Answers

Answers will vary, especially with regard forecasts and quoting seasonal variation figures depending on your choice of either a multiplicative seasonal pattern or an arithmetic one. It is important you can justify your selection.

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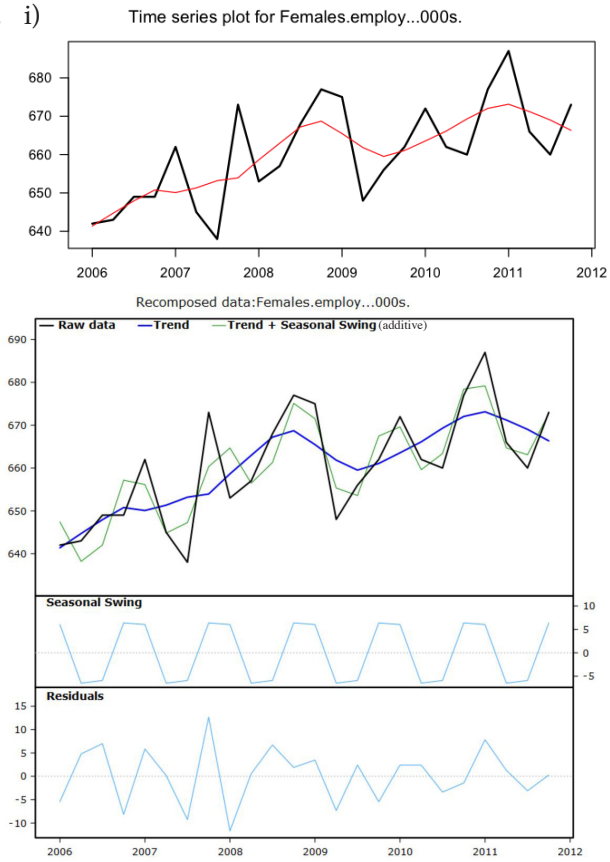
1. i)



If we look at the recomposed series we can see from the raw data that the peak number of female employees is about 687 000 with a low of 638 000.

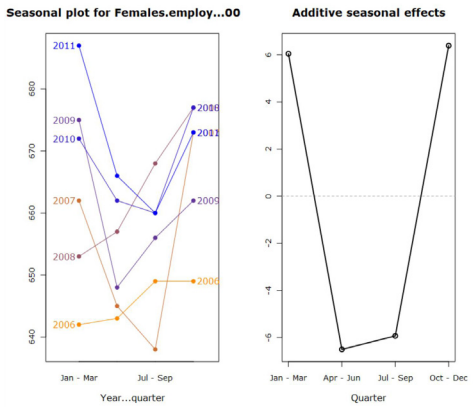
The trend shows females employed in the NZ workforce show an increasing trend from 2006 until 2009 and then a drop perhaps reflecting the onset of the global economic crisis and higher rates of unemployment. The trend from late 2009 until early 2011 is an increasing one and then it begins to drop again from early 2011. Peak number of female employees are 670 000 with a low of 642 000. This gives a variation of 28 000. Overall the trend shows an increase in female employees of approximately 6000 per year over the five years.

If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is little difference so we select the additive one in this instance as it appears better in the earlier years.

The seasonal component goes from ⁻6500 to 6500 which gives a total seasonal variation of 13 000.

There is some residual activity in the series. Residuals have a range of 23 000 (+12 000 to ⁻11 000), but most residuals are in the range ±6000. Two residuals that fall outside the range occur in mid 2007 and early 2008 and reflect the increase in female employees in mid 2007 followed by the fall. Approximately 57% ((670 000 – 642 000) ÷ (687 000 – 638 000)) of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

ii)

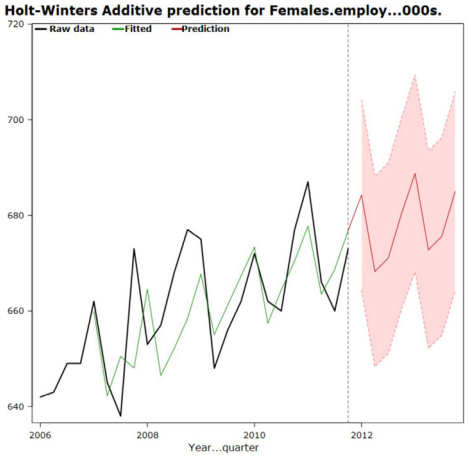


A strong seasonal cycle is evident with higher employment in the January to March and October to December quarters (+6500 above the trend, perhaps reflecting increased seasonal summer work) and lower employment in the April to June and July to September quarters (⁻6500 below the trend).

An increasing trend is indicated by the gap between each year's seasonal plots. From 2006 to 2008 the gap between the yearly seasonal plots is significant indicating an increasing trend. In 2009 there is evidence of a drop in female employment and in 2010 and 2011 female employment rises again.

There is also evidence of some seasonal variation in female employment from year to year.

iii)



Time Series Forecasts

	fit	upr	lwr
2012 Q1	684.2386	704.1204	664.3568
2012 Q2	668.2341	688.1368	648.3315
2012 Q3	671.0651	690.9944	651.1359
2012 Q4	680.4408	700.4032	660.4784
2013 Q1	688.7755	709.3979	668.1530
2013 Q2	672.7710	693.4401	652.1019
2013 Q3	675.6020	696.3260	654.8780
2013 Q4	684.9777	705.7655	664.1898

Forecasted female employment for January quarters in 2012 and 2013 is 684 000 and 689 000 respectively.

Relatively wide forecast intervals (664 000 to 704 000 and 668 000 to 709 000) reflect that the series has potential for changes in trend level and direction. Overall there is uncertainty whether female employment will increase or decrease.

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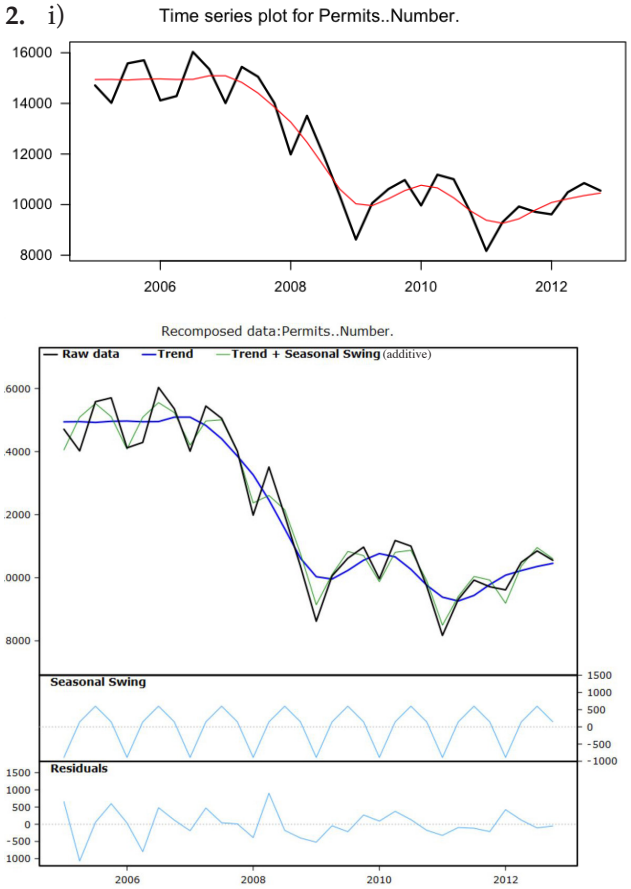
2. i)



If we look at the recomposed series we can see from the raw data that the peak number of residential building permits issued is about 16 000 in 2005 - 2006 with a low of 8200 in 2011.

The trend shows residential building permits dropped steeply from late 2007 through to 2009 reflecting the effect of the global recession. A small increase in permits issued occurred in 2010 but then dropped again. Since late 2011 and early 2012 permits have increased perhaps reflecting the reconstruction after the Christchurch earthquake. The trend shows peak building permits at 15 000 with a low of 9000. This gives a variation of 6000 within the trend and 7800 within the raw data (16 000 – 8200).

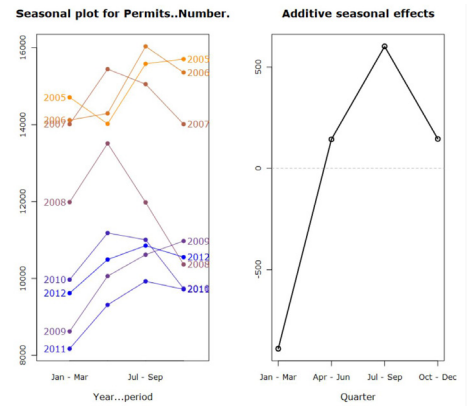
If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is little difference so we select the additive one in this instance as it appears better in the latter years.

The seasonal component goes from ⁻900 to 600 which gives a total seasonal variation of 1500.

There is some residual activity in the series. Residuals have a range of 2000 (+1000 to ⁻1000), but most residuals are in the range ±500. Two residuals that fall outside the range occur in mid 2006 and mid 2008 and reflect the beginning of the steep drop in building permits issued and also the continued drop through 2008 and 2009

Around 77% ((15000 – 9000) ÷ (16000 – 8200)) of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

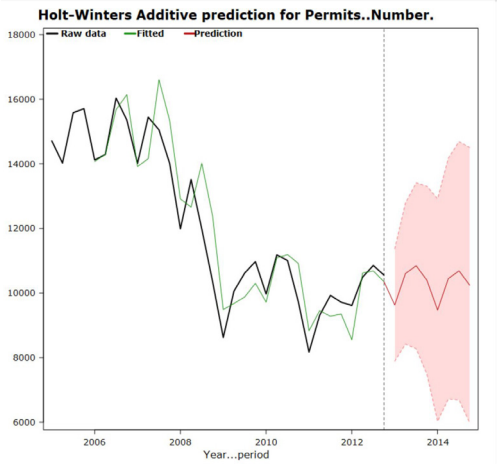
ii)



A strong seasonal cycle is evident with a higher numbers of residential permits issued in the July to September quarter (+600 above the trend) and lower residential permits issued in the January to March quarter (⁻900 below the trend). This is undoubtedly a reflection of the Christmas holiday period. The other two quarters show permits issued at +150 above the trend.

A decreasing trend is evident by the gap between each year's seasonal plots. Each successive years seasonal plot is significantly below the previous years. In 2012 there is evidence of an increase in residential permits issued.

iii)



Time Series Forecasts

	fit	upr	lwr
2013 Q1	9629.053	11370.78	7887.327
2013 Q2	10602.870	12789.14	8416.602
2013 Q3	10843.921	13411.79	8276.057
2013 Q4	10396.107	13307.70	7484.512
2014 Q1	9472.160	12918.38	6025.936
2014 Q2	10445.977	14174.57	6717.385
2014 Q3	10687.028	14687.22	6686.836
2014 Q4	10239.213	14502.45	5975.980

Forecasted residential building permits for the third quarters of 2013 and 2014 are 10 844 and 10 687 respectively.

Increasingly wider forecasting intervals (8276 to 13 412 and 6687 to 14 687) reflect that the series has potential for changes in trend level and direction. Overall there is unlikely to be a major change in the building permits for the next two years although the Christchurch rebuild may affect this.

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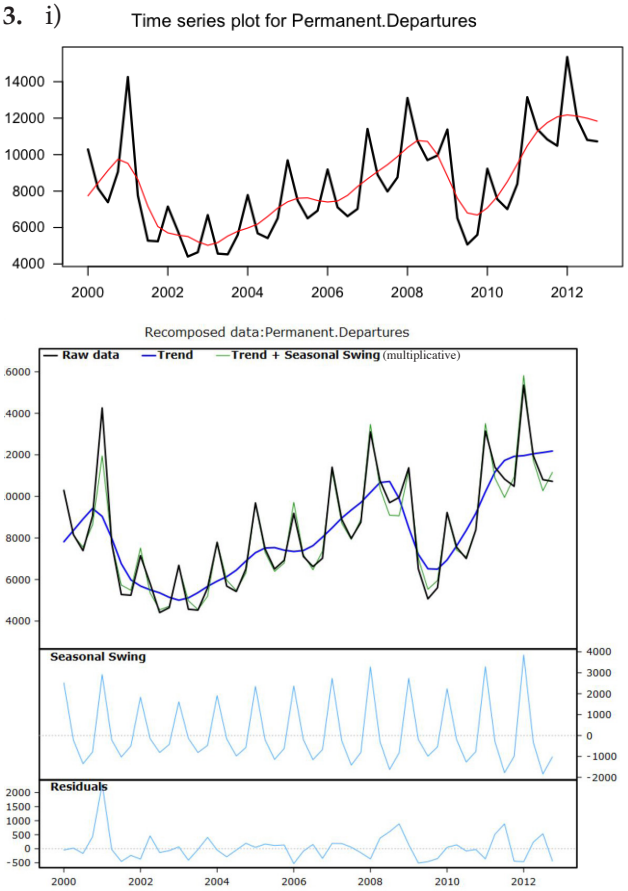
3. i)



If we look at the recomposed series we can see from the raw data that the peak number of permanent departures to Australia is about 15 400 in 2012 with a low of 4400 in 2002.

The trend shows departures to Australia by NZ citizens reached a low in 2003 and climbed steadily until late 2008 where there was a steep decline until the end of 2009. From 2010 permanent departures to Australia have increased significantly until 2012 perhaps reflecting the strong Australian economy and greater job opportunities. The trend shows peak permanent departures at 12 000 with a low of 5000. This gives a variation of 7000 within the trend and 11 000 within the raw data (15 400 – 4400).

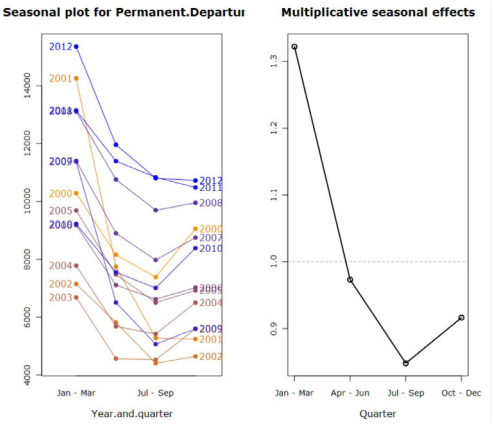
If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, the multiplicative appears to be a better fit for the raw data.

The seasonal component goes from ⁻1800 to 3800 which gives a total seasonal variation of 5600.

There is some residual activity in the series. Residuals have a range of 2700 (+2200 to ⁻500), but most residuals are in the range ±500. One residual that falls outside the range occurs in 2001 and reflects the beginning of the steep decline in departures to Australia by NZ citizens from 2001 to 2003.

Around 64% ((12 000 – 5000) ÷ (15 400 – 4400)) of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

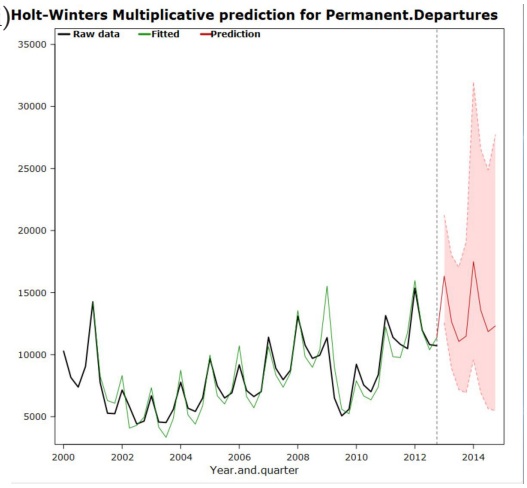
ii)



A strong seasonal cycle is evident with a higher number of permanent departures in the January to March quarter (approximately 32% above the trend value) and lower permanent departures in the July to September quarter (approximately 17% below the trend value). This reflects that most permanent departures to Australia are in preparation for the start of the year (new school year, starting of a new job etc.).

From an initial decreasing trend evident by the gap between each year's seasonal plots to an increasing one from 2003 to 2008 and then a steep fall. From 2010 permanent departures have increased reflecting the strong Australian economy and greater job opportunities.

iii)



Time Series Forecasts

	fit	upr	lwr
2013 Q1	16332.18	21232.78	12562.651
2013 Q2	12665.06	18013.70	8904.535
2013 Q3	11058.95	17040.35	7177.105
2013 Q4	11492.60	19095.17	6916.924
2014 Q1	17502.72	31978.39	9579.757
2014 Q2	13572.77	26579.61	6930.885
2014 Q3	11851.56	24874.31	5646.768
2014 Q4	12316.29	27711.26	5473.981

Permanent departures to Australia by NZ citizens for the first quarters of 2013 and 2014 are 16 332 and 17 502 respectively.

Increasingly wider forecast intervals (12 563 to 21 233 and 9580 to 31 978) reflect that the series has potential for changes in trend level and direction. Overall permanent departures to Australia by NZ citizens are forecasted to increase on 2012 levels.

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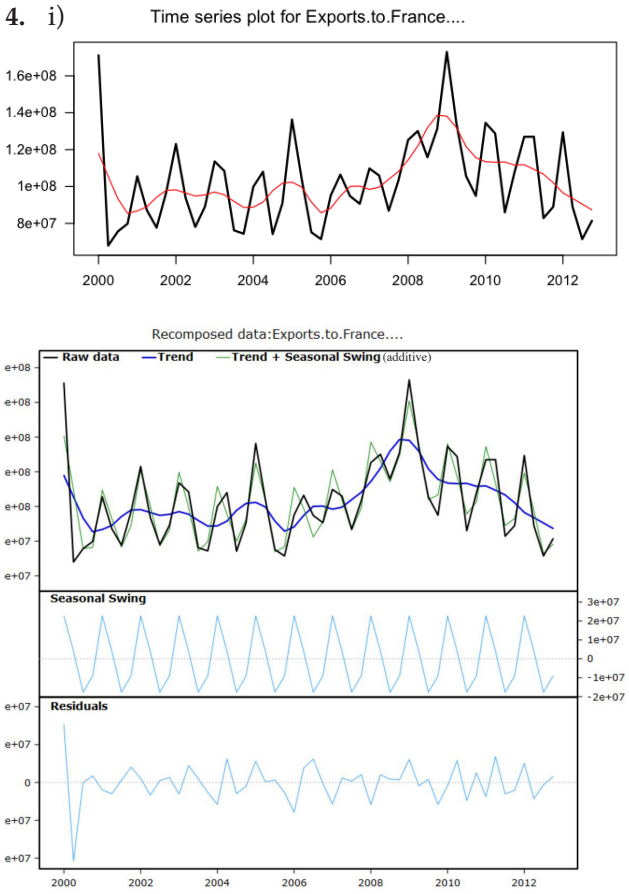
4. i)



If we look at the recomposed series we can see from the raw data that peak Exports to France were $173 million in 2009 with a low of $68 million in 2000.

The trend shows exports to France reached a low in 2001 and then oscillated until 2007 and then climbed steadily reaching a peak in 2009. Since 2009 exports to France have continued to drop perhaps reflecting the onset of the global economic crisis. The trend shows peak exports to France of $140 million with a low of $87 million. This gives a variation of $53 million within the trend and $105 million within the raw data (173 – 68).

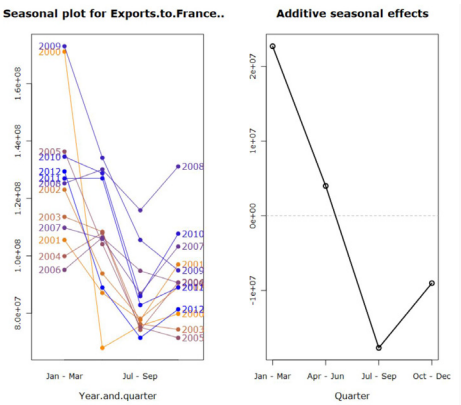
If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is not a lot of difference and since the amplitude of seasonal activity is not increasing we choose additive.

The seasonal component goes from ⁻$19 million to $21 million which gives a total seasonal variation of $40 million.

There is some residual activity in the series. Residuals have a range of $7 million (+$3 million to ⁻$4 million), but most residuals are in the range ±$1 million. One residual that falls outside the range occurs in 2000 and reflects the steep drop in exports to France in 2000.

Around 50% ((140 – 87) ÷ (173 – 68)) of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

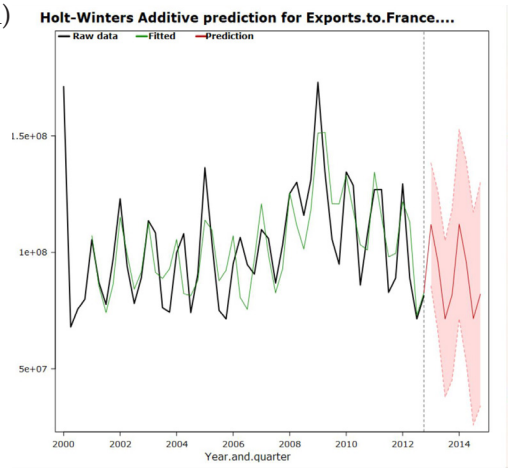
ii)



A strong seasonal cycle is evident with higher exports to France in the January to March quarter (+$21 million above the trend) and lower exports to France in the July to September quarter (⁻$19 million below the trend). In particular exports in 2000 and 2009 have contributed to the overall higher exports to France in the January to March quarter.

From an initial steep drop in exports evident by the gap between 2000 and 2001 seasonal plots, exports have oscillated until 2008 and then increased steeply to a high in 2009. From 2009 exports to France have continued to decline, this is evident in the seasonal plot graph because successive year's seasonal plots are significantly below the previous years.

iii)



Time Series Forecasts

	fit	upr	lwr
2013 Q1	111975679	138354345	85597013
2013 Q2	95648533	125857262	65439805
2013 Q3	71470580	105075646	37865513
2013 Q4	81945042	118633375	45256709
2014 Q1	112123790	152786481	71461099
2014 Q2	95796644	139042311	52550978
2014 Q3	71618691	117301520	25935861
2014 Q4	82093153	130089550	34096756

Exports to France for the first quarters of 2013 and 2014 are both $112 million.

Increasingly wider prediction intervals ($86m to $138m and $71m to $153m) reflect that the series has potential for changes in trend level and direction.

Overall exports to France are predicted to stay at a similar level or drop slightly for 2013 and 2014.

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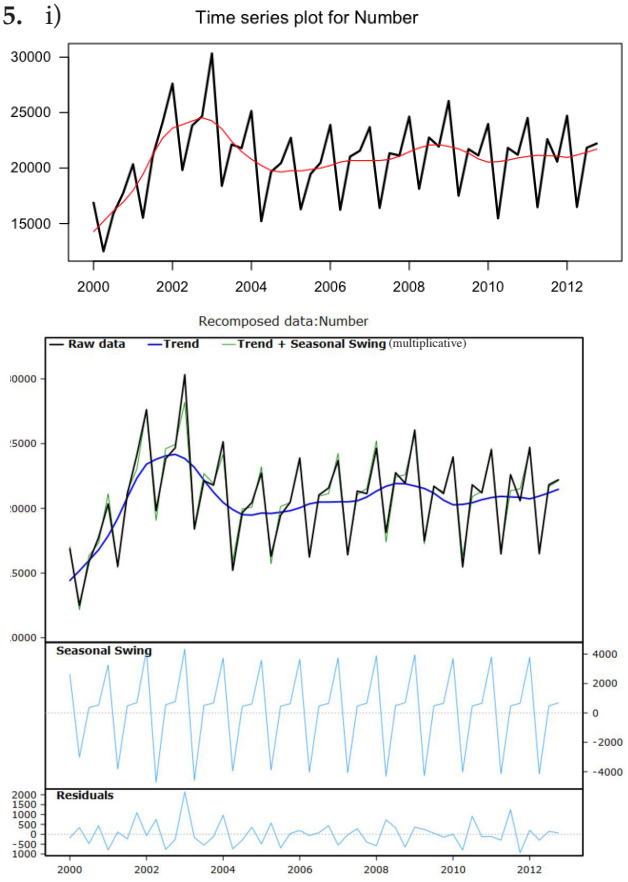
5. i)



If we look at the recomposed series we can see from the raw data that peak permanent migration to NZ occurred in 2003 at 30 000 and reached a low in 2000 of 12 500.

The trend shows permanent migration to NZ reached a low in 2000 and then climbed steeply reaching a peak in 2003. Since 2003 permanent migration to NZ has dropped to 20 000 and has only risen slightly over the remaining 8 years. The trend shows peak permanent migration to NZ of 24 000 with a low of 14 000. This gives a variation of 10 000 within the trend and 17 500 within the raw data (30 000 – 12 500).

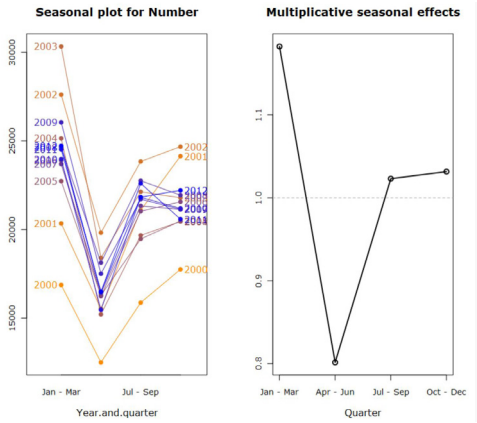
If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is not a lot of difference but we have chosen the multiplicative one in this instance because the multiplicative appears to be a better fit on a number of points for the raw data.

The seasonal component goes from ⁻4100 to 4100 which gives a total seasonal variation of 8200.

There is some residual activity in the series. Residuals have a range of 3500 (+2500 to ⁻1000), but most residuals are in the range ±500. One residual that falls outside the range occurs in 2003 which coincides with the steep drop in permanent migration to NZ in 2003.

Around 57% ((24 000 – 14 000) ÷ (30 000 – 12 500)) of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

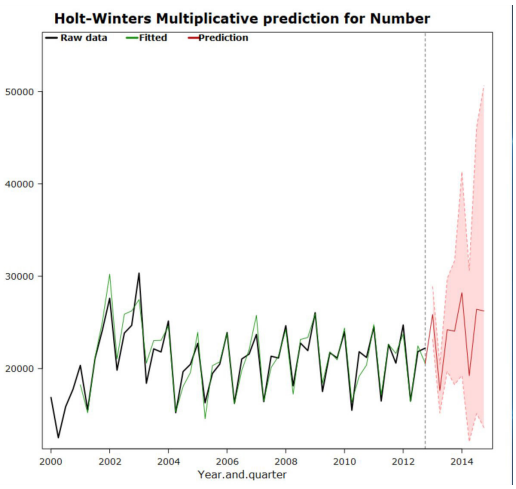
ii)



A strong seasonal cycle is evident with higher migration to NZ in the January to March quarter (aprrox. 18% above the trend value) and lower migration to NZ in the April to June quarter (approx. 20% below the trend value). This reflects that most permanent migration to NZ is in preparation for the start of the year (new school year, starting of a new job etc.).

Initial increase in permanent migration from 2000 to 2003 is evident by the large gap between the seasonal plots for these years. From 2004 to 2012 there is not a great variation in the annual seasonal plots indicating that permanent migration to NZ has not changed greatly.

iii)



Time Series Forecasts

	fit	upr	lwr
2013 Q1	25852.19	28867.60	23151.77
2013 Q2	17618.62	20459.51	15172.19
2013 Q3	24205.35	29751.29	19693.23
2013 Q4	24039.32	31682.41	18240.05
2014 Q1	28212.83	41329.70	19258.88
2014 Q2	19227.42	30620.97	12073.22
2014 Q3	26415.60	46137.44	15124.03
2014 Q4	26234.41	50639.85	13590.97

Permanent Migration to NZ for the first quarters of 2013 and 2014 are 25 852 and 28 212 respectively.

Increasingly wider prediction intervals (23 152 to 28 868 and 19 259 to 41 330) reflect that the series has potential for changes in trend level and direction.

Overall permanent migration to NZ is predicted to be similar or rise slightly for 2013 and 2014.

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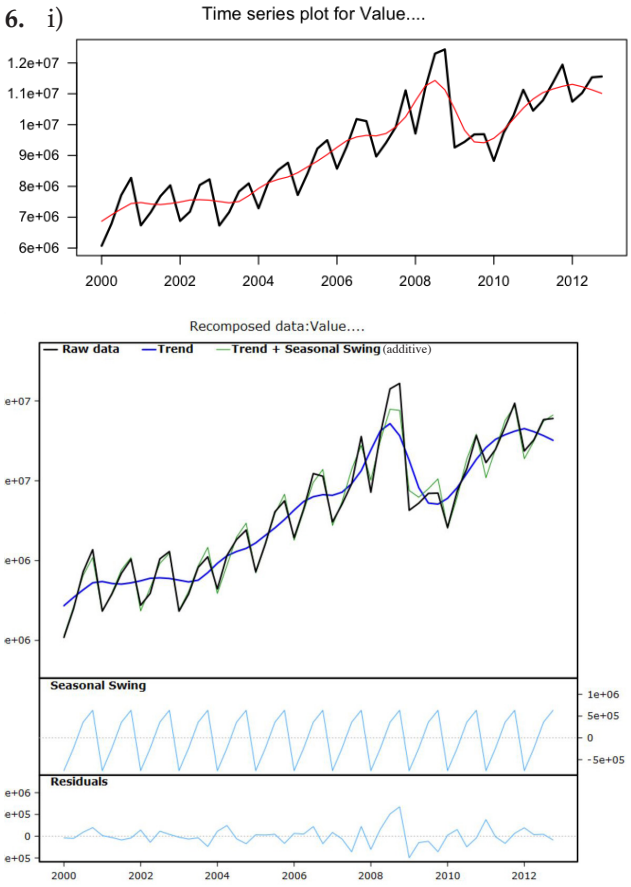
6. i)



If we look at the recomposed series we can see from the raw data that peak value of total imports to NZ occurred in late 2008 at $12 000 million and reached a low in 2000 of $6000 million.

The trend shows value of total imports to NZ reached a low in 2000 ($7000 million) and then climbed reaching a peak in 2008 ($11 500 million). From 2008 value of total imports to NZ dropped to approximately $9500 million in 2010 and then has increased again up to a level close to that of the peak in 2008. This gives a variation of $4500 million within the trend and $6000 million within the raw data.

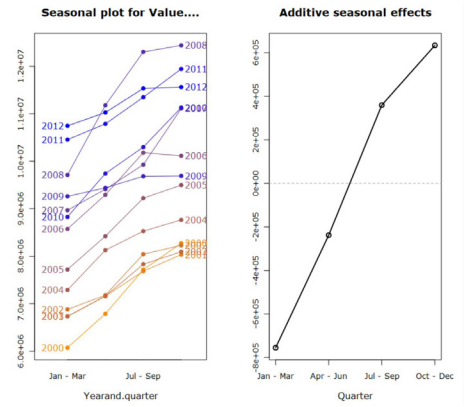
If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is not a lot of difference and since the amplitude of seasonal activity is not increasing we choose additive.

The seasonal component goes from ⁻$750 million to $650 million which gives a total seasonal variation of $1400 million.

There is some residual activity in the series. Residuals have a range of $1100 million (+$600 million to ⁻$500), but most residuals are in the range ±$200 million. One residual that falls outside the range occurs in 2008 which coincides with the steep drop in value of total imports to NZ.

Around 75% of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

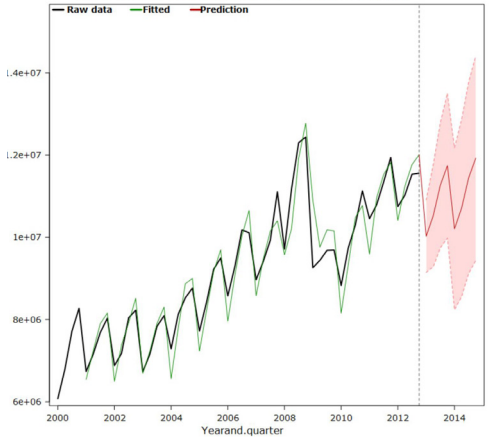
ii)



A strong seasonal cycle is evident with higher value of total imports to NZ in the October to December quarter (+$650 million above the trend) and lower value of total imports to NZ in the January to March quarter (⁻$750 million below the trend). This high value of imports in the October to December quarter reflect imports of goods for Christmas.

Initial increase in value of total imports to NZ from 2000 to 2008 is evident by the successive gaps between the seasonal plots for these years. From 2009 to 2010 there is drop in the value of total imports evident by the drop in the annual seasonal plots. 2011 and 2012 show an increase in total imports but still not at the level reached in 2008.

iii)



Time Series Forecasts

	fit	upr	lwr
2013 Q1	10024858	10905612	9144105
2013 Q2	10526603	11772176	9281030
2013 Q3	11267521	12793030	9742012
2013 Q4	11741331	13502838	9979825
2014 Q1	10206771	12176195	8237347
2014 Q2	10708515	12865911	8551119
2014 Q3	11449433	13779687	9119179
2014 Q4	11923244	14414390	9432097

Value of total imports to NZ for the first quarters of 2013 and 2014 are $10 025 million and $10 207 million respectively.

Increasingly wider forecast intervals ($9144 million to $10 906 million and $8237 million to $12 176 million) reflect that the series has potential for changes in trend level and direction. Overall value of total imports to NZ is forecasted to stay at a similar level for 2013 and 2014 but there is a lot of uncertainty in any prediction.

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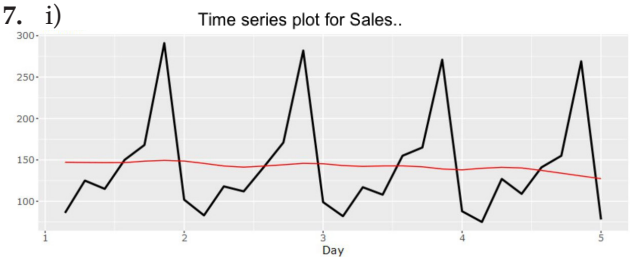
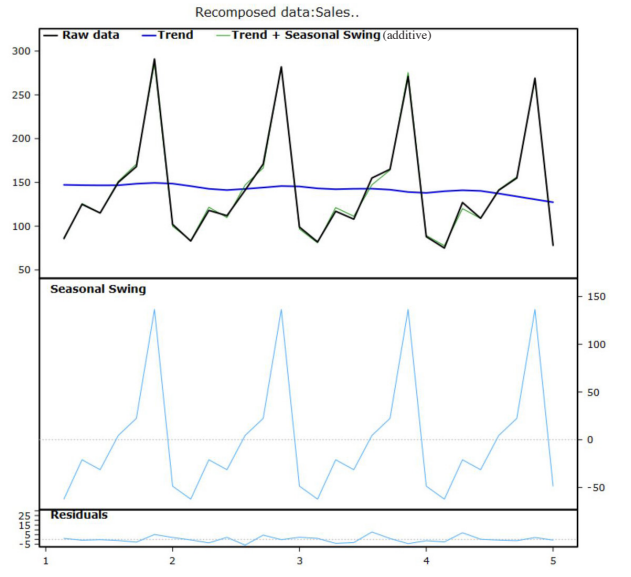
7. i)





If we look at the recomposed series we can see from the raw data that hardware sales reached a peak on Saturday week 1 at $290 m and reached a low on Sunday week 4 of $78 m.

The trend shows hardware sales reaching a high of $150 m in week 1 and a low of $130 m in week 4. This gives a variation of $20 m within the trend ($5 m per week) and $212 m within the raw data.

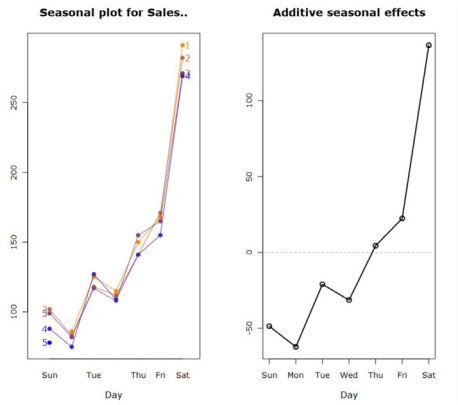
If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is not a lot of difference and since the amplitude of seasonal activity is not increasing we choose additive.

The seasonal component goes from ⁻$70 m to $140 m which gives a total seasonal variation of $210 m.

There is very little residual activity in the series. Residuals have a range of $7 m (+$5 m to ⁻$2 m).

Around 9.4% of the overall variation of the series can be accounted for by the trend component. The seasonal component accounts for the majority of variation in the series.

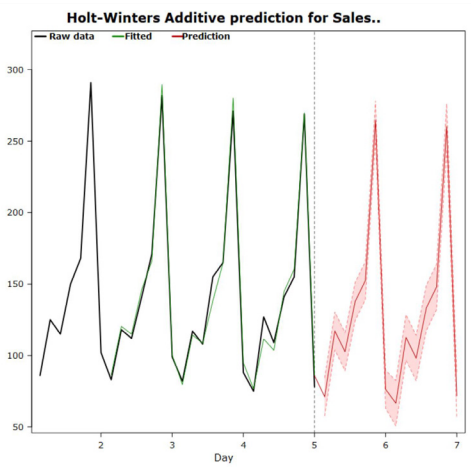
ii)



A strong seasonal cycle is evident with higher hardware sales on Saturday each week (+$140 m above the trend) and lower hardware sales on Monday of each week (⁻$70 m below the trend). High hardware sales are to be expected on a Saturday as it is when the majority of home handymen purchase supplies to undertake DIY work on their homes.

There is very little difference in the seasonal plots for the four weeks. Each week's seasonal plot sits on the previous weeks indicating little variation from week to week for the four week period.

iii)



	Prediction	Lower	Upper
MW5	71	58	84
TW5	117	104	130
WW5	103	89	116
TW5	138	124	151
FW5	152	139	166
SW5	265	251	278
SW5	76	63	90
MW6	67	51	83
TW6	113	97	129
WW6	98	82	114
TW6	133	117	149
FW6	148	132	164
SW6	260	244	276
SW6	72	56	88

Hardware sales for Saturday week 5 and Sunday week 6 are $265 m and $260 m respectively.

Prediction intervals are ($251 m to $278 and $244 m to $276). Overall hardware sales are predicted to fall slightly for the following two Saturday's week 5 and week 6, but well within expected norms.

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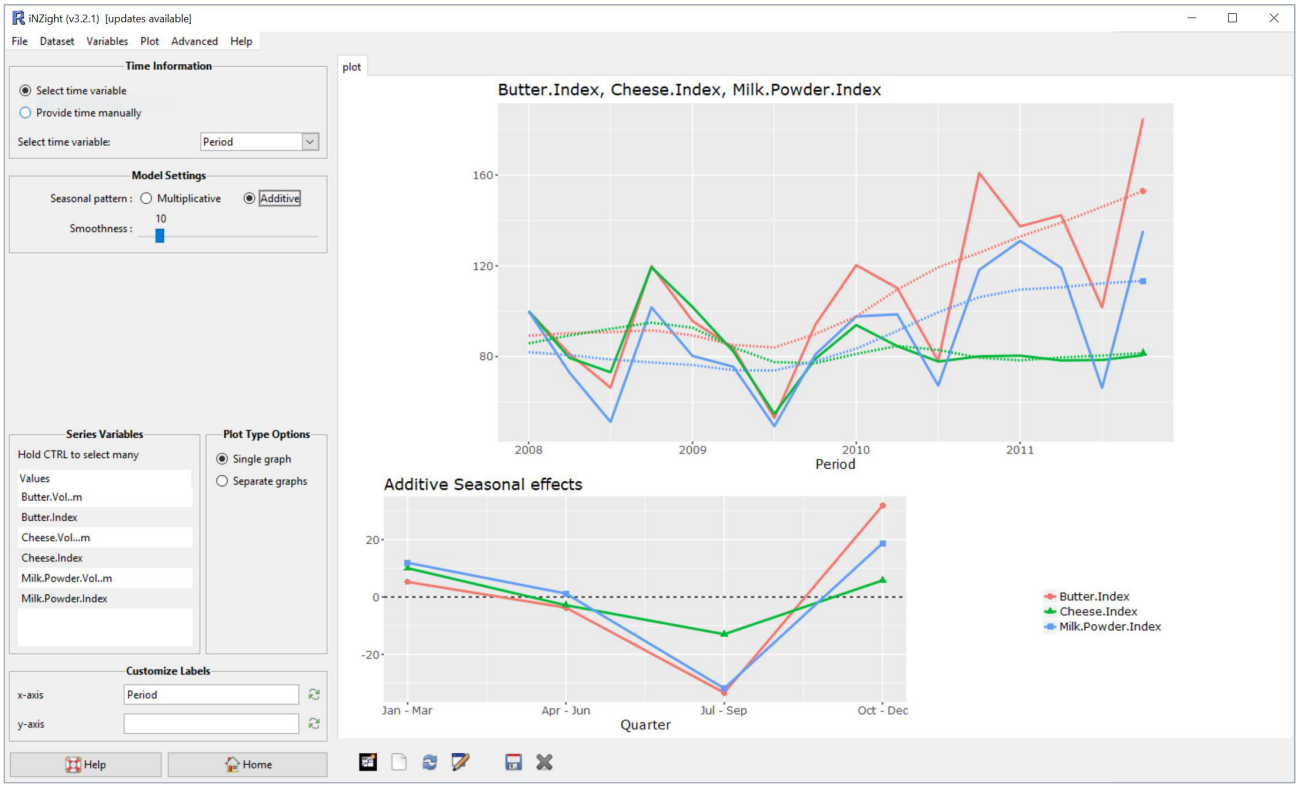
8.

	A	B	C	D	E	F	G
1	Period	Butter Vol $m	Butter Index	Cheese Vol $m	Cheese Index	Milk Powder Vol $m	Milk Powder Index
2	2008Q1	463	100	428	100	1551	100
3	2008Q2	376	81.2	340	79.4	1130	72.9
4	2008Q3	307	66.3	313	73.1	794	51.2
5	2008Q4	555	119.9	511	119.4	1577	101.7
6	2009Q1	443	95.7	436	101.9	1246	80.3
7	2009Q2	388	83.8	352	82.2	1171	75.5
8	2009Q3	245	52.9	234	54.7	764	49.3
9	2009Q4	435	94.0	338	79.0	1255	80.9
10	2010Q1	557	120.3	402	93.9	1516	97.7
11	2010Q2	510	110.2	362	84.6	1530	98.6
12	2010Q3	361	78.0	333	77.8	1043	67.2
13	2010Q4	745	160.9	343	80.1	1834	118.2
14	2011Q1	636	137.4	344	80.4	2032	131.0
15	2011Q2	659	142.3	335	78.3	1848	119.1
16	2011Q3	471	101.7	336	78.5	1026	66.2
17	2011Q4	856	184.9	345	80.6	2100	135.4



Exports of butter show a strong seasonal pattern with high sales in the October to December quarter and lower sales in the July to September. Sales appear to be increasing at a higher rate each year, especially from mid 2009.

Exports of cheese also show a strong seasonal pattern, but less than for butter. Sales are generally high in the January to March quarter and low in the June to September quarter. In late 2010 and 2011 the seasonal cycle was less pronounced and more even sales occurred throughout the year. Perhaps this reflects a change in export purchases or is a one-off occurrence. Further investigation of future years is required. Trend is relatively constant.

Exports of milk powder show a seasonal pattern similar to that of butter with high sales in the October to December quarter and low sales in the July to September quarter. Milk powder sales over the period 2008 to 2010 have been relatively constant but have increased after 2010 perhaps reflecting increased exports to a country as a result of a free trade agreement or increased quota etc.

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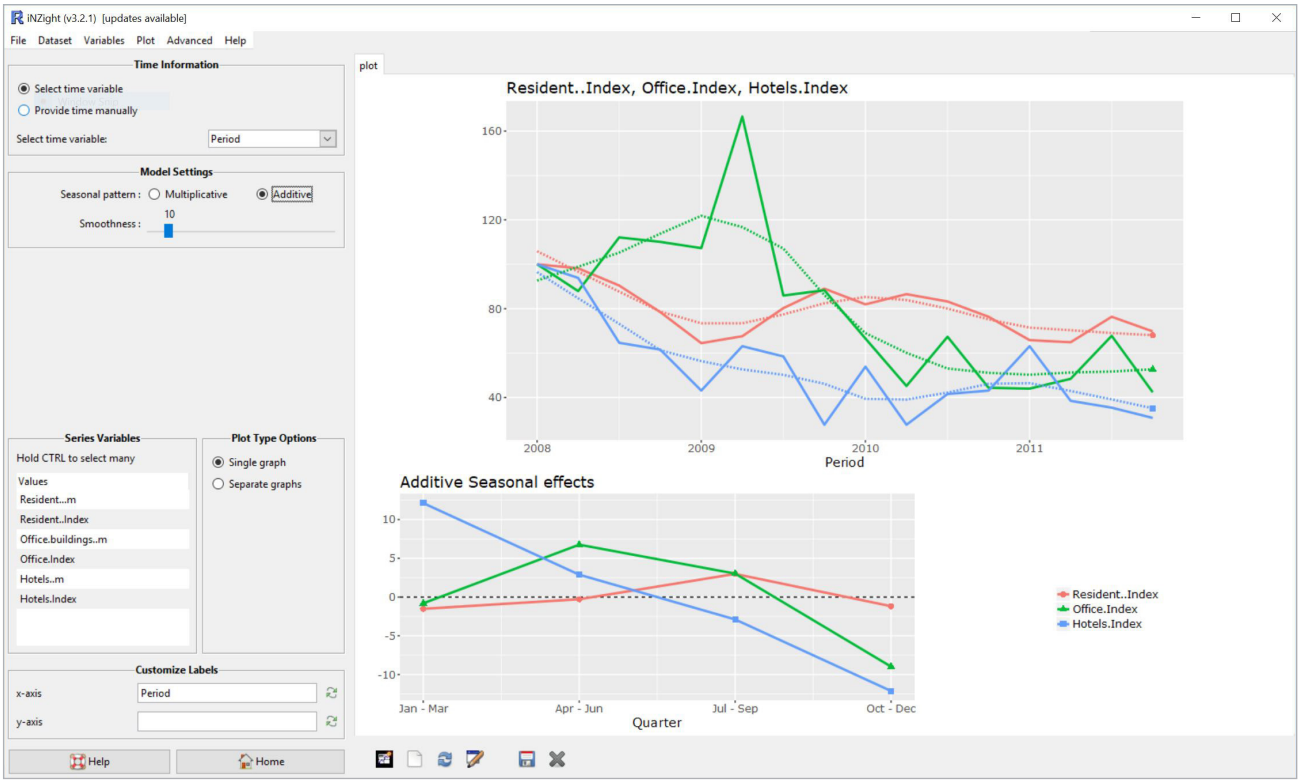
9.

	A	B	C	D	E	F	G
1	Period	Resident. $m	Resident. Index	Office buildings $m	Office Index	Hotels $m	Hotels Index
2	2008Q1	1699	100	248	100	65	100
3	2008Q2	1668	98	218	88	61	94
4	2008Q3	1536	90	278	112	42	65
5	2008Q4	1333	78	273	110	40	62
6	2009Q1	1095	64	266	107	28	43
7	2009Q2	1148	68	413	167	41	63
8	2009Q3	1363	80	213	86	38	58
9	2009Q4	1512	89	219	88	18	28
10	2010Q1	1392	82	165	67	35	54
11	2010Q2	1470	87	112	45	18	28
12	2010Q3	1414	83	167	67	27	42
13	2010Q4	1297	76	110	44	28	43
14	2011Q1	1118	66	109	44	41	63
15	2011Q2	1102	65	120	48	25	38
16	2011Q3	1297	76	168	68	23	35
17	2011Q4	1185	70	105	42	20	31



Residential permit values show a mild seasonal pattern with generally higher values in the July to September quarter. From 2008 the value of residential permits dropped steeply until 2009 and then rose until 2010. The decline from 2010 coincides with the onset of the global economic recession.

Office buildings permit values increased slightly from 2008 to 2009. A spike in permits occurred in June 2009, but this may reflect the issue of a permit for a large one-off commercial development. From June 2009 permit values have been on the decline reflecting the onset of the global economic recession. Little seasonal pattern is evident although more permits are issued in the April to June and July to September quarters.

The value of hotel permits issued shows an almost continual drop from 2008. Hotel permits issued are less than that of residential and commercial (office) permits and appear to have been more affected by the global recession. A very mild seasonal pattern is evident with more permits issued in the first quarter of the year and less in the last quarter.

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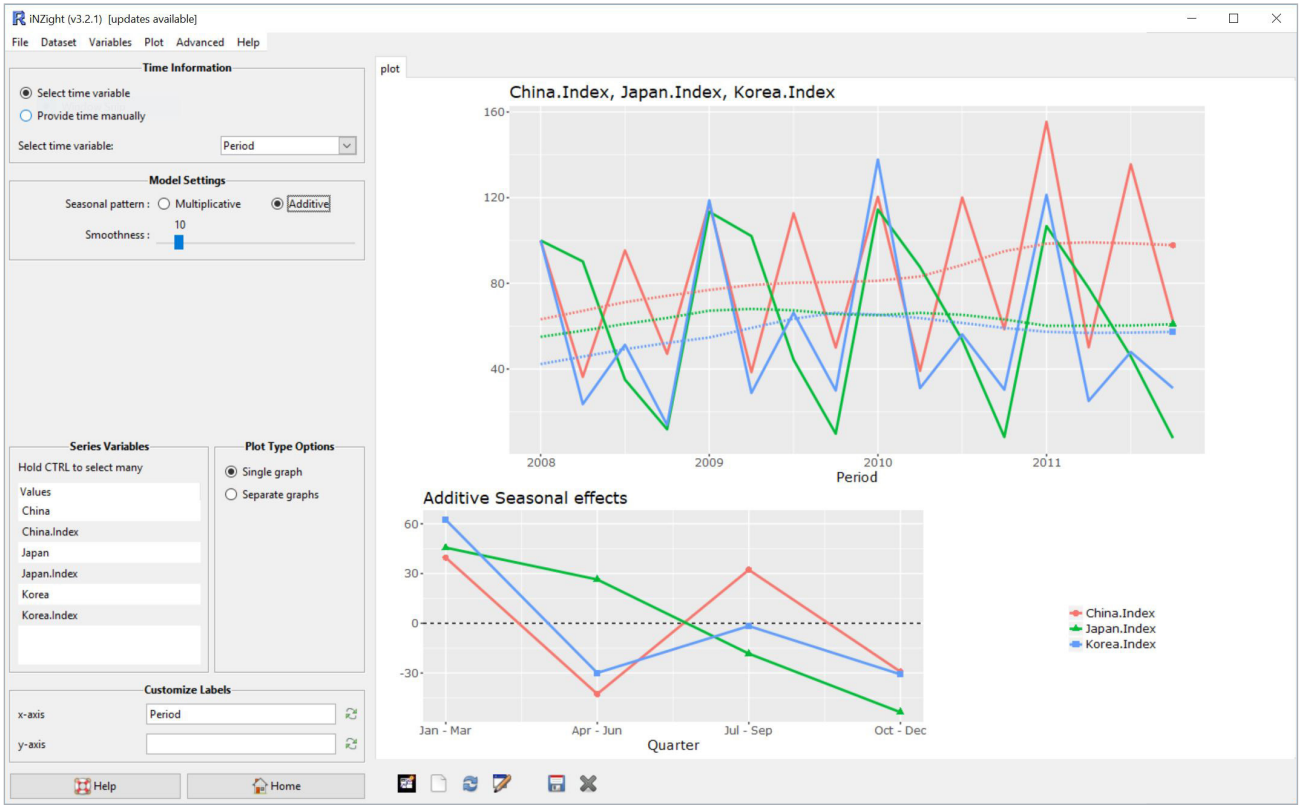
10.

	A	B	C	D	E	F	G
1	Period	China	China Index	Japan	Japan Index	Korea	Korea Index
2	2008Q1	818	100	194	100	267	100
3	2008Q2	297	36	175	90	63	24
4	2008Q3	780	95	68	35	137	51
5	2008Q4	385	47	23	12	37	14
6	2009Q1	960	117	220	113	317	119
7	2009Q2	315	39	198	102	77	29
8	2009Q3	922	113	86	44	177	66
9	2009Q4	409	50	19	10	80	30
10	2010Q1	985	120	222	114	368	138
11	2010Q2	320	39	170	88	83	31
12	2010Q3	982	120	104	54	150	56
13	2010Q4	479	59	16	8	81	30
14	2011Q1	1271	155	207	107	324	121
15	2011Q2	410	50	151	78	67	25
16	2011Q3	1109	136	89	46	128	48
17	2011Q4	510	62	15	8	83	31



The Korean index shows a strong seasonal cycle with highs in the January to March quarter and lows in the October to December quarter (coinciding with the start and end of the academic year). The Korean index reached its peak in 2010 and has decreased slightly since then.

The Japanese index also shows a strong seasonal cycle with highs in the January to March quarter and lows in the October to December quarter (coinciding with the start and end of the academic year). The Japanese index reaches similar heights to that of the Korean index. The number of Japanese overseas students has been relatively constant over the period.

The Chinese index also shows a strong seasonal cycle with the same highs and lows as the previous two indexes. In addition each July to September quarter there is a seasonal spike not evident in the Japanese index and Korean index. This obviously reflects students starting their studies part way through the year. The Chinese index is an increasing one over the period.

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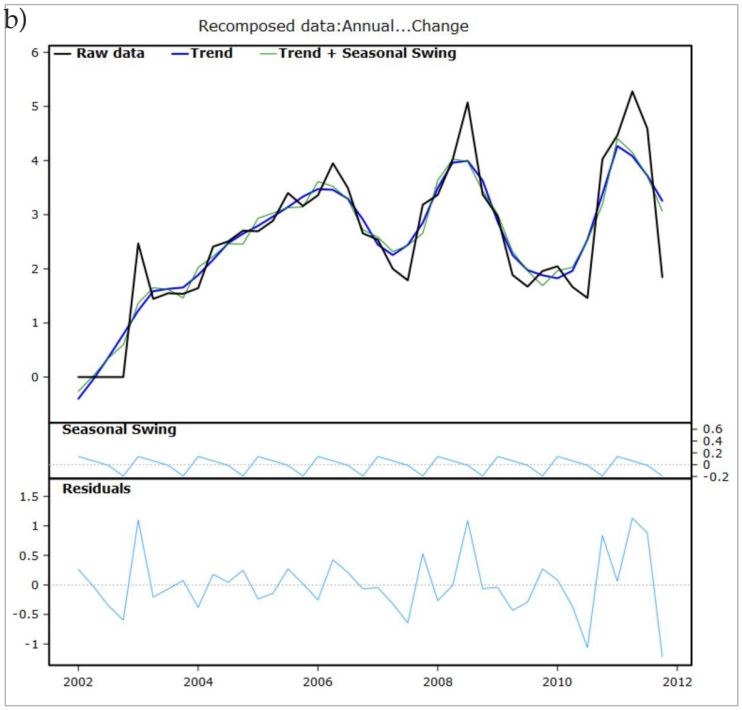
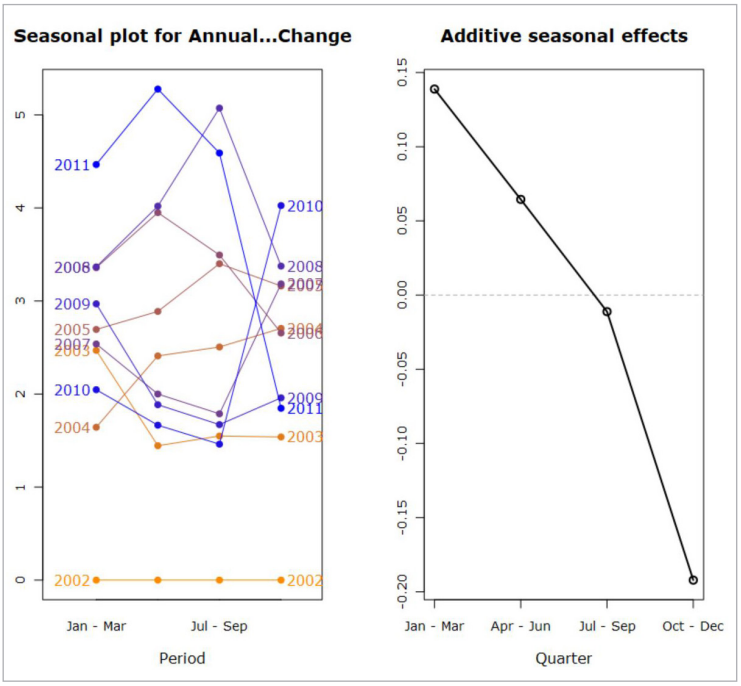
11. a)

	A	B	C
1	Period	CPI	Annual % Change
2	2002Q1	891	0
3	2002Q2	900	0
4	2002Q3	904	0
5	2002Q4	910	0
6	2003Q1	913	2.5
7	2003Q2	913	1.4
8	2003Q3	918	1.5
9	2003Q4	924	1.5
10	2004Q1	928	1.6
11	2004Q2	935	2.4
12	2004Q3	941	2.5
13	2004Q4	949	2.7
14	2005Q1	953	2.7
15	2005Q2	962	2.9
16	2005Q3	973	3.4
17	2005Q4	979	3.2
18	2006Q1	985	3.4
19	2006Q2	1000	4.0
20	2006Q3	1007	3.5
21	2006Q4	1005	2.7
22	2007Q1	1010	2.5
23	2007Q2	1020	2.0
24	2007Q3	1025	1.8
25	2007Q4	1037	3.2
26	2008Q1	1044	3.4
27	2008Q2	1061	4.0
28	2008Q3	1077	5.1
29	2008Q4	1072	3.4
30	2009Q1	1075	3.0
31	2009Q2	1081	1.9
32	2009Q3	1095	1.7
33	2009Q4	1093	2.0
34	2010Q1	1097	2.0
35	2010Q2	1099	1.7
36	2010Q3	1111	1.5
37	2010Q4	1137	4.0
38	2011Q1	1146	4.5
39	2011Q2	1157	5.3
40	2011Q3	1162	4.6
41	2011Q4	1158	1.8

b)





c) Rate of Inflation

d) From 2002 inflation increased significantly reaching a peak in 2006 then dropping until late 2007 before rising steeply again reaching a peak a year later. Inflation dropped again reflecting the onset of the global economic recession but has risen since 2010 to again reach a peak in 2011.

The rate of inflation shows a strong seasonal cycle with highs in the January to March quarter (+0.14 above the trend) and lows in the October to December quarter (⁻0.19 below the trend). The seasonal component goes from ⁻0.19 to 0.14 which gives a total seasonal variation of 0.33.

There is significant residual activity in the series coinciding with the steep rises and falls in the rate of inflation.

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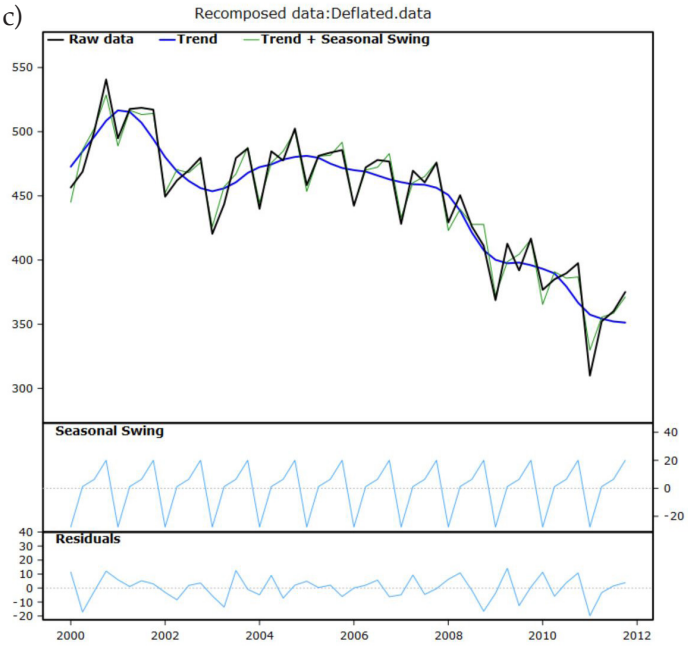
12. a)

	A	B	C	D
1	Period	Printing sales $m	CPI June 06	Deflated data
2	2000Q1	384.8	843	456.5
3	2000Q2	398	849	468.8
4	2000Q3	430.3	860	500.3
5	2000Q4	470.4	870	540.7
6	2001Q1	430	869	494.8
7	2001Q2	453.5	876	517.7
8	2001Q3	456.9	881	518.6
9	2001Q4	458.2	886	517.2
10	2002Q1	400.4	891	449.4
11	2002Q2	415.8	900	462
12	2002Q3	424.8	904	469.9
13	2002Q4	436.5	910	479.7
14	2003Q1	383.8	913	420.4
15	2003Q2	404.9	913	443.5
16	2003Q3	440.2	918	479.5
17	2003Q4	450	924	487
18	2004Q1	408.2	928	439.9
19	2004Q2	453.2	935	484.7
20	2004Q3	449.4	941	477.6
21	2004Q4	476.8	949	502.4
22	2005Q1	436.8	953	458.3
23	2005Q2	462.9	962	481.2
24	2005Q3	470.6	973	483.7
25	2005Q4	475.5	979	485.7
26	2006Q1	435.7	985	442.3
27	2006Q2	472.2	1000	472.2
28	2006Q3	481.3	1007	478
29	2006Q4	479.1	1005	476.7
30	2007Q1	432.4	1010	428.1
31	2007Q2	479	1020	469.6
32	2007Q3	472	1025	460.5
33	2007Q4	493.5	1037	475.9
34	2008Q1	448.1	1044	429.2
35	2008Q2	478	1061	450.5
36	2008Q3	458.9	1077	426.1
37	2008Q4	440.7	1072	411.1
38	2009Q1	396.4	1075	368.7
39	2009Q2	446.2	1081	412.8
40	2009Q3	429.1	1095	391.9
41	2009Q4	455.5	1093	416.7
42	2010Q1	413.3	1097	376.8
43	2010Q2	423.1	1099	385
44	2010Q3	432.9	1111	389.6
45	2010Q4	452	1137	397.5
46	2011Q1	355.2	1146	309.9
47	2011Q2	407.5	1157	352.2
48	2011Q3	418.4	1162	360.1
49	2011Q4	434.4	1158	375.1

c)



If we look at the recomposed series we can see from the 'deflated' raw data that the peak value of Printing Sales in NZ occurred in late 2000 at $540 m and reached a low in the first quarter of 2011 of $309 m.

The trend shows that 'deflated' Printing Sales in NZ reached a high in late 2001 of $510 m and then dropped nearly continuously (except for a slight rise in 2003) to a low in late 2011 of $360 m (⁻$15 m per year). This gives a variation of $150 m within the trend and $231 m within the raw data.

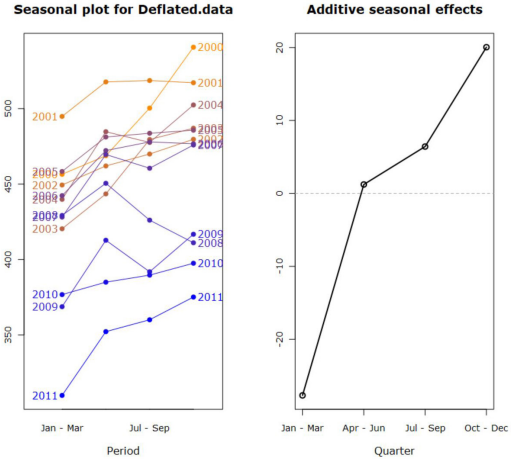
If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is not a lot of difference and since the amplitude of seasonal activity is not increasing we choose additive.

The seasonal component goes from ⁻$30 m to $20 m which gives a total seasonal variation of $50 m.

There is some residual activity in the series. Residuals have a range of $30 m (+$10 m to ⁻$20 m), but most residuals are in the range ±$10 m. A number of residuals fall outside this range and coincide with spikes or steps in printing sales during the period.

Around 65% of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

d)

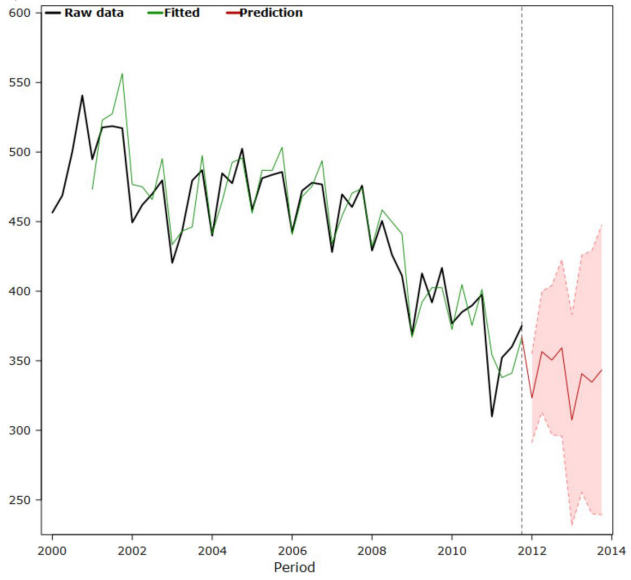


A strong seasonal cycle is evident with higher values of Printing Sales in NZ in the October to December quarter (+$20 m above the trend) and lower values of Printing Sales in NZ in the January to March quarter (⁻$30 m below the trend). The higher value of printing sales in the October to December quarter reflects the increased demand over the Christmas period.

The annual seasonal plots show an almost consistent significant drop from year to year (except for 2004) evident by the downward successive gaps between the seasonal plots for these years.

Page 34 Q12 cont...

e) **Holt-Winters Additive prediction for Deflated.data**



Time Series Forecasts

	fit	upr	lwr
2012 Q1	323.2302	355.2222	291.2383
2012 Q2	356.5141	399.8790	313.1491
2012 Q3	350.4528	404.1355	296.7701
2012 Q4	359.2646	422.8148	295.7144
2013 Q1	307.3653	383.2467	231.4839
2013 Q2	340.6491	425.8513	255.4469
2013 Q3	334.5878	429.1923	239.9834
2013 Q4	343.3996	447.5194	239.2798

Predicted values of Printing Sales in NZ for the fourth quarters of 2012 and 2013 are \$359.3 m and \$343.4 m respectively.

Increasingly wider prediction intervals (\$295.7 m to \$422.8 m and \$239.3 m to \$447.5 m) reflect that the series has potential for changes in trend level and direction. Overall Printing Sales in NZ is predicted to continue to decline in 2012 and 2013.

f)

The 'deflated' value of printing sales in New Zealand shows a nearly continuous drop over the period 2001 to 2011 (except for 2004 where there is a slight rise) whereas the raw data although reflecting a drop initially shows a rise in sales up to 2008 and then followed by a drop. In 'real' terms printing sales in New Zealand have dropped considerably by approximately \$15 m annually.

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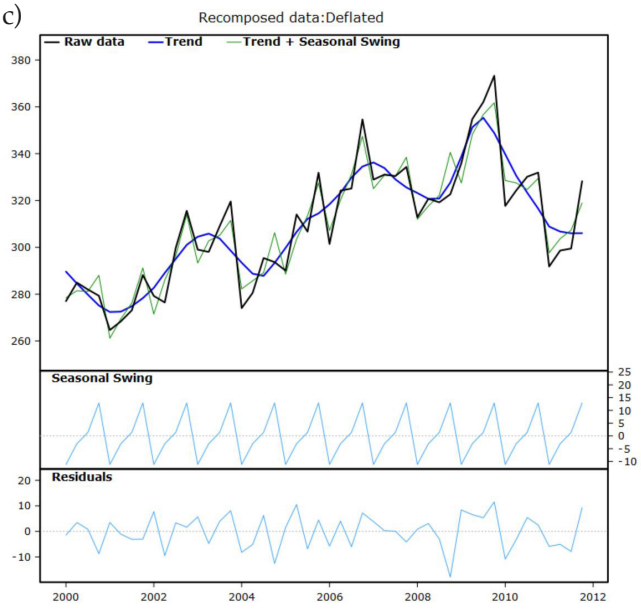
13. a)

	A	B	C	D
1	Period	Sales ($m)	CPI June 06	Deflated
2	2000Q1	233.5	843	277.0
3	2000Q2	241.9	849	284.9
4	2000Q3	242.5	860	282.0
5	2000Q4	243.0	870	279.3
6	2001Q1	230.0	869	264.7
7	2001Q2	235.1	876	268.4
8	2001Q3	240.6	881	273.1
9	2001Q4	255.3	886	288.1
10	2002Q1	248.8	891	279.2
11	2002Q2	248.8	900	276.4
12	2002Q3	271.0	904	299.8
13	2002Q4	287.2	910	315.6
14	2003Q1	273.0	913	299.0
15	2003Q2	272.1	913	298.0
16	2003Q3	283.7	918	309.0
17	2003Q4	295.3	924	319.6
18	2004Q1	254.3	928	274.0
19	2004Q2	262.3	935	280.5
20	2004Q3	278.0	941	295.4
21	2004Q4	278.7	949	293.7
22	2005Q1	276.4	953	290.0
23	2005Q2	302.1	962	314.0
24	2005Q3	298.4	973	306.7
25	2005Q4	324.9	979	331.9
26	2006Q1	296.9	985	301.4
27	2006Q2	324.2	1000	324.2
28	2006Q3	327.4	1007	325.1
29	2006Q4	356.4	1005	354.6
30	2007Q1	332.2	1010	328.9
31	2007Q2	337.7	1020	331.1
32	2007Q3	338.7	1025	330.4
33	2007Q4	346.7	1037	334.3
34	2008Q1	326.6	1044	312.8
35	2008Q2	340.3	1061	320.7
36	2008Q3	343.8	1077	319.2
37	2008Q4	345.9	1072	322.7
38	2009Q1	361.1	1075	335.9
39	2009Q2	383.5	1081	354.8
40	2009Q3	396.4	1095	362.0
41	2009Q4	408.0	1093	373.3
42	2010Q1	348.5	1097	317.7
43	2010Q2	356.4	1099	324.3
44	2010Q3	366.8	1111	330.2
45	2010Q4	377.4	1137	331.9
46	2011Q1	334.4	1146	291.8
47	2011Q2	345.5	1157	298.6
48	2011Q3	348.0	1162	299.5
49	2011Q4	380.1	1158	328.2

c)



Page 35 Q13 c) **cont...**

If we look at the recomposed series we can see from the 'deflated' raw data that the peak value of Appliance Sales in NZ occurred in late 2009 at \$373 m and reached a low in the first quarter of 2001 of \$264 m.

The trend shows that 'deflated' Appliance Sales in NZ reached a low in 2001 of \$270 m and a high in late 2009 of \$355 m. During this time appliance sales rose and fell but the trend is an increasing one. Since 2009 appliance sales have dropped considerably perhaps reflecting the onset of the global economy. Overall there is a variation of \$85 m within the trend and \$109 m within the raw data.

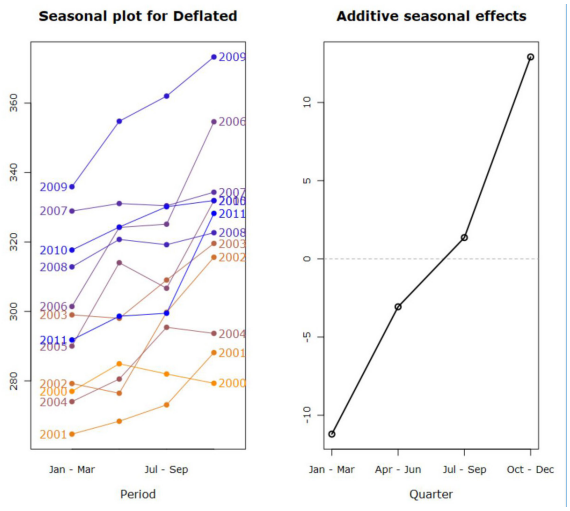
If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is not a lot of difference and since the amplitude of seasonal activity is not increasing we choose additive.

The seasonal component goes from ⁻\$11 m to \$14 m which gives a total seasonal variation of \$25 m.

There is some residual activity in the series. Residuals have a range of \$25 m (⁻\$15 m to +\$10 m), but most residuals are in the range ±\$10 m. A number of residuals fall outside this range and coincide with spikes or steps in appliance sales during the period.

Around 78% of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

d)



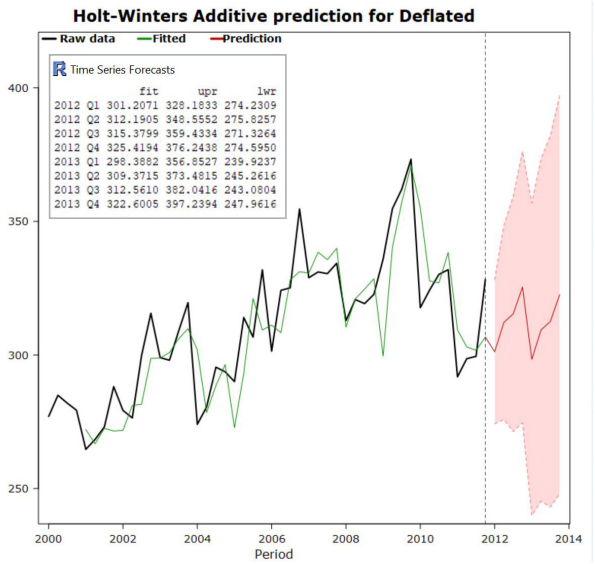
A strong seasonal cycle is evident with higher values of Appliance Sales in NZ in the October to December quarter (+\$14 m above the trend) and consistent lower values of Appliance Sales in NZ in the other three quarters with the lowest being January to March quarter (⁻\$11 m below the trend). The higher value of appliance sales in the October to December quarter reflects the increased demand for appliances coming up to Christmas each year.

The annual seasonal plots show the increase in appliance sales from 2000 to 2003 and then the sharp

Page 35 Q13 d) **cont...**

drop in 2004 followed by a rise and then another fall and rise again. Since late 2009 sales have continued to drop perhaps reflecting the onset of the global economic recession.

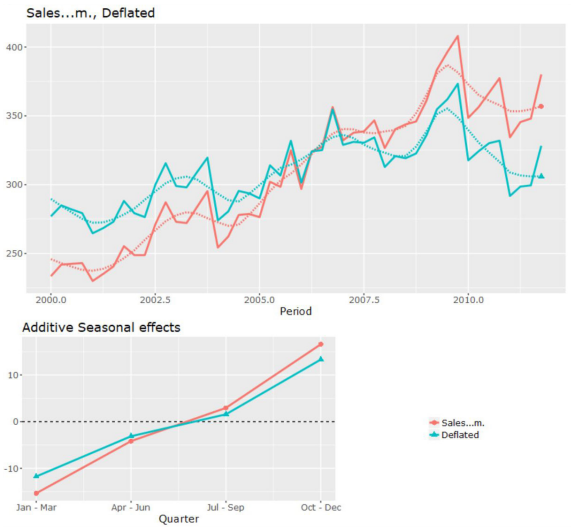
e)



Forecasted values of Appliance Sales in NZ for the fourth quarters of 2012 and 2013 are \$325.4 m and \$322.6 m respectively.

Increasingly wider forecast intervals (\$274.6 m to \$376.2 m and \$247.9 m to \$397.2 m) reflect that the series has potential for changes in trend level and direction. Overall there is a lot of uncertainty over forecasted Appliance Sales in NZ in 2012 and 2013.

f)



The 'deflated' value of appliance sales in New Zealand shows an increasing trend from 2001 to 2009 although there is a drop in 2003 to 2004 and again in 2007 to 2008. From 2009 the trend has been a downward one. The raw data shows an almost continual increase is appliance sales since 2001. From 2009 a drop is evident. In dollar terms there is a rise in the total amount spent on appliances since 2000 but in 'real' terms, i.e. taking inflation into account appliance sales in New Zealand have dropped considerably over the period.

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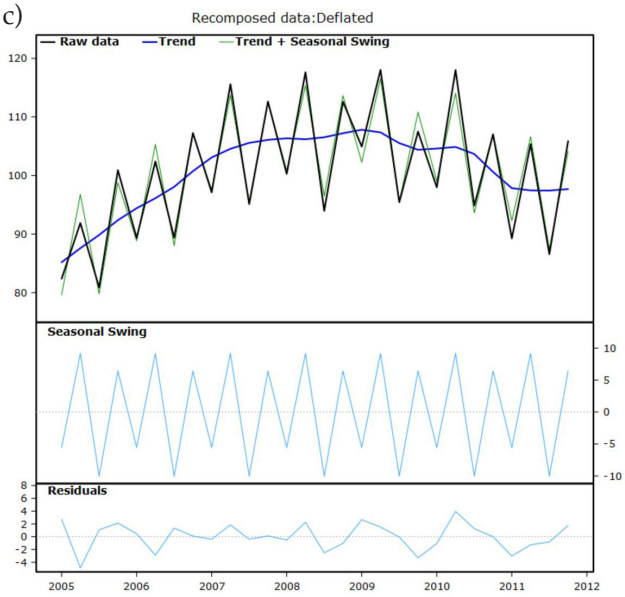
14. a)

	A	B	C	E
1	Period	Footwear sales ($m)	CPI (June 2006)	Deflated
2	2005Q1	78.5	953	82.4
3	2005Q2	88.4	962	91.9
4	2005Q3	78.7	973	80.9
5	2005Q4	98.8	979	100.9
6	2006Q1	88	985	89.3
7	2006Q2	102.4	1000	102.4
8	2006Q3	90	1007	89.4
9	2006Q4	107.8	1005	107.3
10	2007Q1	98.1	1010	97.1
11	2007Q2	117.9	1020	115.6
12	2007Q3	97.5	1025	95.1
13	2007Q4	116.8	1037	112.6
14	2008Q1	104.7	1044	100.3
15	2008Q2	124.8	1061	117.6
16	2008Q3	101.2	1077	94.0
17	2008Q4	120.7	1072	112.6
18	2009Q1	112.8	1075	104.9
19	2009Q2	127.6	1081	118.0
20	2009Q3	104.5	1095	95.4
21	2009Q4	117.5	1093	107.5
22	2010Q1	107.5	1097	98.0
23	2010Q2	129.7	1099	118.0
24	2010Q3	105.4	1111	94.9
25	2010Q4	121.7	1137	107.0
26	2011Q1	102.3	1146	89.3
27	2011Q2	121.9	1157	105.4
28	2011Q3	100.6	1162	86.6
29	2011Q4	122.6	1158	105.9

c)



If we look at the recomposed series we can see from the 'deflated' raw data that the peak value of Footwear Sales in NZ occurred in 2009 and 2010 at $118 m and reached a low in the third quarter of 2005 of $81 m.

The trend shows that 'deflated' Footwear Sales in NZ increased from a low of $85 m in 2005 to a high in 2009 of $108 m and then dropped from that point. This gives a variation of $23 m within the trend and $37 m within the raw data.

If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is not a lot of difference and since the amplitude of seasonal activity is not increasing we choose additive.

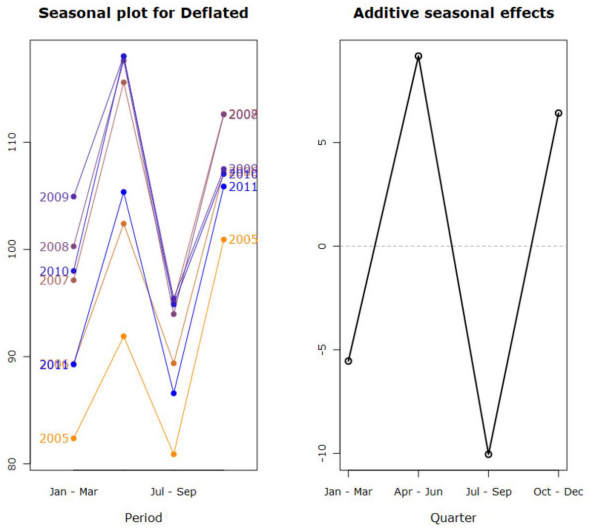
Page 36 Q14 c) **cont...**

The seasonal component goes from ⁻$10 m to $9 m which gives a total seasonal variation of $19 m.

There is some residual activity in the series. Residuals have a range of $8 m (+$4 m to ⁻$4 m), but most residuals are in the range ±$2 m. A number of residuals fall outside this range and coincide with the increases and decreases in footwear sales during the period, e.g. 2005 with the increase in sales and then the fall in footwear sales from 2009.

Around 62% (23 ÷ 37) of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

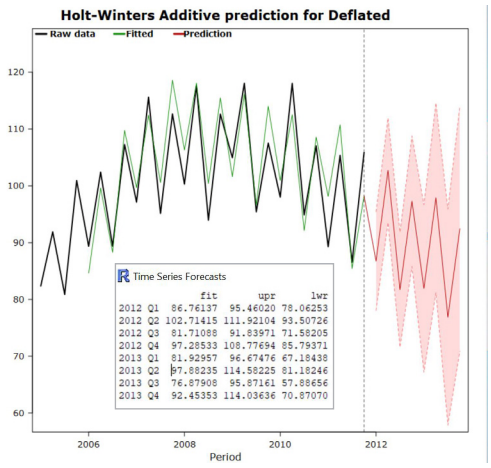
d)



A strong seasonal cycle is evident with higher values of Footwear Sales in NZ in the April to June quarter (+$9 m above the trend) and lower Footwear Sales in NZ in the July to September quarter (⁻$10 m below the trend). The higher value of footwear sales in the April to June quarter reflect the onset of winter. Sales are also high prior to the onset of summer (+$7 m above the trend).

The annual seasonal plots show the increase in footwear sales from 2005 to 2009 and then the drop in sales. Since late 2009 sales have continued to drop perhaps reflecting the onset of the global economic recession.

e)



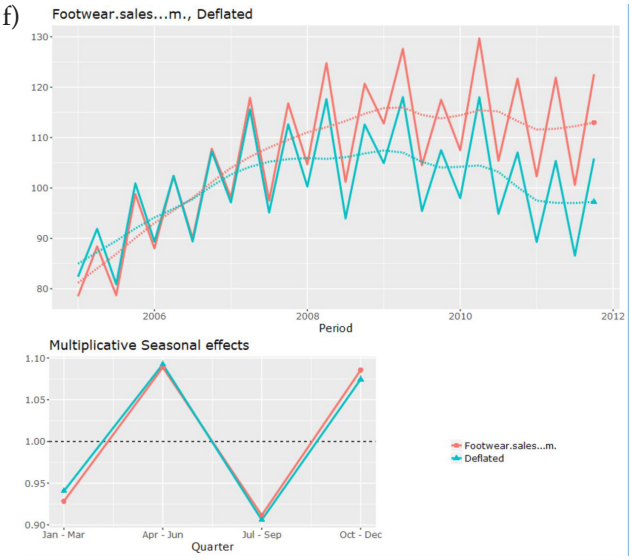
Page 36 Q14 e) **cont...**

Forecasted Footwear Sales in NZ for the fourth quarters of 2012 and 2013 are \$97.4 m and \$92.6 m respectively.

Increasingly wider forecasted intervals (\$85.9 m to \$108.9 m and \$71.0 m to \$114.2 m) reflect that the series has potential for changes in trend level and direction although the fitted line and raw data are a good fit in early years but more 'white space' is evident in the prediction plot between the fitted and raw data in latter years.

Overall Footwear Sales in NZ is forecasted to continue to decline in 2012 and 2013.

f)



The 'deflated' value of Footwear Sales in New Zealand shows an increasing trend from 2005 until 2009 and then a continued drop. The raw data shows a similar (but greater) increase from 2005 but then only a slight decrease in footwear sales from 2009.

In 'real' dollar terms footwear sales have been significantly affected by the onset of the global recession.

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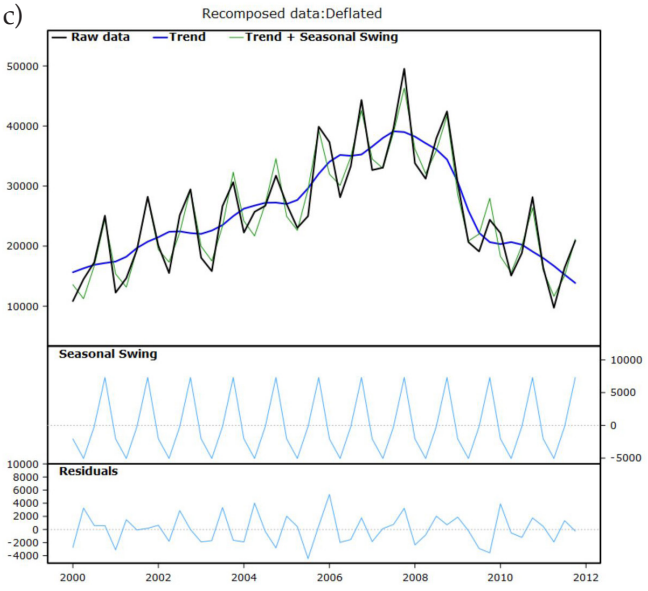
15. a)

	A	B	C	D
1	Period	Motor cycles	CPI (june 2006)	Deflated
2	2000Q1	9140	843	10842.2
3	2000Q2	12316	849	14506.5
4	2000Q3	14883	860	17305.8
5	2000Q4	21816	870	25075.9
6	2001Q1	10655	869	12261.2
7	2001Q2	12848	876	14666.7
8	2001Q3	17116	881	19427.9
9	2001Q4	25006	886	28223.5
10	2002Q1	17889	891	20077.4
11	2002Q2	13970	900	15522.2
12	2002Q3	22740	904	25154.9
13	2002Q4	26809	910	29460.4
14	2003Q1	16501	913	18073.4
15	2003Q2	14460	913	15837.9
16	2003Q3	24479	918	26665.6
17	2003Q4	28331	924	30661.3
18	2004Q1	20664	928	22267.2
19	2004Q2	24052	935	25724.1
20	2004Q3	25140	941	26716.3
21	2004Q4	30120	949	31738.7
22	2005Q1	25714	953	26982.2
23	2005Q2	22178	962	23054.1
24	2005Q3	24327	973	25002.1
25	2005Q4	39053	979	39890.7
26	2006Q1	36767	985	37326.9
27	2006Q2	28139	1000	28139
28	2006Q3	33550	1007	33316.8
29	2006Q4	44556	1005	44334.3
30	2007Q1	32990	1010	32663.4
31	2007Q2	33737	1020	33075.5
32	2007Q3	40694	1025	39701.5
33	2007Q4	51368	1037	49535.2
34	2008Q1	35293	1044	33805.6
35	2008Q2	33135	1061	31230
36	2008Q3	40872	1077	37949.9
37	2008Q4	45485	1072	42430
38	2009Q1	32815	1075	30525.6
39	2009Q2	22356	1081	20680.9
40	2009Q3	20934	1095	19117.8
41	2009Q4	26665	1093	24396.2
42	2010Q1	24329	1097	22177.8
43	2010Q2	16581	1099	15087.4
44	2010Q3	20933	1111	18841.6
45	2010Q4	32023	1137	28164.5
46	2011Q1	18810	1146	16413.6
47	2011Q2	11266	1157	9737.3
48	2011Q3	19068	1162	16409.6
49	2011Q4	24222	1158	20917.1

c)



Page 37 Q15 c) **cont...**

If we look at the recomposed series we can see from the 'deflated' raw data that the peak value of Motorcyle Imports to NZ ($000) occurred at the end of 2007 at $50 m and reached a low in the second quarter of 2011 of $9.7 m.

The trend shows that 'deflated' Motorcyle Imports to NZ ($000) increased from $16 m in 2000 to a high in late 2007 of $38 m and then dropped from that point to a low of $13 m in 2011. This gives a variation of $25 m within the trend and $40.3 m within the raw data.

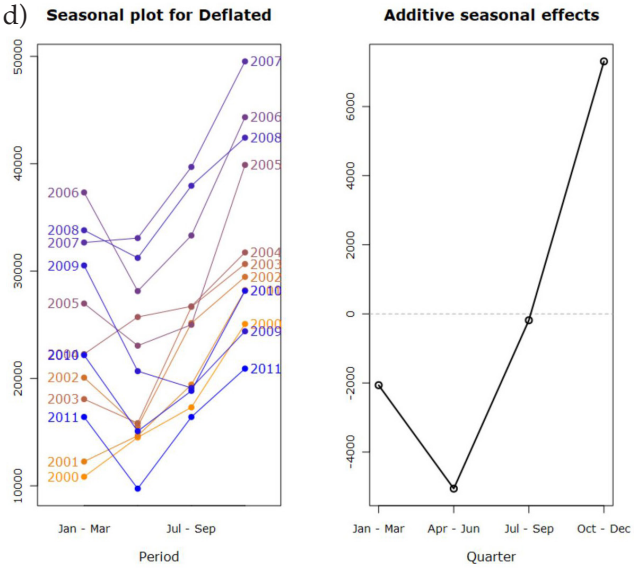
If we look at the recomposed graphs and compare a multiplicative seasonal pattern with an additive one, there is not a lot of difference and since the amplitude of seasonal activity is not increasing we choose additive.

The seasonal component goes from ⁻$5 m to $7.5 m which gives a total seasonal variation of $12.5 m.

There is some residual activity in the series. Residuals have a range of $10 m (+$6 m to ⁻$4 m), but most residuals are in the range ±$3 m. A number of residuals fall outside this range and coincide with the increases and decreases in motorcycle imports during the period.

Around 62% (25 ÷ 40.3) of the overall variation of the series can be accounted for by the trend component. Seasonal and residual components account for the remaining variation in the series.

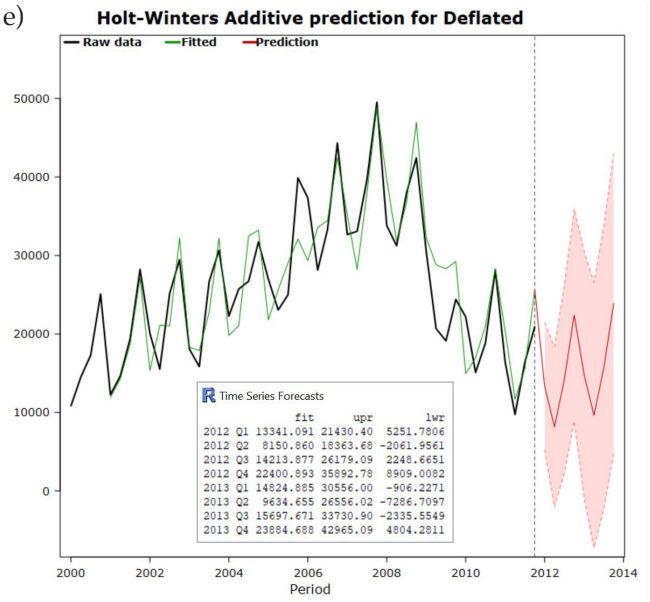
d)



A strong seasonal cycle is evident with higher values of Motorcycle Imports in NZ in the October to December quarter (+$7.5 m above the trend) and lower sales of Motorcycle Imports in NZ in the April to June quarter (⁻$5 m below the trend). The higher value of motorcycle imports in the October to December quarter reflect the onset of summer and the lower sales the winter season.

The annual seasonal plots show an increase in motorcycle imports from 2000 to late 2007 and then a nearly continuous drop in imports. Since early 2008 imports have continued to drop perhaps reflecting the onset of the global economic recession and decreased demand for motorcycles.

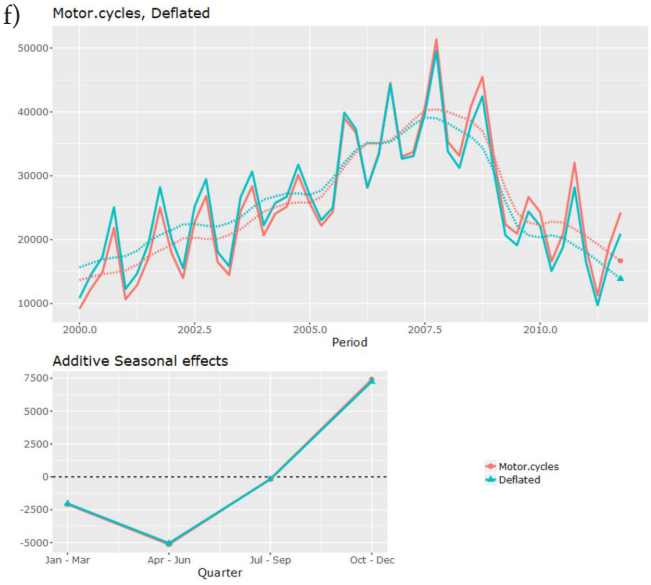
e)



Forecasted values of Motorcycle Imports in NZ for the fourth quarters of 2012 and 2013 are $22.4 m and $23.9 m respectively.

Increasingly wider forecasted intervals ($8.9 m to $35.9 m and $4.8 m to $43.0 m) reflect that the series has potential for changes in trend level and direction. Overall Motorcyle Imports in NZ are forecasted to level off or increase slightly in 2012 and 2013.

f)



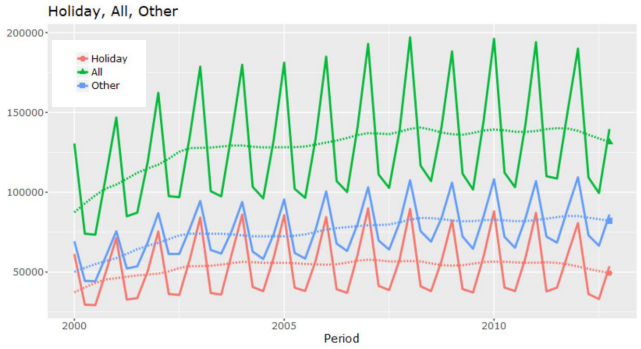
The trend of the 'deflated' value of motorcycle imports in New Zealand shows little or no difference to the trend of the raw data of motorcycle imports in NZ.

The only difference between the two series is the dollar value. The trend of the 'deflated' series is slightly less than that of the trend of the raw data series.

Page 40

16. b) The 'Other' variable is all those visitors to New Zealand who are not here for the reason of a holiday.

c)

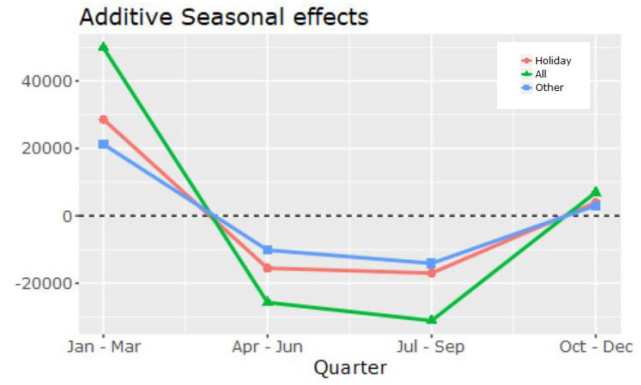


Visitors to New Zealand for holidays alone showed a small rise from 2000 to 2003 but since 2003 have remained relatively constant (at an average of around 55 000 per quarter).

Numbers for all visitors to New Zealand shows a similar trend to just visitors on holiday with an increasing trend from 2000 to 2003. From 2003 all visitor numbers to NZ have remained relatively constant at about an average of 130 000.

Visitor numbers to New Zealand for other than holidays shows a steeper increasing trend from 2000 to 2003 and then a further gradual increase until 2012. These other visitors could include those attending conferences, conventions, education, business etc.

d)

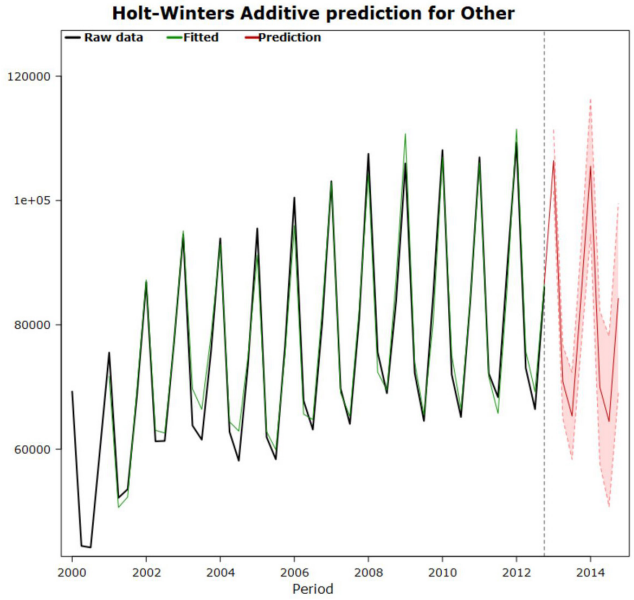


Visitors to NZ (All, Holiday and Other) all show a strong seasonal cycle with highs in the January to March quarter (30 000 above the trend for Holidays, 50 000 above the trend for All and 22 000 above the trend for Other) and lows in the July to September quarter (20 000 below the trend for Holiday, 38 000 below the trend for All and 15 000 below the trend for Other). Visitors to New Zealand for whatever reason occur in the warmer seasons of the year (October to March).

e)

The seasonal effects in the three series are fairly constant over time and we see roughly the same size peaks and troughs throughout so it makes sense to use an additive seasonal effect. An additive seasonal effect assumes underlying seasonal swings are the same every year.

f)



Time Series Forecasts

	fit	upr	lwr
2013 Q1	106406.13	111345.32	101466.95
2013 Q2	70846.50	76726.74	64966.26
2013 Q3	65323.22	72309.40	58337.04
2013 Q4	85115.74	93347.37	76884.12
2014 Q1	105524.87	116503.57	94546.18
2014 Q2	69965.24	82251.80	57678.68
2014 Q3	64441.96	78158.32	50725.61
2014 Q4	84234.48	99490.44	68978.53

Forecasted values of 'Other' visitors to NZ for the fourth quarters of 2013 and 2014 are 85 116 and 84 234 respectively.

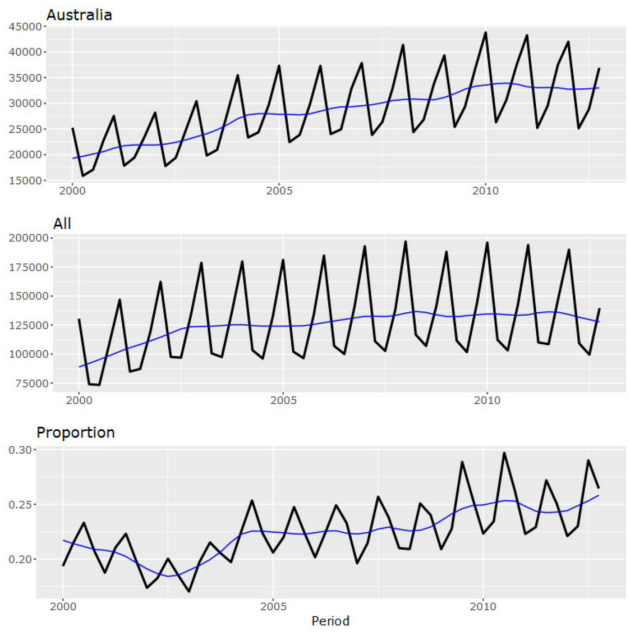
Forecasted intervals are 76 884 to 93 347 and 68 979 to 99 490. Overall the forecasted value of 'Other' visitors to NZ is to decline slightly in 2013 and 2014.

Increasingly wider forecast intervals reflect that the series has potential for changes in trend level and direction.

Page 41

17. b) The 'Proportion' variable is the proportion of all visitors to New Zealand that are Australian.

c)



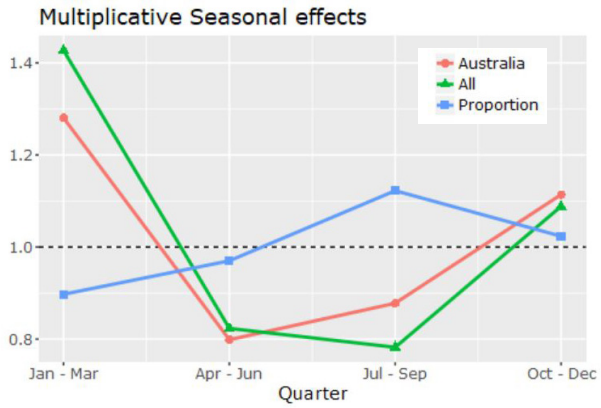
Visitors to New Zealand from Australia alone showed an increasing trend (of approximately 1400 per year) from a low of 20 000 to a high of 34 000 in 2010.

Numbers for all visitors to New Zealand show an increasing trend from 2000 to 2003. From 2003 all visitor numbers to NZ have remained relatively constant at about an average of 130 000.

The proportion of Australian visitors to New Zealand dropped from 2000 to 2003 but since has shown an increasing trend to a high of 26% in 2012.

This increase in Australian visitors is likely to be a result of the favourable exchange rate between New Zealand and Australia making New Zealand a 'cheap' holiday destination for Australians.

d)



Visitors to NZ (All and Australian) all show a strong seasonal cycle with highs in the January to March quarter (30% above the trend for Australian visitors and 42% above the trend for All visitors) and lows in the April to June quarter (20% below the trend for Australian visitors and 21% below the trend for All visitors to New Zealand in the July to September quarter).

Page 41 Q17 d) **cont...**

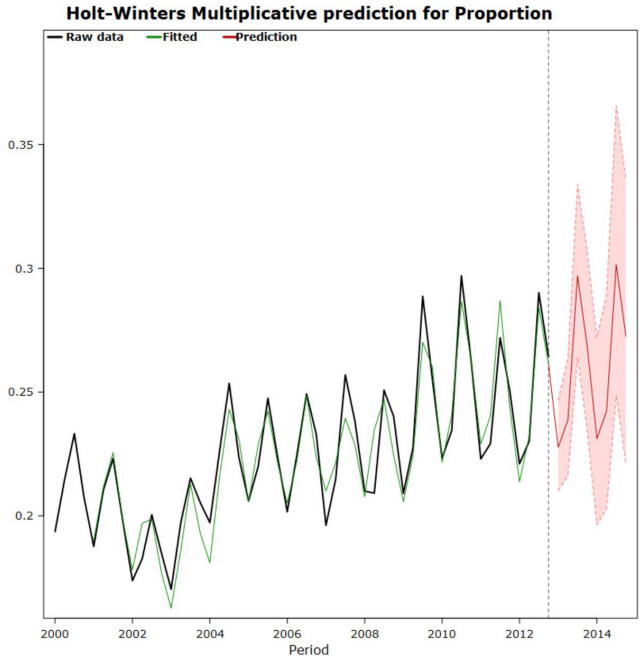
Increased visitor numbers to New Zealand occur in the warmer seasons of the year (January to March).

The proportion of Australian visitors to New Zealand reaches a high in the July to September quarter because less northern hemisphere visitors come to New Zealand in the winter months so the proportion of Australian visitors is increased. Also many Australians visit New Zealand for skiing holidays in the winter months.

e)

The three series have an increasing trend and the amplitude of seasonal activity has increased a little from the bottom left of the time series graphs for Australian and All visitors to NZ, so it makes sense to use an multiplicative seasonal effect. Also if we look at the recomposed graph in iNZight a multiplicative seasonal effect shows a better fit to the raw data.

f)



Time Series Forecasts

	fit	upr	lwr
2013 Q1	0.2276901	0.2467305	0.2101190
2013 Q2	0.2386349	0.2636156	0.2160214
2013 Q3	0.2969476	0.3339025	0.2640826
2013 Q4	0.2684323	0.3069836	0.2347224
2014 Q1	0.2311500	0.2721508	0.1963262
2014 Q2	0.2422612	0.2895409	0.2027018
2014 Q3	0.3014599	0.3657497	0.2484707
2014 Q4	0.2725114	0.3356621	0.2212417

Page 41 Q17 f) **cont...**

The forecasted proportion of Australian visitors to NZ for the fourth quarters of 2013 and 2014 are both 0.27 (27%).

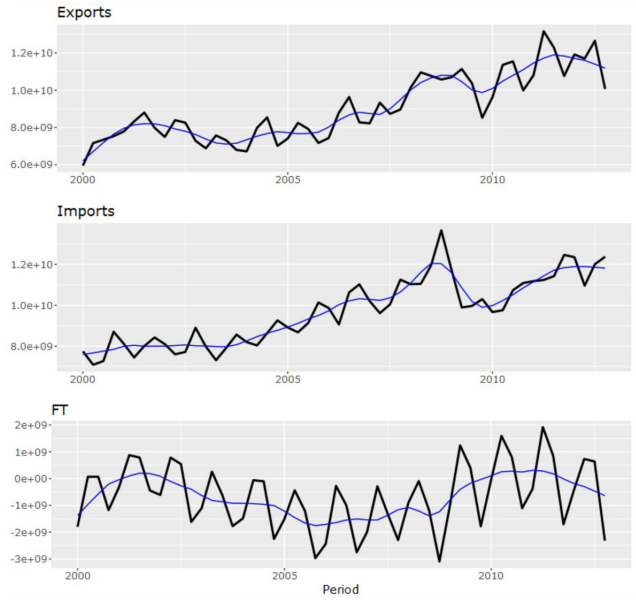
Forecast intervals are 0.23 to 0.31 and 0.22 to 0.34 Overall the forecast proportion of Australian visitors to NZ is to remain constant for 2013 and 2014.

Forecast intervals are relatively similar for both 2013 and 2014 further confirming the constant proportion.

Page 42

18. b) The 'FT' variable represents Foreign Trade, i.e. Exports – Imports.

c)

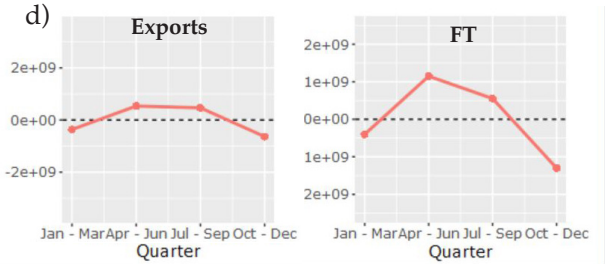


Exports show an increasing trend from 2000 until 2012 with an average increase of approximately $500 million per year. Dips in exports are evident in 2004 and 2009. The 2009 one perhaps reflecting the onset of the global economic recession.

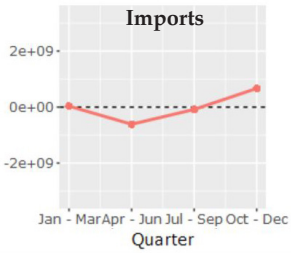
Imports show an increasing trend from 2000 until 2009 of approximately $470 million per year. In 2009, the onset of the global economic recession resulted in a sharp drop in imports to New Zealand. Since 2010 imports have continued to rise again.

The foreign trade trend shows a surplus (positive) in late 2001 and early 2002 and then again in 2011. From 2002 to 2011 the foreign trade trend shows a deficit, i.e. imports greater than exports.

d)



Page 42 Q18 d) **cont...**



Imports show a strong seasonal cycle of highs in the October to December quarter (+$750 million above the trend) reflecting the Christmas season and lows in the April to June quarter (⁻$600 million below the trend).

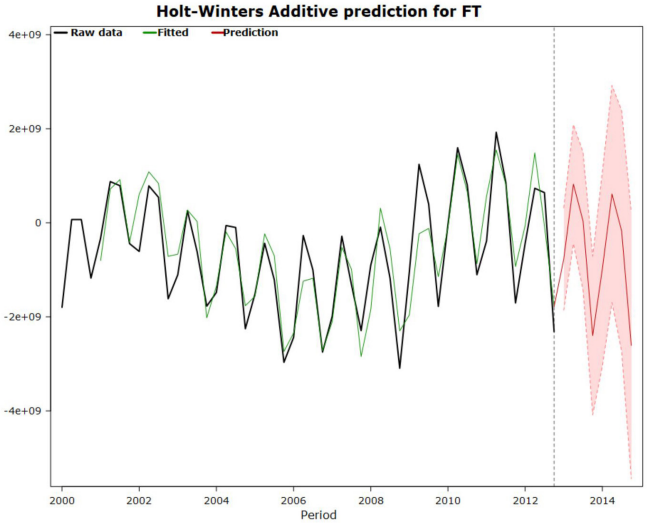
Exports are higher in the April to June and July to September quarters (+$500 million above the trend) and lower in the other two quarters of the years.

Foreign trade shows a surplus in the April to June and July to September quarters but a deficit in the other two quarters of the year. The October to December quarter shows a deficit of $1500 million below the trend.

e)

The seasonal effects in the three series are fairly constant over time even though both Exports and Imports show an increasing trend. An additive seasonal effect is best when underlying seasonal swings are the same every year. There is variation but it is relatively constant.

f)



Time Series Forecasts

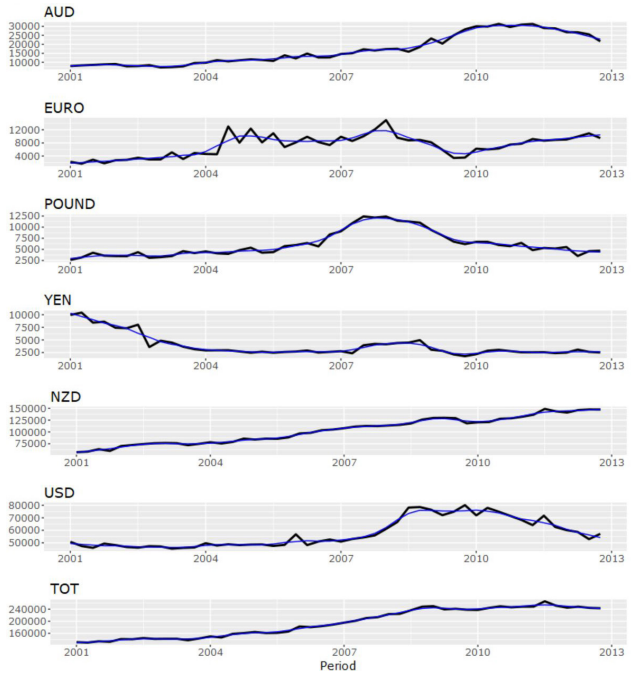
	fit	upr	lwr
2013 Q1	-771354292	318148005	-1860856589
2013 Q2	821748095	2088397619	-444901429
2013 Q3	35625799	1502334670	-1431083073
2013 Q4	-2398517899	-711812649	-4085223149
2014 Q1	-982013470	1089182308	-3053209247
2014 Q2	611088917	2919719718	-1697541883
2014 Q3	-175033379	2387968600	-2738035359
2014 Q4	-2609177077	223651637	-5442005791

Forecasted foreign trade for the fourth quarters of 2013 and 2014 are ⁻$2400 million and ⁻$2600 million respectively.

Forecast intervals are ⁻$4100 million to ⁻$710 million for 2013 and ⁻$5400 million to $220 million for 2014 Overall forecasted foreign trade for 2013 and 2014 is that of an increasing deficit.

Page 43

19. b)

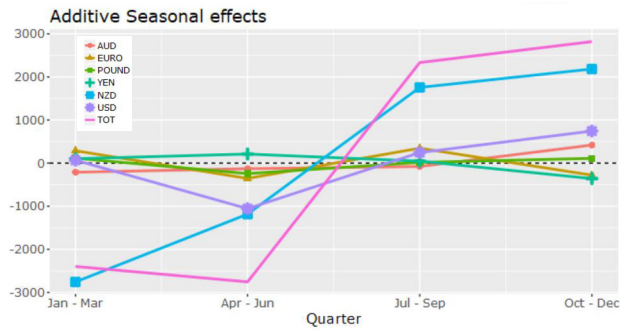


Using AUD and YEN for comparison.

New Zealand's liability in AUD has continued to increase since 2001 reaching a peak in 2011 of $31 000 million (+$2500 million per year). It has dropped slightly since. In comparison New Zealand's liability in YEN was high in 2001 ($10 000 million) but has declined to a level of $2500 million since 2005.

Total liability across all currencies has shown a continuous upward trend (+$11 000 million per year) reaching a peak of $250 000 million in 2012.

c)

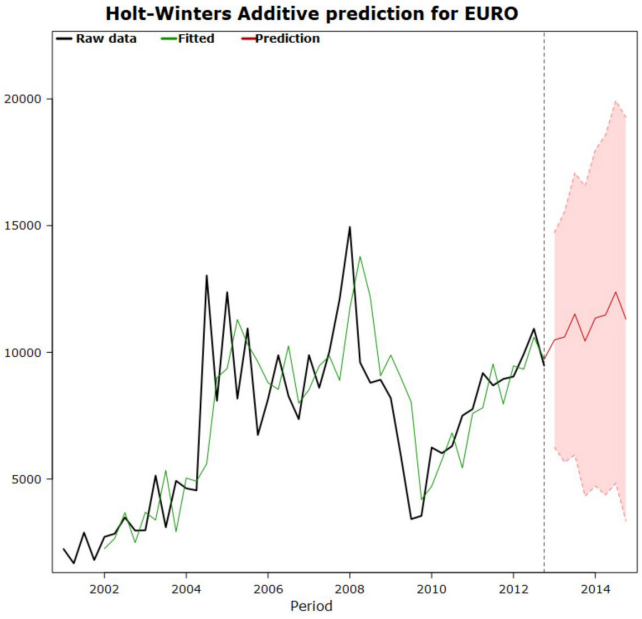


There is little or no seasonal variation for New Zealand's liability for the AUD, YEN, POUND or EURO. Liability for these currencies remains relatively constant throughout the year.

For the USD there appears to be a reduction in liability in Apr-Jun only.

In terms of NZ's total liability across all currencies it appears to reach a peak in the Oct-Dec quarter with a reduced liability across all six currencies in the Apr - Jun quarter.

d)



e)

Time Series Forecasts

	fit	upr	lwr
2013 Q1	10486.27	14726.43	6246.124
2013 Q2	10606.47	15553.87	5659.083
2013 Q3	11514.17	17079.65	5948.702
2013 Q4	10441.37	16562.84	4319.913
2014 Q1	11352.57	17983.57	4721.580
2014 Q2	11472.77	18576.85	4368.698
2014 Q3	12380.47	19928.04	4832.912
2014 Q4	11307.67	19274.07	3341.276

New Zealand's forecasted liability for the EURO in the fourth quarter of 2013 and 2014 is $10 400 million and $11 300 million respectively.

Forecast intervals are $4300 million to $16 600 million and $3300 million to $19 300 million.

Overall New Zealand's predicted liability across all countries is expected to increase.

Pages 44 – 50

Practice Internal Assessment Task – Time Series

Achievement

The student has investigated time series data. They have shown evidence of using each component of the statistical enquiry cycle to investigate time series data.

The student has:

- selected a variable to investigate from the dataset with respect to an identified purpose for the investigation.
- produced (using iNZight) displays of raw data, trend, seasonal effects (justifying their choice of additive or multiplicative) and residuals.
- identified and commented on trend, seasonal pattern, residuals and any unusual features and related these to the context.
- produced an appropriate model (using iNZight).
- made a forecast (prediction) including forecast interval with correct units.
- written a quantitative description in context of the trend as well as the seasonal pattern and related these to the context.
- communicated findings in a conclusion and clearly communicated each component of the cycle. The conclusion is consistent with the purpose of the investigation.

Merit

The student has investigated time series data with justification. They have shown evidence of linking components of the statistical enquiry cycle to the context, and referring to evidence such as statistics, data values, trends, or features of visual displays in support of statements made.

The student has:

- selected another variable to investigate from the dataset with respect to an identified purpose for the investigation. They have commented on similar features as described in Achievement for this variable.
- produced (using iNZight) displays of raw data, trend, seasonal effects (justifying their choice of additive or multiplicative) and residuals.
- identified and commented on trend, seasonal pattern, residuals and any unusual features and related these to the context.
- calculated at least one trend as a rate per appropriate time period.
- commented on prediction/forecasted intervals.
- compared features of the two series and commented on similarities and differences.
- communicated findings in a conclusion, clearly communicating each component of the cycle. The conclusion is consistent with the purpose of the investigation.

Excellence

The student has investigated time series data with statistical insight. They have shown evidence of integrating statistical and contextual knowledge throughout the statistical enquiry cycle. They may have reflected on the process, considered other relevant variables, evaluated the adequacy of any models, or shown a deeper understanding of models.

The student has:

- selected/formed a third time series and analysed it using iNZight as in Achievement and Merit. The third series could be a sum, difference or ratio.
- produced (using iNZight) displays of raw data, trend, seasonal effects (justifying their choice of additive or multiplicative) and residuals of the selected/formed variable.
- made a forecast (prediction) including prediction interval with correct units.
- commented on the models capability for prediction purposes and justified how reliable it is. Any comments made must be supported with references to statistical evidence. There is an understanding that the forecasted values are estimates.
- communicated findings in a conclusion, clearly communicating each component of the cycle. The purpose of the investigation has been addressed and there are contextual references throughout the entire investigation to support findings. There is a reflection on the analysis with respect to the background research undertaken.