

# STATISTICAL NEWS

FBoS Release No: 09, 2019

5<sup>th</sup> February, 2019

## SEASONALLY ADJUSTED VISITOR ARRIVALS DECEMBER 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

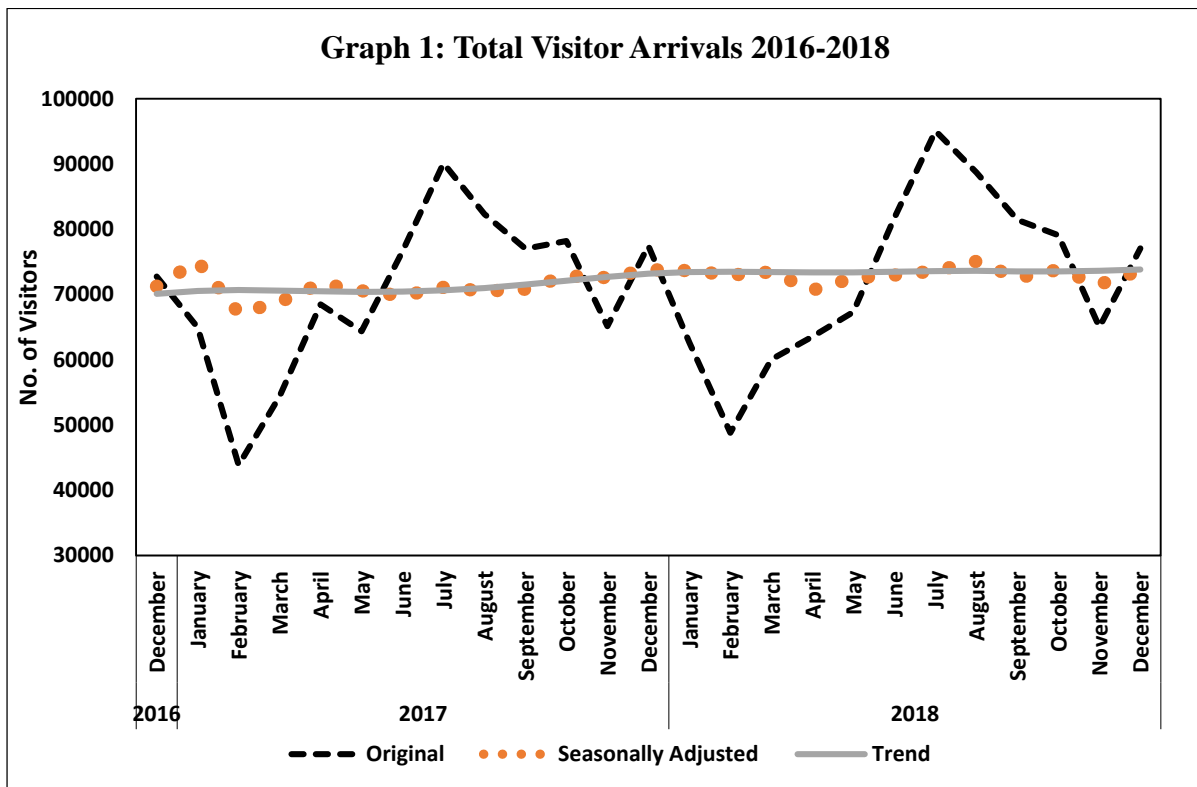
	December 2018	November 2018 to December 2018 % change	December 2017 to December 2018 % change
<b>Total</b>			
Trend	73,809	0.27	0.86
Seasonally Adjusted	73,642	2.93	...
Original	77,070	...	...
<b>Australia</b>			
Trend	30,806	0.02	-0.19
Seasonally Adjusted	30,323	-1.80	...
Original	35,252	...	...
<b>New Zealand</b>			
Trend	17,109	1.36	6.10
Seasonally Adjusted	17,411	5.25	...
Original	15,574	...	...
<b>USA</b>			
Trend	7,315	0.45	3.55
Seasonally Adjusted	7,271	1.21	...
Original	7,244	...	...
<b>Continental Europe</b>			
Trend	3,227	-0.09	9.28
Seasonally Adjusted	3,162	1.22	...
Original	3,304	...	...
<b>Japan</b>			
Trend	1,461	-1.22	-6.82
Seasonally Adjusted	1,476	63.64	...
Original	1,355	...	...

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

**Note:**

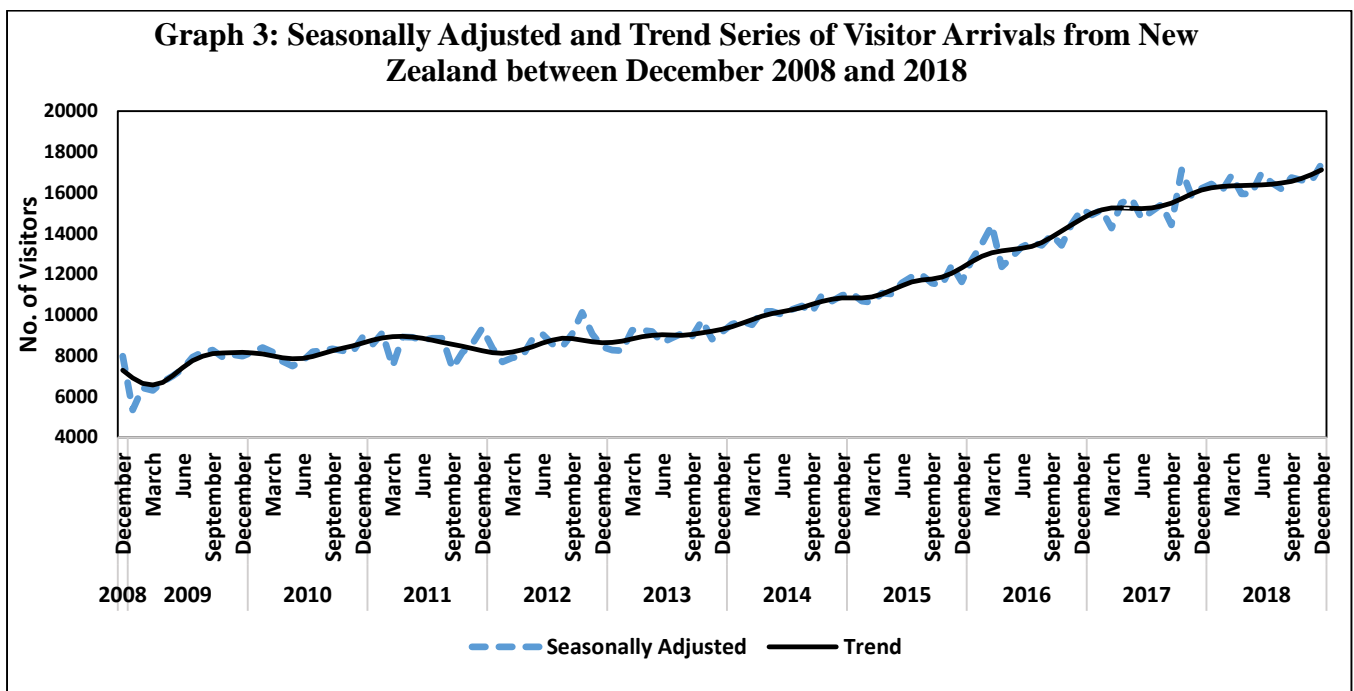
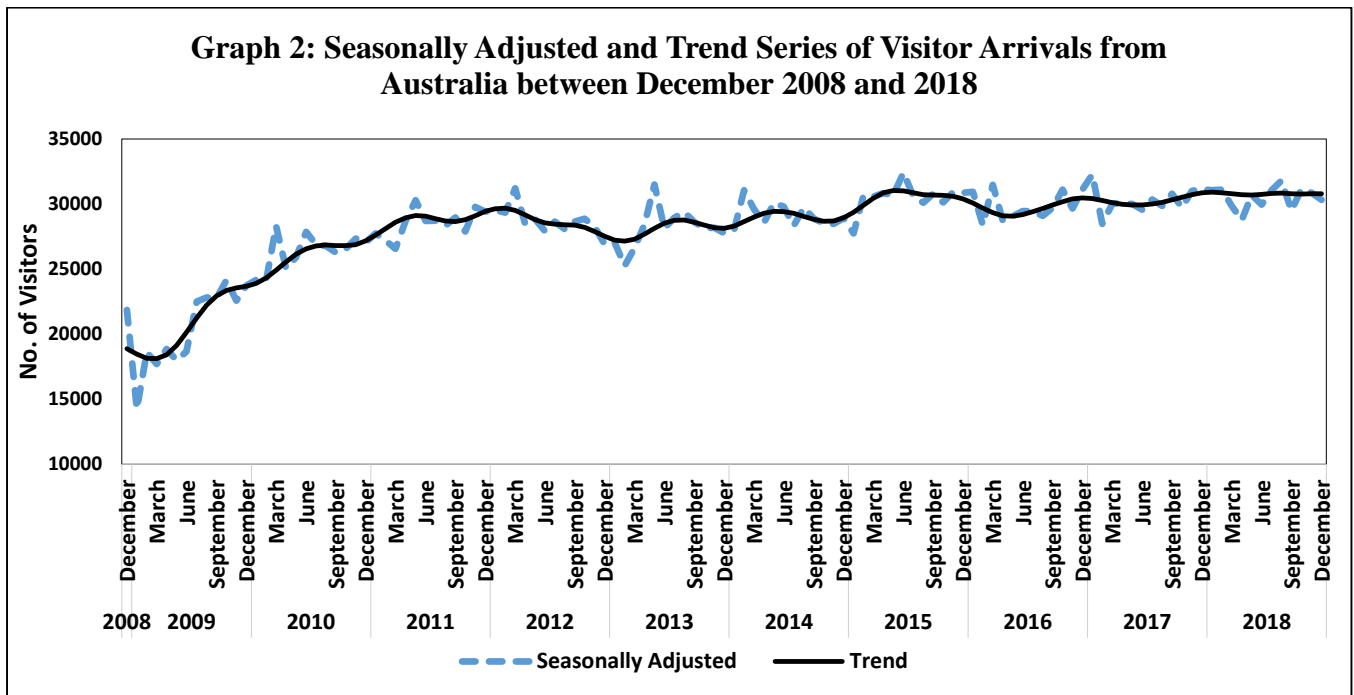
1. *Month-to-month % change and year-to-year % change* in the original estimates are not shown here and must be used with caution as seasonal and irregular influences can dominate movements.
2. *Year-to-year % change* in the seasonally adjusted estimates are not shown here and must be used with caution 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 December 2018 (73,809) **increased by 0.27%**, compared with November 2018 (73,609). The current trend estimate for arrivals **is 0.86% higher** than December 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 December 2018, seasonally adjusted Total Visitor Arrivals to Fiji (73,642) **increased by 2.93%** compared with November 2018 (71,545).
- **Original estimates:** The Total Visitor Arrivals to Fiji in December 2018 was 77,070. 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 December 2016 to December 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 45.74% and 20.21% 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	December	36,130	13,172	6,558	1,055	1,522	2,753	528	800	5,082	4,735	384	<b>72,719</b>
2017	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>
	November	29,686	12,214	6,465	993	1,243	3,036	394	771	5,142	4,847	360	<b>65,151</b>
	December	36,786	14,573	7,262	1,457	1,616	3,141	409	833	5,972	5,253	597	<b>77,430</b>
2018	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>
	November	29,828	12,631	6,913	1,063	1,145	3,092	693	699	4,314	4,290	321	<b>64,989</b>
	December	35,252	15,574	7,244	1,175	1,630	3,304	1,355	617	5,837	4,647	435	<b>77,070</b>
<b>SEASONALLY ADJUSTED VISITOR ARRIVALS</b>													
2016	December	31,118	15,181	6,435	986	1,390	2,744	1,912	731	5,947	4,451	334	<b>71,229</b>
2017	January	32,276	14,901	6,698	1,035	1,406	2,654	1,879	700	8,363	4,758	401	<b>75,071</b>
	February	28,480	15,153	6,714	983	1,377	2,487	2,212	764	4,293	4,276	365	<b>67,104</b>
	March	30,060	14,259	6,426	1,022	1,359	2,826	1,514	701	5,963	4,363	364	<b>68,857</b>
	April	30,037	15,503	6,703	1,189	1,422	3,250	1,818	710	6,356	4,254	441	<b>71,683</b>
	May	30,013	15,699	6,408	1,148	1,246	2,803	1,669	668	6,359	4,205	342	<b>70,560</b>
	June	29,570	14,730	6,522	1,084	1,622	2,800	1,594	744	6,546	4,232	310	<b>69,754</b>
	July	30,349	15,072	7,093	934	1,582	2,915	1,619	731	6,140	4,314	332	<b>71,081</b>
	August	29,863	15,414	6,710	1,089	1,224	2,756	1,656	742	6,132	4,558	357	<b>70,501</b>
	September	30,790	14,409	6,947	1,099	1,586	2,811	1,777	839	5,548	4,647	374	<b>70,827</b>
	October	29,730	17,109	6,755	1,044	1,364	3,046	1,525	819	6,363	4,598	520	<b>72,873</b>
	November	31,010	15,823	6,968	966	1,350	2,978	1,627	708	6,017	4,743	382	<b>72,572</b>
	December	31,135	16,197	7,124	900	1,405	3,087	1,471	746	6,511	4,688	512	<b>73,776</b>
2018	January	31,067	16,416	7,090	1,099	1,343	2,856	1,614	737	6,135	4,877	404	<b>73,638</b>
	February	31,120	16,058	7,214	1,095	1,316	2,915	1,543	677	6,431	4,040	552	<b>72,961</b>
	March	29,832	16,848	7,448	1,088	1,308	2,775	1,460	708	7,022	4,577	406	<b>73,472</b>
	April	28,771	15,942	7,189	1,038	1,278	2,674	1,614	806	6,561	4,315	446	<b>70,634</b>
	May	30,694	15,939	7,283	912	1,341	3,137	1,486	662	6,587	4,065	430	<b>72,536</b>
	June	29,960	16,938	7,229	1,290	1,301	2,996	1,398	692	6,317	4,429	429	<b>72,979</b>
	July	31,071	16,484	6,560	1,206	1,486	3,244	1,485	706	6,653	4,268	432	<b>73,595</b>
	August	31,796	16,166	7,376	1,200	1,437	3,585	1,554	727	6,541	4,311	385	<b>75,078</b>
	September	29,500	16,744	7,221	1,181	1,335	3,656	1,423	637	6,193	4,255	394	<b>72,539</b>
	October	31,137	16,604	7,346	938	1,414	3,269	1,583	647	6,212	4,254	415	<b>73,819</b>
	November	30,880	16,542	7,184	1,091	1,309	3,124	902	618	5,407	4,158	330	<b>71,545</b>
	December	30,323	17,411	7,271	1,109	1,392	3,162	1,476	580	6,359	4,177	382	<b>73,642</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	NEW		USA	CANADA	UNITED KINGDOM	CONTINENTAL EUROPE	JAPAN	SOUTH KOREA	REST OF ASIA	PACIFIC ISLANDS	OTHERS	TOTAL	
		AUSTRALIA	ZEALAND											
<b>SEASONALLY ADJUSTED VISITOR ARRIVALS</b>														
2016	December	31,118	15,181	6,435	986	1,390	2,744	1,912	731	5,947	4,451	334	<b>71,229</b>	
2017	January	32,276	14,901	6,698	1,035	1,406	2,654	1,879	700	8,363	4,758	401	<b>75,071</b>	
	February	28,480	15,153	6,714	983	1,377	2,487	2,212	764	4,293	4,276	365	<b>67,104</b>	
2017	March	30,060	14,259	6,426	1,022	1,359	2,826	1,514	701	5,963	4,363	364	<b>68,857</b>	
	April	30,037	15,503	6,703	1,189	1,422	3,250	1,818	710	6,356	4,254	441	<b>71,683</b>	
	May	30,013	15,699	6,408	1,148	1,246	2,803	1,669	668	6,359	4,205	342	<b>70,560</b>	
	June	29,570	14,730	6,522	1,084	1,622	2,800	1,594	744	6,546	4,232	310	<b>69,754</b>	
	July	30,349	15,072	7,093	934	1,582	2,915	1,619	731	6,140	4,314	332	<b>71,081</b>	
	August	29,863	15,414	6,710	1,089	1,224	2,756	1,656	742	6,132	4,558	357	<b>70,501</b>	
	September	30,790	14,409	6,947	1,099	1,586	2,811	1,777	839	5,548	4,647	374	<b>70,827</b>	
	October	29,730	17,109	6,755	1,044	1,364	3,046	1,525	819	6,363	4,598	520	<b>72,873</b>	
	November	31,010	15,823	6,968	966	1,350	2,978	1,627	708	6,017	4,743	382	<b>72,572</b>	
	December	31,135	16,197	7,124	900	1,405	3,087	1,471	746	6,511	4,688	512	<b>73,776</b>	
	2018	January	31,067	16,416	7,090	1,099	1,343	2,856	1,614	737	6,135	4,877	404	<b>73,638</b>
		February	31,120	16,058	7,214	1,095	1,316	2,915	1,543	677	6,431	4,040	552	<b>72,961</b>
March		29,832	16,848	7,448	1,088	1,308	2,775	1,460	708	7,022	4,577	406	<b>73,472</b>	
April		28,771	15,942	7,189	1,038	1,278	2,674	1,614	806	6,561	4,315	446	<b>70,634</b>	
May		30,694	15,939	7,283	912	1,341	3,137	1,486	662	6,587	4,065	430	<b>72,536</b>	
June		29,960	16,938	7,229	1,290	1,301	2,996	1,398	692	6,317	4,429	429	<b>72,979</b>	
July		31,071	16,484	6,560	1,206	1,486	3,244	1,485	706	6,653	4,268	432	<b>73,595</b>	
August		31,796	16,166	7,376	1,200	1,437	3,585	1,554	727	6,541	4,311	385	<b>75,078</b>	
September		29,500	16,744	7,221	1,181	1,335	3,656	1,423	637	6,193	4,255	394	<b>72,539</b>	
October		31,137	16,604	7,346	938	1,414	3,269	1,583	647	6,212	4,254	415	<b>73,819</b>	
November		30,880	16,542	7,184	1,091	1,309	3,124	902	618	5,407	4,158	330	<b>71,545</b>	
December		30,323	17,411	7,271	1,109	1,392	3,162	1,476	580	6,359	4,177	382	<b>73,642</b>	
<b>TREND SERIES VISITOR ARRIVALS</b>														
2016	December	30,481	14,710	6,433	1,030	1,384	2,712	1,843	709	6,033	4,378	361	<b>70,074</b>	
2017	January	30,434	14,974	6,529	1,031	1,387	2,729	1,896	719	6,064	4,387	368	<b>70,518</b>	
	February	30,290	15,155	6,580	1,040	1,391	2,759	1,894	720	6,120	4,361	368	<b>70,678</b>	
2017	March	30,112	15,239	6,589	1,057	1,397	2,792	1,837	714	6,196	4,311	360	<b>70,604</b>	
	April	29,995	15,248	6,583	1,080	1,410	2,810	1,762	708	6,259	4,270	349	<b>70,474</b>	
	May	29,939	15,225	6,588	1,102	1,426	2,818	1,699	711	6,297	4,260	338	<b>70,403</b>	
	June	29,931	15,218	6,621	1,111	1,438	2,821	1,665	725	6,285	4,295	334	<b>70,444</b>	
	July	30,001	15,245	6,682	1,102	1,439	2,833	1,647	746	6,237	4,372	339	<b>70,643</b>	
	August	30,120	15,333	6,758	1,081	1,430	2,859	1,639	767	6,179	4,474	355	<b>70,995</b>	
	September	30,319	15,485	6,830	1,058	1,414	2,901	1,632	780	6,125	4,578	377	<b>71,499</b>	
	October	30,536	15,700	6,902	1,044	1,395	2,940	1,615	777	6,118	4,671	400	<b>72,098</b>	
	November	30,723	15,943	6,981	1,040	1,376	2,958	1,592	763	6,179	4,732	418	<b>72,705</b>	
	December	30,864	16,126	7,064	1,043	1,357	2,953	1,568	744	6,293	4,741	430	<b>73,183</b>	
	2018	January	30,920	16,231	7,152	1,050	1,339	2,931	1,549	725	6,420	4,696	434	<b>73,447</b>
		February	30,873	16,298	7,223	1,065	1,322	2,909	1,535	710	6,521	4,608	436	<b>73,500</b>
March		30,791	16,328	7,265	1,085	1,312	2,907	1,524	703	6,592	4,500	435	<b>73,442</b>	
April		30,724	16,338	7,279	1,110	1,312	2,945	1,510	703	6,624	4,395	433	<b>73,373</b>	
May		30,698	16,355	7,276	1,137	1,324	3,023	1,495	703	6,616	4,318	430	<b>73,375</b>	
June		30,750	16,378	7,271	1,162	1,344	3,117	1,487	701	6,559	4,279	425	<b>73,473</b>	
July		30,812	16,413	7,265	1,179	1,364	3,197	1,484	694	6,471	4,270	418	<b>73,567</b>	
August		30,846	16,468	7,260	1,180	1,377	3,242	1,487	680	6,389	4,267	407	<b>73,603</b>	
September		30,804	16,556	7,260	1,166	1,381	3,254	1,489	661	6,333	4,251	395	<b>73,550</b>	
October		30,781	16,696	7,267	1,145	1,378	3,243	1,487	642	6,293	4,219	382	<b>73,533</b>	
November		30,799	16,879	7,282	1,129	1,372	3,230	1,479	627	6,254	4,185	373	<b>73,609</b>	
December		30,806	17,109	7,315	1,124	1,366	3,227	1,461	620	6,234	4,180	367	<b>73,809</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

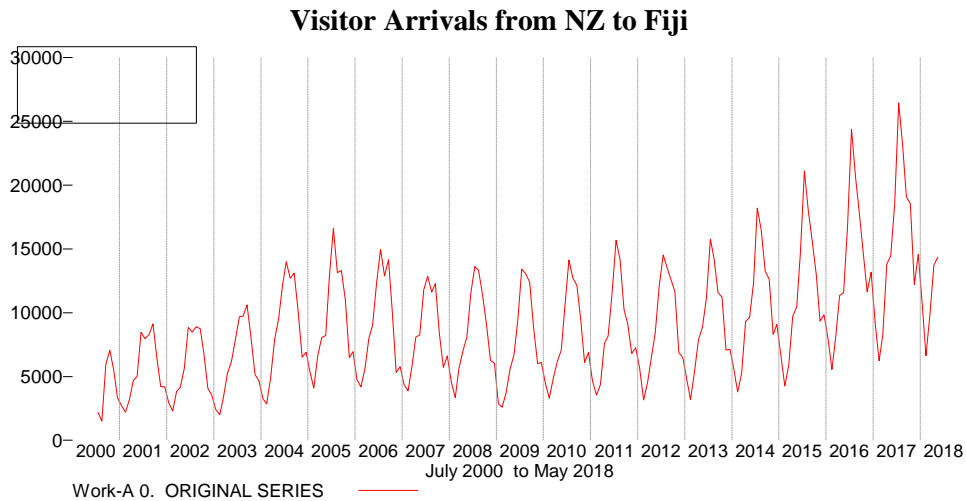


- **Moving Holiday Effects**

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.



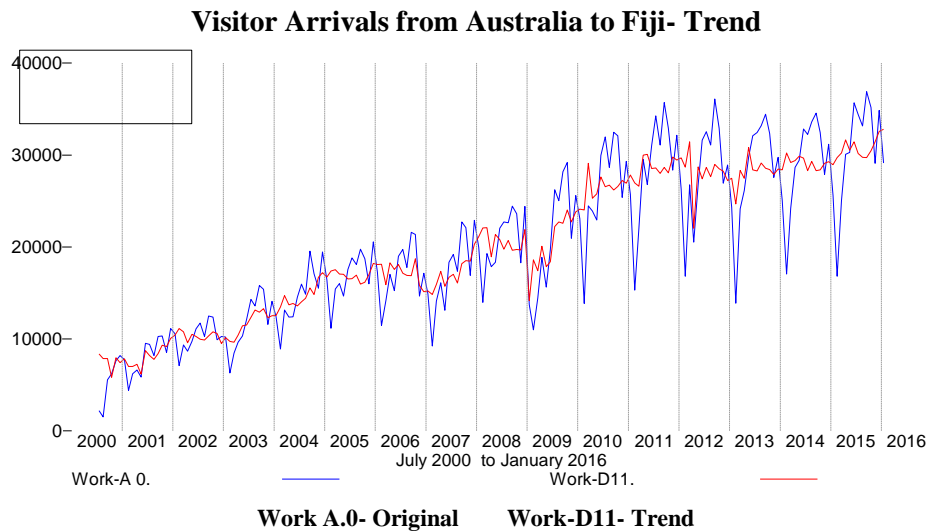
**WHAT IS AN IRREGULAR?**

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 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)**