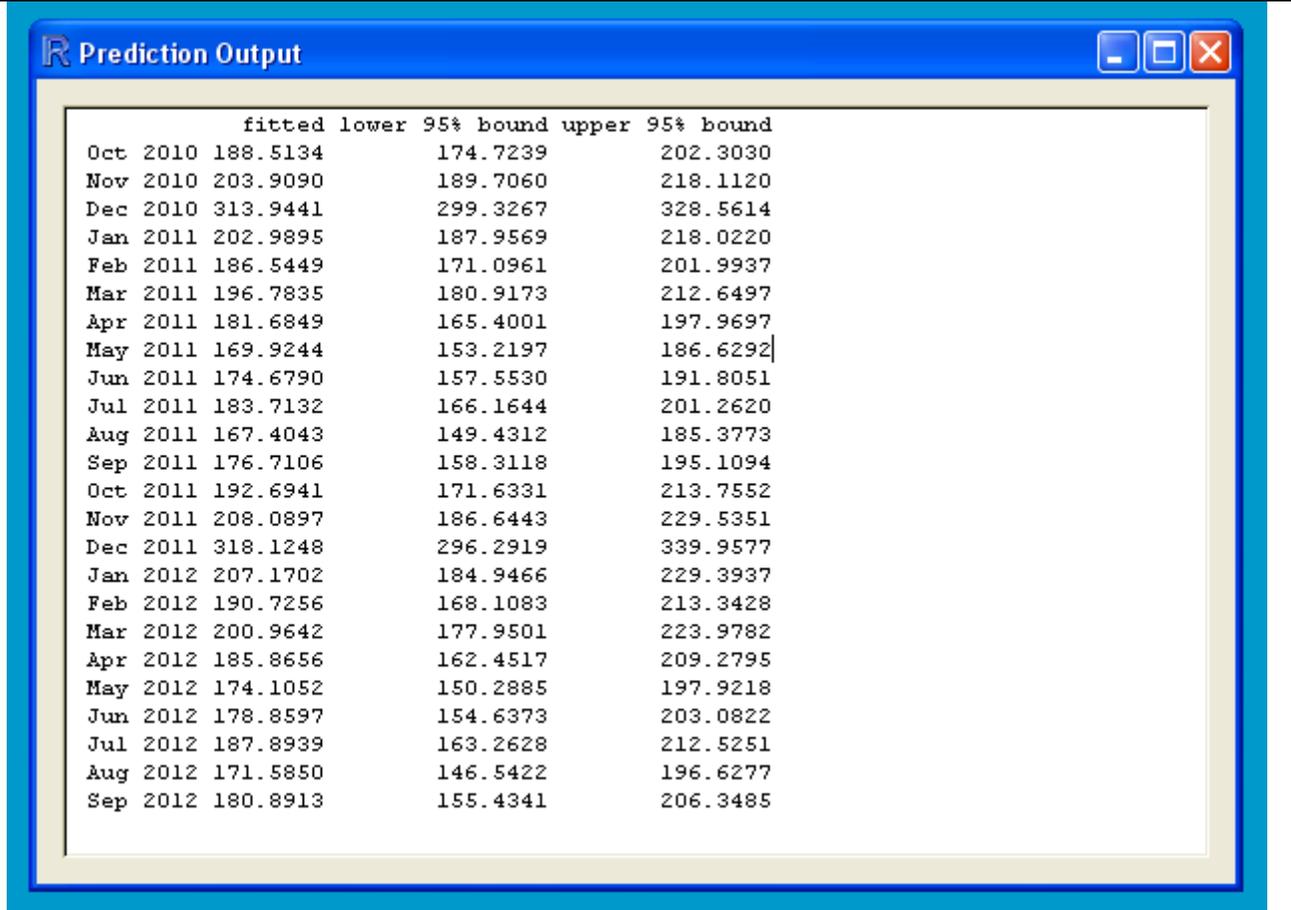
**Step 9**  
You can also use iNZight to predict. You should not predict too far ahead. This package will only predict two years ahead, as any further than this is ill-advised. You will also see that the predictions are given as intervals around a point.



The prediction values are also given (but with spurious accuracy – you should round them before writing them into a report.)

What do you notice about the width of the intervals? Compare the difference between the upper and lower bounds for the two July predictions. For 2011 it is 35 million. For 2012 it is 49 million.

This is because we are less sure of our predictions, the further into the future they occur. This is reflected in a wider prediction interval for the later predictions.



R Prediction Output

		fitted	lower	95% bound	upper	95% bound
Oct	2010	188.5134		174.7239		202.3030
Nov	2010	203.9090		189.7060		218.1120
Dec	2010	313.9441		299.3267		328.5614
Jan	2011	202.9895		187.9569		218.0220
Feb	2011	186.5449		171.0961		201.9937
Mar	2011	196.7835		180.9173		212.6497
Apr	2011	181.6849		165.4001		197.9697
May	2011	169.9244		153.2197		186.6292
Jun	2011	174.6790		157.5530		191.8051
Jul	2011	183.7132		166.1644		201.2620
Aug	2011	167.4043		149.4312		185.3773
Sep	2011	176.7106		158.3118		195.1094
Oct	2011	192.6941		171.6331		213.7552
Nov	2011	208.0897		186.6443		229.5351
Dec	2011	318.1248		296.2919		339.9577
Jan	2012	207.1702		184.9466		229.3937
Feb	2012	190.7256		168.1083		213.3428
Mar	2012	200.9642		177.9501		223.9782
Apr	2012	185.8656		162.4517		209.2795
May	2012	174.1052		150.2885		197.9218
Jun	2012	178.8597		154.6373		203.0822
Jul	2012	187.8939		163.2628		212.5251
Aug	2012	171.5850		146.5422		196.6277
Sep	2012	180.8913		155.4341		206.3485

Now you can explore the other series in the data set. Which series shows the least seasonal effect? How do the trends compare? Which one is least regular and has the largest residuals? Have fun, and think about what it all means, as this is real data!