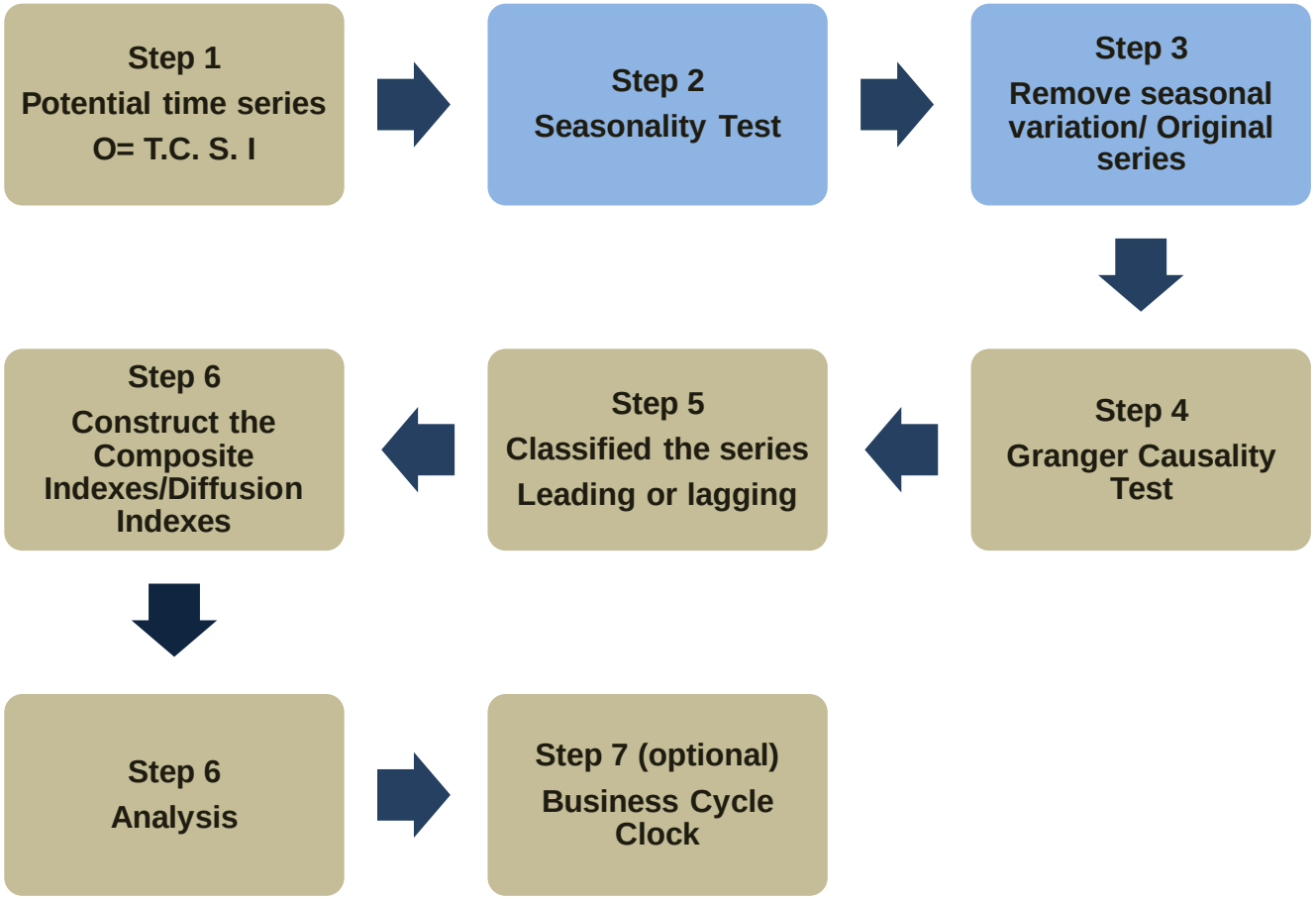
Seasonal Adjustment

Outline

- First Day
  - Overview of BCI
  - Malaysia BCI
  - Time series Decomposition
  - **Seasonal Adjustment**

- Second Day
  - Indicators selection
  - The Composite Index
  - The Diffusion Index

Flow chart for BCI Construction



INTRODUCTION

- The time series components discussed earlier can be separated using the decomposition method /software.
- In practice, researchers only separate the seasonal component in the data series for analysis purpose.
- While, for the purpose of short-term analysis, most researchers also separate the trend component of the data series.

INTRODUCTION

- Seasonal factors only occur on a monthly and quarterly time series data.
- Usually, the seasonal element exist in the data of production, sales, income/revenue and prices.
- It is important to note that, not all monthly/ quarterly time series data (ii) should be seasonal adjustment. The seasonality test must be made before deciding to implement a series of seasonality adjustment.

INTRODUCTION

- The term 'deseasonalising' the data refers to the process of removing the seasonal effect from the actual values, hence, 'deseasonalised data'.
- Deseasonalising involves replacing the original time series with another one where most or all of the seasonal variation has been removed.
- For example, given (assuming multiplicative effect). Thus, the deseasonalised data, is given as;

$$y_t(\text{deseasonalised}) = \frac{y_t}{S_t.}$$

$$= \frac{T_t.S_t.C_t.I_t}{S_t}$$

$$= T_t.C_t.I_t$$

Jabatan Perangkaan
MALAYSIA

❖ Additive Assumption

Under additive assumption, deseasonalised data is obtained by taking the difference between the actual and the adjusted seasonal effect, that is,

$$y_t(\text{deseasonalised}) - S_t = y_t - S_t$$

$$= (T_t + S_t + C_t + I_t) - S_t$$

$$= T_t + C_t + I_t$$

WHY DO WE WANT SEASONALLY ADJUSTED DATA?

"…Seasonal movements can make features difficult or impossible to see…"

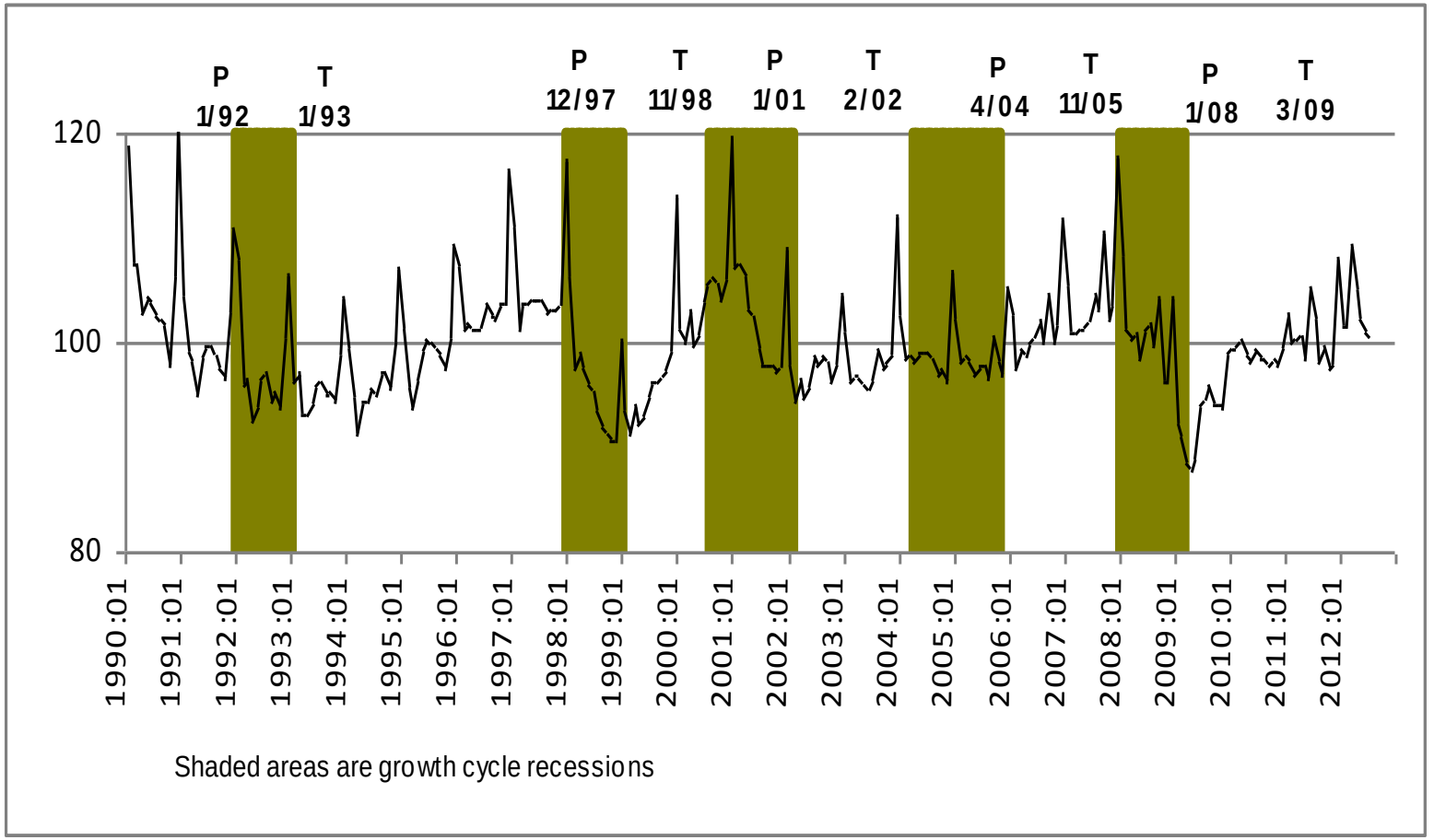
PURPOSE OF SEASONAL ADJUSTMENT

- Bell and Hillmer (1984)

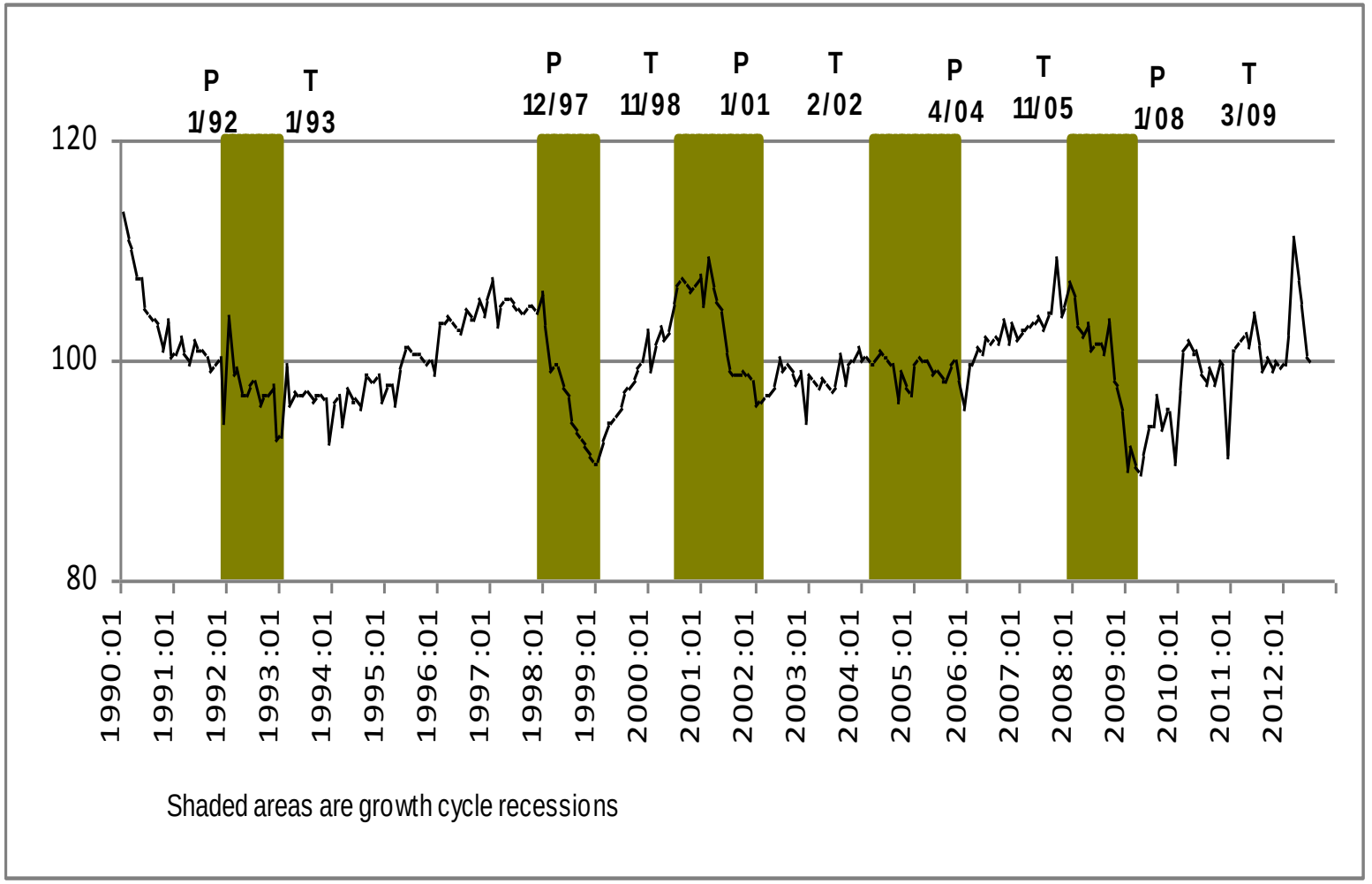
  "..Seasonal adjustment is done to simplify the data so that they may be more easily interpreted, without a significant loss of information.."

  - The seasonalized data allow us to see better the underlying pattern in the data.
  - It provides us with measures of the extent of seasonality in the form of seasonal indexes.

Cyclical Development of Salaries and Wages (Original Series)



Cyclical Development of Salaries and Wages (Seasonally Adjusted Series)



SEASONALITY TEST
USING SAS – X11 PROCEDURE

Result of Seasonality Test for Number of Investment Project Approved

Stable Seasonality Test				
Source	**Sum of Squares**	**DF**	**Mean Square**	**F Value**
Between Months	8358	11	759.8	0.79
Error	355902	372	956.7	
Total	364260	383		

Probability of a Larger F is 0.6460

Moving Seasonality Test				
Source	**Sum of Squares**	**DF**	**Mean Square**	**F Value**
Between Years	301349293	31	9720945	2.51
Error	1318291189	341	3865957	

Probability of a Larger F is < 0.0001

SEASONALITY TEST
USING SAS – X11 PROCEDURE

Result of Seasonality Test for Number of Investment Project Approved

Summary of Results and Combined Test for the Presence of Identifiable Seasonality	
Seasonality Tests:	Probability Level
Stable Seasonality F-test	0.646
Moving Seasonality F-test	0.000
Kruskal-Wallis Chi-square Test	0.391
Combined Measures:	Value
T1 = 7/F_Stable	8.81
T2 = 3*F_Moving/F_Stable	9.50
T = (T1 + T2)/2	9.16
Combined Test of Identifiable Seasonality:	Not Present

SEASONALITY TEST
USING SAS – X11 PROCEDURE

Result of Seasonality Test for Real Money Supply, M1

Stable Seasonality Test				
Source	**Sum of Squares**	**DF**	**Mean Square**	**F Value**
Between Months	2540	11	230.9	77.92
Error	1458	492	2.963	
Total	3997	503		

Probability of a Larger F is < 0.0001

Moving Seasonality Test				
Source	**Sum of Squares**	**DF**	**Mean Square**	**F Value**
Between Years	1989462	41	48523	2.35
Error	9304975	451	20632	

Probability of a Larger F is < 0.0001

SEASONALITY TEST
USING SAS – X11 PROCEDURE

Result of Seasonality Test for **Real Money Supply, M1**

Summary of Results and Combined Test for the Presence of Identifiable Seasonality	
Seasonality Tests:	Probability Level
Stable Seasonality F-test	0.000
Moving Seasonality F-test	0.000
Kruskal-Wallis Chi-square Test	0.000
Combined Measures:	Value
T1 = 7/F_Stable	0.09
T2 = 3*F_Moving/F_Stable	0.09
T = (T1 + T2)/2	0.09
Combined Test of Identifiable Seasonality:	Present

SEASONALITY TEST
USING SAS X11 PROCEDURE

Jabatan Perangkaan
MALAYSIA

D10 Final Seasonal Factors

D10 Final Seasonal Factors													
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Avg
1992	108.346	106.060	100.695	99.675	97.946	98.565	96.240	96.777	97.995	97.949	98.282	101.481	100.001
1993	108.522	106.475	100.409	99.537	97.587	98.651	95.934	96.789	98.256	98.111	98.401	101.586	100.021
1994	108.624	106.623	100.072	99.160	97.323	98.847	95.877	96.801	98.501	98.395	98.411	101.815	100.037
1995	108.856	106.414	99.662	98.787	96.890	99.017	96.068	96.867	98.925	98.584	98.639	102.002	100.059
1996	108.958	105.937	99.224	98.184	96.789	99.114	96.553	96.994	99.137	98.724	98.862	102.373	100.071
1997	108.889	105.332	98.875	97.749	96.707	99.077	97.142	97.078	99.341	98.746	99.175	102.737	100.071
1998	108.672	104.626	98.701	97.391	96.873	99.042	97.552	97.224	99.370	98.795	99.241	103.197	100.057
1999	108.276	104.139	98.591	97.482	96.906	98.927	97.730	97.511	99.371	98.802	99.370	103.371	100.040
2000	107.774	103.729	98.636	97.636	97.160	98.751	97.865	97.986	99.078	98.826	99.516	103.315	100.023
2001	107.146	103.460	98.877	97.971	97.331	98.623	97.915	98.337	98.818	98.919	99.703	102.991	100.008
2002	106.698	103.099	99.279	98.165	97.522	98.651	97.882	98.606	98.629	99.063	99.804	102.629	100.002
2003	106.328	102.859	99.510	98.395	97.644	98.770	97.876	98.754	98.519	99.187	99.977	102.251	100.006
2004	105.952	102.709	99.520	98.500	97.949	98.859	98.044	98.877	98.401	99.251	100.056	101.938	100.005
2005	105.557	102.636	99.461	98.586	98.224	99.043	98.284	98.882	98.445	99.199	99.992	101.794	100.009
2006	105.126	102.518	99.379	98.685	98.587	99.160	98.532	98.917	98.599	98.983	99.909	101.749	100.012
2007	104.639	102.428	99.320	98.716	98.967	99.368	98.638	99.010	98.798	98.672	99.849	101.707	100.009
2008	104.267	102.298	99.274	98.713	99.369	99.537	98.611	99.207	98.847	98.443	99.754	101.609	99.994
2009	104.094	102.155	99.354	98.628	99.650	99.827	98.472	99.436	98.947	98.355	99.775	101.639	100.028
2010	103.916	101.925	99.318	98.545	99.799	99.992	98.329	99.609	98.916	98.365	**99.751**	101.544	100.001
2011	103.877	101.847	99.307	98.517	99.918	**100.096**	98.205	99.686	98.873	98.320	99.738	101.376	99.980
2012	103.858	101.808	99.301	98.503	99.978	100.148	98.143	99.724	98.851	98.297	99.731	101.292	99.970
Avg	105.669	103.659	99.747	99.019	98.516	99.215	98.109	98.503	98.685	98.098	98.922	101.824	

SEASONALITY TEST
USING SAS X11 PROCEDURE

Description based on the result from D10
Final Seasonal Factors:

- **99.751 Seasonal factor in November 2010 means that Real Money Supply, M1 is 0.249% lower in that period with the absence of seasonality.**
- **100.096 Seasonal factor in June 2011 means that Real Money Supply, M1 is 0.096% higher in that period with the absence of seasonality.**

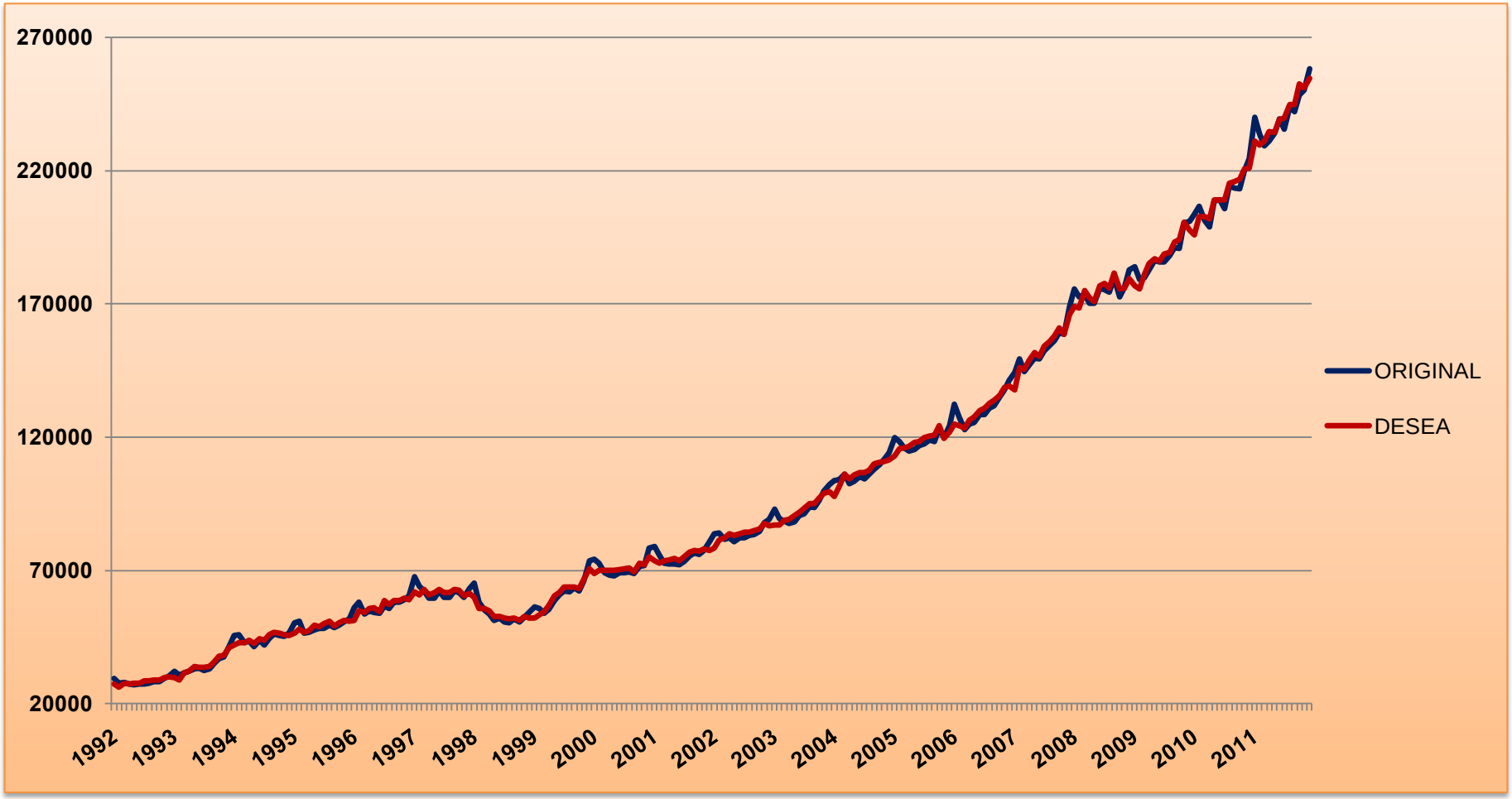
SEASONALITY TEST
USING SAS X11 PROCEDURE

Example based on the result from D10 Final Seasonal Factors:

Period	Original Data (M1)	Seasonal Factor	Deseasonalized data
2011:01	239973.5	103.877	231017.0
2011:02	233770.8	101.847	229531.4
2011:03	229361.3	99.307	230961.9
2011:04	231001.8	98.517	234479.1
2011:05	234031.6	99.918	234223.7
2011:06	239440.0	100.096	239210.4
2011:07	235476.8	98.205	239780.9
2011:08	243857.8	99.686	244625.9
2011:09	241927.9	98.873	244685.5
2011:10	248334.6	98.320	252577.9
2011:11	250230.7	99.738	250888.0
2011:12	258223.9	101.376	254719.0

SEASONALITY TEST
USING SAS X11 PROCEDURE

Real Money Supply, M1: Original VS Deseasonalized



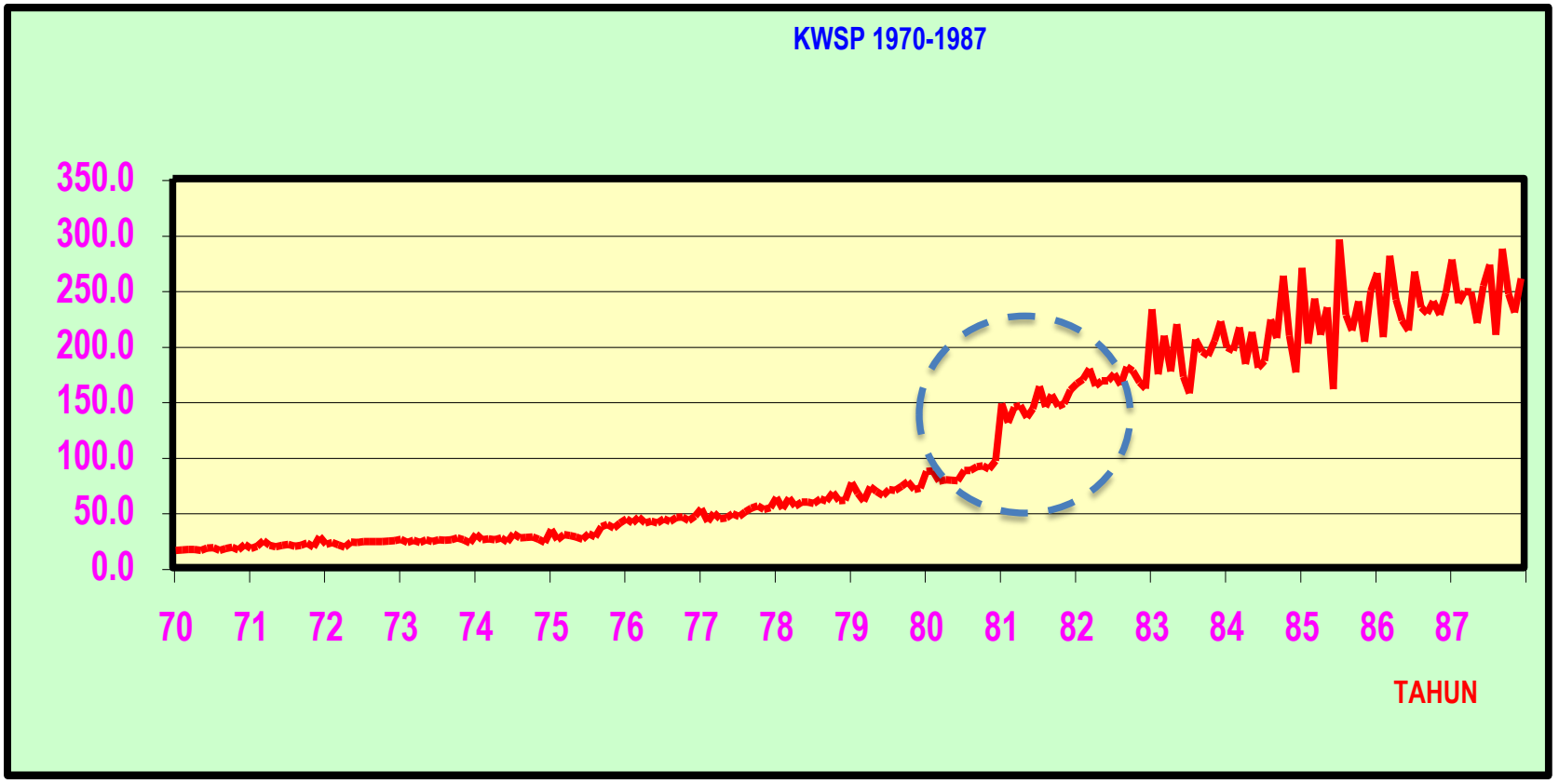
SEASONAL ADJUSTMENT IN MALAYSIA

Jabatan Perangkaan
MALAYSIA

- Malaysian economic time series data are effected by major religious festivals such as the Eid-ul Fitr of the Muslims, the Chinese New Year of the Chinese and the Deepavali of the Indian.
- The major festivals in this country are usually related to the religious activities and as such, the dated are determined by the respective religious calendar which are not in line with the Gregorian calendar.
- Hence, they tend to move along the Gregorian calendar and strong seasonal influence on many economic time series.

- Since these non-fixed holidays have large impacts on the time series data, they need to be taken into account when performing seasonal adjustment process as to avoid confusion in seasonally adjusted data and trend estimates.
- Therefore, the approach used for seasonal adjustment is the Seasonal Adjustment for Malaysia (SEAM).
- SEAM is a procedure to remove moving holiday effect on the selected Malaysian economic time series data by introducing the next steps that can be used to overcome the limitations of the existing seasonal adjustment procedure as shown before.

The Structural/Trend break and Seasonal adjustment

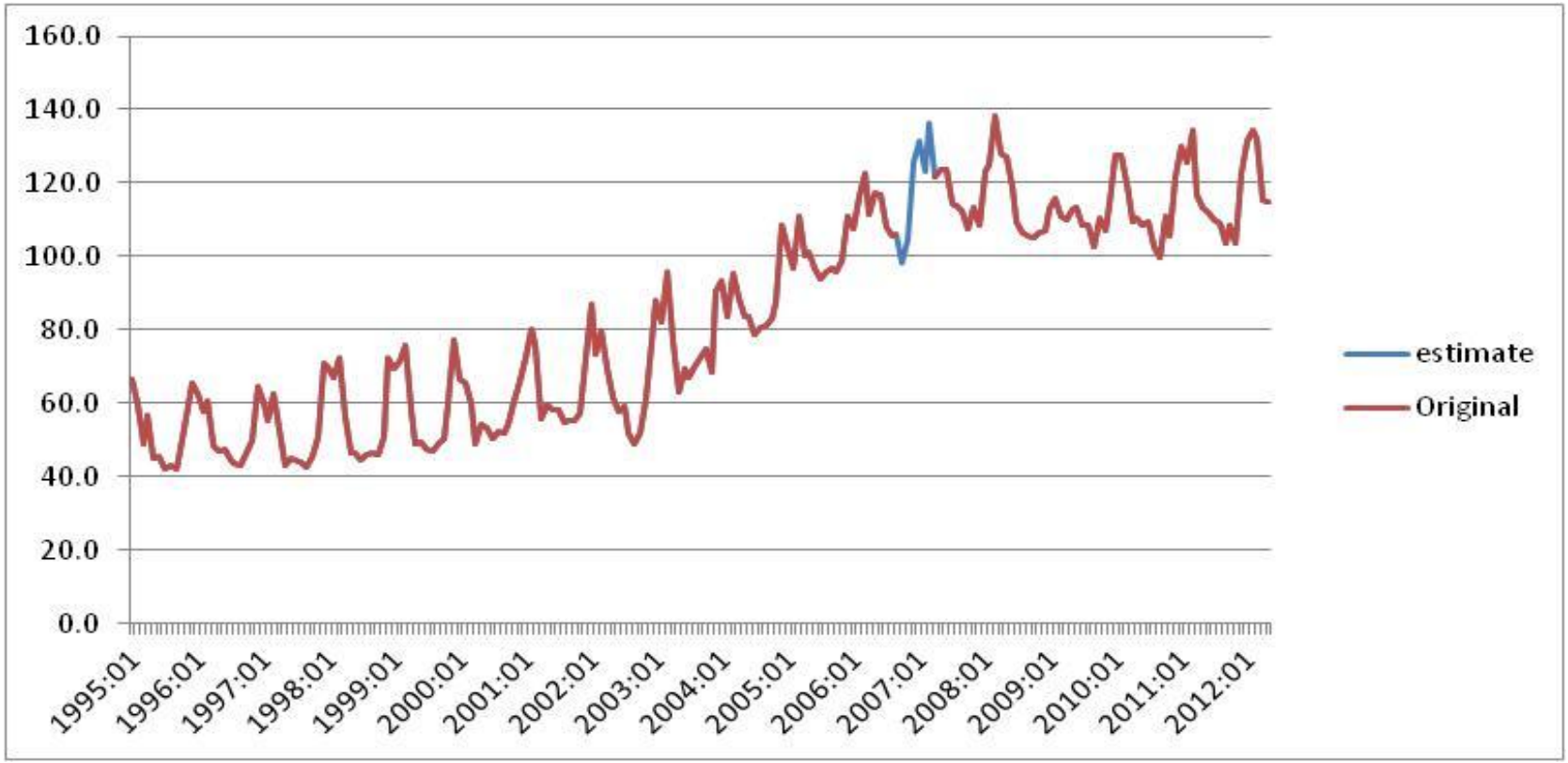


Example Seasonal Adjustment Using SAS X11 Procedure: Testing Pakistan Manufacturing Prod Index 1995-2012

Check if any trend break of the series

Check also if any missing values

Pakistan Manufacturing Prod Index: 1995-2012



Findings

Stable Seasonality Test				
Source	Sum of Squares	DF	Mean Square	F Value
Between Months	23788	11	2163	41.58
Error	10245	197	52.01	
Total	34033	208		

Probability of a Larger F is < 0.0001

Moving Seasonality Test				
Source	Sum of Squares	DF	Mean Square	F Value
Between Years	38610042	16	2413128	10.18
Error	41719048	176	237040	

Probability of a Larger F is < 0.0001

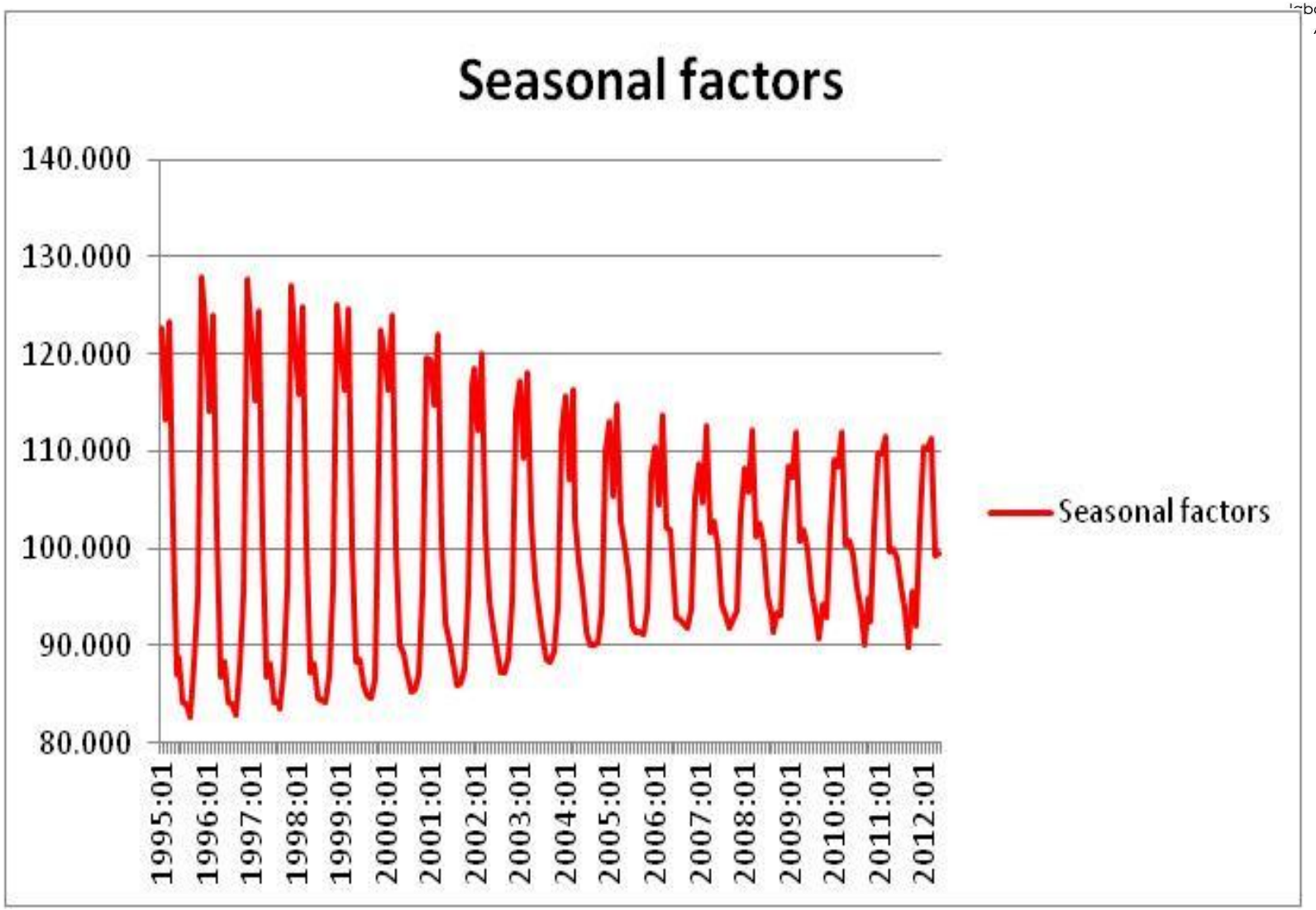
Findings

Summary of Results and Combined Test for the Presence of Identifiable Seasonality	
Seasonality Tests:	Probability Level
Stable Seasonality F-test	0.000
Moving Seasonality F-test	0.000
Kruskal-Wallis Chi-square Test	0.000
Combined Measures:	Value
T1 = 7/F_Stable	0.17
T2 = 3*F_Moving/F_Stable	0.73
T = (T1 + T2)/2	0.45
Combined Test of Identifiable Seasonality:	Present

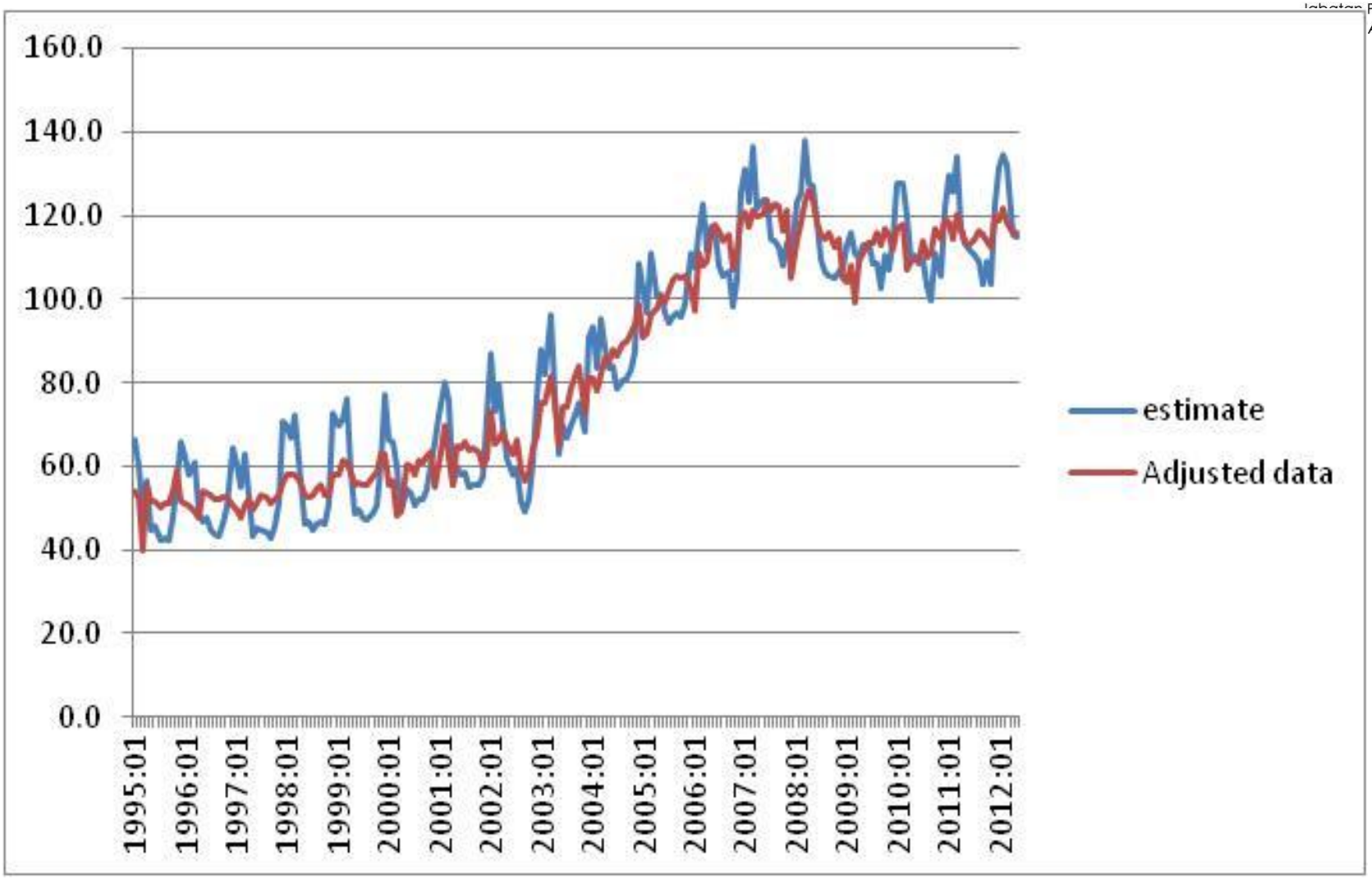
Nonparametric Test for the Presence of Seasonality Assuming Stability		
Kruskal-Wallis Statistic	DF	Probability Level
146.6659	11	.00%

Seasonality present at the one percent level.

Seasonal Factors



Findings


160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1995:01
1996:01
1997:01
1998:01
1999:01
2000:01
2001:01
2002:01
2003:01
2004:01
2005:01
2006:01
2007:01
2008:01
2009:01
2010:01
2011:01
2012:01
estimate
Adjusted data

SUMMARY

- Seasonally adjusted series is only for monthly or quarterly time series.
- But not all monthly or quarterly time series need to be adjusted
- It is subjected to your decision based on the appropriate statistical test.

THANK YOU

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