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STATISTICAL NEWS

FBoS Release No: 38, 2020 4th June 2020

SEASONALLY ADJUSTED VISITOR ARRIVALS MARCH 2020

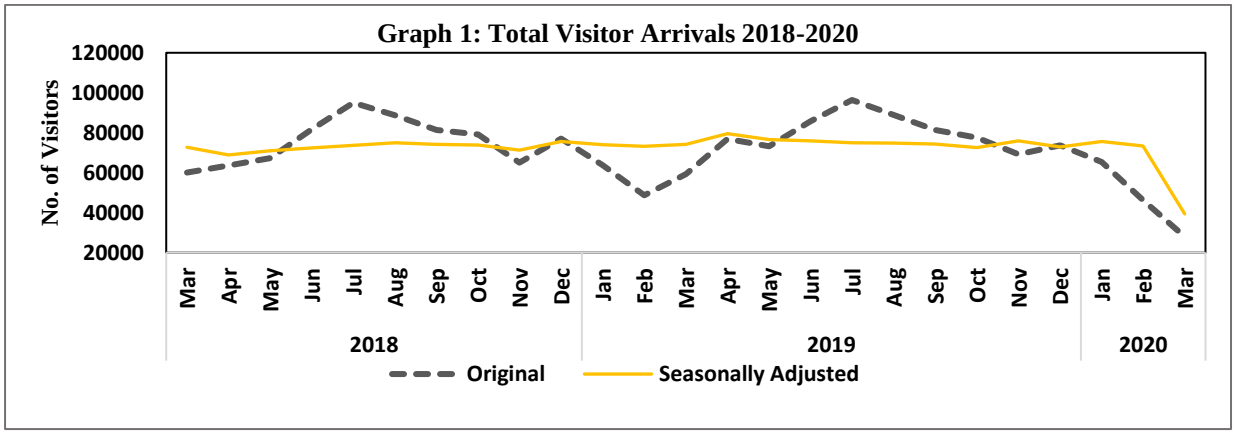
Seasonal adjustment is the process of estimating and removing from a time series influences that are systematic and calendar related. Observed (original) data needs to be seasonally adjusted as seasonal effects can hide both the true underlying movement in the series, as well as certain non-seasonal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

Trend estimates show the long term, underlying movement in the series after the removal of seasonal (systematic) and irregular influences. *Due to effects of the COVID-19 pandemic on international travel, the **trend estimates have been suspended** from March 2020. See "Appendix 1-Explanatory Notes" p.10 for more details.*

Seasonally Adjusted estimates show the trend and irregular components after removing all seasonal and systematic related behaviors from the series.

Original estimates are the actual values observed and contain the trend, seasonal and irregular components.[1]

Total Visitor Arrivals to Fiji



	March 2020	February 2020 to March 2020 % change
Total		
Trend	na	na
Seasonally Adjusted	39,373	-46.37
Original	27,972	…

na - not available (see "Appendix 1-Explanatory Notes" p.10 for more details)
… - not applicable (see notes on p.2 and "Appendix 1-Explanatory Notes" for more details)

Seasonally adjusted estimates of Total Visitor Arrivals to Fiji (39,373) in March 2020 decreased by **46.37%** compared with February 2020 (73,421).

Original estimates of Total Visitor Arrivals to Fiji in February 2020 was 27,972. In this publication, the month-to-month % change and year-to-year % change is not reported as they contain seasonal and irregular influences that may hide the underlying long term movement of the series.

[1] For more details on trend, seasonal and irregular influences, see "Appendix: 1, Explanatory Notes" pages: 9-11.

Graph 1 shows the Total Visitor Arrivals to Fiji from March 2018 to March 2020 using two series: original and seasonally adjusted. 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 and seasonal influences in the series, therefore seasonally adjusted series is produced to show the underlying behavior of the series.

Visitor Arrivals by Country of Residence

	March 2020	February 2020 to March 2020 % change
Australia		
Trend	na	na
Seasonally Adjusted	17,812	-42.44
Original	11,260	…
New Zealand		
Trend	na	na
Seasonally Adjusted	9,890	-49.49
Original	5,520	…
USA		
Trend	na	na
Seasonally Adjusted	3,777	-56.70
Original	3,835	…
Continental Europe		
Trend	na	na
Seasonally Adjusted	1,630	-47.28
Original	1,361	…
Japan		
Trend	na	na
Seasonally Adjusted	592	-42.19
Original	460	…
Pacific Islands		
Trend	na	na
Seasonally Adjusted	2,147	-50.97
Original	1,923	…

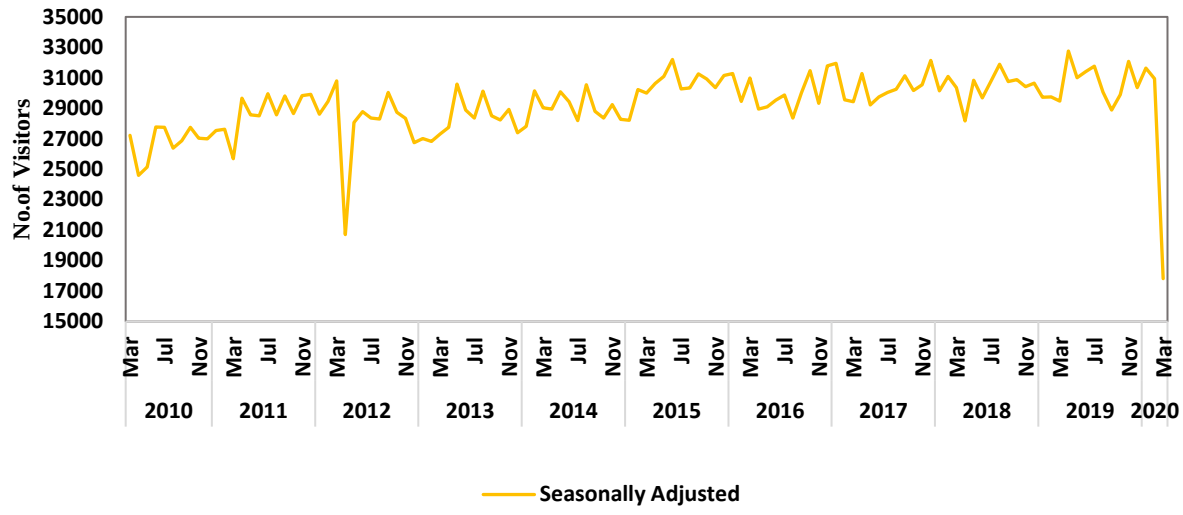
na - not available (see "Appendix 1-Explanatory Notes" p.10 for more details)
… - not applicable (see notes below and "Appendix 1-Explanatory Notes" for more details)

Note:

1. The original series is dominated by seasonal and irregular influences. Due to these influences, *Month-to-month % change* and *year-to-year % change* in the original estimates are not shown here and must be used with caution.
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.
3. The trend series is suspended therefore *year-to-year* movement is not reported. The current *COVID-19* crisis may dominate movements and misrepresent the true long term underlying behavior of the series. *(see "Appendix 1-Explanatory Notes" p.10 for more details)*

Arrivals from Australia

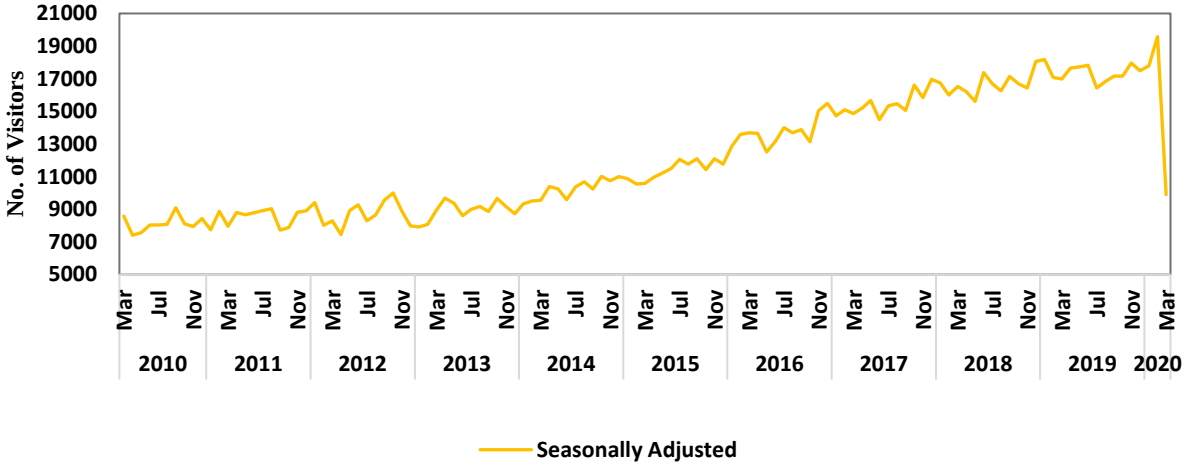
Graph 3: Seasonally Adjusted series of Visitor Arrivals from Australia between March 2010 and 2020



Australia is the largest contributor of Visitor Arrivals in Fiji, consisting of about **40.25%** of total arrivals. Due to the **COVID-19** pandemic, the arrivals from Australia in March 2020 plummeted by **42.44%** when compared with February 2020.

Arrivals from New Zealand

Graph 4: Seasonally Adjusted Series of Visitor Arrivals from New Zealand between March 2010 and 2020



New Zealand is Fiji's second largest source of visitor arrivals consisting of about **19.73%,** behind Australia. The arrivals from New Zealand in March 2020 (9,890) also fell steeply by **49.49%** when compared with February 2020 (19,579)**.**

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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Kemueli Naiqama [Mr]
Chief Executive

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
						ORIGINAL VISITOR ARRIVALS							
2018	March	25,196	9,868	7,264	1,196	1,474	2,706	427	720	6,667	4,112	428	**60,058**
	April	26,809	13,731	6,170	908	1,261	2,763	438	760	6,346	3,926	423	**63,535**
	May	29,730	14,383	7,059	834	1,239	3,013	391	598	5,907	3,725	411	**67,290**
	June	32,785	22,404	9,962	1,099	1,239	2,431	336	683	5,923	4,450	341	**81,653**
	July	35,608	28,572	9,104	1,675	1,871	3,392	1,736	712	7,513	4,403	475	**95,061**
	August	34,641	24,065	7,727	1,437	1,486	4,301	2,454	685	7,297	4,219	381	**88,693**
	September	35,585	21,675	6,060	883	1,000	3,176	1,723	585	6,340	4,014	396	**81,437**
	October	34,899	18,562	7,004	957	1,379	3,621	1,335	772	6,241	3,923	384	**79,077**
	November	29,828	12,631	6,913	1,063	1,145	3,092	693	699	4,314	4,290	321	**64,989**
	December	35,252	15,574	7,244	1,175	1,630	3,304	1,355	617	5,837	4,647	435	**77,070**
2019	January	27,860	11,573	5,709	1,121	1,265	2,906	1,127	766	5,806	5,203	471	**63,807**
	February	15,489	7,145	5,855	1,023	1,375	2,355	1,203	677	8,205	5,011	410	**48,748**
	March	22,972	9,457	8,323	1,247	1,471	2,758	1,468	586	6,302	4,240	482	**59,306**
	April	32,850	16,126	7,938	1,090	1,444	3,223	1,125	648	7,291	4,646	432	**76,813**
	May	30,035	16,372	8,585	984	1,374	2,536	944	813	6,876	4,179	471	**73,169**
	June	34,620	23,076	10,504	949	1,605	2,708	803	547	5,945	4,471	424	**85,652**
	July	36,799	27,963	9,926	1,601	2,020	3,541	1,571	602	6,995	4,849	509	**96,376**
	August	32,725	24,790	8,721	1,244	1,446	4,468	2,363	627	7,970	4,091	389	**88,834**
	September	33,329	21,632	8,027	897	1,246	3,031	1,491	741	6,169	4,298	493	**81,354**
	October	33,739	19,024	8,428	886	1,164	3,214	810	255	5,284	4,256	407	**77,467**
	November	31,701	13,788	7,922	1,043	1,171	2,749	870	269	4,430	4,882	298	**69,123**
	December	34,901	15,052	7,030	1,184	1,275	2,569	1,093	275	5,659	4,243	459	**73,740**
2020	January	29,886	11,316	6,209	1,075	1,423	2,802	726	316	6,139	5,022	472	**65,386**
	February	16,690	8,242	7,020	1,167	1,286	2,524	1,042	161	3,179	4,685	347	**46,343**
	March	11,260	5,520	3,835	623	723	1,361	460	28	2,062	1,923	177	**27,972**
						SEASONALLY ADJUSTED VISITOR ARRIVALS							
2018	March	30,359	16,523	7,310	1,074	1,362	2,929	489	762	6,844	4,600	424	**72,676**
	April	28,159	16,198	6,875	1,048	1,296	2,860	591	793	6,328	4,279	424	**68,851**
	May	30,840	15,597	7,144	1,056	1,364	3,070	554	610	6,302	3,994	426	**70,957**
	June	29,686	17,364	7,379	1,129	1,238	2,916	530	713	6,408	4,593	415	**72,371**
	July	30,774	16,679	7,024	1,144	1,341	3,088	1,552	729	6,678	4,228	434	**73,671**
	August	31,881	16,255	7,370	1,140	1,448	3,202	1,734	745	6,478	4,366	418	**75,037**
	September	30,751	17,142	7,150	1,119	1,288	3,352	1,486	608	6,391	4,401	414	**74,102**
	October	30,870	16,680	7,177	1,112	1,463	3,250	1,482	700	6,368	4,254	407	**73,763**
	November	30,424	16,434	7,418	1,125	1,363	3,167	977	628	5,227	4,178	409	**71,350**
	December	30,651	18,063	7,666	1,134	1,488	3,342	1,382	544	6,482	4,479	413	**75,644**
2019	January	29,732	18,179	7,464	1,133	1,344	3,072	1,246	702	6,068	4,604	431	**73,975**
	February	29,737	17,083	7,292	1,109	1,445	2,940	1,190	745	6,617	4,680	423	**73,261**
	March	29,469	16,981	8,229	1,126	1,387	3,051	1,554	628	6,494	4,734	442	**74,095**
	April	32,758	17,650	8,622	1,133	1,457	3,233	1,299	681	7,219	5,042	434	**79,528**
	May	31,006	17,722	8,522	1,126	1,450	2,511	1,139	825	7,273	4,488	443	**76,505**
	June	31,406	17,816	7,849	1,098	1,529	3,154	1,031	578	6,422	4,610	439	**75,932**
	July	31,757	16,423	7,803	1,117	1,447	3,154	1,354	619	6,215	4,653	446	**74,988**
	August	30,061	16,832	8,285	1,098	1,392	3,221	1,558	687	7,025	4,246	426	**74,831**
	September	28,892	17,152	9,182	1,106	1,485	3,125	1,230	764	6,221	4,705	445	**74,307**
	October	29,886	17,159	8,561	1,098	1,330	2,945	965	183	5,438	4,613	426	**72,604**
	November	32,078	17,953	8,495	1,106	1,401	2,957	1,147	198	5,431	4,746	401	**75,913**
	December	30,364	17,491	7,675	1,112	1,273	2,806	1,097	202	6,280	4,106	429	**72,835**
2020	January	31,645	17,790	8,227	1,106	1,457	3,021	862	252	6,411	4,445	427	**75,643**
	February	30,943	19,579	8,723	1,124	1,379	3,092	1,024	229	2,547	4,379	402	**73,421**
	March	17,812	9,890	3,777	520	625	1,630	592	71	2,135	2,147	174	**39,373**

*China India and Hong Kong are included in Rest of Asia

*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 10 years (from 2010) 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 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 (between years) have a 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 contain 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 the 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.

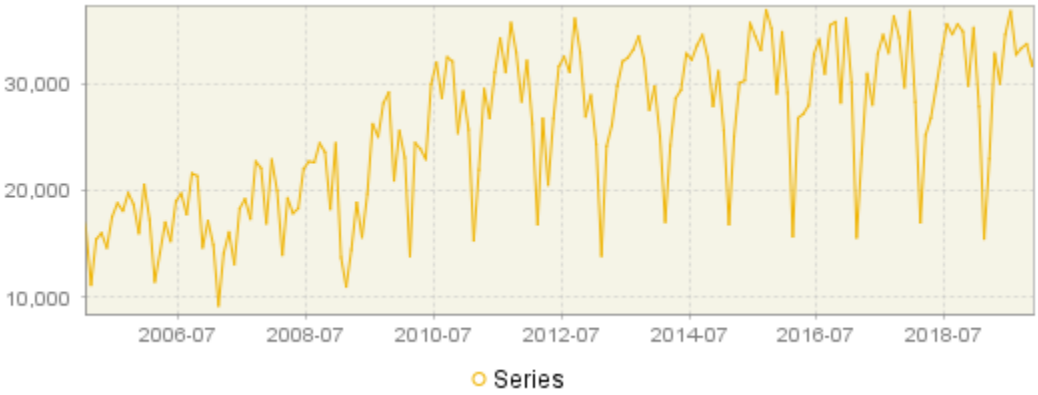
WHEN IS SEASONAL ADJUSTMENT INAPPROPRIATE?

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 THE SEASONAL COMPONENT?

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 graph shows the original series of tourist arrivals to Fiji from Australia and depicts a highly seasonal series. There is an obvious seasonal increase in tourist arrivals from Australia in December due to the holiday season which starts to decline from January every year. In this example, the magnitude of the seasonal component increases over time, as does the trend.

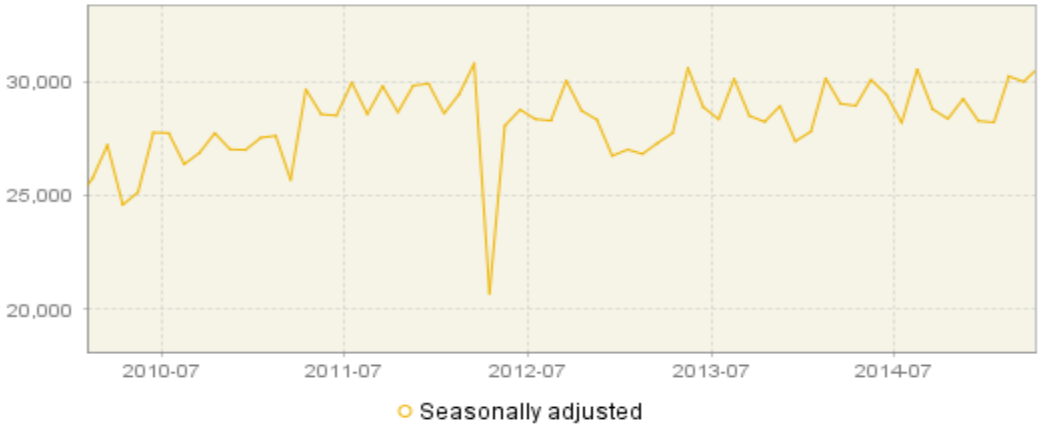
Visitor Arrivals from Australia to Fiji



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. There are two main parts of the irregular component; the short term fluctuations in the series which are neither systematic nor predictable and one-off extreme events. In a highly irregular series, these fluctuations can dominate movements, which will mask the trend and seasonality. The following graph shows the seasonally adjusted series (trend and irregular components) and is an example of a highly irregular time series. Note, the general noise around the trend and the one-off low extreme value around mid-2012.

Visitor Arrivals from Australia to Fiji



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 shows the trend and seasonally adjusted series and shows an obvious upward trend over time.

Visitor Arrivals from Australia to Fiji- Trend

HOW IS SEASONAL ADJUSTMENT CONDUCTED?

To seasonally adjust series FBoS uses JDemetra Plus package which was developed by the National Bank of Belgium in collaboration with EuroStat. JDemetra Plus can be used to perform a filter based method of seasonal adjustment.

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.

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, unusual values have a large impact on the final result as the process is influenced by extreme values. The original series are not always well behaved. In reality, there are activities that are systematic and predictable, but don'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 an optimal series to use for estimating the trend, seasonal and irregular components. The 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 points in the series. 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 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 the seasonal adjustment process 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 requires at least six months (for monthly series) or three quarters (for quarterly series) of raised or lowered levels. If the span of increased or decreased values is shorter than this, they are classified as extreme values or transitional changes (several extreme values consecutively).

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.

Other Factors to consider in producing optimal seasonal adjustment results

Trading Day Effects

The number of occurrences of each weekday in a given month will differ from year to year.
E.g. There were four weekends in March in 2000, but five weekends in March of 2002 which may lead to different levels of activity in these months.

Moving Holiday Effects

Holidays which occur each year, but whose exact timing shifts are known as moving holidays.
E.g. Easter, Chinese New Year and Ramadan

SUSPENSION OF TREND SERIES

The trend estimates have been suspended from March 2020 for all visitor arrivals series. The COVID-19 pandemic outbreak imposed strict border restrictions worldwide which significantly affected international travel.

The trend series attempts to measure long term underlying behavior of visitor arrivals. Any unusual influences in the original and seasonally adjusted data will create misleading estimates of the trend if these unusual movements are not dealt with properly. The magnitude and form of this pandemic's impact is currently unknown and may continue for the coming months. Therefore, it is vital to be fully aware of the pandemic's impact before performing adjustments to produce optimal trend estimates. Producing trend estimates now would provide a misleading view of the underlying movement of the series. This decision will be reviewed as more is known about the impact and behavior of COVID-19 on visitor arrivals to Fiji.