Moving Holiday Effects Adjustment for Malaysian Economic Time Series

Norhayati Shuja', Mohd Alias Lazim and Yap Bee Wah[1]

Abstract

The dates of holidays such as Eid-ul Fitr, Eid-ul Adha, Chinese New Year and Deepavali vary from one year to the next and non-fixed date can affect time series data. The moving holidays need to be taken into consideration in the seasonal adjustment process to avoid misleading interpretations on the seasonally adjusted and trend estimates. Hence, by removing the moving holiday effect, the important features of economic series, such as the turning points can be easily identified. Seasonally adjusted data also allows meaningful comparisons to be made over a shorter time frame and it also reflects real economic movements. Currently, there are various methods applied for seasonal adjustment such as the X-12 ARIMA. However, these methods can only be used to adjust for the North American Easter effect and there is no such method which can deal with holiday effects in Malaysia such as Eid-ul Fitr, Eid-ul Adha, Chinese New Year and Deepavali. Due to these limitations, this paper proposes a procedure for seasonal adjustment of moving holiday effects in Malaysian economic time series data called SEAM (Seasonal Adjustment for Malaysia). The procedure involves estimating the irregular components using the X-12 ARIMA program and subsequently removing the moving holiday effects using a regression method. Three types of regressors namely, REG1 (using one weight variable), REG2 (using two weight variables) and REG3 (using three weight variables) are proposed in this study to measure the Eid-ul Fitr, Chinese New Year and Deepavali effects. Overall, it is found that SEAM is an effective method in removing the Malaysian moving holiday effects.

Key words: Moving holiday effect, seasonality, X-12 ARIMA program

Introduction

The major festivals in Malaysia are usually related to religious activities and as such, the dates are determined based on the lunar calendar. For example, the Eid-ul Fitr and Eid-ul Adha are based on the Islamic calendar, Chinese New Year of the Chinese lunar calendar and Deepavali of the Hindu lunar calendar. Hence, the dates of these holidays do not occur at a fixed date according to the Gregorian calendar but move from period to period over the years. When these holidays take place, they tend to influence the normal activity such as sales, production, monetary activity, service activity and etc. of the affected industry. Such effect is known as "*moving holiday effect*". The major moving holidays in the United States are Easter, Labour Day and Thanks giving. Elsewhere, holidays that are tied to a lunar calendar are the Eid-ul Fitr, Eid-ul Adha, Chinese New Year and Deepavali. Hence, by removing the moving holiday effect, the important features of economic series such as direction, turning

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points and consistency between other economic indicators can be easily identified (Ashley, 2001). Due to the importance of eliminating the effect of moving holiday from time series data, many researchers have shown interest in undertaking such studies with the aim of achieving more reliable methods of seasonal adjustment.

Hillmer, Bell & Tiao (1983) introduced a simple type of regressor that has proven to be versatile for modeling effects for a variety of moving holidays. The X-12 ARIMA explicitly includes a correction factor for the Easter effect, but the correction is based on a North American Easter holiday period. Therefore, the correction methods using X-12 ARIMA is not suitable for the Australian time series. Subsequently, Leung *et al.* (1999) and Zhang *et al*. (2001) presented new approaches to remove the impact of Australian Easter holidays and to illustrate the effectiveness of the modeling approaches using the monthly Australian Total Retail Turnover series. As a calendar event, the movement of Easter holiday period needs to be taken into account in the seasonal adjustment process to avoid biased seasonally adjusted and trend estimates. For example, when Easter falls in late March or early in April, without a correction of the Easter proximity effect, the seasonal adjustment process will produce biased estimates on the March and April seasonally adjusted trend estimates. Biased estimates can lead to misleading decisions by users and policy makers.

Lin and Liu made a study in 2002 on the impact of moving holiday on ten selected Taiwanese time series data using the holiday regressor. The regressor measures the length of the period before, around and after the holiday in each month using the RegARIMA model and X-12 ARIMA. The use of the holiday regressor could effectively remove the impact of moving holidays. Findley and Soukup (2000), however noted that the X-12 ARIMA is only able to remove the holiday effect as experienced in the United States i.e. Easter, Labor Day and Thanksgiving and has limitation in removing moving holiday effect that is tied to a lunar calendar, such as Chinese New Year, Passover and Ramadan. Findley *et al*. (2005) investigated the reliability of the X-12 ARIMA and detected the Easter effects using 30 simulated series which represent 12 years of monthly data. The results indicate that outliers in March or April can induce false positive effect for most series.

Due to the limitations of the X-12 ARIMA, this paper proposes a procedure for seasonal adjustment of moving holiday effects in Malaysian time series data. The following section explains the regressors for measuring the holiday effects and the methodology for SEAM (Seasonal Adjustment for Malaysia). This is followed by discussion on results and ends with some concluding remarks.

Methodology

This section discusses the methodology for the developed procedure namely, Seasonal Adjustment for Malaysia (SEAM) to estimate and remove moving holiday effect for the purpose of seasonally adjusting the Malaysian economic time series. The procedure involves estimating the irregular components using the X-12 ARIMA methodology and subsequently removing the moving holiday effects using a regression method. Three types of regressors, REG1 (using one weight variable), REG2 (using two weight variables) and REG3 (using three weight variables) are proposed to measure the Eid-ul Fitr, Chinese New Year and Deepavali effects.

a. Regressors for Malaysian festivals

The seasonal adjustment package program such as X-12 ARIMA, SEASABS and TRAMO do not provide suitable regressor to capture the information pertaining to the Malaysian festival effects. The Eid-ul Fitr, Eid-ul Adha, Chinese New Year and Deepavali effects are the most common moving holiday effects in Malaysian economic time series data. In particular, the date of Eid-ul Fitr moves forward from one period to another at approximately eleven or twelve days earlier each year over the Gregorian calendar. Meanwhile, the date of Chinese New Year usually falls on the first full moon of each year falling between 21st January and 21st February and the date of Deepavali falls between 15th October and 15th November.

A festival falling within a certain month reduces the number of working days in that particular month. Hence, the observance of Eid-ul Fitr, Eid-ul Adha, Chinese New Year and Deepavali as public holidays, may also influence the economic activity in the prior or the following months. Therefore, the number of holidays before, during and after the Eid-ul Fitr, Chinese New Year and Deepavali are being taken into account during the construction of the regressors. The numbers of holidays taken to celebrate a festival is known as "*the number of window length" and* were obtained from a survey conducted on 350 individuals, primarily to collect the information on the number of holidays taken to celebrate the festivals. The number of holidays falling in a festive month as well as prior or after the festive month were used as the regressor values. Based on the results from the survey, the values of the window length (w, w_1 and w_2) are as shown in Table 1.

Table 1 : The number of window length

Festival	Before w_1	During & After w_2	Total w
Eid-ul Fitr	2	5	7
Chinese New Year	2	6	8
Deepavali	1	3	4

REG1

The REG1 uses one weight variable which combined the Eid-ul Fitr, Chinese New Year and Deepavali effects. The number of *window lengths* was obtained from the survey conducted and is as shown in Table 1. The Eid-ul Fitr has a total window length of seven days (w), two days to model the effect prior (w_1) and five days to model the effect during and after the holiday (w_2). The Chinese New Year has a total window length of eight days (w), two days prior (w_1) and six days during and after the holiday (w_2). The Deepavali has a total window length of four days (w), one day prior (w_1) and three days during and after the holiday (w_2). If two festivals fall in the same month, then the number of holidays for the two festivals is combined. The weight value for REG1 depends on the date of the festival. There are two scenarios;

Case 1 : festival date falls between 1st to 15th
Case 2 : festival date falls between 16th to 31st

Case 1 : If the date of festival falls in the beginning of the month (1st-15th), the weight value is defined as follows;

$$Reg1 = \begin{cases} \dfrac{n_1}{w} & \text{in the respective festive month} \\ \dfrac{n_2}{w} & \text{before the respective festive month} \\ 0 & \text{otherwise} \end{cases}$$

where,
w is the total number of window length, *w*=7 for Eid-ul Fitr, *w*=8 for Chinese New Year, *w*=4 for Deepavali, n_1 is the number of holidays that fall in the respective festive month and n_2 is the number of holidays that fall before the respective festive month.

For example, when Deepavali falls on 1st November 1986, then $n_1 = 3$ and $n_2 = 1$.

Case 2 : If the date of festival falls at the end of the month (16th-31st), the weight value is defined as follows;

$$Reg1 = \begin{cases} \dfrac{n_1}{w} & \text{in the respective festive month} \\ \dfrac{n_2}{w} & \text{after the respective festive month} \\ 0 & \text{otherwise} \end{cases}$$

where,
w is the total number of window length, *w*=7 for Eid-ul Fitr, *w*=8 for Chinese New Year, *w*=4 for Deepavali, n_1 is the number of holidays that fall in the respective festive month and n_2 is the number of holidays that fall after the respective festive month.

For example, when the Chinese New Year falls on 29th January 1987, then $n_1 = 5$ and $n_2 = 3$.

Figure 1 shows an illustration of determining n_1 and n_2 for REG1. The example of REG1 using one weight variable is shown in Table 2.

Figure 1 : An illustration of determining n_1 and n_2

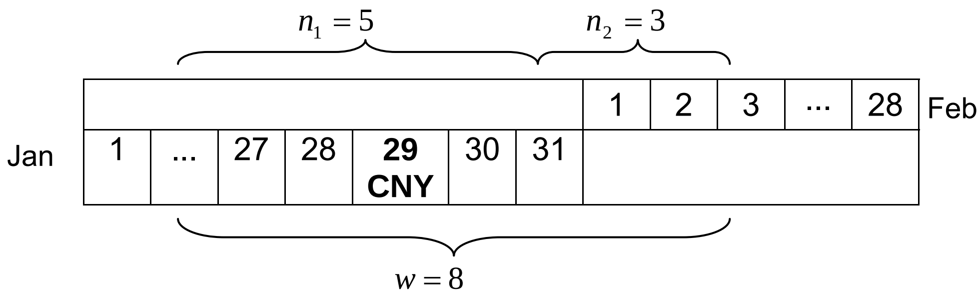

Table 2 : An example of REG1 using one weight variable

Year	Month	Date of Festival	Ratio	Weight Variable
1986	9			0.00
1986	10		1/4	0.25
1986	11	1-Nov	3/4	0.75
1986	12			0.00
1987	1	29-Jan	5/8	0.62
1987	2		3/8	0.38
1987	3			0.00
1987	4			0.00
1987	5	29-May	5/7	0.71
1987	6		2/7	0.29
1987	7			0.00
1987	8			0.00

REG2

The REG2 uses two weight variables, before and during & after. REG2 follows the similar method of regressor used for Australian Ramadan (Australian Bureau of Statistics, 2005). A quadratic regressor was considered to model the monthly change in activity with an assumption that the daily activity is not consistent. Similarly, the number of window lengths was obtained from the survey conducted and is as shown in Table 1.

The quadratic regressor design is based on the assumption that the level of activity changes on the w^{th} day before and after the festive holiday for a specified *w* (Leung *et al*., 1999). Let the linear increase have slope of tan*(a)*. The extra activity which is equal to the area of the triangle within the *w* days is given as $\frac{w^2 \tan(a)}{2}$. Therefore, the activity which takes place in the festive month is $\frac{n^2 \tan(a)}{2}$. A regressor is constructed by using the proportion of activity in a month to the extra activity. The proportion is then

$$\frac{\frac{1}{2}(n^2 \tan(a))}{\frac{1}{2}(w^2 \tan(a))} = (\frac{n}{w})^2 .$$

For the ***"before"*** regressor, the weight value is defined as,

$$Reg2_{before} = \begin{cases} -(\frac{n_1}{w_1})^2 & \text{before the respective festive month} \\ (\frac{n_1}{w_1})^2 & \text{in the respective festive month} \\ 0 & \text{otherwise} \end{cases}$$

where,
w_1 is the window length of days to model the prior effect of the respective festival, $w_1 = 2$ for Eid-ul Fitr , $w_1 = 2$ for Chinese New Year, $w_1 = 1$ for Deepavali and n_1 is the number of w_1 days that fall in the respective festive month.

The ***"during and after"*** regressor, the weight value is defined as,

$$Reg2_{after} = \begin{cases} 2(\frac{n_2}{w_2}) - (\frac{n_2}{w_2})^2 & \text{in the respective festive month} \\ -\left[2(\frac{n_2}{w_2}) - (\frac{n_2}{w_2})\right]^2 & \text{after the respective festive month} \\ 0 & \text{otherwise} \end{cases}$$

where,
w_2 is the window length of days to model the effect during and after the respective festival, $w_2 = 5$ for Eid-ul Fitr, $w_2 = 6$ for Chinese New Year, $w_2 = 3$ for Deepavali and n_2 is the number of w_2 days that fall in the respective festive month.

For example, when Chinese New Year falls on 29th January 1987, the determination of n_1, n_2, w_1 and w_2 is as shown in Figure 2. An example of REG2 using two weight variables is shown in Table 3.

Figure 2 : An illustration of determining n_1 , n_2, w_1 and w_2

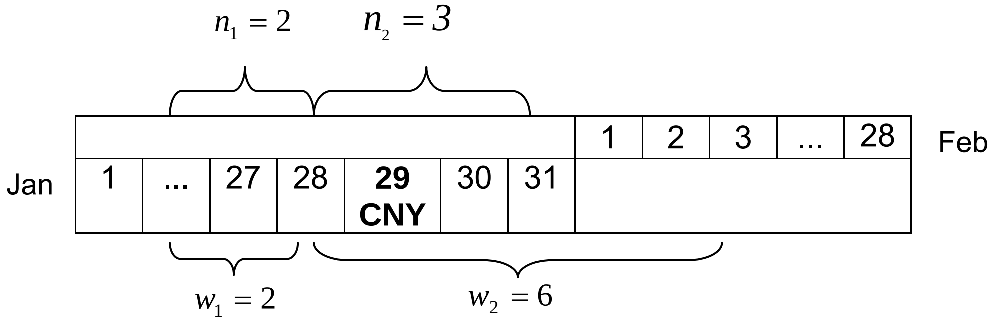

Table 3 : An example of REG2 using two weight variables

Year	Month	Date of Festival	Weight Variable	
			Before	After
1986	9		0	0
1986	10		-1	0
1986	11	1-Nov	1	1
1986	12		-1	-1
1987	1	29-Jan	1	0.75
1987	2		0	-0.75
1987	3		0	0
1987	4		-1	0
1987	5	29-May	1	0.84
1987	6		0	-0.84
1987	7		0	0
1987	8		0	0

REG3

The REG3 uses three weight variables. The Eid-ul Fitr, Chinese New Year and Deepavali festivals are separated into three different weight variables. The method for determining the weight variable values for REG3 is the same as for REG1, but for REG3 the value of (-1) is assigned and the total weight variable for any year is zero (0). This is as illustrated in Table 4. The values for each weight variable for Eid-ul Fitr, Chinese New Year and Deepavali is defined as follows:

Case 1 : If the date of festival falls in the beginning of the month (1st-15th), the weight value is defined as follows;

$$Reg3 = \begin{cases} \frac{n_1}{w} & \text{in the respective festive month} \\ \frac{n_2}{w} & \text{before the respective festive month} \\ -1 & \text{after the respective festive month} \\ 0 & \text{otherwise} \end{cases}$$

where,
w is the total number of window lengths, *w*=7 for Eid-ul Fitr, *w*=8 for Chinese New Year, *w*=4 for Deepavali, n_1 is the number of holidays that fall in the respective festive month and n_2 is the number of holidays that fall before the respective festive month. For example, when Deepavali falls on 1st November 1986, then $n_1 = 3$ and $n_2 = 1$.

Case 2 : If the date of festival falls at the end of the month (16th-31st), the weight value is defined as follows;

$$Reg3 = \begin{cases} \dfrac{n_1}{w} & \text{in the respective festive month} \\ \dfrac{n_2}{w} & \text{after the respective festive month} \\ -1 & \text{before the respective festive month} \\ 0 & \text{otherwise} \end{cases}$$

where,
w is the total number of window lengths, w=7 for Eid-ul Fitr, w=8 for Chinese New Year, w=4 for Deepavali, n_1 is the number of holidays that fall in the respective festive month and n_2 is the number of holidays that fall after the respective festive month.

For example, when the Chinese New Year falls on 29th January 1987, then $n_1 = 5$ and $n_2 = 3$ (see Figure 1).

An example of REG3 using three weight variables is shown in Table 4.

Table 4 : An example of REG3 using three weight variables

Year	Month	Date of Festival	Weight Variable		
			Chinese New Year	Eid-ul Fitri	Deepavali
1986	9		0	0	0
1986	10		0	0	0.25
1986	11	1-Nov	0	0	0.75
1986	12		-1	0	-1
1987	1	29-Jan	0.62	0	0
1987	2		0.38	0	0
1987	3		0	0	0
1987	4		0	-1	0
1987	5	29-May	0	0.71	0
1987	6		0	0.29	0
1987	7		0	0	0
1987	8		0	0	0

b. Seasonal adjustment for Malaysia (SEAM)

The SEAM procedure is primarily based on the use of irregular values obtained after performing an initial seasonal adjustment on the assumption that the moving holiday effects resides in the irregular series. This series is used to derive correction factors. The X-12 ARIMA program is needed in the first phase of the SEAM procedure. The SEAM procedure for removing Malaysian moving holiday effects involved two stages.

In the first stage of the procedure, the irregular (I_t) estimates is obtained by running the X-12 ARIMA program with the assumption that the moving holiday effects reside in the irregular series. The series is then used to estimate the 'true irregular' (I_t') which is free from moving holiday effects. Hence, the correction factor for moving holiday is done after the first run of the X-12 ARIMA program. The seasonally adjusted time series data without moving holiday effect is then obtained by multiplying the final trend-cycle (T_t) with the true irregular (I_t') as explained below.

Step 1: Run X-12 ARIMA

Run the X-12 ARIMA program and obtained the two different components of the time series namely the 'Final Trend-Cycle' (comprises the interaction of the trend and the cyclical component) represented by T_t and the 'Final Irregular', I_t.

Step 2: Estimate the true irregular (irregular without moving holiday effect)

Let Y_t , t = 1,2,3,…,n denotes the observed series. Based on the multiplicative assumption, the model is represented as follows,

$$Y_t = T_t \times S_t \times I_t \qquad [1]$$

where,
T_t is trend-cycle, S_t is seasonal and I_t is the irregular component.

However, I_t is comprised of three distinct components, that is,

$$I_t = E_t \times H_t \times I_t' \qquad [2]$$

where,
E_t is the extreme value which falls outside the sigma limit of 2.5, H_t is the moving holiday effect and I_t' is the true irregular which assumed free of moving holiday effects.

During the first run of X-12 ARIMA, the component E_t in equation [2] will be automatically removed and thus leaving components H_t and I_t'. To estimate the moving holiday effect, fit a regression model to the irregular component (I_t).

$$I_t = \beta_0 + \beta_1 h_t + \varepsilon_t \qquad [3]$$

where,
β_0 is the intercept term value, β_1 is parameter for moving holidays (h_t), h_t is the weight value for the month *t* with the holiday effects and ε_t is random error which is identical and independently distributed with mean, $E(\varepsilon_t) = 0$ and variance $(\varepsilon_t) = \sigma_\varepsilon^2$. The weight variable h_t is assigned using REG1, REG2 and REG3.

The estimated function for the moving holiday effect is then given as,

$$\hat{I}_t = \hat{\beta}_o + \hat{\beta}_1 h_t \qquad [4]$$

where,
$\hat{I}_t$ is the estimated irregular in time *t*, $\hat{\beta}_0$ is the estimated intercept term value, $\hat{\beta}_1$ is the estimated parameter for moving holiday effect (h_t), h_t is the weight value for the month *t* with the holiday effects and t is month of the year for *t= 1, 2, …, 12*.

Step 3 : Removing the moving holiday component

The process of removing the moving holiday effect, H_t is done by dividing the value of the irregular component (I_t) obtained from X-12 ARIMA procedure by the value of the estimated irregular component ($\hat{I}_t$) as given in equation [4],

$$\frac{I_t}{\hat{I}_t} = I_t'' \qquad [5]$$

The resulting value, I_t'' in equation [5] is therefore the irregular component which is assumed to be free from the influence of moving holiday component (H_t).

Step 4 : Seasonally adjusting the series

A new set of time series data Y_t' (seasonally adjusted for moving holiday effect) is then generated as the product of T_t and I_t'' where T_t is the “Final trend cycle” obtained from X-12 ARIMA procedure.

Thus, $Y_t' = T_t \times I_t''$ [6]

The variable Y_t' is now a new seasonally adjusted series obtained after the removal of the seasonal and moving holiday effects.

Findings

The proposed SEAM procedure for the adjustment of moving holiday effects was carried out on ten Malaysian economic time series. The ten economic time series are assigned with special names as given in brackets.

a. Monthly Total Imports (IMPORT)
b. Monthly Total Exports (EXPORT)
c. Monthly Sales Value of Own Manufactured Products (Ex-factory) (OMP)
d. Monthly Production of Crude Palm Oil (PALM)
e. Monthly Exports of Machinery & Transport Equipment (include electrical & electronic products) (MACHINE)
f. Monthly New Registration of Private Motor Vehicles (RPV)
g. Monthly Manufacture & Assembly of Motor Vehicle (1600 cc & below) (VEHICLE)
h. Monthly New Local Companies Registered (COMPANY)
i. Monthly Electricity Local Consumption : Domestic & Public Lighting (ELECTRIC)
j. Monthly Consumer Price Index (2000=100) (CPI)

Under the assumption of normality, the F_s-test is used to test for the presence of stable seasonality within the original series. The F_m-test is used to test for the presence of moving seasonality. The F_s-test and F_m-test were observed at 0.1 percent and 5 percent level of significance respectively. The X12-ARIMA program calculates the combinations of the two F tests to determine whether the seasonality of the series is 'identifiable' or not (Dagum, 1988). The results given in Table 5, indicate that the CPI and ELECTRIC series do not have stable seasonality, at 0.1 percent level of significance. For COMPANY series however, the seasonality effect was found to be absent at 5 percent level of significance. But when both tests are combined, only two series, the CPI and ELECTRIC were found not to be affected by the seasonality effect. As a result, only eight series were found to have significant presence of seasonality effects.

Table 5 : Test for presence of seasonality results using X-12 ARIMA

ORIGINAL DATA SERIES		STABLE SEASONALITY (test at 0.1%)			MOVING SEASONALITY (test at 1%)			COMBINED TEST
		F-value	p-value	Presence	F-value	p-value	Presence	SEASONALITY PRESENCE
1	RPV	10.507	0.00	YES	2.980	0.00	YES	YES
2	COMPANY	8.183	0.00	YES	0.891	* 0.60	NO	YES
3	CPI	1.472	0.14	NO	12.684	0.00	YES	NO
4	EXPORT	16.391	0.00	YES	4.972	0.00	YES	YES
5	ELECTRIC	1.600	0.00	NO	5.153	0.00	YES	NO
6	IMPORT	12.452	0.00	YES	3.719	0.00	YES	YES
7	MACHINE	13.69	0.00	YES	2.905	0.00	YES	YES
8	PALM	19.283	0.00	YES	9.341	0.0002	YES	YES
9	OMP	3.523	0.00	YES	5.161	0.001	YES	YES
10	VEHICLE	11.371	0.99	YES	1.889	0.00	YES	YES

Note : * test at 5 percent

Having confirmed that the seasonality effect is present in the eight data series (IMPORT, EXPORT, OMP, PALM, MACHINE, RPV, VEHICLE and COMPANY) tested, the next step is to specifically determine whether there is a presence of moving holiday. The F-test at 5 percent level of significance was then performed. The weights values (REG1, REG2 and REG3) were used to represent the moving holiday effect. The results are summarised in Table 6. For all data series, the effects of moving holidays were significant at 5 percent level of significance.

Table 6 : The results of test for moving holiday effects

REGRESSOR	TIME SERIES DATA	TEST FOR MOVING HOLIDAY EFFECT (α =0.05)		
		F-value	p-value	Presence
REG1	IMPORT	28.677	0.000	YES
	EXPORT	44.492	0.000	YES
	OMP	26.204	0.000	YES
	PALM	16.724	0.000	YES
	MACHINE	29.711	0.000	YES
	RPV	7.042	0.000	YES
	VEHICLE	24.628	0.000	YES
	COMPANY	16.508	0.000	YES
REG2	IMPORT	19.394	0.000	YES
	EXPORT	32.155	0.000	YES
	OMP	20.909	0.000	YES
	PALM	20.357	0.000	YES
	MACHINE	21.317	0.000	YES
	RPV	8.119	0.000	YES
	VEHICLE	28.797	0.000	YES
	COMPANY	15.652	0.000	YES
REG3	IMPORT	13.881	0.000	YES
	EXPORT	23.993	0.000	YES
	OMP	14.356	0.000	YES
	PALM	12.678	0.000	YES
	MACHINE	10.823	0.000	YES
	RPV	9.272	0.000	YES
	VEHICLE	12.865	0.000	YES
	COMPANY	12.552	0.000	YES

The eight data series, which showed the presence of moving holiday effects were then seasonally adjusted using the SEAM procedure. To test for the effectiveness of the application of the SEAM procedure, the seasonally adjusted data series were then tested to determine the presence of seasonality by using the X-12 ARIMA program. The results are presented in Table 7 and the SEAM procedure is found capable to remove the moving holiday effects. However, when the combined test was performed, the overall results were surprisingly more conclusive in a way all series showed an absence of any seasonality effect.

Table 7 : Test of seasonality for seasonally adjusted data

SEASONALLY ADJUSTED TIME SERIES DATA	REGRESSOR	TEST FOR PRESENCE OF SEASONALITY						COMBINED TEST
		STABLE SEASONALITY (test at 0.01%)			MOVING SEASONALITY (test at 5%)			SEASONALITY
		F-value	p-value	Presence	F-value	p-value	Presence	Presence
IMPORT	REG1	0.802	0.64	NO	1.267	0.20	NO	NO
	REG2	1.867	0.04	NO	1.066	0.39	NO	NO
	REG3	0.740	0.70	NO	0.939	0.54	NO	NO
EXPORT	REG1	0.545	0.87	NO	0.874	0.63	NO	NO
	REG2	1.780	0.06	NO	1.441	0.10	NO	NO
	REG3	0.355	0.97	NO	0.827	0.69	NO	NO
OMP	REG1	1.000	0.45	NO	1.931	0.01	YES	NO
	REG2	1.007	0.44	NO	1.971	0.008	* YES	NO
	REG3	0.943	0.50	NO	1.960	0.009	* YES	NO
PALM	REG1	0.646	0.79	NO	1.045	0.41	NO	NO
	REG2	1.121	0.34	NO	1.602	0.05	NO	NO
	REG3	0.456	0.93	NO	1.190	0.26	NO	NO
MACHINE	REG1	1.467	0.14	NO	1.292	0.18	NO	NO
	REG2	1.413	0.17	NO	1.736	0.03	YES	NO
	REG3	1.107	0.36	NO	1.240	0.22	NO	NO
RPV	REG1	1.134	0.33	NO	1.143	0.30	NO	NO
	REG2	1.229	0.27	NO	1.310	0.17	NO	NO
	REG3	0.798	0.64	NO	1.130	0.32	NO	NO
VEHICLE	REG1	2.230	0.01	NO	1.240	0.22	NO	NO
	REG2	1.916	0.04	NO	1.612	0.05	YES	NO
	REG3	1.984	0.03	NO	1.119	0.33	NO	NO
COMPANY	REG1	1.517	0.13	NO	1.166	0.28	NO	NO
	REG2	1.567	0.11	NO	1.567	0.06	NO	NO
	REG3	1.348	0.20	NO	1.401	0.12	NO	NO

Note : * test at 1 percent

Conclusion

This study shows that the festivals such as Eid-ul Fitr, Chinese New Year and Deepavali significantly affect the eight time series data. These three major festivals have the effects of either stimulating or reducing activities for the periods in vicinity of the holiday dates. The application of the seasonal adjustment procedure by using SEAM (Seasonal Adjustment for Malaysia) can significantly eliminate the presence of the moving holiday effects. Therefore, the proposed procedure SEAM, is able to remove the moving holiday effects and to seasonally adjust the Malaysian economic data series. Presently, further works are being undertaken to compare the performance of the three different weight regressors as well as to compare the proposed procedure (SEAM) with Regression-ARIMA (adjusted for Malaysia).

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