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STATISTICAL NEWS

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SEASONALLY ADJUSTED VISITOR ARRIVALS MARCH 2019

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

	March 2019	February 2019 to March 2019 % change	March 2018 to March 2019 % change
Total			
Trend	72,011	-0.17	-1.83
Seasonally Adjusted	73,631	2.43	…
Original	59,306	…	…
Australia			
Trend	28573	-1.31	-8.10
Seasonally Adjusted	29,112	0.92	…
Original	22,972	…	…
New Zealand			
Trend	17,285	0.09	7.90
Seasonally Adjusted	17,408	1.05	…
Original	9,457	…	…
USA			
Trend	7,448	1.72	2.36
Seasonally Adjusted	8,486	17.76	…
Original	8,323	…	…
Continental Europe			
Trend	2,885	-0.28	-2.76
Seasonally Adjusted	2,898	8.22	…
Original	2,758	…	…
Japan			
Trend	1,274	-0.62	-12.56
Seasonally Adjusted	1,484	23.87	…
Original	1,468	…	…

…not applicable (see notes below and "Appendix 1-Explanatory Notes" for more details)

Note:

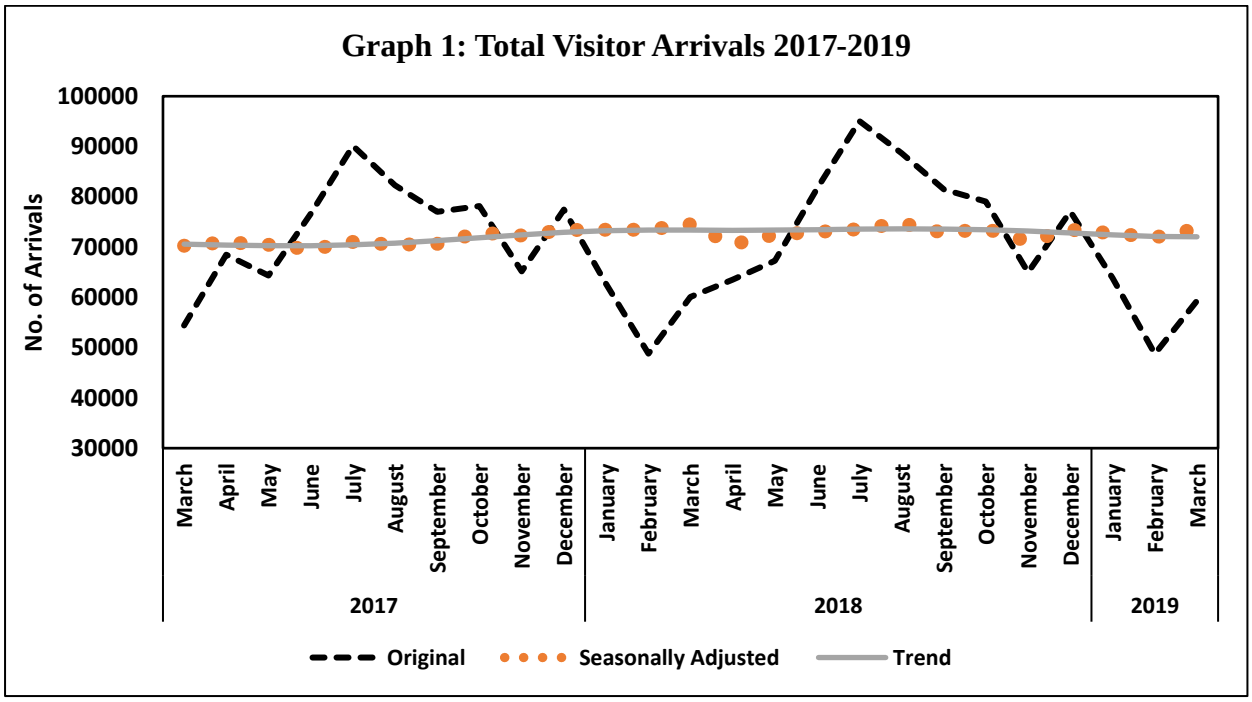
1. **Original series estimates are low because it is dominated by seasonal and irregular influences like February having less days compared to other months or end of holiday period. Due to these influences, *Month-to-month % change* and *year-to-year % change* in the original estimates are not shown 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.**

- **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 March 2019 (72,011) **decreased by 0.17%**, compared with February 2019 (72,137). The current trend estimate for arrivals **is 1.83% less** than March 2018.

- **Seasonally adjusted estimates**: Seasonally Adjusted estimates show the trend and irregular components after removing all seasonal and systematic related behaviors from the series. During March 2019, seasonally adjusted Total Visitor Arrivals to Fiji (73,631) **increased by 2.43%** compared with February 2019 (71,885).

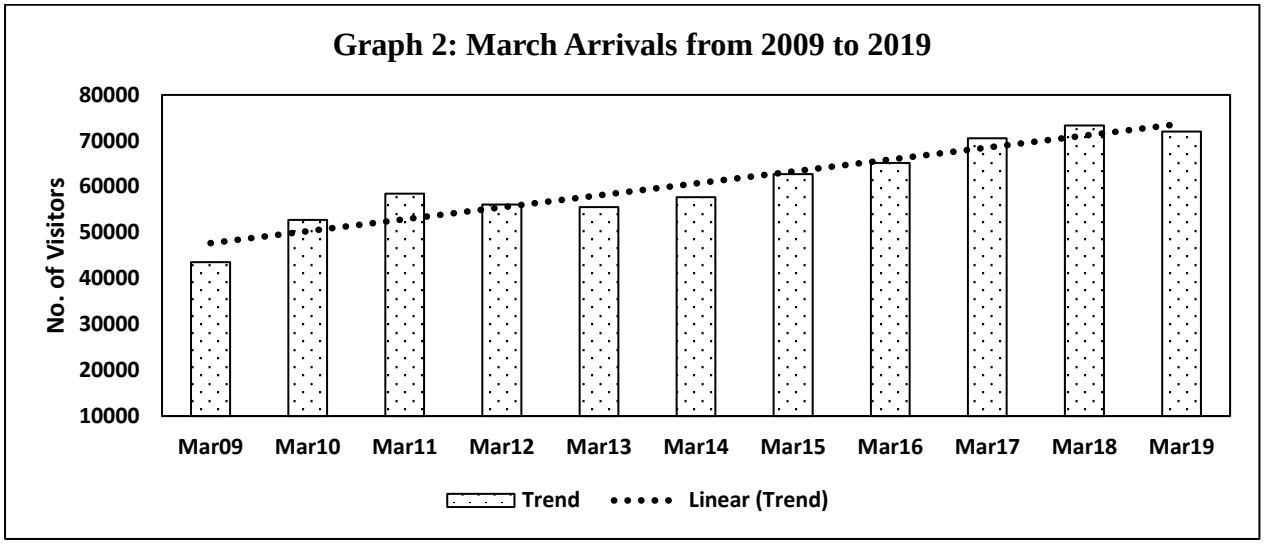
- **Original estimates**: The Total Visitor Arrivals to Fiji in February 2019 was 59,306. In this publication, the *month-to-month % change* and *year-to-year % change* is not reported as they contain seasonal and irregular influences that may hide the underlying, long term movement of the series.

Total Visitor Arrivals: Original, Seasonally Adjusted and Trend Series



Graph 1 shows the Total Visitor Arrivals to Fiji from March 2017 to March 2019 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.

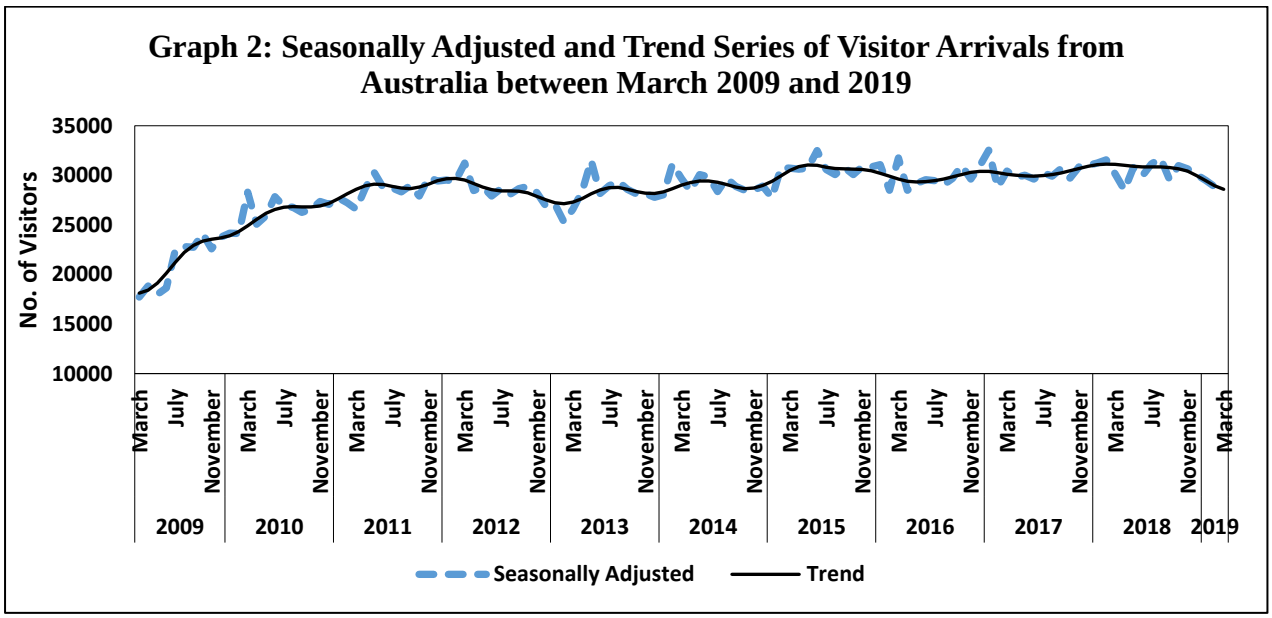
March Visitor Arrivals



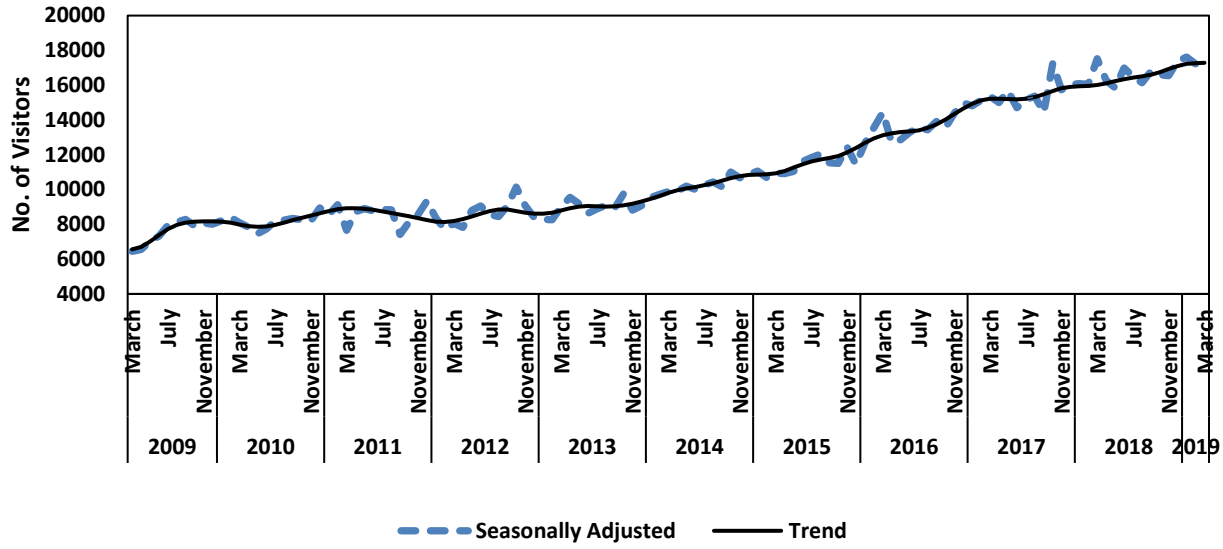
Graph 2 shows the trend of visitor arrivals to Fiji in March from 2009 to 2019. It is evident that the number of arrivals in March over the years have increased. However, there was a slight decline in the number of arrivals in March 2019 when compared with March 2018. To graph the long term movement of arrivals, trend series is used because it is adjusted and does not contain seasonal and irregular influences. **(For more details on trend, linear trend, seasonal and irregular influences, see "Appendix: 1, Explanatory Notes" pages: 9-11).**

Arrivals from Australia and New Zealand

Australia and New Zealand are the two major contributors of Visitor Arrivals in Fiji, consisting of 38.73% and 15.95% of total arrivals respectively. After removing seasonal and irregular influences, arrivals from Australia (Graph 3) shows a slightly increasing trend which has been generally stable since 2010. On the other hand, arrivals from New Zealand (Graph 4) is trending upwards. The seasonally adjusted series contains both the trend as well as random fluctuations and the impact of one-off real world events. **(For difference between seasonally adjusted and trend series see "Appendix: 1, Explanatory Notes").**

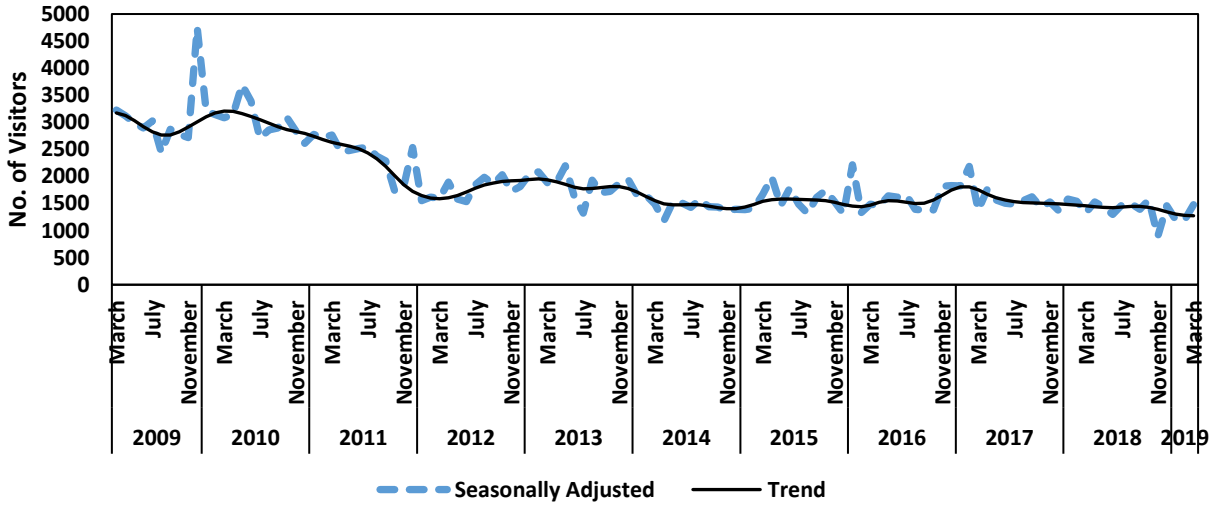


Graph 3: Seasonally Adjusted and Trend Series of Visitor Arrivals from New Zealand between March 2009 and 2019



Arrivals from Japan

Graph 5: Visitor Arrivals from Japan Between March 2009 and 2019



Graph 5 shows the number of visitor arrivals from Japan between March 2009 to 2019. In terms of the trend series, there is a decline of
12.56% compared to the same time last year. A 0.62% reduction in tourist arrival was noted from February to March 2019. Both, the trend and seasonally adjusted estimates are declining over the years however, seasonally adjusted estimate shows an increment of 23.87% from February to March 2019. This is because seasonally adjusted estimates contain the irregular component, thus the effect of it will be reflected in the month to month movement. **(For difference between seasonally adjusted and trend series see "Appendix: 1, Explanatory Notes").**

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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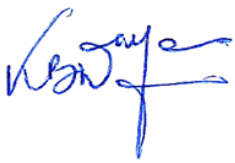

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APPENDIX 1: EXPLANATORY NOTES

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:

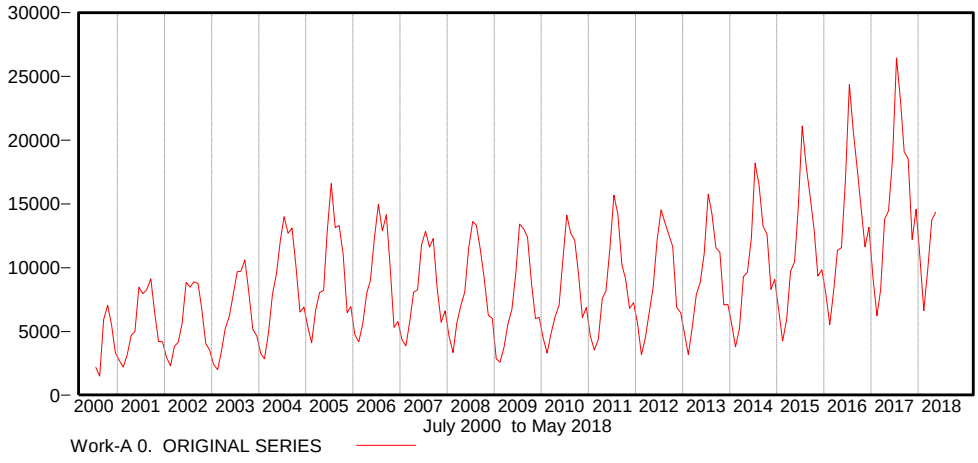
- **Trading Day Effects**
  The number of occurrences of each of the day of the week in a given month will differ from year to year
  - There were 4 weekends in March in 2000, but 5 weekends in March of 2002

- **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.

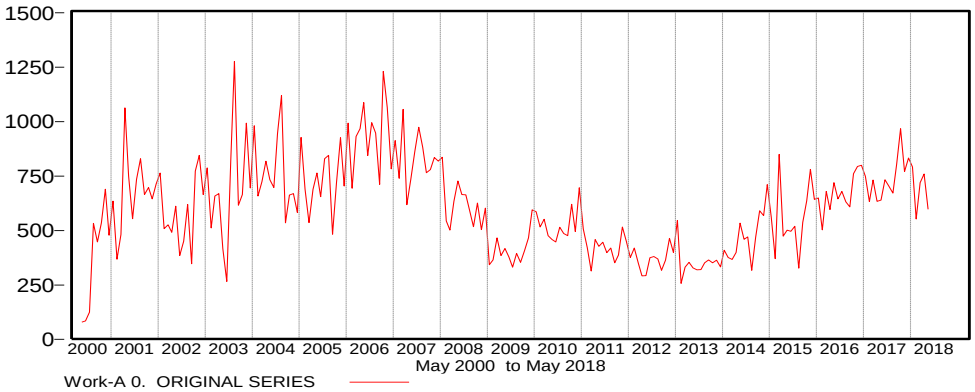
Visitor Arrivals from NZ to Fiji



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. 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.

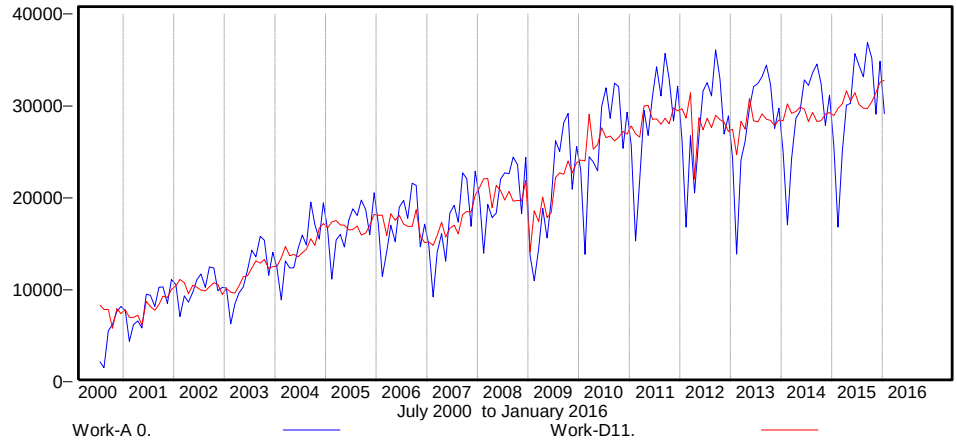
Visitor Arrivals from South Korea to Fiji



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 depicts a series in which there is an obvious upward trend over time:

Visitor Arrivals from Australia to Fiji- Trend



Work A.0- Original **Work-D11- Trend**

LINEAR TREND

Linear trend is a "straight line" which gives the general direction that a group of points seems to follow. In this publication, linear trend is used only to visualize the overall direction of visitor arrivals to Fiji in terms of the trend series.

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)