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A.D.K Al-Hiyali

Professor, Dept. of. Agricultural Economics, College of Agriculture, University of Anbar, Iraq

ali.darub@uoanbar.edu.iq

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Abstract: The research aimed to analyze the seasonality of the data of the monthly wholesale prices of the tomato crop in the city of Baghdad during the period (2014-2019) based on the method of simple means corrected for the Trend. The seasonality of the data was revealed using the Kruskal-Wallis test. The research found the presence of seasonal compounds in the tomato crop price data, which confirms that prices are greatly affected by the Season. This is evident from the low prices in the hot seasons due to the high costs of storing it if the merchant tries to keep it and is forced to sell it, in addition to the high production quantities in the summer months. In addition, the extracted seasonal index values indicated the fact that prices were affected by the season through a decrease in the seasonal index values affected by the season, meaning that the results confirmed each other. The research recommended that although prices are affected by seasonality, reliance on production quantities, for example (greenhouses), will make it necessary to prevent the import of the crop at peak times. In addition to the need for production to be balanced between the production of open farms and the production of greenhouses so that it does not affect prices significantly. The research also recommends the availability of accurate data because inaccurate data affects the research results. Finally, work to implement laws that protect farmers and not just legislate them without implementing them.

Keywords: *Prices Fluctuations; Seasonal Index; Kruskle-Wallis test.*

1. Introduction

The analysis of time series at the global level has witnessed a vary important development in the second half of the twentieth century; especially, in the last three decades. The general trend in economic, social and administrative research and studies has become to use quantitative methods and statistical means of persuasion in order to determine the characteristics and highlight the general trends of economic, social and administrative phenomena and analyze the intertwined and mutual relationships between phenomena on an objective and unbiased basis. Time series are among the most important modern statistical methods through which it is possible to know the nature of the changes that occur in the values of the phenomenon with time, determine the causes and results, explain the observed relationships between them, and predict what will happen in the change in the values of the phenomenon in the future in light of what happened to it in the past. As for the temporal data, it is obtained by monitoring the data or values that express the phenomenon or variable under study at successive time intervals with the aim of achieving several goals, the most important of which is discovering the pattern of historical development of the phenomenon or variable under study and how to take advantage of this pattern in predicting this phenomenon in the future.

The research problem is summarized in the presence of the seasonal phenomenon in the prices of the tomato crop, which will be reflected in one way or another on the short-term planning process, and in order to avoid any bias in the forecasting process, which is very important in future planning processes, these changes or seasonal effects should be studied in order to be neutralized and excluded of the time series, which will make price forecasting Possible; especially that seasonal variations take a more regular form than other changes such as periodicity and thus will facilitate the forecasting process and in turn will be reflected in the short-term planning process. In addition, the presence of factors led to neutralizing the effect of the seasonality phenomenon and limiting its impact on the prices of the tomato crop.

The importance of the research stems from the importance of the tomato crop to the consumer from a nutritional point of view, as well as the planning process for drawing its prices and sales operations, which reflect positively on the budget of the parties related to these products, namely the producer, seller and consumer if they are better managed. The research also gains its importance because the analysis of time series, especially the analysis of seasonality variations, reveals the seasonality effects accurately because of their stability or the lack of fluctuations occurring in them, and the exclusion of these effects gives important results for the prediction process more than other methods.

The research aims to analyze the prices of the tomato crop in the city of Baghdad during the period (2014-2019) and extracting seasonal indices by the method of simple averages correcting the trend. Also detecting these seasonal variations or the so-called (seasonal component).

The topic of seasonality has been addressed by many researchers and used in various fields, whether in agriculture, trade, real estate economics, and others [1, 2, 3, 7, 11, 15]

2. Material and Methods

2.1. Theoretical Framework

- **Seasonality**

It is a feature of a time series in which the data undergoes regular, predictable changes that repeat annually. The term seasonality refers to frequent fluctuations in certain business activities and cycles that occur regularly on the basis of a particular season. The season may mean a season. When analyzing stocks, the effects of seasonal changes should be taken into account because of the implications they have on profits and the investor's portfolio. It is also important to take seasonal variations into account when following up on economic data, as economic growth may be affected by various seasonal factors such as weather and holidays to get a better picture of the movement of the economy, as they adjusted their analyses according to these factors [11, 16].

- **Agricultural Prices Fluctuations**

Many forms of price fluctuations can be distinguished within the agricultural markets and are summarized as follows:

Short Time Fluctuation

These fluctuations occur in short-term periods of time, which are called short-term price fluctuations, and they may occur daily in the markets, and often have nothing to do with other normal price movements, as prices may change several times during the day, as happens in the vegetable and fruit markets. Since we see the price is lower at the end of the marketing day, and such price changes may occur in the short term within days or weeks, and these short-term price fluctuations have nothing to do with the total quantitative supply because it has nothing to do with the quantities of seasonal agricultural production, so it becomes difficult for agricultural producers to respond to such price changes, but only affect the time of the marketing process because the agricultural crops offered for sale in the market have already been produced and presented, and farmers are apologetic to make any adjustment in their production or display within the short period because of the time difference between production and marketing, Therefore, the factors affecting daily or short-term price fluctuations are represented in the difference in the amount of perishable agricultural crops imported to the market, as well as temporary changes in the behavior of consumers, market conditions or the country, as well as daily weather changes such as rain, which makes it difficult for many farmers to bring their crops to market [7, 8].

Unusual Price Fluctuations

Such fluctuations occur abnormally as a result of emergency causes, and their occurrence cannot be predicted or controlled in the productive season of agricultural crops, which may cause sharp fluctuations in price levels because emergency disasters, droughts or unjust disease injuries affect the commodity supply in the market which helps sharp price deviations in the markets [3].

Seasonal Price Movements

The prices of most agricultural products are not fixed during the season, as they follow a regular seasonal pattern to some extent, and this does not necessarily reflect an imperfection of the market compared to time, as the price of the product may rise in some months of the season compared to the same months. For multiple seasons, most of the field crops are often marketed to the markets at the time of harvest, and certainly the peak of the harvest pressures the prices of agricultural crops tend to fall sharply and to a lower level, which makes the storage costs during the season the decisive factor in determining the price path later. As for the prices of fresh crops such as vegetables and fruits, their seasonal fluctuations are more severe than those of storable crops, although technological progress may make their supply over time more stable and therefore their prices less severe in terms of fluctuation. Marketing channels have the ability to determine the marketing productivity programs according to the knowledge available to them about the productive seasons, and this remains the subject of identifying seasonal price fluctuations as a general indicator to identify the behavior of prices for one season during the year, and that it requires great efforts to identify the price trends for each commodity or for

each agricultural product independently for the potential to benefit from these price behaviors during the season [1,2].

2.2. Data sources

The monthly data for wholesale market prices in Baghdad during the period (from January 2014 to December 2019) will be relied upon, as it could be obtained from the wholesale markets, as well as the data obtained from the Ministry of Planning and related master's theses.

For the purpose of detecting the seasonal compound, the statistical test called the Kruskal-Wallis test. The Kruskal-Wallis H test (sometimes also called the "one-way ANOVA on ranks") is a rank-based nonparametric test that can be used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable. It is considered the nonparametric alternative to the one-way ANOVA, and an extension of the Mann-Whitney U test to allow the comparison of more than two independent groups. This test will be used and symbolized by the symbol (KW) and its formula is [5, 4, 9, 13, 17]:

$$\boldsymbol{KW = \frac{12}{n(n-1)} \sum \frac{R_t^2}{m_i} - 3(n+1)}$$

As this amount x^2 follows a distribution of degrees of freedom $df = p - 1$ and (p represents the number of seasons of the year).

R_t represents the ranks of the phenomenon values or the values of the studied variable corresponding to the season i.

m_i represents the number of values and observations corresponding to the chapter, and in most cases, it is the number of years

3. Results and Discussion

3.1. Seasonal analysis of the monthly prices of the tomato crop (applied aspect)

The data that was used in this research is a monthly time series data of (72) views representing the monthly prices of the tomato crop in Baghdad city estimated in Iraqi dinars, which were taken from the wholesale markets, the Ministry of Agriculture, the Ministry of Planning and related departments, which extends for the period from (January 2014- to December 2019).

3.2. Extracting the seasonal index by the method of simple averages corrected to trend

This method will be relied upon to extract the seasonal index, and the seasonal indices for the monthly prices of the tomato crop, as shown in table 2.

Table (1): Monthly price data of the tomato crop in the wholesale markets during the period 2014-2019

Months / Years	1	2	3	4	5	6	7	8	9	10	11	12
2014	1328	1000	844	1063	735	532	657	782	812	750	1375	1375
2015	782	875	641	813	688	625	922	1182	875	813	1266	1266
2016	849	831	820	1153	810	633	614	765	842	969	892	701
2017	642	750	889	1447	785	559	459	565	639	746	742	819
2018	663	642	652	751	623	644	644	774	881	1488	1061	953
2019	929	837	837	967	716	680	707	623	620	992	909	829

Source: Data were collected from wholesale markets in the city of Baghdad

Table (2): Seasonal evidence of tomato crop prices in Baghdad by the method of simple averages corrected to trend

Months / Year	1	2	3	4	5	6	7	8	9	10	11	12	Total	Averages
2014	1328	1000	844	1063	735	532	657	782	812	750	1375	1375	11253	973.75
2015	782	875	641	813	688	625	922	1182	875	813	1266	1266	10748	895.7
2016	849	831	820	1153	810	633	614	765	842	969	892	701	9879	823.3
2017	642	750	889	1447	785	559	549	565	639	746	742	819	9132	761
2018	663	642	652	751	623	644	644	774	881	1488	1061	953	9776	814.7
2019	929	837	837	967	716	680	707	623	620	992	909	829	9646	803.8
Total	5193	4935	4683	6194	4357	3673	4093	4691	4669	5758	6245	5943		
average	865.5	822.5	780.5	1032.333	726.1667	612.1667	682.1667	781.8333	778.1667	959.6667	1040.833	990.5	10072.33	839.4
							839.4							
Trend	854.8	852	849.2	846.4	843.6	840.8	838	835.2	832.4	829.6	826.8	824		
S.I	1.012518	0.965376	0.9191	1.219675	0.860795	0.728076	0.814041	0.936103	0.934847	1.156782	1.25887	1.202063	12.00825	

Source: The results of the above table are based on the simple averages corrected to trend method

This method was relied on for its relevance to the monthly data of tomato crop prices more than the quarterly (seasonal) data, which calls for converting the monthly data into a quarterly. From the observation of table (2), we find that the seasonal indices for the months have taken the following values:

Table (3): Monthly seasonal indices of tomato crop prices in Baghdad (100%)

Months	Seasonal index	Months	Seasonal Index
January	101.3	July	81.4
February	96.5	August	93.6
March	91.9	September	93.5
April	121.9	October	115.7
May	86.1	November	125.9
June	72.8	December	120.2
Total of seasonal indices = 1200.825			

Source: Based on the results of table 2

It is noted from Table 3 that the sum of the seasonal evidence is approximately equal to 1200.8 which is very close to 1200 and this is what it is supposed to be.

As for the seasonal indices during the months, we note that the cold months recorded for each of January, October, November and December an increase in the seasonal indices above (100), and this means that there are increases in the prices of the crop. This is expected in the months when the crop is not present in a regular manner mostly.

As for the summer months, it is expected that there will be a decrease in the seasonal evidence, and this is what is observed in the months of May, June, July, August and September. Because the abundance of the crop in these months and the high temperatures push prices down for fear of damage and the high costs of storage, especially for the tomato crop, all of this pushes prices downward, and this is what was reflected in the seasonal evidence in these months.

3.3. Detective of the seasonal component of the prices of the tomato crop

The (seasonal component) of the tomato crop prices will be revealed using the (Kruskle-Wallis) test and it is symbolized by the symbol (kw) and its formula as:

$$\sum \frac{R_i^2}{mi} - 3(n+1)KW = \frac{12}{n(n-1)}$$

A detailed explanation will be given of this method and the steps followed to reach the results through which it is possible to know whether there is a seasonal phenomenon in it or not, and it will explain the prices of the tomato crop in detail [6,10, 14].

First step:

In this step, the months were arranged for the price data of the tomato crop starting from (December 2013-November 2019), as all (3) seasons for each year of (2014-2019), which were extracted according to the months of winter, spring, summer and autumn, and thus a table will be made showing how to arrange these Months, data, and how to extract seasons.

Second Step:

Creating a table with the seasons extracted in the first step for the years (2014-2019).

Third Step: Detecting seasonal component (Seasonal variations)

Create a table in which the ranks of the series values are placed from the smallest value to the largest value, that is, the ascending order of the extracted seasons. Next, the seasonal component is finally calculated using the aforementioned law, and now all these details will be reviewed in a practical way until the result is reached and thus an attempt is made to explain it.

Table (4): Arrangement of months for tomato crop prices and extraction of seasons for each (3) months

Q	Averages	Total	Prices data	Months	Q	Averages	Total	Prices data	Months
Q1	737	2211	819	Dec	Q1	1234.3	3703	1375	Dec
			642	Jun				1328	Jan
			750	Feb				1000	Feb
Q2	1040.3	3121	889	March	Q2	880.7	2642	844	March
			1447	April				1063	April
			785	May				735	May
Q3	557.7	1673	559	June	Q3	657	1971	532	June
			549	July				657	July
			656	August				782	August
Q4	709	2127	639	Sep	Q4	979	2937	812	Sep
2017			746	Oct	*2014*			750	Oct
			742	Nov				1375	Nov
Q1	752.7	2258	953	Dec	Q1	974.3	2923	1266	Dec
			663	Jan				782	Jan
			642	Feb				875	Feb
Q2	675.3	2026	652	March	Q2	714	2142	641	March
			751	April				813	April
			623	May				688	May
Q3	687.3	2062	644	June	Q3	909.7	2729	625	June
			644	July				922	July
			774	August				1182	August
Q4	1143.3	3430	881	Sep	Q4	984.7	2954	875	Sep
2018			1488	Oct	*2015*			813	Oct
			1061	Nov				1266	Nov
Q1	865	2595	829	Dec	Q1	793.7	2381	701	Dec
			929	Jan				849	Jan
			837	Feb				831	Feb
Q2	840	2520	837	March	Q2	927.7	2783	820	March
			967	April				1153	April
			716	May				810	May
Q3	670	2010	680	June	Q3	670.7	2012	633	June
			707	July				614	July
			623	August				765	August
Q4	840.3	2521	620	Sep	Q4	901	2703	842	Sep
2019			992	Oct	*2016*			969	Oct
			909	Nov				892	Nov

Source: The data were collected and arranged according to table 1.

The second step: Extracting price data on a quarterly basis.

Table (5): Seasons prices of tomato for the years (2014-2019)

Year	Q1	Q2	Q3	Q4
2014	1234.3	880.7	657	979
2015	974.3	714	909.7	984.7
2016	793.7	927.7	670.7	901
2017	737	1040	557.7	709
2018	752.7	675.3	687.3	1143.3
2019	865	840	670	840.3

Source: Calculated by the researcher based on the data of table 1

Table (6): Ascending order of string values (R_t)

Year	*Q1*	*Q2*	*Q3*	*Q4*
2014	24	15	2	20
2015	19	8	17	21
2016	11	18	4	16
2017	9	22	1	7
2018	10	5	6	23
2019	14	12	3	13
R_t	87	80	33	100

The seasonal phenomenon (the seasonal component) of the tomato crop prices will be revealed using the Kruskal-Wallis test, which is symbolized by the symbol (kw) after the values have been arranged In an ascending order.

The number of values or observations for each season is (6), meaning that:

$$m1 = m2 = m3 = m4 = 6$$

And the number (6) indicates the number of years studied from (2014-2019).

The number of total values (total sample size) is equal to (24), meaning that $n = 24$, then:

$$\boldsymbol{Kw} = \frac{\boldsymbol{12}}{\boldsymbol{n(n-1)}}\sum\frac{\boldsymbol{R_t^2}}{\boldsymbol{mi}} - \boldsymbol{3(n+1)}$$

$$\boldsymbol{Kw} = \frac{\boldsymbol{12}}{\boldsymbol{24(24-1)}}\sum\left[\frac{\boldsymbol{(87)^2}}{\boldsymbol{6}} + \frac{\boldsymbol{(80)^2}}{\boldsymbol{6}} + \frac{\boldsymbol{(33)^2}}{\boldsymbol{6}} + \frac{\boldsymbol{(100)^2}}{\boldsymbol{6}}\right] - \boldsymbol{3(24+1)}$$

$$\boldsymbol{Kw} = \boldsymbol{0.02}\sum\boldsymbol{[1261.5 + 1066.7 + 181.5 + 1666.7]} - \boldsymbol{75}$$

$$\boldsymbol{Kw} = \boldsymbol{0.02[4176.4]} - \boldsymbol{75}$$

$$\boldsymbol{Kw} = \boldsymbol{83.5} - \boldsymbol{75}$$

$$\boldsymbol{Kw} = \boldsymbol{8.53}$$

The fourth step:

Calculate the value of (x^2) in degrees of freedom and compare it with the value (kw) to find out the presence or absence of the seasonal phenomenon (the seasonal component). The decision is as follows:

$$\boldsymbol{df} = \boldsymbol{p-1} \qquad \boldsymbol{kw = 8.53} \quad \therefore$$

$$\boldsymbol{df} = \boldsymbol{4-1-3} \qquad \boldsymbol{x_{0.05}^2 = 7.81} \quad \therefore$$

$$\boldsymbol{x_{0.05}^2} = \boldsymbol{7.81} \qquad \boldsymbol{x_{0.05}^2} < kw \quad \therefore$$

Since the value of Kw is greater than the value of x^2, it can be said that there is a seasonal component.

4. Conclusion

The data confirmed the presence of the seasonal variations in the tomato crop price data, which confirms that prices are significantly affected by the season, and this is evident from the low prices in the hot seasons due to the high costs of storing it if the merchant tries to keep it and is forced to sell it, in addition to the high production quantities in the summer months although some results show the opposite in a few cases, and the reason is due to the overlap of the monthly data when converting it into quarterly data. The clear conclusion is that the monthly prices of the tomato crop are affected by the seasonal variations**.** In addition, the values of the extracted seasonal indices proved to the fact that prices were affected by the season through a decrease in the values of the seasonal indices affected by the season, meaning that the results confirmed each other.

Recommendation

- Although prices are affected by seasonality, the production of greenhouses makes it necessary to prevent the import of the crop at peak times.
- The need for production to be balanced between the production of open farms and greenhouses so that it does not affect prices significantly.
- Working on implementing laws that protect farmers, not just legislating them without implementation.

References

1. Allen, R. G. D. (1954). Seasonal variation in retail prices. *Economica*, 21(81), 1-6. https://doi.org/10.2307/2601491
2. Amikuzuno, J. & S. von Cramon-Taubadel. (2012). Seasonal variation in price transmission between tomato markets in Ghana. *Journal of African Economies*, 21(4), 669-686. https://doi.org/10.1093/jae/ejs008
3. Cedrez, C. B., Chamberlin, J., & Hijmans, R. J. (2020). Seasonal, annual, and spatial variation in cereal prices in Sub-Saharan Africa. *Global food security*, 26, 100438. https://doi.org/10.1016/j.gfs.2020.100438
4. Corder, G. W.&, D. I. Foreman (2009). *Nonparametric Statistics for Non-Statisticians*. Hoboken: John Wiley & Sons. pp. 99–105. ISBN 9780470454619.
5. Daniel, Wayne W. (1990). *Kruskal–Wallis one-way analysis of variance by ranks. Applied Nonparametric Statistics (2nd ed.)*. Boston: PWS-Kent. pp. 226–234. ISBN 0-534-91976-6.
6. G S Maddala. (1992). *Introduction to Econometrics*. MACMILLAN publishing company, New York, Second Edition.
7. Garretta Mark J. KamstrabLisa A. & Kramerc. (2005). Winter blues and time variation in the price of risk. Journal of *Empirical Finance*, 12(2), 291-316. https://doi.org/10.1016/j.jempfin.2004.01.002
8. Gupta, C.B. (1973). *An Introduction to Statistical Methods*. Vikas publishing House pvt LTD.Seventh revised edition.
9. John D. S. (2003). On the null distribution of the Kruskal–Wallis statistic. *Journal of Nonparametric Statistics*, 15(6), 685-691. https://doi.org/10.1080/10485250310001634719
10. John. E. Freund. (1973). *Modern Elementary Statistics*. Englewood Cliffs, New Jersey. Prentice-Hall,INC.

11. Kamstra, Mark J. and Kramer, Lisa A. and Levi, Maurice David. (2014). *Seasonal Variation in Treasury Returns*. Rotman School of Management Working Paper No. 1076644.
12. Kruskal, Wallis (1952). Use of ranks in one-criterion variance analysis. *Journal of the American Statistical Association*, 47 (260): 583–621. https://doi.org/10.1080/01621459.1952.10483441
13. Kruskal–Wallis H Test using SPSS Statistics, Laerd Statistics.
14. Lyman Ott, Michael Longnecker. (2008). *An introduction to statistical methods and data analysis*. sixth edition.
15. Miller, N. G. (1978). Time on the market and selling price. *Real Estate Economics*, 6(2), 164-174.
16. Nick H. B. (2000). Aspects of seasonality. *Journal of Experimental Botany*, 51, (352), 1769–1780, https://doi.org/10.1093/jexbot/51.352.1769
17. Spurrier, J. D. (2003). On the null distribution of the Kruskal–Wallis statistic. *Journal of Nonparametric Statistics*, 15 (6), 685–691. https://doi.org/10.1080/10485250310001634719

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أثر الموسمية في أسواق الجملة لمحصول الطماطم على الأسعار الشهرية في مدينة بغداد خلال الفترة (2014-2019)

علي درب كسار الحيالي
أستاذ دكتور في قسم الاقتصاد الزراعي- كلية الزراعة- جامعة الأنبار- العراق
ali.darub@uoanbar.edu.iq

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الملخص:

استهدف البحث تحليل الموسمية لبيانات أسعار الجملة الشهرية لمحصول الطماطم في مدينة بغداد خلال الفترة (2014-2019) بالاعتماد على طريقة الأوساط البسيطة المصححة للاتجاه، وقد تم الكشف عن موسمية البيانات باستخدام اختبار Kruskal-Wallis. واستنتج البحث وجود المركبة الموسمية في بيانات أسعار محصول الطماطم، مما يؤكد تأثر الأسعار بشكل كبير بالموسم، ويتضح ذلك من انخفاض الأسعار في المواسم الحارة بسبب ارتفاع تكاليف تخزينها إذا حاول التاجرالاحتفاظ بها، فضلًا عن ارتفاع كميات الإنتاج في أشهر الصيف. كما أشارت قيم الادلة الموسمية المستخرجة إلى تأثر الأسعار بالموسم من خلال انخفاض قيم الدليل الموسمي المتأثرة بالموسم، أي أن النتائج أكدت بعضها البعض. أوصى البحث بأنه على الرغم من تأثر الأسعار بالموسمية، إلا أن الاعتماد على كميات الإنتاج، على سبيل المثال (البيوت البلاستيكية)، سيجعل من الضروري منع استيراد المحصول في أوقات الذروة. فضلًا عن ضرورة موازنة الإنتاج بين إنتاج المزارع المكشوفة وإنتاج البيوت البلاستيكية بحيث لا تؤثر على الأسعار بشكل كبير. يوصي البحث أيضًا بضرورة توافر بيانات دقيقة لأن البيانات غير الدقيقة تؤثر على نتائج البحث. أخيرًا، العمل على تنفيذ القوانين التي تحمي المزارعين وليس مجرد تشريعها دون تنفيذها.

الكلمات المفتاحية: تقلبات الأسعار؛ الدليل الموسمي؛ اختبار كروسكل– واليس.