

Seasonal Hog Price Patterns in North Dakota and the United States

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The hog-pork industry has been characterized over the years as having definite seasonal production and pricing patterns. Traditionally, pigs were farrowed in either the spring or fall, which led to periods within the year when production, packing, and processing facilities were underutilized. Recently, hog production has become much more capital intensive, with large investments in facilities and equipment. The increase in environmentally controlled, confinement production facilities could be expected to have a smoothing effect on seasonal fluctuations in production. This study was undertaken to see if seasonal price patterns have, in fact, changed due to the larger production facilities operating near full capacity throughout the year to cover high fixed costs.

General Procedures

Four types of price variations associated with production over time may be identified as seasonal, trend, cyclical, and random or irregular variation. Separating each component for study is called time series analysis. Seasonal variation is the price pattern which occurs within a year and is followed year after year. Trend is the price direction over a relatively long period of time. Cycles are movements representing alternating periods of increases and decreases in a series, where these recurring movements occur in periods exceeding one year. Irregular and random variation are unusual events that are not included in seasonal, trend, and cyclical variations.

A seasonal pattern is one which recurs at similar times each year. Seasonality in hog marketing is related to the biological factors of hogs and management practices. The stability of the seasonal pattern depends on the continuous repeatability of the annual events causing the seasonal pattern. Hogs are generally slaughtered six to seven months after farrowing. The seasonal pattern in farrowing largely determines the seasonal pattern in slaughter and prices.

The computer package Statistical Analysis System Seasonal Adjustment (SAS X11) (1) was used to calculate seasonal indexes for North Dakota and the United States. The model employs the ratio-to-moving average method for time series separation. The X-11 model removes the trend, cyclical, and irregular components from the time

series so that the seasonal effect can be determined. In general, a 12-month moving-average of the original data is computed and interpreted as the trend-cycle component (TC). Dividing the original series trend, cycle, seasonal, and irregular (TCSI) by the TC leaves the seasonal-irregular (SI) component for each month. An average of the SI's for each month over several years is calculated to remove the irregular factor. The irregular component is removed because it contains random elements, such as the sudden impact of wars, the effect of elections, unseasonable weather conditions, reporting and sampling errors, etc. Removal of the irregular component from the seasonal-irregular component (SI) results in a seasonal index (S), which should be interpreted as the percentage of the annual average. The seasonal index (S) is more accurate as an indicator of seasonality than the seasonal-irregular (SI) component because the irregular portion in the component has been removed (2).

A monthly seasonal index calculation results in price indexes that are above, below, or equal to 100, with 100 equaling the yearly average. An index number greater than 100 indicates prices for that month were greater than the yearly average. A number less than 100 indicates prices were lower than the yearly average. A number equal to the seasonal index indicates prices are equal to the yearly average.

The prices used for North Dakota were monthly averages of United States No. 1 and 2, 200-240 pound barrows and gilts at West Fargo. USDA prices were available for the West Fargo terminal market from 1963 to 1983. Prices for 1956 to 1962 were obtained from the Union Stockyards Company at West Fargo.

The prices used to determine the seasonal indexes for United States slaughter hogs were USDA monthly prices for barrows and gilts at the seven major hog markets combined. These prices are computed by USDA and are the weighted average from markets at Indianapolis, Kansas City, Omaha, National Stockyards, Sioux City, South St. Joseph, and South St. Paul.

Results

The seasonal hog price indexes for North Dakota for years 1956 through 1983 are shown in Table 1. Hog prices in North Dakota have exhibited a very definite seasonal

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price pattern (see Figure 1). Prices tend to increase from January to February, then decline in March and April when the seasonal low is reached, then increase until July or August when the seasonal high is reached, then decline again through November with an increase in December. The seasonal low occurred in November for years 1956 through 1971 and in April for years 1972 through 1983. The seasonal high occurred in August for years 1956 through 1959 and 1980 through 1983, and in July for years 1960 through 1979. Prices have generally been equal to or higher than the yearly average during February, June, July, August, September, and October, and lower than the average in January, March, April, May, November, and December.

Sows are generally bred to farrow during March and April for the spring pig crop and during September for the fall pig crop. Hog production has improved through better genetic quality and feeding practices to allow producers to market hogs six months after birth. Six months following April for the spring pig crop and September for the fall pig crop are November and April - the two seasonal lows in hog prices. Relatively high seasonal prices have occurred during July, August, and September with August being the annual high. Fewer numbers of hogs marketed in August and, therefore, lower pork production is the reason for the August high.

Seasonal indexes were projected one year ahead to 1984 (Table 1). This process combines the seasonal pattern with the trend to give projected estimates of seasonal indexes. The April and November lows and the August high are evident.

The seasonal price pattern for the United States was nearly identical to the seasonal pattern for North Dakota (Table 2 and Figure 1). It was expected that the seasonal price pattern for North Dakota would be similar to the seasonal price pattern for the United States, because North Dakota hog prices are a result of prices determined in major United States hog markets adjusted for geographic location. The same monthly pattern has existed with the seasonal high occurring in July for years 1956 through 1978 and in August for years 1979 through 1983. The seasonal low has oscillated between April and November; for years 1963 through 1967 and 1971 through 1983 the seasonal low occurred in April, and for years 1956 through 1962 and 1968 through 1972 the seasonal low was November. Seasonal indexes were also projected into 1984 for the United States (Table 2). The annual pattern with April and November lows and the August high were repeated.

Two five-year seasonal index averages were identified for years 1956 through 1960 and 1979 through 1983 (see Figure 2 for North Dakota) to show changes in monthly seasonal price patterns. Greater annual variations in prices were evident during years 1979 through 1983. The five-year seasonal variations for North Dakota were both lower and higher during the 1979 through 1983 time period (92.2 April and 113.1 August) than during years 1956 through 1960 (93.6 November and 105.6 August).

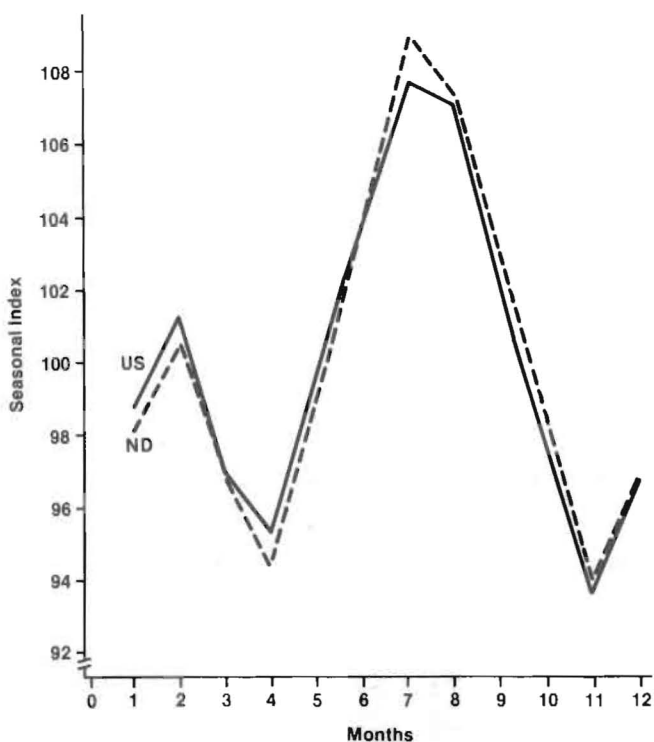


Figure 1. Monthly Averages of Hog Price Seasonal Indexes for Years, 1956 through 1983, North Dakota and United States.

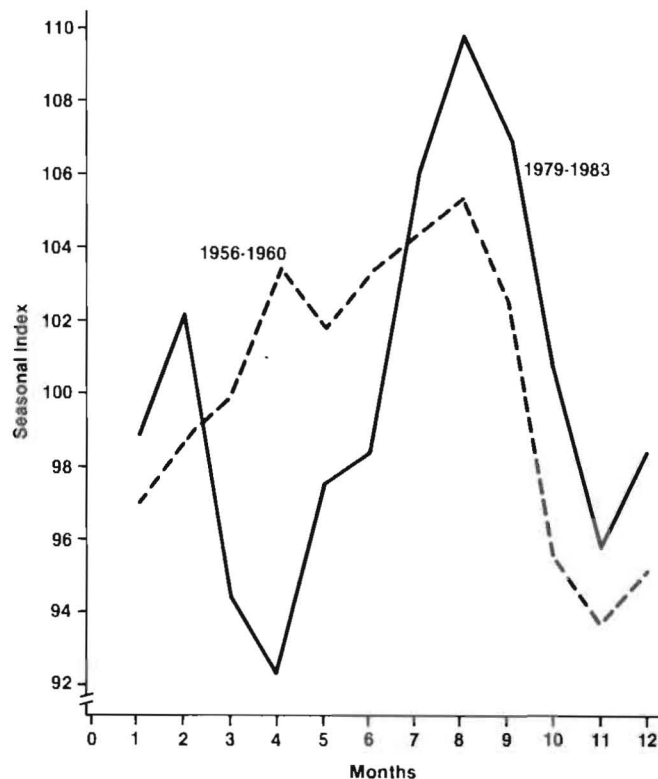


Figure 2. Seasonal Index of Hog Prices North Dakota, 1956 through 1960 and 1979 through 1983.

Table 1. Seasonal Indexes for West Fargo Slaughter Hog Prices, 1956 through 1983.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1956	97.7	99.0	99.4	103.5	102.7	103.0	104.0	106.3	103.1	94.4	92.2	94.8
1957	97.4	98.8	99.6	103.8	102.7	103.1	104.0	105.9	102.8	94.7	92.6	94.8
1958	96.9	98.6	100.1	103.9	102.2	103.3	104.2	105.3	102.7	95.2	93.6	94.9
1959	96.4	98.6	100.5	103.5	101.3	103.5	104.3	104.7	102.3	96.1	94.4	95.3
1960	96.4	98.5	100.3	102.5	100.2	104.0	104.8	104.7	102.0	97.0	95.1	95.6
1961	96.6	98.5	99.6	100.8	99.1	104.8	105.6	105.4	101.4	97.9	95.0	96.3
1962	97.3	98.6	98.3	98.4	98.3	105.8	106.9	106.7	100.9	98.0	94.3	96.7
1963	98.3	99.0	97.1	95.8	98.0	106.9	108.4	108.0	100.3	97.7	93.4	97.2
1964	99.0	99.2	95.7	93.7	98.4	108.3	109.8	109.0	99.5	96.9	92.8	97.3
1965	99.4	99.8	95.2	92.4	99.1	109.2	110.8	109.1	98.9	96.0	92.2	97.1
1966	99.4	100.4	95.3	91.9	100.1	109.8	111.1	108.5	98.6	95.1	91.9	96.8
1967	99.3	101.3	96.1	92.3	100.5	109.6	111.1	107.5	98.7	94.4	91.6	96.3
1968	99.2	102.1	97.2	93.0	100.8	109.0	110.9	106.4	98.6	94.2	91.4	95.8
1969	99.2	103.3	98.2	93.6	100.7	107.9	110.6	105.3	99.0	94.5	91.2	95.6
1970	99.3	104.4	99.0	93.9	100.4	106.4	109.9	104.9	99.3	95.3	91.6	95.9
1971	99.8	105.3	99.0	93.5	99.3	104.6	109.2	105.2	99.9	96.6	92.6	96.7
1972	99.9	105.0	98.4	92.7	98.4	103.1	108.9	106.0	100.7	98.4	93.8	97.2
1973	99.7	104.0	97.0	92.2	97.8	102.3	108.9	106.8	101.6	99.7	94.4	97.7
1974	99.2	102.4	95.9	92.2	98.1	102.5	109.0	107.3	102.0	100.1	94.3	97.9
1975	99.0	101.4	95.2	92.7	98.8	102.7	109.1	106.9	101.8	99.9	94.0	98.0
1976	99.2	101.4	95.4	93.5	99.7	102.6	108.6	105.7	101.8	99.2	93.7	98.2
1977	99.8	102.2	95.8	93.9	100.1	101.5	107.5	104.9	101.9	98.8	94.3	98.9
1978	100.3	103.2	96.3	93.8	99.4	99.9	106.6	104.9	102.9	98.7	95.3	99.6
1979	100.4	103.5	96.2	93.1	98.4	98.3	106.1	106.0	104.2	99.5	96.4	99.6
1980	99.7	103.2	95.4	92.4	97.6	97.7	105.7	107.9	106.2	100.1	96.6	99.2
1981	98.9	102.3	94.3	91.9	97.2	97.8	105.7	110.3	107.7	100.8	96.2	98.5
1982	97.8	101.3	93.2	91.7	97.2	98.7	106.0	112.2	108.5	100.9	95.2	97.9
1983	97.1	100.7	92.7	91.8	97.3	99.4	106.4	112.8	108.7	100.9	94.4	97.2

Seasonal Factors, One Year Ahead

1984	96.7	100.4	92.5	91.8	97.4	99.7	106.6	113.1	108.8	100.9	94.0	96.8
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Table 2. Seasonal Indexes for United States Hog Prices, 1956 through 1983.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1956	96.5	96.7	99.8	100.3	107.6	108.7	106.8	100.8	93.7	90.6	95.6	
1957	96.3	96.6	99.9	100.7	102.8	107.3	108.6	106.4	100.7	94.2	91.3	95.7
1958	96.1	96.8	99.7	100.9	102.1	106.7	108.5	106.0	100.9	95.2	92.5	96.0
1959	95.9	97.0	99.4	100.4	100.9	105.8	108.4	105.6	101.2	96.4	94.1	96.4
1960	96.1	97.3	98.5	99.4	99.2	105.1	108.5	106.0	101.9	97.8	95.3	96.7
1961	96.4	97.4	97.5	97.8	97.8	104.4	109.0	106.8	102.6	99.0	95.9	96.9
1962	96.9	97.5	96.0	95.9	96.7	104.5	109.6	108.2	103.3	99.3	95.7	96.9
1963	97.6	97.9	94.9	93.9	96.5	105.0	110.3	109.2	103.8	99.1	95.1	96.8
1964	98.0	98.2	94.0	92.3	96.9	106.3	111.0	109.7	103.7	98.4	94.4	96.2
1965	98.2	98.7	94.1	91.6	97.7	107.3	111.6	109.3	103.4	97.6	93.6	95.6
1966	98.1	99.4	94.7	91.4	98.6	108.1	111.7	108.6	102.9	96.6	92.9	95.2
1967	98.2	100.4	95.8	91.9	99.1	108.0	111.6	107.7	102.5	95.9	92.4	94.9
1968	98.2	101.3	97.0	92.6	99.4	107.7	111.6	106.7	101.7	95.7	92.1	94.5
1969	98.2	102.5	98.2	93.3	99.5	106.6	111.4	105.9	101.4	95.9	91.7	94.7
1970	98.3	103.6	98.9	93.6	99.3	105.4	110.6	105.4	101.1	96.3	92.1	95.3
1971	98.8	104.5	98.9	93.2	98.6	104.0	109.9	105.7	101.2	97.4	93.0	96.2
1972	98.9	104.4	98.3	92.5	97.9	103.2	109.5	106.3	101.2	99.0	94.1	96.7
1973	98.8	103.7	97.1	91.9	97.5	103.0	109.4	107.0	101.3	100.1	94.7	97.1
1974	98.5	102.4	96.0	91.8	97.9	103.5	109.3	107.5	101.0	100.4	94.6	97.3
1975	98.6	101.6	95.5	92.4	98.7	103.8	109.2	107.0	100.3	100.3	94.0	97.6
1976	99.1	101.7	95.9	93.3	99.7	103.5	108.4	105.8	100.0	99.8	93.7	98.0
1977	99.9	102.6	96.5	93.9	100.0	102.2	107.2	104.9	100.3	99.5	94.0	98.8
1978	100.5	103.4	96.8	93.8	99.4	100.5	106.3	104.8	101.7	99.4	94.9	99.7
1979	100.6	103.6	96.7	93.2	98.4	98.8	105.7	105.8	103.6	100.1	95.8	99.8
1980	99.9	103.1	95.8	92.4	97.4	98.1	105.4	107.8	106.0	100.5	96.1	99.5
1981	99.0	101.9	94.6	92.0	97.0	98.1	105.5	110.1	107.8	101.0	95.9	98.8
1982	97.9	100.8	93.6	91.7	97.0	98.9	105.9	111.9	108.8	100.9	95.0	98.2
1983	97.2	100.1	93.2	91.8	97.2	99.6	106.2	112.6	109.1	100.8	94.2	97.4

Seasonal Factors, One Year Ahead

1984	96.8	99.8	92.9	91.8	97.3	99.9	106.4	112.9	109.2	100.8	93.8	97.1
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The most noticeable change in the seasonal price pattern occurred in March and April. Prices for March and April were increasing during the 1956 through 1960 time period. However, during the 1979 through 1983 time period hog prices declined and reached the annual seasonal low in April. The seasonal low moved from November during 1956 through 1960 time period to April during 1979 through 1983. The seasonal high occurred in August for both time periods. Hog prices were equal to or above the annual average during April, May, June, July, August, and September for the 1956 through 1960 time period. Prices were above the annual average in February, July, August, September, and October for years 1979 and 1983. Prices in July, August and September consistently ranged above the annual average, while January, March, November, and December prices remained below the annual average in both time periods.

The two time periods, 1956 through 1960 and 1979 through 1983, were similar for both North Dakota and the United States (see Figure 3 for the United States). The seasonal annual high and low were also greater for the United States during the 1979 through 1983 time period.

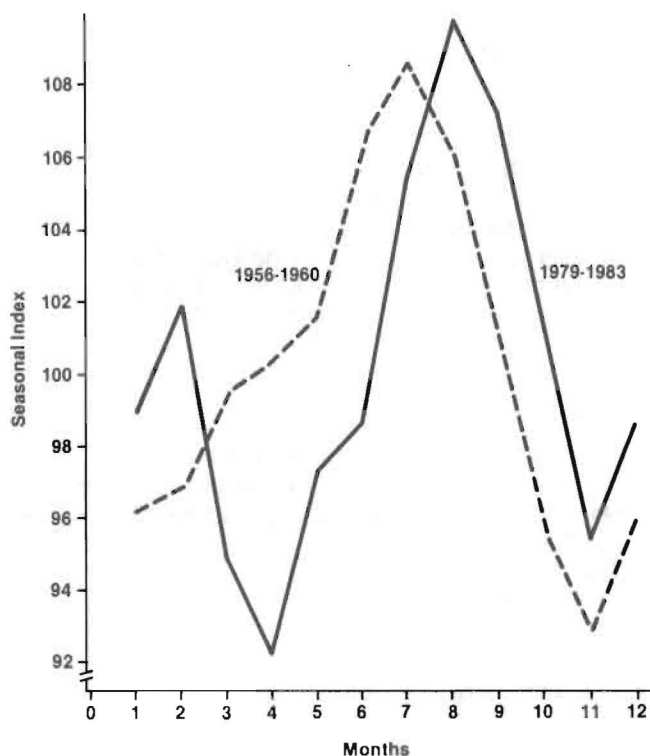


Figure 3. Seasonal Index of Hog Prices United States, 1956 through 1960 and 1979 through 1983.

During 1956 through 1960 the annual low occurred in November with a seasonal index of 92.8, and during the 1979 through 1983 time period the annual low occurred in April with a seasonal index of 92.2. The seasonal high for the same two time periods took place during July for 1956 through 1960 with a seasonal index of 108.5, and during August for 1979 through 1983 with a seasonal index of 109.6. Consequently, hog prices are fluctuating more even with a greater number of hog producers using complete confinement systems and farrowing throughout the entire year. In addition, November and April are the two months when hog prices reach their annual seasonal lows with the April low being the lower of the two. One possible reason could be the change in scheduling of hog production within the year. The spring farrowing used to produce 70 to 75 percent of all hogs marketed and that number has been dropping to around 50 to 55 percent today.

Prices were equal to or greater than the yearly average during April, May, June, July, August, and September for years 1956 through 1960, and during February, July, August, September, and October for years 1979 through 1983. Prices in July, August, and September remained above the annual average, while January, March, November, and December prices were below the annual average for the United States. There were six months of above average prices during years 1956 through 1960 for both North Dakota and the United States, and only five months during years 1979 through 1983. The seasonal high was higher and the low was lower during the year 1979 through 1983.

Summary

It was hypothesized that year-around production and marketing of hogs would have caused less seasonal variation in hog prices. However, the opposite situation was found to exist. Greater seasonal variations in hog prices were evident during 1979 through 1983 than 1956 through 1960. Evidently, there still are many hog producers who continue to schedule farrowings of pigs in either or both the spring and fall. Because of the seasonality in sows farrowing and the six-month feeding period, high slaughter levels and high prices usually occur in the spring and fall, while low production and high prices typically occur in the summer. Producers should consider forward contracting or futures market hedging for hogs to be marketed in months when below average prices are probable.

References

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