NOTES AND COMMUNICATIONS

SEASONAL MOVEMENT IN THE CONSUMPTION OF MEAT IN BENGHAZI

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Introduction ;

Agricultural commodities generally exhibit market variations within a year. In certain months in a year the production of a given commodity is more than in other months. Meat, though not an agricultural commodity itself, shows a set pattern of variation over the seasons. Breeding, live-stock feed and available number of animals in marketable shape all depend on seasons.

In this paper our main interest is to isolate the seasonal component in the data showing the number of lambs, calves and camels butchered in the Benghazi Municipal Slaughtering House. The data was made available to us by the kind co-operation of Mr. Mabrook Buzazia, chief of the department of statistics, Municipality of Benghazi. The data refers to the period July 1963 to June 1968. Number of animals of each type butchered each month together with the prevailing average prices per kilo were available. In a subsequent paper we intend to study the relationship between prices and quantities of various types of meats.

The Municipal Slaughtering House processes most of the meats of

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the above type sold in the Benghazi market. However, sometimes agencies outside the city limits also utilize this service. There are no records showing separately the number of animals of each type proces sed for consumption outside the city. We feel, however, that this will have effect on the derivation of the demand or the supply functions of meat for Benghazi town but it is not likely to influence much the seasonal pattern in the meat processed. A relevant point worth considering is that major number of animals butchered here are imported. Imports of animals either over land or sea may not be in unison with the natural breeding pattern of the animals. Thus we expect that import of animals is likely to disturb the smooth seasonal movements. However, the following analysis shows that the data does show a seasonal pattern, perhaps the intensity of the movement would have been more had there been no import of the animals.

Methodology ;

There are a number of methods available for estimating the seasonal component in a time series. We will use the centred 12 month moving average method. For successful application of this method it is necessary that the seasonal movement have a constant period of twelve months. Another method [1] is applicable if the period does not remain constant but has two components, one with periodicity of 12 months and the other changing slowly over time. If we assume that a given time series has three components namely, trend, seasonal and random variation, then a 12 month moving average will be free from the seasonals but will have the trend component and errors. Division of individual monthly values by the corresponding moving averages will eliminate the trend part leaving the seasonals and errors. Now, averaging these ratios over the years will reduce the errors leaving the seasonals. A final adjustment is made such that the sum of the seasonals over 12 months in a year becomes equal to 1200. If the given series does not have seasonality these calculations will give for each

(1) Wald A. : Berechung und Ausschaltug von Saisonchwankunge (Vienna), 1936.

month the value 100. Any deviation from 100 will indicate the effect of seasonality. Unfortunately, standard errors of the seasonal components are not known. Thus we will not be able to state quantitatively the amount of deviation from 100 which may be regarded as significant and not due to random fluctuations.

Calculations and Results :

Graph 1 (annexed) shows the actual data and corresponding 12 month moving averages plotted for lamb. Graphs 2 and 3 show the figures for beef and camel respectively. From graph 1 it can be seen that the data show an increasing trend together with marked seasonal fluctuations. For beef there is no marked trend and the intensity of seasonals is not as strong as that for lamb. For camel again there is no marked trend but seasonal oscillations are strong.

The moving averages have been correctly centred. Thus the moving average for any month has been calculated by adding half the monthly values six months before and after the particular month and the intermediate values. This sum divided by 12 gives the moving average. As an illustration the first moving average corresponding to the month January 1964 in table 1 is obtained as

$$[\ \tfrac{1}{2}\ (11818) + 8849 + 8749 + 8166 + 7639 + 8206 + 10485 + 12246 + 20282 + 19987 + 18644 + 15353 + \tfrac{1}{2}\ (11540)\ ] \div 12 = 12523.75$$

The moving averages are smoother than the observed data and reflect the effect of trend and errors in the data. Tables 2 and 3 show the observed data and 12 month moving averages for beef and camel respectively. Table 4 shows the ratio of observed data to trend values in percentage for lamb. Tables 5 and 6 show the corresponding trend eliminated series for beef and camel respectively.

Averaging these monthly percentages over the years give the seasonal component. The averaging reduces the errors. Table 7

show these averages for the three varieties of meat namely, lamb, beef and camel respectively. A final adjustment is made to the averages such that they add up to 1200. If there were no seasonal effect each monthly index will be nearly 100.

Table 8 shows the adjusted seasonals for each type of meat this table brings out some interesting points. It can seen that the seasonal indices for lamb in the months of March, April and May are relatively high. This may be explained by the fact that in Spring most of the locally bred lambs come to the market. For beef it is seen that the indices are high for winter months December, January and February. Camel, on the other hand, shows a marked increase in the summer months. Thus the three types of meats show three different seasonal patterns.

Next let us study the relationship between average prices and seasonal indices for the three varieties of meat. The seasonal indices derived are assumed to be typical for any year, thus for this study we need not consider the full data ; instead we concentrate on the most recent year 1967. In 1967 the average price of lamb meat per kilogram for the months of March, April and May were 958 and 717 mils. for the local and imported varieties respectively. For the remaining nine months the average prices for local and imported varieties were respectively 1094 and 940 mils. respectively. We have already noted a strong seasonal effect for these three months and the average price for these months are relatively lower. This is in agreement with the normal laws of demand and supply. In Spring more lambs are available, consequently the prices are lower and the demand is pushed up.

In the same year for beef we find the average price per kilogram for the two varieties of meat namely, small and big, in the months December, January and February were 825 and 708 mils. respectively. For the remaining months the average prices turn out to be 790 and 610 mils. respectively. Beef shows seasonality in the winter months, however, the average price in the winter months is not lower than

the price in other months. This appears to be in contradiction to the accepted idea of demand and supply. Perphaps, the explanation may be that consumers prefer beef in winter in spite of its higher price.

Finally, for the same year the average price for camel meat per kilogram for the months June, July, August and September were 506 mils. for small and 419 mils. for big animals respectively. For the remaining months the average prices for the two varieties were 547 and 466 mils. respectively. Here again we find that for the part of the year when seasonality is strong the average price is lower than in the other part of the year.

Summary :

Monthly data on the number of live-stocks butchered in Benghazi Municipal Slaughtering House has been analysed here. Three varieties of meat have been considered namely, lamb, beef and camel. Consumption of these three varieties of meat show distinct seasonal fluctuations. Seasonal indices for lamb meat are higher in Spring. For beef the indices are higher in winter months and for camel they are high in summer months.

Average prices of the meats, except for beef, show a movement in agreement with the movement of the seasonal indices. For, beef it is felt that consumers prefer this meat in winter.

In a later work we intend to study the pattern of seasonal variation in meat consumption using data for whole of Libya. Also the demand function for meat will be studied.

TABLE 1

Data showing the number of lamb butchered in Benghazi Municipal Slaughtering House between July 1963 and June 1968. Estimated trend values are also showon.

Year	Month	No. of lamb	12 month moving sum	Trend* (Col. 4 ÷ 12)	Year	Month	No. of lamb	12 month moving sum	Trend* (Col. 4 ÷ 12)
1963	July	11818			1966	Jan.	16606	165846	13820.56
	Aug.	8849				Feb.	13192	169449	14120.75
	Sept.	8749				March	20876	176183	14681.92
	Oct.	8166				April	17754	184536	15378.00
	Nov.	7639				May	17414	194167	16180.58
	Dec.	8206				June	10840	203611	16967.58
1964	Jan.	10485	150285	12523.75		July	11545	209323	17443.58
	Feb.	12246	150605	12550.42		Aug.	15750	209544	17462.00
	March	20282	151765	12647.08		Sept.	17435	206507	17208.92
	April	19987	153839	12819.92		Oct.	20302	204826	17068.83
	May	18644	156804	13067.00		Nov.	22960	205889	17157.42
	June	15353	159279	13273.25		Dec.	23305	208591	17382.58
	July	11540	158330	13194.17	1967	Jan.	19293	213454	17787.83
	Aug.	9766	155450	12954.17		Feb.	10947	219233	18269.42
	Sept.	10151	153122	12760.16		March	17048	224586	18715.50
	Oct.	10914	148831	12402.58		April	18220	229986	19165.50
	Nov.	10822	144299	12024.92		May	19074	235271	19605.92
	Dec.	9972	140985	11748.75		June	14583	235444	19620.33
1965	Jan.	6810	138535	11544.58		July	17528	236443	19703.58
	Feb.	10171	137925	11493.75		Aug.	21325	239372	19947.67
	March	17701	137826	11485.50		Sept.	22566	244004	20333.67
	April	13985	137808	11484.00		Oct.	25972	247515	20626.25
	May	15583	138940	11578.33		Nov.	23490	253990	21165.83
	June	11785	142232	11852.67		Dec.	27490	264332	22027.67
	July	10209	149428	12452.33	1968	Jan.	17105		
	Aug.	9878	155837	12986.42		Feb.	18994		
	Sept.	9840	158935	13244.58		March	18266		
	Oct.	11190	162407	13533.92		April	24023		
	Nov.	12810	165207	13767.25		May	26222		
	Dec.	14568	165650	13804.17		June	28119		

(*) In the 12 month moving average method trend values for the first and last six moths are not available.

TABLE 2

Data showing the number of calves butchered in Benghazi Municipal Slaughtering House between July 1963 and June 1968. Estimated trend values are also shown.

Year	Month	No. of calves	12 month moving sum	Trend (Col. 4 ÷ 12)	Year	Month	No. of calves	12 month moving sum	Trend (Col. 4 ÷ 12)
1963	July	547			1966	Jan.	504	4943	411.92
	Aug.	526				Feb.	439	5010	417.50
	Sept.	546				March	453	5105	425.42
	Oct.	587				April	310	4963	413.58
	Nov.	519				May	400	4752	396.00
	Dec.	539				June	342	4664	388.67
1964	Jan.	696	7509	625.75		July	262	4823	401.92
	Feb.	680	7760	646.67		Aug.	700	5118	426.50
	March	610	7948	662.33		Sept.	278	5368	447.33
	April	576	7999	666.58		Oct.	262	5557	463.08
	May	776	8081	673.42		Nov.	201	5717	476.42
	June	776	8299	691.58		Dec.	538	5840	486.67
	July	809	8443	703.58	1967	Jan.	772	5972	497.67
	Aug.	766	8357	696.42		Feb.	762	5848	487.33
	Sept.	682	8161	680.08		March	627	5820	485.00
	Oct.	553	7969	664.08		April	516	6044	503.67
	Nov.	719	7702	641.83		May	514	6300	525.00
	Dec.	773	7355	612.92		June	474	6674	556.17
1965	Jan.	750	6961	580.08		July	394	6915	576.25
	Feb.	454	6587	548.92		Aug.	320	6964	580.33
	March	444	6258	521.50		Sept.	601	6892	574.33
	April	357	6051	504.25		Oct.	388	6786	565.50
	May	462	5858	488.17		Nov.	586	6964	580.33
	June	359	5571	464.25		Dec.	901	7038	506.50
	July	403	5304	442.00	1968	Jan.	892		
	Aug.	424	5173	431.08		Feb.	740		
	Sept.	365	5171	430.92		March	504		
	Oct.	458	5151	429.25		April	428		
	Nov.	428	5097	424.75		May	857		
	Dec.	487	5040	420.00		June	380		

TABLE 3

Data showing the number of camel butchered in Benghazi Municipal Slaughtering House between July 1963 and June 1968. Estimated trend values are also shown.

Year	Month	No. of camel	12 month moving sum	Trend (Col. 4 ÷ 12)	Year	Month	camel	12 month moving sum	Trend (Col. 4 ÷ 12)
1963	July	680			1966	Jan.	653	9992	832.67
	Aug.	943				Feb.	237	10517	866.42
	Sept.	1087				March	146	10022	835.17
	Oct.	1080				April	188	9676	806.33
	Nov.	838				May	836	9403	783.58
	Dec.	914				June	1672	9315	776.25
1964	Jan.	1151	9671	805.92		July	1655	9199	766.58
	Feb.	872	9967	830.58		Aug.	1279	9126	760.50
	March	352	9951	829.25		Sept.	822	9177	764.75
	April	104	9702	808.50		Oct.	560	9166	763.83
	May	568	9524	793.67		Nov.	559	9085	757.08
	June	856	9425	785.42		Dec.	708	8837	736.42
	July	1132	9377	781.42	1967	Jan.	420	8499	708.25
	Aug.	1082	9238	769.83		Feb.	326	8332	694.33
	Sept.	916	9165	763.75		March	158	8208	684.00
	Oct.	754	9398	783.17		April	154	8190	682.50
	Nov.	809	9494	791.17		May	707	8096	674.67
	Dec.	744	9595	799.58		June	1205	7972	664.33
1965	Jan.	1224	9853	821.08		July	1546	7905	658.75
	Feb.	521	10048	837.33		Aug.	1055	7948	662.33
	March	557	10234	852.83		Sept.	799	8049	670.75
	April	365	10437	869.75		Oct.	546	8129	677.42
	May	500	10537	878.08		Nov.	385	8090	674.17
	June	1126	10431	869.25		Dec.	633	7711	642.58
	July	1377	10129	844.08	1968	Jan.	362		
	Aug.	1227	9702	808.50		Feb.	470		
	Sept.	1144	9354	779.50		March	216		
	Oct.	931	9060	755.00		April	256		
	Nov.	733	9139	761.58		May	526		
	Dec.	709	9580	798.33		June	628		

TABLE 4

Seasonals showing the ratio of lambs actually slaughtered to the estimated trend, expressed in percentages.

Year	Month	Seasonals	Year	Month	Seasonals
1964	Jan.	83.7*	1966	Jan.	120.1
	Feb.	97.6		Feb.	93.4
	March	160.4		March	142.2
	April	155.9		April	115.5
	May	142.7		May	107.6
	June	115.7		June	63.9
	July	87.5		July	66.2
	Aug.	75.4		Aug.	90.2
	Sept.	79.6		Sept.	101.3
	Oct.	88.0		Oct.	118.9
	Nov.	90.0		Nov.	133.8
	Dec.	84.9		Dec.	134.1
1965	Jan.	59.0	1967	Jan.	108.5
	Feb.	88.5		Feb.	59.9
	March	154.1		March	91.1
	April	121.8		April	95.1
	May	134.6		May	97.3
	June	99.4		June	74.3
	July	82.0		July	88.9
	Aug.	76.1		Aug.	106.9
	Sept.	74.3		Sept.	110.9
	Oct.	82.7		Oct.	125.9
	Nov.	93.0		Nov.	111.0
	Dec.	105.5		Dec.	124.8

(*) Calculated as follows

(10485 ÷ 12523.75) 100 = 83.7 etc.

TABLE 5

Seasonals showing the ratio of calves actually butchered to the estimated trend, expressed in percentages.

Year	Month	Seasonals	Year	Month	Seasonals
1964	Jan.	111.2*	1966	Jan.	122.4
	Feb.	105.2		Feb.	105.1
	March	92.1		March	106.5
	April	86.4		April	75.0
	May	115.2		May	101.0
	June	112.2		June	88.0
	July	115.0		July	65.2
	Aug.	110.0		Aug.	164.1
	Sept.	100.2		Sept.	62.1
	Oct.	83.3		Oct.	56.6
	Nov.	112.0		Nov.	42.2
	Dec.	126.1		Dec.	110.5
1965	Jan.	129.3	1967	Jan.	155.1
	Feb.	82.7		Feb.	156.4
	March	85.1		March	129.3
	April	70.8		April	102.4
	May	94.6		May	97.9
	June	85.1		June	85.2
	July	91.2		July	68.4
	Aug.	98.4		Aug.	55.1
	Sept.	84.7		Sept.	104.6
	Oct.	106.7		Oct.	68.6
	Nov.	100.8		Nov.	100.9
	Dec.	116.0		Dec.	153.8

(*) Calculated as follows

$$(696 \div 625.76)\ 100 = 111.2 \text{ etc.}$$

TABLE 6

Seasonals showing the ratio of camel actually butchered to the estimated trend, expressed in percentages.

Year	Month	Seasonals	Year	Month	Seasonals
1964	Jan.	142.8*	1966	Jan.	78.4
	Feb.	105.0		Feb.	28.0
	March	42.4		March	17.5
	April	12.7		April	23.3
	May	71.6		May	106.7
	June	108.9		June	218.2
	July	144.9		July	215.9
	Aug.	140.6		Aug.	168.2
	Sept.	119.9		Sept.	107.5
	Oct.	96.3		Oct.	73.3
	Nov.	102.3		Nov.	73.8
	Dec.	93.0		Dec.	96.1
1965	Jan.	149.1	1967	Jan.	59.3
	Feb.	62.2		Feb.	46.9
	March	65.3		March	23.1
	April	41.9		April	22.6
	May	56.9		May	104.8
	June	129.5		June	181.4
	July	163.1		July	234.7
	Aug.	151.8		Aug.	159.3
	Sept.	146.8		Sept.	119.1
	Oct.	123.3		Oct.	80.6
	Nov.	96.2		Nov.	57.1
	Dec.	88.8		Dec.	98.5

(*) Calculated as follows

(1151 ÷ 805.92) 100 = 142.8 etc.

TABLE 7

Average seasonals

Month	Average seasonal for		
	Lamb	Beef	Camel
Jan.	92.8*	129.5	107.4
Feb.	84.8	112.4	60.5
March	137.0	103.2	37.1
April	122.1	83.7	25.1
May	120.6	102.2	85.0
June	88.3	92.6	159.5
July	81.2	84.9	189.7
Aug.	87.2	106.9	155.0
Sept.	91.5	87.9	123.3
Oct.	103.9	78.8	93.4
Nov.	106.9	88.9	82.4
Dec.	112.3	126.6	94.1

(*) Calculated as follows

(83.7 + 59.0 + 120.1 + 108.5) / 4 = 92.8 etc.

TABLE 8

The seasonal component

Month	Seasonal for		
	Lamb	Beef	Camel
Jan.	91*	130	106
Feb.	83	113	60
March	135	103	37
April	119	84	25
May	118	102	84
June	86	93	158
July	79	85	188
Aug.	85	107	153
Sept.	89	88	122
Oct.	101	79	92
Nov.	104	89	82
Dec.	110	127	93

(*) Obtained as follows

[92.8 / (84.8 + ... + 106.9 + 112.3)] 1200 = 90.6 etc.