

# STATISTICAL NEWS

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## SEASONALLY ADJUSTED VISITOR ARRIVALS OCTOBER 2018

Seasonal adjustment is the process of estimating and then removing from a time series influences that are systematic and calendar related. Observed data needs to be seasonally adjusted as seasonal effects can conceal both the true underlying movement in the series, as well as certain non-seasonal characteristics which may be of interest to analysts. (Refer to “Appendix 1-Explanatory Notes” for a detailed explanation).

### VISITOR ARRIVALS TO FIJI

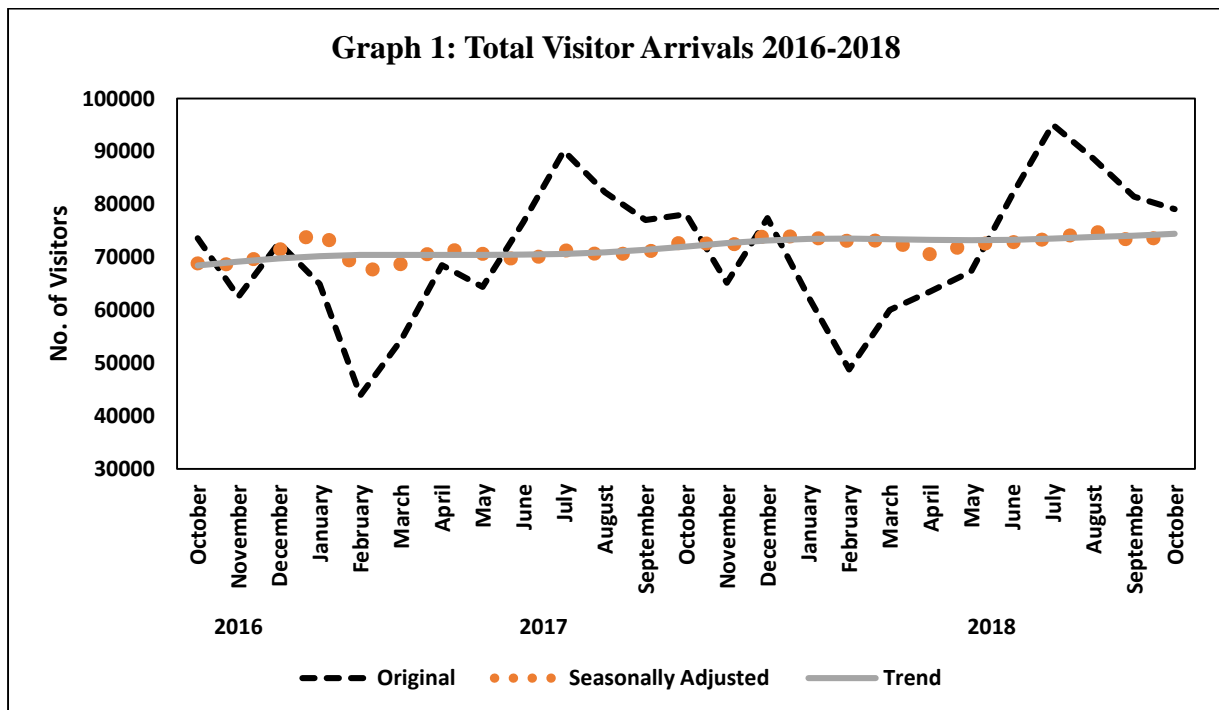
	October 2018	September 2018 to October 2018 % change	October 2017 to October 2018 % change
<b>Total</b>			
Trend	74,426	0.45	3.32
Seasonally Adjusted	74,259	1.73	...
Original	79,077	...	...
<b>Australia</b>			
Trend	30,808	0.04	0.85
Seasonally Adjusted	31,119	5.65	...
Original	34,899	...	...
<b>New Zealand</b>			
Trend	16,797	1.05	6.80
Seasonally Adjusted	16,668	-0.99	...
Original	18,562	...	...
<b>USA</b>			
Trend	7,380	0.89	6.71
Seasonally Adjusted	7,380	1.68	...
Original	7,004	...	...
<b>Continental Europe</b>			
Trend	3,399	1.01	17.45
Seasonally Adjusted	3,393	-7.60	...
Original	3,621	...	...
<b>Japan</b>			
Trend	1,530	1.32	-4.97
Seasonally Adjusted	1,615	10.92	...
Original	1,335	...	...

...not applicable (see notes below and “Appendix 1-Explanatory Notes” for more details)

**Note:**

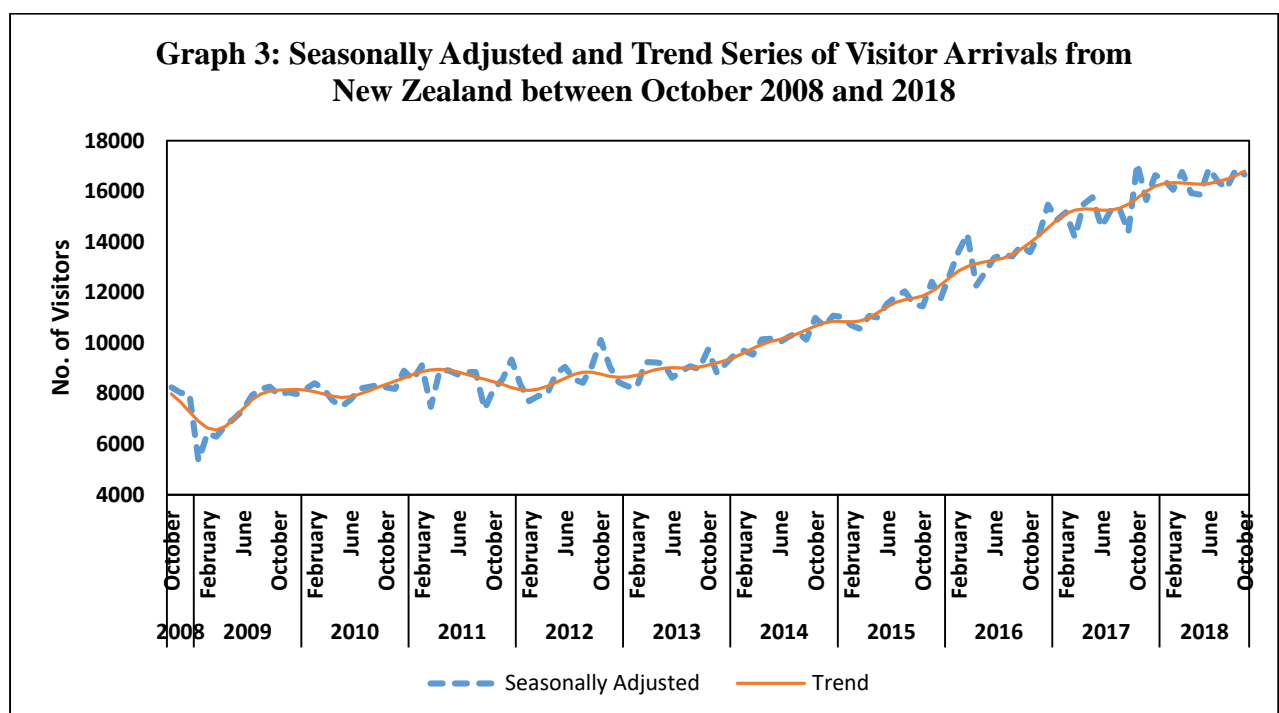
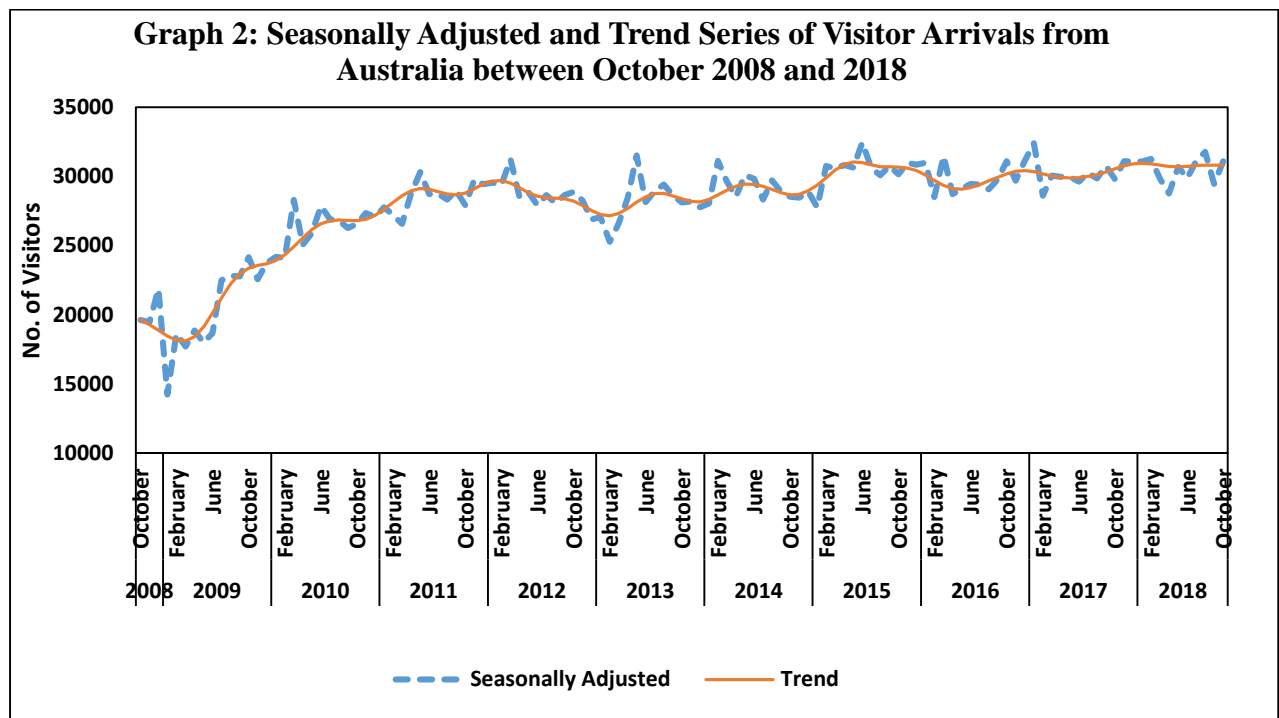
1. *Month-to-month % change and year-to-year % change* in the original estimates are not shown here and must be used with caution as seasonal and irregular influences can dominate movements.
2. *Year-to-year % change* in the seasonally adjusted estimates are not shown here and must be used with caution as irregular influences can dominate movements.

- **Trend estimates:** Trend estimates show the long term, underlying movement in the series after the removal of seasonal and irregular influences. The trend estimates of Total Visitor Arrivals during October 2018 (74,426) **increased by 0.45%**, compared with September 2018 (74,096). The current trend estimate for arrivals is **3.32% higher** than October 2017.
- **Seasonally adjusted estimates:** Seasonally Adjusted estimates show the trend and irregular components after removing all seasonal and systematic related behaviors from the series. During October 2018, seasonally adjusted Total Visitor Arrivals to Fiji (74,259) **increased by 1.73%** compared with September 2018 (72,998).
- **Original estimates:** The Total Visitor Arrivals to Fiji in October 2018 was 79,077. In this publication, the *month-to-month % change* and *year-to-year % change* are not reported as they contain seasonal and irregular influences that may hide the underlying, long term movement of the series.



Graph 1 shows the Total Visitor Arrivals to Fiji from October 2016 to September 2018 using three series: original, seasonally adjusted and trend. In terms of the original series, arrivals in February are low which could be due to visitors returning to their home countries after the holiday period in December and January. February also has less days compared to other months of the year. Arrivals in June and July on the other hand, are higher as these are winter months in the southern hemisphere. These variations contribute to calendar related, seasonal and irregular influences in the series, therefore seasonally adjusted and trend estimates are produced to show the true underlying movement of the series.

Australia and New Zealand are the two major contributors of Visitor Arrivals in Fiji, consisting of 44.1% and 23.5% of total arrivals respectively. After removing seasonal and irregular influences, arrivals from Australia (Graph 2) shows a slightly increasing trend which has been generally stable since 2010. On the other hand, arrivals from New Zealand (Graph 3) is trending upwards. The seasonally adjusted shows the trend and irregular so contains random fluctuations as well as the impact of one-off real world events. (For difference between seasonally adjusted and trend series see “Appendix: 1, Explanatory Notes” 3-5).



For details on trend breaks and extreme outliers (see “Appendix: 1, Explanatory Notes”, subheading 7&8)

For more information, the following can be referred to:

- Table 1: Original and Seasonally Adjusted Visitor Arrivals- Number by Country of Residence
- Table 2: Seasonally Adjusted and Trend Series of Visitor Arrivals- Number by Country of Residence
  
- Appendix 1: Explanatory Notes

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TABLE 1

## ORIGINAL AND SEASONALLY ADJUSTED VISITOR ARRIVALS : NUMBER BY COUNTRY OF RESIDENCE

YEAR	MONTH	AUSTRALIA	NEW ZEALAND	USA	CANADA	UNITED KINGDOM	CONTINENTAL EUROPE	JAPAN	SOUTH KOREA	REST OF ASIA	PACIFIC ISLANDS	OTHERS	TOTAL
<b>ORIGINAL VISITOR ARRIVALS</b>													
2016	October	35,804	14,732	5,952	1,138	1,284	2,896	386	761	6,160	4,194	288	<b>73,595</b>
	November	28,234	11,633	5,847	1,154	1,379	2,776	471	794	5,468	4,366	366	<b>62,488</b>
2017	December	36,130	13,172	6,558	1,055	1,522	2,753	528	800	5,082	4,735	384	<b>72,719</b>
	January	30,128	9,251	5,533	918	1,349	2,849	587	749	7,676	5,435	468	<b>64,943</b>
	February	15,603	6,228	5,538	896	1,325	2,295	720	633	5,576	4,712	350	<b>43,876</b>
	March	23,489	8,253	6,068	1,154	1,553	2,754	460	732	5,680	3,881	383	<b>54,407</b>
	April	30,951	13,804	5,922	1,099	1,449	3,450	467	634	6,382	3,928	409	<b>68,495</b>
	May	28,039	14,465	6,002	1,054	1,189	2,622	441	640	5,626	3,979	310	<b>64,367</b>
	June	32,833	18,590	9,167	865	1,465	2,314	407	733	5,810	4,152	262	<b>76,598</b>
	July	34,584	26,448	9,525	1,319	1,961	3,006	564	703	7,102	4,547	349	<b>90,108</b>
	August	32,908	23,106	7,165	1,290	1,296	3,421	836	672	6,928	4,330	364	<b>82,316</b>
	September	36,323	19,099	5,795	792	1,183	2,295	655	803	5,405	4,312	367	<b>77,029</b>
	October	34,359	18,564	6,756	1,053	1,296	3,455	410	968	6,448	4,344	511	<b>78,164</b>
	2018	November	29,686	12,214	6,465	993	1,243	3,036	394	771	5,142	4,847	360
December		36,786	14,573	7,262	988	1,616	3,141	409	833	5,972	5,253	597	<b>77,430</b>
January		28,313	10,612	5,617	1,000	1,321	2,952	505	792	5,569	5,529	438	<b>62,648</b>
February		17,014	6,641	5,951	993	1,252	2,682	510	553	8,245	4,416	541	<b>48,798</b>
March		25,196	9,868	7,264	1,196	1,474	2,706	427	720	6,667	4,112	428	<b>60,058</b>
April		26,809	13,731	6,170	908	1,261	2,763	438	760	6,346	3,926	423	<b>63,535</b>
May		29,730	14,383	7,059	834	1,239	3,013	391	598	5,907	3,725	411	<b>67,290</b>
June		32,785	22,404	9,962	1,099	1,239	2,431	336	683	5,923	4,450	341	<b>81,653</b>
July		35,608	28,572	9,104	1,675	1,871	3,392	1,736	712	7,513	4,403	475	<b>95,061</b>
August		34,641	24,065	7,727	1,437	1,486	4,301	2,454	685	7,297	4,219	381	<b>88,693</b>
September		35,585	21,675	6,060	883	1,000	3,176	1,723	585	6,340	4,014	396	<b>81,437</b>
October		34,899	18,562	7,004	957	1,379	3,621	1,335	772	6,241	3,923	384	<b>79,077</b>
<b>SEASONALLY ADJUSTED VISITOR ARRIVALS</b>													
2016	October	31,095	13,580	6,122	1,114	1,379	2,623	1,510	689	6,023	4,362	319	<b>68,816</b>
	November	29,686	14,268	6,242	1,071	1,400	2,731	1,867	691	6,096	4,213	365	<b>68,630</b>
	December	31,091	15,471	6,400	989	1,404	2,716	1,945	715	5,889	4,446	328	<b>71,394</b>
2017	January	32,387	14,865	6,727	1,033	1,381	2,632	1,858	700	8,301	4,729	411	<b>75,024</b>
	February	28,599	15,168	6,699	979	1,374	2,487	2,245	763	4,284	4,290	353	<b>67,241</b>
	March	30,054	14,165	6,414	1,015	1,350	2,820	1,518	700	5,934	4,369	360	<b>68,699</b>
	April	29,969	15,488	6,692	1,212	1,438	3,247	1,844	701	6,381	4,240	445	<b>71,657</b>
	May	29,953	15,762	6,427	1,142	1,265	2,835	1,660	668	6,394	4,225	345	<b>70,676</b>
	June	29,617	14,589	6,515	1,056	1,575	2,772	1,575	749	6,433	4,225	309	<b>69,415</b>
	July	30,273	15,224	7,082	966	1,623	2,921	1,633	736	6,212	4,317	341	<b>71,328</b>
	August	29,854	15,335	6,729	1,086	1,230	2,763	1,657	754	6,165	4,558	369	<b>70,500</b>
	September	30,746	14,386	6,950	1,089	1,593	2,829	1,762	851	5,665	4,670	375	<b>70,916</b>
	October	29,804	17,089	6,810	1,040	1,343	3,106	1,527	836	6,378	4,603	546	<b>73,082</b>
	November	31,085	15,651	6,895	958	1,331	2,914	1,597	692	5,901	4,724	354	<b>72,102</b>
	December	31,077	16,633	7,130	913	1,432	3,080	1,497	727	6,512	4,678	509	<b>74,188</b>
2018	January	31,071	16,452	7,099	1,091	1,365	2,871	1,613	734	6,169	4,877	407	<b>73,749</b>
	February	31,262	16,061	7,203	1,089	1,313	2,916	1,569	678	6,414	4,055	531	<b>73,091</b>
	March	29,823	16,766	7,433	1,081	1,293	2,761	1,445	708	6,929	4,571	406	<b>73,216</b>
	April	28,760	15,934	7,187	1,055	1,262	2,632	1,627	788	6,532	4,325	447	<b>70,549</b>
	May	30,674	15,871	7,273	905	1,343	3,157	1,485	668	6,578	4,062	437	<b>72,453</b>
	June	29,877	16,900	7,242	1,267	1,308	3,028	1,366	699	6,321	4,416	430	<b>72,854</b>
	July	31,091	16,386	6,579	1,232	1,468	3,239	1,463	716	6,640	4,264	443	<b>73,521</b>
	August	31,769	16,107	7,360	1,195	1,427	3,580	1,560	737	6,528	4,325	387	<b>74,975</b>
	September	29,454	16,835	7,258	1,196	1,372	3,672	1,456	652	6,433	4,257	413	<b>72,998</b>
September	31,119	16,668	7,380	929	1,446	3,393	1,615	658	6,333	4,287	431	<b>74,259</b>	

\*China India and Hong Kong are included in Rest of Asia due to less than 10 years of data

\* Seasonally Adjusted figures and trend estimates change as new data becomes available. This ensures that the most up-to-date and best possible estimates are derived.

TABLE 2

## SEASONALLY ADJUSTED AND TREND VISITOR ARRIVALS : NUMBER BY COUNTRY OF RESIDENCE

YEAR	MONTH	AUSTRALIA	NEW ZEALAND	USA	CANADA	UNITED KINGDOM	CONTINENTAL EUROPE	JAPAN	SOUTH KOREA	REST OF ASIA	PACIFIC ISLANDS	OTHERS	TOTAL
<b>SEASONALLY ADJUSTED VISITOR ARRIVALS</b>													
2016	October	31,095	13,580	6,122	1,114	1,379	2,623	1,510	689	6,023	4,362	319	<b>68,816</b>
	November	29,686	14,268	6,242	1,071	1,400	2,731	1,867	691	6,096	4,213	365	<b>68,630</b>
	December	31,091	15,471	6,400	989	1,404	2,716	1,945	715	5,889	4,446	328	<b>71,394</b>
2017	January	32,387	14,865	6,727	1,033	1,381	2,632	1,858	700	8,301	4,729	411	<b>75,024</b>
	February	28,599	15,168	6,699	979	1,374	2,487	2,245	763	4,284	4,290	353	<b>67,241</b>
	March	30,054	14,165	6,414	1,015	1,350	2,820	1,518	700	5,934	4,369	360	<b>68,699</b>
	April	29,969	15,488	6,692	1,212	1,438	3,247	1,844	701	6,381	4,240	445	<b>71,657</b>
	May	29,953	15,762	6,427	1,142	1,265	2,835	1,660	668	6,394	4,225	345	<b>70,676</b>
	June	29,617	14,589	6,515	1,056	1,575	2,772	1,575	749	6,433	4,225	309	<b>69,415</b>
	July	30,273	15,224	7,082	966	1,623	2,921	1,633	736	6,212	4,317	341	<b>71,328</b>
	August	29,854	15,335	6,729	1,086	1,230	2,763	1,657	754	6,165	4,558	369	<b>70,500</b>
	September	30,746	14,386	6,950	1,089	1,593	2,829	1,762	851	5,665	4,670	375	<b>70,916</b>
	October	29,804	17,089	6,810	1,040	1,343	3,106	1,527	836	6,378	4,603	546	<b>73,082</b>
	November	31,085	15,651	6,895	958	1,331	2,914	1,597	692	5,901	4,724	354	<b>72,102</b>
	December	31,077	16,633	7,130	913	1,432	3,080	1,497	727	6,512	4,678	509	<b>74,188</b>
2018	January	31,071	16,452	7,099	1,091	1,365	2,871	1,613	734	6,169	4,877	407	<b>73,749</b>
	February	31,262	16,061	7,203	1,089	1,313	2,916	1,569	678	6,414	4,055	531	<b>73,091</b>
	March	29,823	16,766	7,433	1,081	1,293	2,761	1,445	708	6,929	4,571	406	<b>73,216</b>
	April	28,760	15,934	7,187	1,055	1,262	2,632	1,627	788	6,532	4,325	447	<b>70,549</b>
	May	30,674	15,871	7,273	905	1,343	3,157	1,485	668	6,578	4,062	437	<b>72,453</b>
	June	29,877	16,900	7,242	1,267	1,308	3,028	1,366	699	6,321	4,416	430	<b>72,854</b>
	July	31,091	16,386	6,579	1,232	1,468	3,239	1,463	716	6,640	4,264	443	<b>73,521</b>
	August	31,769	16,107	7,360	1,195	1,427	3,580	1,560	737	6,528	4,325	387	<b>74,975</b>
	September	29,454	16,835	7,258	1,196	1,372	3,672	1,456	652	6,433	4,257	413	<b>72,998</b>
	October	31,119	16,668	7,380	929	1,446	3,393	1,615	658	6,333	4,287	431	<b>74,259</b>
<b>TREND SERIES VISITOR ARRIVALS</b>													
2016	October	30,178	13,955	6,217	1,022	1,377	2,725	1,666	679	6,012	4,297	344	<b>68,472</b>
	November	30,369	14,233	6,315	1,025	1,379	2,701	1,740	691	6,006	4,348	349	<b>69,156</b>
	December	30,423	14,546	6,432	1,023	1,380	2,698	1,820	705	5,999	4,390	358	<b>69,774</b>
2017	January	30,346	14,860	6,521	1,025	1,382	2,717	1,870	714	6,024	4,403	366	<b>70,228</b>
	February	30,188	15,108	6,569	1,032	1,387	2,751	1,868	715	6,082	4,377	368	<b>70,445</b>
	March	30,015	15,255	6,584	1,043	1,397	2,788	1,817	710	6,172	4,324	363	<b>70,468</b>
	April	29,918	15,302	6,590	1,057	1,413	2,814	1,750	706	6,251	4,277	354	<b>70,432</b>
	May	29,885	15,289	6,614	1,073	1,431	2,828	1,695	712	6,297	4,263	346	<b>70,433</b>
	June	29,901	15,257	6,663	1,080	1,441	2,830	1,664	730	6,282	4,298	341	<b>70,487</b>
	July	29,989	15,252	6,732	1,074	1,438	2,830	1,647	754	6,219	4,376	346	<b>70,657</b>
	August	30,114	15,327	6,805	1,058	1,423	2,840	1,635	776	6,144	4,479	359	<b>70,960</b>
	September	30,319	15,488	6,863	1,040	1,402	2,865	1,626	787	6,079	4,582	380	<b>71,431</b>
	October	30,549	15,727	6,916	1,029	1,384	2,894	1,610	779	6,071	4,671	406	<b>72,036</b>
	November	30,748	15,995	6,979	1,027	1,367	2,912	1,590	760	6,137	4,728	430	<b>72,673</b>
	December	30,898	16,195	7,053	1,030	1,351	2,916	1,570	738	6,258	4,735	446	<b>73,190</b>
2018	January	30,956	16,298	7,141	1,038	1,335	2,908	1,555	721	6,391	4,688	454	<b>73,485</b>
	February	30,901	16,342	7,217	1,058	1,319	2,898	1,542	712	6,498	4,600	456	<b>73,543</b>
	March	30,805	16,328	7,258	1,088	1,308	2,902	1,528	711	6,563	4,492	452	<b>73,435</b>
	April	30,722	16,296	7,268	1,122	1,307	2,940	1,507	716	6,589	4,387	444	<b>73,298</b>
	May	30,682	16,281	7,253	1,157	1,319	3,016	1,485	716	6,577	4,308	435	<b>73,229</b>
	June	30,719	16,304	7,238	1,185	1,343	3,116	1,474	710	6,533	4,268	427	<b>73,317</b>
	July	30,774	16,376	7,240	1,201	1,372	3,219	1,477	702	6,487	4,265	423	<b>73,536</b>
	August	30,816	16,481	7,265	1,199	1,395	3,305	1,491	693	6,475	4,278	420	<b>73,818</b>
	September	30,796	16,622	7,315	1,180	1,409	3,365	1,510	688	6,508	4,285	418	<b>74,096</b>
	October	30,808	16,797	7,380	1,152	1,413	3,399	1,530	690	6,565	4,279	413	<b>74,426</b>

\*China India and Hong Kong are included in Rest of Asia due to less than 10 years of data

\*Seasonally Adjusted figures and trend estimates change as new data becomes available. This ensures that the most up-to-date and best possible estimates are derived.

## **APPENDIX 1: EXPLANATORY NOTES**

### **WHAT IS A TIME SERIES?**

A time series is a collection of observations of well-defined data items obtained through repeated measurements over time. For example, measuring the value of retail sales each month over several years would comprise a time series. This is because sales revenue is well defined, and consistently measured at equally spaced intervals. Data collected irregularly or only once are not time series. In this release, monthly Visitor Arrivals to Fiji by country of residence for the past 48 years (from 1970) are analyzed as a time series. An observed time series can be decomposed into three components: the trend (long term direction), the seasonal (systematic, calendar related movements) and the irregular (unsystematic, short term fluctuations).

### **WHAT ARE SEASONAL EFFECTS?**

A seasonal effect is a systematic and calendar related effect. Some examples include the sharp escalation in most Retail series leading up to December due to the Christmas holiday period, or the increase in tourist arrivals to Fiji during the winter months of Australia and New Zealand.

### **WHAT IS SEASONAL ADJUSTMENT AND WHY DO WE NEED IT?**

Seasonal adjustment is the process of estimating and then removing from a time series influences that are systematic and calendar related. Observed data needs to be seasonally adjusted as seasonal effects can conceal both the true underlying movements in the series, as well as certain non-seasonal characteristics which may be of interest to analysts.

### **WHY CAN'T WE JUST COMPARE ORIGINAL DATA FROM THE SAME PERIOD IN EACH YEAR?**

A comparison of original data from the same period in each year does not completely remove all seasonal effects. Certain holidays such as Easter and Chinese New Year fall in different periods in each year, hence they will distort observations. Also, year to year values will be biased by any changes in seasonal patterns that occur over time. For example, consider a comparison between two consecutive March months i.e. compare the level of the original series observed in March for 2000 and 2001. This comparison ignores the moving holiday effect of Easter. Easter occurs in April for most years but if Easter falls in March, the level of activity can vary greatly for that month for some series. This distorts the original estimates. A comparison of these two months will not reflect the underlying pattern of the data. The comparison also ignores trading day effects. If the two consecutive months of March have different composition of trading days, it might reflect different levels of activity in original terms even though the underlying level of activity is unchanged. In a similar way, any changes to seasonal patterns might also be ignored. The original estimates also contains the influence of the irregular component. If the magnitude of the irregular component of a series is strong compared with the magnitude of the trend component, the underlying direction of the series can be distorted.

However, the major disadvantage of comparing year to year original data, is lack of precision and time delays in the identification of turning points in a series. Turning points occur when the direction of underlying level of the series changes, for example when a consistently decreasing series begins to rise steadily. If we compare year apart data in the original series, we may miss turning points occurring during

the year. For example, if March 2001 has a higher original estimate than March 2000, by comparing these year apart values, we might conclude that the level of activity has increased during the year. However, the series might have increased up to September 2000 and then started to decrease steadily.

## **WHICH INDICATOR SHOULD BE USED TO COMPARE MONTH-TO-MONTH OR QUARTER-TO QUARTER PERCENTAGE CHANGES?**

### **Original estimates- *Do not use***

Usually dominated by seasonal effects; also residual noise and irregular influences

### **Seasonally adjusted estimates- *Use with caution***

Provides useful information on the effects of short term, major events. Dominated by irregular and noise, except for series with very little volatility

### **Trend estimates- *Preferred option***

The best indicator of underlying behavior for month-to-month or quarter-to-quarter changes. Recent estimates, usually the last 3 or 4, may be revised.

## **WHEN IS SEASONAL ADJUSTMENT INAPPROPRIATE?**

When a time series is dominated by the trend or irregular components, it is nearly impossible to identify and remove what little seasonality is present. Hence seasonally adjusting a non-seasonal series is impractical and will often introduce an artificial seasonal element.

## **WHAT IS SEASONALITY?**

The seasonal component consists of effects that are reasonably stable with respect to timing, direction and magnitude. It arises from systematic, calendar related influences such as:

- **Natural Conditions**  
Weather fluctuations that are representative of the season (uncharacteristic weather patterns such as snow in summer would be considered irregular influences).
- **Business and Administrative procedures**  
Start and end of the school term.
- **Social and Cultural behavior**  
Christmas.

It also includes calendar related systematic effects that are not stable in their annual timing or are caused by variations in the calendar from year to year, such as:

- **Trading Day Effects**  
The number of occurrences of each of the day of the week in a given month will differ from year to year  
- There were 4 weekends in March in 2000, but 5 weekends in March of 2002

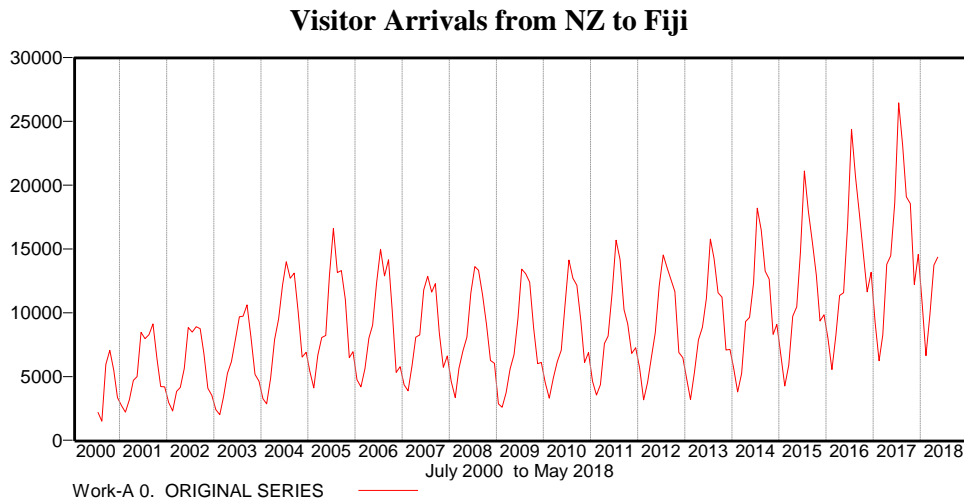


- **Moving Holiday Effects**

Holidays which occur each year, but whose exact timing shifts  
 - Easter, Chinese New Year

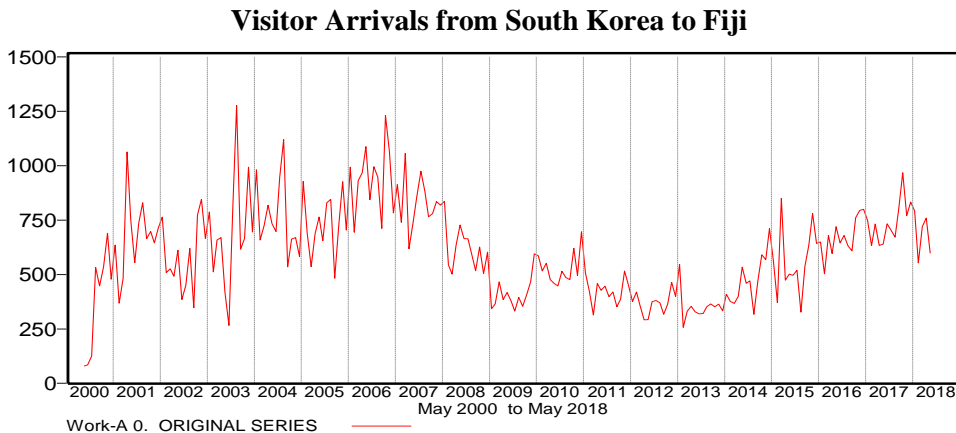
**HOW DO WE IDENTIFY SEASONALITY?**

Seasonality in a time series can be identified by regularly spaced peaks and troughs which have a consistent direction and approximately the same magnitude every year, relative to the trend. The following diagram depicts a strongly seasonal series. There is an obvious large seasonal increase in December tourist arrival to Fiji from Australia in December due to holiday season in Australia and a decline in January as tourists return. In this example, the magnitude of the seasonal component increases over time, as does the trend.



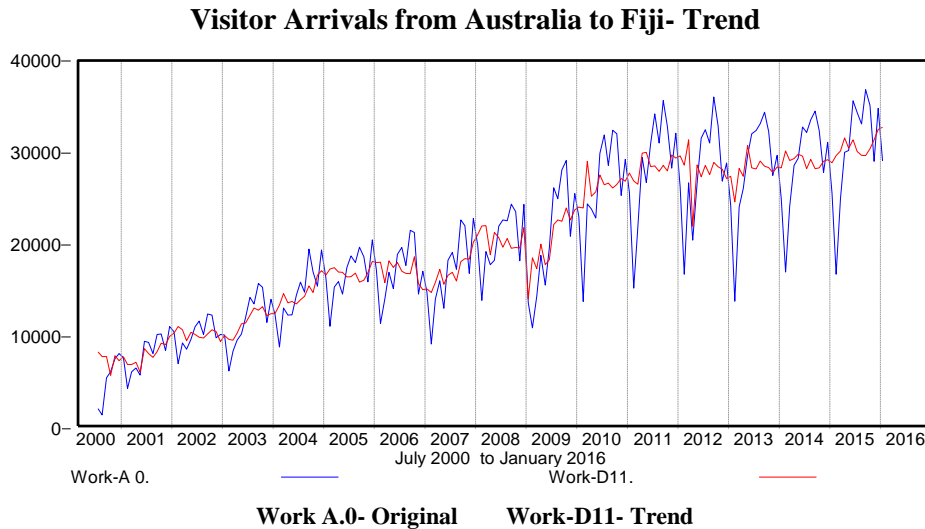
**WHAT IS AN IRREGULAR?**

The irregular component (sometimes also known as the residual) is what remains after the seasonal and trend components of a time series have been estimated and removed. It results from short term fluctuations in the series which are neither systematic nor predictable. In a highly irregular series, these fluctuations can dominate movements, which will mask the trend and seasonality. The following graph is an example of a highly irregular time series.



## WHAT IS THE TREND?

The trend is defined as the 'long term' movement in a time series without calendar related and irregular effects, and is a reflection of the underlying level. It is the result of influences such as population growth, price inflation and general economic changes. The following graph depicts a series in which there is an obvious upward trend over time:



## HOW IS SEASONAL ADJUSTMENT CONDUCTED?

A filter based method of seasonal adjustment based on the X11 algorithm) is applied to FBoS series. The procedure consists of the following steps:

- 1) Estimate the trend by a moving average
- 2) Remove the trend leaving the seasonal and irregular components
- 3) Estimate the seasonal component using moving averages to smooth out the irregulars.

Seasonality generally cannot be identified until the trend is known, however a good estimate of the trend cannot be made until the series has been seasonally adjusted. Therefore X11 uses an iterative approach to estimate the components of a time series.

## HANDLING UNUSUAL BEHAVIOURS IN A TIME SERIES

Often series display behaviour that is not consistent with the expected seasonal pattern or trend. When series are not well behaved they need to be corrected or adjusted to avoid obtaining an inferior seasonal adjustment. Since seasonal adjustment often involves filters, any strange values will have a large impact on the final result average is influenced by a real large or low value. The original series are not always well behaved. In reality, there are activities that are systematic and predictable, but doesn't affect the same calendar period the same way every year, for example, moving holidays, trading day, etc. There are cases of unusually high or low values, sudden and sustained level shifts, and sudden and sustained changes in the seasonal patten pattern.

Before estimating the components of the time series, we need to correct for these so that we have a series that is better but may not be perfect because we are still dealing with estimates. Prior corrected series is used for calculating higher quality estimates of the Seasonal factors and the Trend. It enables more adequate

models to be found both in terms of the decomposition model and ARIMA model. It also ensures that the results of the seasonal adjustment process are not distorted by known events.

### **EXTREME VALUES**

Extremes or outliers are values in a time series that are unusually large or small relative to the other data. They can distort the appearance of the underlying movement of the time series by altering the trend. For this reason, and to improve estimation of the three series components (trend, seasonal and irregular), it is necessary to detect and correct outliers.

For example, a real world event one off event (like a tropical cyclone) could lead to a sudden and drastic decline or increase in the number of Tourist Arrivals. In this case, an extreme value correction is applied prior to seasonal adjustment to ensure an optimal result. The value is then returned to the seasonally adjusted series to show the extent of the effect of the real world event.

### **TREND BREAKS**

An abrupt but sustained change in the level of a time series is known as a trend break. This is reflected in at least 6 months or 3 quarters of raised or lowered levels. If the span of increased or decreased values is shorter than this, they are classified as extreme values.

For example, real world events could lead to a sudden and sustained change in the level of the series. In this case, trend break corrections are applied and the factor is returned to the trend and seasonally adjusted series.

**(Source: Australian Bureau of Statistics)**