Measuring seasonal changes in the ratio method to the general average
قياس التغيرات الموسمية بطريقة النسبة إلى المتوسط العام

Seasonal changes are among the most important factors affecting the time series of a phenomenon, specifically phenomena whose observations are recorded seasonally or monthly. Phenomena whose observations are recorded annually are not affected by this type of change.

تعد التغيرات الموسمية من اهم العوامل المؤثرة على السلسلة الزمنية للظاهرة وتحديداً الظواهر التي يتم تسجيل مشاهداتها بشكل فصلي او شهري اذ لا تتأثر الظواهر التي تكون مشاهداتها مسجلة بشكل سنوي بهذا النوع من التغيرات.

Given the impact of seasonal changes on the path of the time series (whether seasonal or monthly), seasonal changes must be measured to exclude (remove) the effect of this type of change from the values of the phenomenon under study and obtain adjusted observations of the phenomenon free from the effect of seasonal changes. To estimate seasonal indicators and eliminate their effect on the values of the phenomenon under study, several methods are used for this purpose, including:

ونظراً لتأثير التغيرات الموسمية على مسار السلسلة الزمنية (فصلية كانت ام شهرية). عليه ينبغي قياس التغيرات الموسمية بهدف استبعاد (ازالة) اثر هذا النوع من التغيرات من قيم الظاهرة المدروسة والحصول على مشاهدات معدلة للظاهرة ومخلصة من اثر التغيرات الموسمية ولتقدير المؤشرات الموسمية (الفصلية) والتخلص من اثرها في قيم الظاهرة المدروسة توجد عدة طرق تستخدم لهذا الغرض منها:

1- Ratio to General Average Method طريقة النسبة إلى المتوسط العام

The ratio method to the general mean is a common method for estimating seasonal (seasonal or monthly) variations. The steps of this method are summarized as follows:

1- Calculating the season averages ($\bar{Q}_i$) حساب متوسط الفصول

2- Calculating the general mean according to one of two formulas: حساب المتوسط العام

$$\text{General mean} = \frac{\sum_{i=1}^{n} y_i}{n}$$

Or

$$\text{General mean} = \frac{\sum_{i=1}^{4} \bar{Q}_i}{4}$$

3- Calculating the seasonal index for the seasons according to the following formula:
حساب المؤشر الموسمي للفصول وفق الصيغة الاتية

$$S_i\% = \frac{\bar{Q}_i}{\text{General mean}} * 100\%$$

4- The effect of the season is removed from the observations of the phenomenon (y) according to the following formula: ازالة تأثير الموسم من المشاهدات وفق الصيغة الاتية

$$y^{**} = \frac{y}{S\%} \times 100\%$$

Example: The following data represents the quarterly sales value of a commercial establishment during the period 2002-2004. Requirements:

1. Calculate seasonal indicators (S%) using the ratio method to the general average.
2. Remove the effect of season (seasonal variation) from the observations of the phenomenon (y).

Years	2002				2003				2004			
seasons	Q_1	Q_2	Q_3	Q_4	Q_1	Q_2	Q_3	Q_4	Q_1	Q_2	Q_3	Q_4
sales	12	14	16	10	20	10	12	18	16	18	20	10

Sol:

To calculate seasonal indicators:

1- We reorganize the displayed observations according to the following table to calculate the seasonal averages.

Years/Seasons	Q_1	Q_2	Q_3	Q_4
2002	12	14	16	10
2003	20	10	12	18
2004	16	18	20	10
Sum of Seasons	48	42	48	38
$\bar{Q}_i$	16	14	16	12.7
$\sum_{i=1}^{4} \bar{Q}_i$	58.7			
	109%	95.4%	109%	86.6%

2- Calculating the overall average of the seasons:

$$\text{General mean} = \frac{\sum_{i=1}^{n} y_i}{n} = \frac{176}{12} = 14.67$$

Or

$$\text{General mean} = \frac{\sum_{i=1}^{4} \bar{Q}_i}{4} = \frac{58.7}{4} = 14.67$$

3- Calculating seasonal indicators according to the following relationship:

$$S_i\% = \frac{\bar{Q}_i}{\text{General mean}} * 100\%$$

$$S_1\% = \frac{16}{14.67} * 100\% = 109\%$$
$$S_2\% = \frac{14}{14.67} * 100\% = 95.4\%$$
$$S_1\% = \frac{16}{14.67} * 100\% = 109\%$$
$$S_1\% = \frac{12.7}{14.67} * 100\% = 86.6\%$$

4- The effect of the season is removed from observation as follows:

Years	Seasons	y	%S	$y^{**} = \frac{y}{S\%} \times 100$
2002	Q_1	12	109	(12/109)×100 =11
	Q_2	14	95.4	(14/95.4)×100 =15
	Q_3	16	109	(16/109)×100 =15
	Q_4	10	86.6	(10/86.6)×100 =12
2003	Q_1	20	109	(20/109)×100 =18
	Q_2	10	95.4	(10/95.4)×100 =10
	Q_3	12	109	(12/109)×100 =11
	Q_4	18	86.6	(18/86.6)×100 =21
2004	Q_1	16	109	(16/109)×100 =15
	Q_2	18	95.4	(18/95.4)×100 =19
	Q_3	20	109	(20/109)×100 =18
	Q_4	10	86.6	(10/86.6)×100 =12