NCCC-134
APPLIED COMMODITY PRICE ANALYSIS, FORECASTING AND MARKET RISK MANAGEMENT

A Review of the Chicago Mercantile Exchange's Broiler Chicken Futures and Options Contracts and Their Effect on the Broiler Industry

by

Lori Aldinger

Suggested citation format:

Aldinger, L. 1991. "A Review of the Chicago Mercantile Exchange's Broiler Chicken Futures and Options Contracts and Their Effect on the Broiler Industry." Proceedings of the NCR-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management. Chicago, IL. [http://www.farmdoc.uiuc.edu/nccc134].

A Review of the Chicago Mercantile Exchange's Broiler Chicken Futures and Options Contracts and Their Effect on the Broiler Industry

Lori Aldinger*

The Chicago Mercantile Exchange (CME) has not introduced any new agricultural futures products since 1981 when futures on plywood began trading; trading in plywood lasted less than a year. The last successful futures contract introduced at the Exchange was feeder cattle, begun in 1971, although options on live cattle, live hogs, pork bellies, feeder cattle and lumber have all been introduced since 1984.

Considering the high failure rate of new futures contracts and the nearly ten years which have passed since the CME's last attempt to launch a new agricultural futures contract, the decision to launch broiler chicken futures and options contracts was an important development for both the industry and the Exchange.

One of the objectives of this paper is to review the broiler industry including a discussion of the industry's need for risk management techniques like broiler futures and options and the benefits (if any) of such contracts to the industry. Past studies have shown the introduction of commodity futures markets permits transfer of risk for hedging participants, a decrease in the volatility of prices, better dissemination of prices and the availability of more and better information.

This is not the first time the CME has offered a futures contract on broilers; the Exchange traded a broiler contract from 1979 to 1982. A second objective is to compare the terms and conditions of the previous contract with the current one, examining what made the previous contract fail and why the current one is expected to succeed. This paper will also review the mechanism of cash settlement as this is the main difference between the two contracts.

In addition, this research gives some indication as to the feasibility of broiler chicken futures and options contracts and how likely the chances are the contracts will succeed.

BROILER INDUSTRY REVIEW

Integrated, concentrated, specialized and decentralized are all words used to describe the broiler industry. The broiler

---

*Economic Analyst, Chicago Mercantile Exchange

industry has become a model of production, processing and marketing efficiency, technological advances, and industrial growth. A review of the industry shows dramatic changes over the years.

BROILER PRODUCTION

Production in the last 30 years has grown dramatically, increasing from 1.8 billion birds in 1960 to an estimated 5.5 billion birds in 1989. Production has increased an average four percent per year with declines in only four of the last 30 years, all in the early 70's. On a live weight basis, production has increased from six billion pounds in 1960 to an estimate of almost 24 billion pounds in 1989.

Broiler production is almost totally integrated with the slaughter and processing sectors. Several or all phases of broiler production, processing and marketing are owned or coordinated by integrated broiler firms. Almost all broilers are raised on contract with these firms or by the firms themselves.

For the last 15 years, the top ten broiler producing states have remained the same. They include Arkansas, Georgia, Alabama, North Carolina, Mississippi, Texas, Maryland, Delaware, California, and Virginia. In addition, there has been little shift in position among the top ten; Texas has edged out Maryland for sixth place the last two years. The top ten states' share of total U.S. broiler production since 1975 has remained fairly constant, about 85 percent. (Poultry Production and Value)

Broiler production over the years has been closely tied to consumption patterns. Peak production coincides with peak consumption during the spring and summer months although production can be affected by such factors as weather. Production patterns have been smoothed out in recent years from increased integration and year round consumption.

Broiler production, along with the rest of the broiler industry, has become increasingly concentrated. According to the U.S. Agricultural Census, in the past 30 years the number of farms producing broilers declined from 42,185 in 1959 to 27,645 in 1987, a decrease of almost 35 percent.

The decline in the number of farms producing broilers has been compensated for by an increase in the average production per farm. Production increased from 33,637 birds per farm in 1959 to 157,786 birds per farm in 1987.

This rise in production per farm is led by the increase in large broiler producing farms. The number of farms producing over 100,000 birds annually increased from 2,254 farms in 1959 to 14,473 farms in 1987. Farms with over 100,000 birds increased their production from 28.5 percent of broilers sold in 1959 to 93 percent in 1987.

BROILER SLAUGHTER

Federally inspected broiler slaughter since 1960 has increased from 1.5 billion birds to almost 5.5 billion birds in 1989, increasing in every year but three by an average of 4.5 percent per year. On a live weight basis, this represents an increase in slaughter from just over five billion pounds in 1960 to almost 24 billion pounds in 1989. On a ready-to-cook basis (dressed, whole birds ready to be cooked), slaughter has increased from 3.7 billion pounds in 1960 to 16.2 billion pounds in 1989. (Poultry Slaughter)

Broiler slaughter like broiler production is becoming increasingly concentrated. Like broiler farms, the number of broiler slaughtering plants is declining yet the plants are increasing in size and quantity of output. Twenty-five years ago in 1964, 201 firms operated 320 plants; in 1984, 134 firms operated 238 plants. This represents a 33 percent decline in the number of firms and a 26 percent decline in the number of plants.

The decline in the number of firms and plants has been offset by increased slaughter per plant. In 1964, average slaughter per plant on a ready-to-cook basis was just over 20 million pounds as compared to almost 75 million pounds in 1984.

The increased slaughter per plant is indicative of the increasing number of large slaughter firms. The 20 largest firms in 1964 operated 52 plants and slaughtered 44 percent of U.S. broiler slaughter. By 1984, the 20 largest firms operated 105 plants and slaughtered 73 percent of total broiler slaughter. (Lasley, Jones, Easterling and Christensen, 1988)

BROILER STOCKS, IMPORTS AND EXPORTS

Frozen broilers in cold storage account for a very small part of total slaughter. Less than seven percent of all broilers are put into cold storage.

Over the past 30 years, there have been very few broilers imported into the United States, and this continues to be the pattern in more recent years. Exports were relatively stable until the mid 70's when they began to increase considerably. As a percent of total broiler supply, exports are still a very small part, accounting for about five percent of production.

BROILER CONSUMPTION

Per capita consumption has increased from 23.4 pounds in 1960 to an estimated 69.9 pounds in 1990. Consumption continues its upward trend; it is forecast to be 73.5 pounds per person in 1991. Per capita consumption has increased in all but five of the last 30 years. (Livestock and Poultry Outlook and Situation Report)

Broiler consumption has also increased as a proportion of total red meat and poultry consumption. As a percent of red meat

and poultry consumption, broiler consumption increased from 14 percent on a retail weight basis in 1960 to 33.3 percent in 1990.

CASH MARKETING CHANNELS

According to the Broiler Marketing Practices Survey, in 1989, 85 percent of broilers were used in the domestic food market (retail groceries, public eating places and institutions), over 11 percent in pet food and rendering markets and 3.5 percent in export markets. Institutions include restaurants, government facilities, hospitals and others.

Broilers moved to the following final markets in 1989; retail grocery stores (51.2. percent), food service (11.4 percent), fast food (18.2 percent), government (1.2 percent), institutions (.7 percent), export markets (3.5 percent), brokers (2.2 percent), and pet food and renderers (11.6 percent). (Weimar and Stillman, 1990)

NATURE OF RISK IN THE BROILER INDUSTRY

The broiler industry faces considerable market uncertainty. Broiler prices can fluctuate by as much as 20 to 40 percent in one year. The table below shows the annual high/low range and the volatility of the USDA 12 City composite weighted average during the five-year period, 1986 to 1990.

The widest range in broiler prices was in 1986 and 1988, with a 33.52 cent/lb. spread between the highest and the lowest price and an annual volatility of 8.01 cents/lb. and 8.42 cents/lb. The narrowest spread of the five-year period was in 1990 at 15.60 cents/lb. The average spread for the five-year period was 26.24 cents/lb. with a standard deviation of 6.39 cents/lb. These wide price ranges suggest the considerable price risk the broiler industry is facing.

High/Low Range and Volatility of USDA 12 City Composite Weighted Average (Cents per Pound)

	1986	1987	1988	1989	1990	1986-90
High	79.72	58.63	72.57	74.96	63.03	79.72
Low	46.20	38.34	39.05	46.71	47.43	38.34
High/Low Range	33.52	20.29	33.52	28.25	15.60	41.38
Standard Deviation	8.01	4.08	8.42	6.78	4.64	7.73

To reduce price risk in the broiler market, buyers and sellers can try for better terms in either the cash market for immediate delivery or the forward market for future delivery. To lock in a price for future delivery of unproduced broilers in a forward market, the seller must find a buyer and negotiate a contract.

In a forward agreement, the buyer and seller agree to trade at a certain price, time, quantity, quality, and location. This is an imperfect process because the terms of the contract may not be standardized, and it can not be offset.

Buyers and sellers may also reduce their price risk by taking positions in the futures market. Currently, broiler producers can hedge their feed costs in soybean and corn futures contracts. However, this still leaves the seller with up to 25 percent of his input costs unhedged and all of his processing costs unhedged on the output side.

Cross hedging in the hog contract has been used to offset some of the price risk in broilers, and although it may have been useful at one time, the relationship has deteriorated in recent years. Looking at the last five years, the relationship was fairly stable in 1985 and 1986, but since then it has become considerably more volatile.

Given the lack of hedging tools using current cash and futures markets, broiler futures and options offer the possibility for improved risk management.

A futures contract on broilers is a useful hedging tool for broiler processors, distributors and brokers (who would be short or long depending on their cash market obligations at any one time) and food service, institutions and groceries (who would likely be long hedgers protecting against an increase in broiler prices).

Price discovery is the process buyers and sellers use to arrive at a specific price for a specific load of broilers at a specific location. This process is improved by high quality market information. The futures market is an important source of information used by the cash market to determine prices.

Basing cash and forward contracts on the futures price could be beneficial for both broiler buyers and sellers. Trading would take place at a fair market price using hedges which have no basis risk since the cash price is set to the futures price. In addition, liquidity is increased in the cash market through hedging and cash/futures arbitrage.

TERMS AND CONDITIONS OF THE BROILER FUTURES CONTRACT

The previous broiler contract was traded at the CME for about three years, from November 1979 to November 1982. Comparing the terms and conditions of the previous contract with the current one highlights why the previous contract failed and the current one is expected to succeed. The main difference between the two contracts is the use of a cash settlement mechanism for the current contract. The settlement price is the USDA composite weighted average which is discussed in the section entitled Final Settlement.

CONTRACT SIZE

The contract size for the current contract, 40,000 pounds, is the industry standard size truck load for the delivery of broiler chickens. Broiler prices are quoted for truck lot sales, the typical cash market transaction size. The contract size for the previous broiler contract was 30,000 pounds.

PRICE INCREMENTS

Minimum price fluctuations are in multiples of $.00025 per pound. This is the standard tick size for other CME livestock and meat contracts and is the same as the previous contract.

DAILY PRICE RANGE

There is no trading at a price more than $.02 per pound above or below the previous day's settlement price. The daily price range of $.02 per pound is consistent with the pork belly contract, is in line with the other CME livestock futures contracts and is the same as the previous contract.

The range is reasonable as shown by the average weekly price change for the USDA 12 City composite weighted average for broilers. The average weekly price change for 1986-1990 was 2.15 cents per pound with a standard deviation of 2.22 cents per pound and a maximum change of 12.31 cents per pound.

POSITION LIMITS

No person can own or control more than 2,000 contracts net long or short in all contract months combined or 500 contracts long or short in any contract month for the current contract. For the previous contract the position limits were 750 contracts in all months combined and 300 in any contract month.

A successful futures contract requires speculators to provide liquidity and take the opposite side of a commercial position. In order to facilitate large commercial positions, speculators must be able to take sizeable positions in the market. These position limits allow speculators to provide the liquidity needed for a successful futures contract.

The speculative position limits for broiler futures is based on the "...breadth and liquidity of the cash market underlying each delivery month and the opportunity for arbitrage between the futures market and cash market in the commodity underlying the futures market." (CME, 1990)

The broiler market underlying the proposed futures contract is extremely large in volume and continues to grow. The position limits for all months combined represent about .34 percent of annual supply. For any one month, production and slaughter would be about two billion pounds. The position limits for any one month

represent about one percent of this supply. The speculative position limits are appropriate for a futures contract with an underlying cash market as immense as that of the broiler industry.

TERMINATION OF TRADING

Trading terminates on the second to last Friday of the contract month, unless a holiday falls on that Friday, in which case trading terminates on the business day immediately preceding the second to last Friday of the contract month. Trading in the previous broiler contract terminated on the business day before the last six business days of the contract month.

The USDA 12 City composite weighted average is published each week on Monday, therefore it is logical for the last day of trading to be a Friday. The second to last Friday was chosen to allow an appropriate number of trading days in the contract month, and yet avoid an expiration around a holiday such as Memorial Day or Christmas.

TRADING MONTHS

The trading months for the current contract include February, April, May, June, July, August, October and December. These months coincide with the peak production of broilers. The previous contract did not include the May contract.

FINAL SETTLEMENT

There is no delivery of broiler chickens in settlement of this contract. All contracts open as of the termination of trading are cash settled based upon the USDA composite weighted average price. (See sections entitled Choosing a Cash Settlement Price and Calculating the USDA 12 City Composite Weighted Average for more information and sample calculation.) The final settlement price is determined on the Monday following the termination of trading, or if that day is a federal (USDA) holiday, on the next business day.

The primary change from the previous broiler futures contract is a cash settlement mechanism instead of a physical delivery mechanism. Physical delivery of the previous contract called for delivery of 2.5 to 3.5 pound birds with various weight and quantity deviations. Par delivery locations included Chicago, Columbus and Indianapolis. Premium delivery locations included Cleveland, Detroit, Minneapolis and New York. In addition, the contract included a certificate of delivery and provisions for tender, retender, reclaim and assignment of certificates.

Cash Settlement versus Physical Delivery

Cash settlement will solve a number of problems related to physical delivery. Cash settlement should eliminate grading disputes, receiving undesirable birds or delivery at inconvenient locations, delivery costs and certain periodic discount, deviation

and delivery point adjustments. (CME, 1985)

The basis (cash price minus futures price) at particular cities can be compared using physical delivery futures prices and the cash settlement price. (Cohen and Gorham, 1985) Weekly average futures prices from 1979 to 1982 were calculated and compared to cash prices at contract expiration for Boston, Chicago, Denver, Detroit, Los Angeles, New York, St. Louis and San Francisco (all cities in the USDA composite weighted average). The cash settlement price based on the USDA composite weighted average was also compared to cash prices at each of these cities. In all cases, the basis using the cash settlement USDA composite weighted average has a lower standard deviation.

City	Mean of the Basis		Standard Deviation	
	Physical Futures	Cash-Settled USDA Avg.	Physical Futures	Cash-Settled USDA Avg.
	(Cents per Pound)			
Boston	2.81	2.06	2.47	1.14
Chicago	0.03	-0.72	2.73	0.51
Denver	3.64	2.88	2.76	1.11
Detroit	0.37	-0.38	2.68	0.46
Los Angeles	3.86	3.10	2.67	0.80
New York	0.47	-0.28	2.12	0.70
St. Louis	0.04	-0.71	2.71	0.57
San Francisco	4.74	3.99	2.82	1.14

Choosing a Cash Settlement Price

In choosing the cash settlement price, primary attention focused on finding an index that yields a final settlement price that meaningfully reflects cash market broiler values while minimizing the likelihood of price manipulation.

Two price series used by the broiler industry are the Georgia dock weighted average and the USDA 12 City composite weighted average. The Georgia Department of Agriculture publishes the Georgia dock weighted average and the USDA publishes the USDA 12 City composite weighted average.

The Georgia dock weighted average is an f.o.b. dock quoted price and is based on truckload lots (40,000 pounds) of ice packed U.S. Grade A broilers of premium size (generally 2.5 to 3.0 pounds).

The Georgia dock weighted average is basically processor determined; the Georgia Department of Agriculture contacts each slaughter/processing company (approximately 20 companies) to obtain a quoted price for the next week's trading. These quotes are then weighted by the company's voice (the USDA authorizes each company to operate at a certain capacity i.e., so many

birds/minute/line/shift). The weighted average is moved to the nearest 1/4 cent and quotes from processors which are more than one cent above or below this average are eliminated.

The Georgia dock weighted average is published on Wednesday at 2:00 p.m. In addition, on Thursday and Friday, a preliminary weighted average is released, with a final weighted average released on Monday. A daily report is also disseminated at 11:00 a.m. every day except Wednesday.

The USDA 12 City composite weighted average is based on negotiated prices for truck lot sales of ready-to-cook broilers delivered to consuming markets in 12 cities. The composite price consists of U.S. Grade A (including branded) and plant grade, whole carcass, ice-packed or CO2-packed broilers, whole carcass chill packed product; and whole birds without giblets (WOGS).

The USDA 12 City composite weighted average is computed by multiplying the loads in each city by the composite price to determine a regional composite for each of the three geographic regions. The regional averages are multiplied by a population factor (this factor is the percentage of the U.S. population that each region represents). The result of this final computation is the USDA 12 City composite weighted average. (See sample calculation below.)

This average is issued as a public release after 1:30 p.m., central time, each Monday. In addition to the composite price, the USDA releases a preliminary U.S. Grade A report for each city every Friday. This preliminary report is for Grade A product only and does not include the additional product forms in the composite weighted average. Daily reports are released for various cities and regions of the country.

A comparison of the USDA and the Georgia Dock price series shows a close relationship, keeping in mind the USDA 12 City composite weighted average is a delivered price and includes freight. The correlation coefficient between the USDA composite weighted average published on Monday for sales to be delivered that week, and the Georgia dock weighted average published on Wednesday for sales for next week's trading, for the same week's delivery for 1986 to 1990, is .978 with an R^2 of .957.

Calculating the USDA 12 City Composite Weighted Average

The USDA has area offices which calculate the composite weighted average price for each of the 12 cities. They contact processors (sellers) in each region and buyers in the 12 cities to confirm sales.

Processors selling to Eastern region cities are typically located in Alabama, the Delmarva Peninsula, Georgia, North Carolina and South Carolina. Processors selling to Central region cities are typically located in Alabama, Arkansas, Florida, Georgia,

Mississippi and Tennessee. Processors selling to Western region cities are typically located in Alabama, Arkansas, Mississippi and Texas.

The Eastern region includes Boston, Cleveland, New York, Philadelphia and Pittsburgh. The Central region includes Chicago, Cincinnati, Detroit and St. Louis. The Western region includes Denver, Los Angeles and San Francisco.

For every city, in each product category, the number of loads sold at each price are multiplied by that price. These are then summed and divided by the total number of loads in the city to obtain the composite weighted average for that location.

The composite weighted average for each region is calculated as follows: the total number of loads in each city is multiplied by the composite weighted average for that city. These numbers, for the cities in each region, are summed. This is divided by the number of loads in the region to obtain the regional composite for each of the three regions.

The region averages are multiplied by a regional population factor (this factor is the percentage of the U.S. population that each region represents). The regional averages are then summed and this price is the USDA 12 City composite weighted average.

This is compared with the 12 City composite weighted average for the previous week, the previous year, and the number of loads for the current week. In the event of a Monday holiday the report is released on Tuesday.

Sample Calculation

<u>Eastern Region</u>		
Boston/New England		54.60 * 15 loads
Cleveland	+	51.17 * 19 loads
New York	+	54.52 * 62 loads
Philadelphia	+	54.17 * 36 loads
Pittsburgh	+	55.22 * 49 loads
	=	9827.37 (181 loads)
Total divided by number of loads		9827.37/181 = 54.29
Multiplied by Eastern region population factor		54.29 * .45 = 24.43
Eastern region contribution		24.43

Central Region		
Chicago		51.18 * 129 loads
Cincinnati	+	54.76 * 43 loads
Detroit	+	51.46 * 70 loads
St. Louis	+	48.84 * 41 loads
	=	14561.54 (283 loads)
Total divided by number of loads		14561.54/283 = 51.45
Multiplied by Central region population factor		51.45 * .25 = 12.86
Central region contribution		12.86
Western Region		
Denver		58.37 * 26 loads
Los Angeles	+	60.59 * 149 loads
San Francisco	+	64.31 * 72 loads
	=	15175.85 (247 loads)
Total divided by number of loads		15175.85/247 = 61.44
Multiplied by Western region population factor		61.44 * .30 = 18.43
Western region contribution		18.43

The region contributions are summed to get the USDA composite weighted average:

Eastern region	24.43
Central region	+ 12.86
Western region	+ 18.43
USDA composite weighted average	= $55.72

Why the USDA 12 City Composite Weighted Average Was Chosen

The cash settlement mechanism should enhance the usefulness of the broiler contract. A final settlement price will be used that represents a national cash market broiler chicken price and the broad geographic and quantity coverage of the index minimizes the

potential for price manipulation for the following reasons:

1. The price series is a composite price of four categories of product. Since it contains a wide variety of products, the price will be more representative of the value of whole carcass broilers. This also reduces the potential for manipulation by allowing more sellers and buyers to participate in the program, increasing the number of loads represented and reducing the impact of each product type.

2. The price series covers a large geographical area. The broad coverage makes the weighted average price reflective of the value of whole carcass broilers for the entire country. And by incorporating price information from 12 cities, the ability to manipulate prices is reduced, and the impact each city has on the price series is smaller.

3. The price series is weighted by regional population. Regional averages are multiplied by a population factor which is a percentage of the U.S. population that each region represents, making the price series more reflective. In addition, the potential for manipulation is reduced because of the additional weighting factor. Markets that are by their nature smaller, and potentially more prone toward price manipulation, are given a smaller weight in the total index.

4. The price series is based on approximately 800 to 1000 loads of broilers each week. The number of loads comprising the composite price represents about ten percent of the weekly U.S. slaughter.

5. The price series is calculated weekly, and the price series is published each Monday for the week's projected deliveries. A weekly price is more reflective and representative of the direction of prices because it allows for the addition of more broiler sales. The inclusion of an adequate number of broiler sales also provides for protection from manipulation.

6. The price series is based on both buyer and seller confirmation. The USDA confirms both sides of trades used in calculating the 12 City Composite Weighted Average making it a representative price for the industry. This is also critical in preventing manipulation because it works to eliminate false price reporting.

7. The price series is published by the USDA. The USDA is generally well respected for its ability to develop price series which are reflective, acceptable to the industry and enjoy widespread use. In addition, the USDA as a government agency, is respected as being unbiased. Careful measures are taken by the USDA to ensure the security of all government numbers, figures and reports and USDA employees are not permitted to use Exchange markets.

SUMMARY AND CONCLUSIONS

Futures and options on broiler chickens began trading at the Chicago Mercantile Exchange on February 7, 1991, almost ten years following the previous attempt by the Exchange to trade broiler chicken futures.

Changes in both the industry and the contract itself led to the decision to launch broiler futures and options contracts. Production and consumption of chicken has increased tremendously and shows little sign of slowing down. And although the industry is highly integrated, there is considerable price risk for both the broiler processor and the broiler buyer such as a fast food chain trying to hold menu prices constant.

Changing the contract from a physical delivery contract to a cash settled contract should enhance the usefulness of this contract to industry participants. This eliminates problems created by the physical delivery process and should also reduce basis variability.

Current marketing tools offer little help in reducing price risk for the broiler industry. Cash and forward contracts are not standardized nor can they be offset. Using other futures contracts such as corn, soybeans or hogs are also unsatisfactory. Futures and options on broilers should provide the industry with better tools to improve their price risk management.

REFERENCES

Broiler Industry. "Survey Results: How Broilers are Marketed," November 1990.

Chicago Mercantile Exchange. Submission of Amendments to the CME Broiler Chickens Contract and Application for Designation as a Contract Market for Options on Broiler Chickens Futures. CME Submission #90-50, June 1990.

Chicago Mercantile Exchange. Submission of Amendments to the CME Feeder Cattle Contract (Cash Settlement). CME Submission #85-8, January 1985.

Cohen, Laurie and Michael Gorham. "The Projected Impact of Cash-Settled Commodity Contracts on Cash/Futures Price Relationships," Proceedings of Applied Commodity Price Analysis, Forecasting and Market Risk Management, NCR-134 Conference, Chicago Il., 1985.

Lasley, Floyd A., Harold B. Jones, Jr., Edward H. Easterling, and Lee A. Christensen. The U.S. Broiler Industry. AER-591, U.S. Dept. Agr., Econ. Res. Serv., November 1988.

U.S. Department of Agriculture, Economic Research Service. Livestock and Poultry Outlook and Situation Report. LPS-28.

Various issues.

U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board. Poultry Production and Value. Various issues.

U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board. Poultry Slaughter. Various issues.

U.S. Department of Commerce, Bureau of Census. Census of Agriculture, 1987.

Weimar, Mark R., and Richard P. Stillman. "Market Trends Driving Broiler Consumption," Livestock and Poultry Outlook and Situation Report, U.S. Dept. Agr., Econ. Res. Serv., November 1990.