Assessment of an Alternative Aggregate Retail Demand Index for Lamb

2018 Update

Prepared for the American Lamb Board

by

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Demand Update for 2018??

The Current Situation

Due to insufficient sample size, the Bureau of Labor Statistics' Consumer Price Index (CPI) for Lamb and Organ Meats has not been reported since August, 2017. The Lamb and Organ Meats CPI is a critical input used in the calculation of the retail demand index for lamb. Due to this reporting lapse, the retail lamb demand index, *in its current form*, cannot be updated to provide a measure of demand for 2018. This analysis examines the use of the Information Resources, Inc., FreshLook Marketing Group (IRI/FL) scanner-based retail lamb data in the construction of an alternative retail demand index for lamb.

Definitions

Demand is defined as a *schedule* of the quantities of a good that consumers are willing to purchase over a range of prices. Demand is a price-quantity relationship. Graphically, demand is often represented as a "demand curve" or a "demand surface".

Per-capita consumption is a measure of per-capita supply *not* demand. Prices will adjust along a given demand surface to whatever level is required to clear per-capita supplies. Unless there is an increase in demand, an increase in per-capita supplies will result in lower prices.

A **demand index** is a simple tool used to measure demand and monitor changes in demand over time. A knowledge and understanding of consumer demand is important because it is the underlying force that supports and sustains the economic viability of the lamb industry. Note, however, that a demand index does not assign causation. That is, the demand index does not provide any information as to *why* demand has changed – increased or decreased.

Background

A retail demand index for lamb was developed for the American Lamb Board (ALB) in 2006, with updates provided in 2015, 2017, and 2018 (Shiflett, *et. al*., 2006, Shiflett and Marsh, 2015, Marsh and Shiflett, 2017, 2018). The index was built based on the methodology described by Purcell (1998) for the now familiar beef demand index and subsequent pork demand index.[1] The methodology involves first selecting a base or reference year, and then estimating an inflation-adjusted demand constant price, or price that would have been expected in the marketplace if demand remained constant at the base year level and the only thing changing was per-capita supply. The expected demand constant price is then compared to, or indexed relative to, the inflation-adjusted price that was actually observed in the marketplace.

Meat industry data used to construct this particular type of demand index are obtained from U.S. Department of Agriculture Economic Research Service (ERS) total disappearance estimates, and U.S. Bureau of Labor Statistics (BLS) price information and inflation estimates. The retail lamb price information collected by the BLS is reported monthly in the form of two separate CPIs – the Lamb and Organ Meats CPI and the Lamb and Mutton CPI. The Lamb and Organ Meats series was introduced December 1977 and the Lamb and Mutton series, December 1997. The Lamb and Organ Meats CPI

[1] The beef and pork demand indices are available on the KSU AgManager website at: http://www.agmanager.info/livestock-meat/meat-demand.

represents the longest-standing and most complete source of historical retail lamb price information available and was selected for building the retail lamb demand index primarily due to its public availability (no user fee), its ability to provide an historical overview of consumer demand for lamb, and because it facilitates comparative analysis of the long-run trends and changes in consumer demand for lamb, beef, and pork. There are, however, a number of inherent weaknesses associated with the ERS and BLS data series as applied to this form retail meat demand index. Among these are:

1) ERS per-capita retail consumption (PCC) data does not map well with BLS retail price data. The ERS PCC data are derived from "total disappearance" estimates that do not differentiate between "food at home" (FAH) and "food away from home" (FAFH) purchases – i.e., between grocery and food service sales. BLS retail price data, on-the-other-hand, represent grocery purchases only.

2) The BLS price data use a simple average of in-store product-labeled retail prices rather than actual volume-adjusted transaction prices.

3) The BLS data do not represent a consistent sampling source or a consistent sample cohort. BLS prices are derived from a random sample of retail outlets, with different outlets rotating in-and-out every six months. In addition, the specific cuts or mix of cuts tracked by the BLS can vary month-to-month.[2]

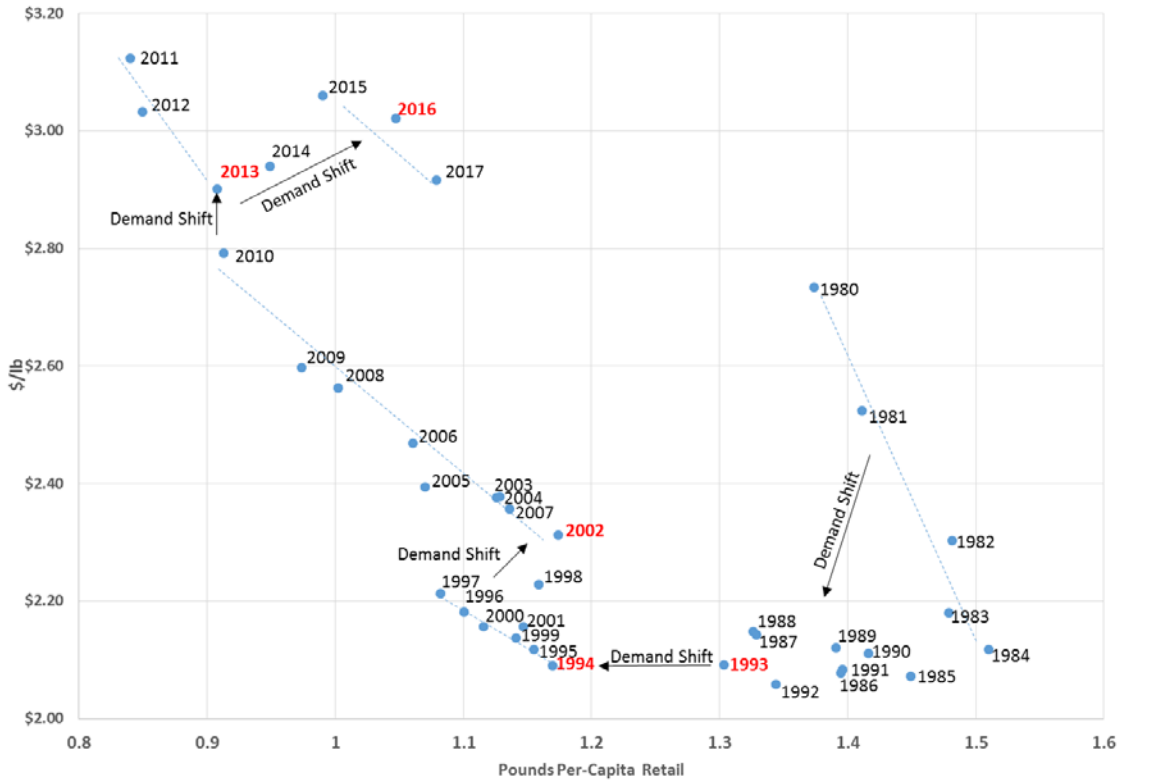
Another obvious data weakness unique to the lamb index, is the unlikely combination of disparate meat products that make up the BLS Lamb and Organ Meats CPI. Note that the 'organ meats' component of the CPI includes not only lamb organ meats, but organ meats of any kind from multiple species – lamb, beef, pork, and veal. Also unique to the BLS lamb retail data is that prices are not reported directly, but must be inferred from the CPI. In addition, neither the ERS nor the BLS series differentiate between domestic and imported lamb.

Figure 1 is a scatter diagram of inferred inflation-adjusted BLS retail lamb prices and ERS PCC for the years 1980-2017. The scatter plot provides a retrospective impression of consumer demand over that extended period. Note, however, that the dashed "demand surfaces" indicated are approximations only, included only as a means to highlight those periods when more generalized shifts in demand were likely. A demand shift is not simply a change in per-capita consumption (a.k.a. per-capita supply). When demand changes, the entire demand curve shifts, indicating that 1) consumers are willing to pay a higher/lower price for the same quantity of lamb, or, 2) consumers are willing to purchase more/less lamb at the prevailing price, or, 3) consumers are willing to purchase more/less lamb at a higher/lower price.

For example, PCC was at about the same level in both 1994 and 2002, approximately 1.17 pounds per-capita. However, the inflation-adjusted price in 1994 was $2.09/lb. compared to $2.31/lb. in 2002. Demand clearly increased between 1994 and 2002, as consumers purchased about the same amount of lamb in 2002 as they had in 1994, but at a higher inflation-adjusted price. On-the-other-hand, demand clearly decreased between 1993 and 1994. In both 1993 and 1994, the inflation-adjusted price per pound held constant at $2.09. However, PCC decreased by about 10 percent, from approximately 1.30 pounds per-capita in 1993, to 1.17 pounds per-capita in 1994. If demand had remained constant between 1993 and 1994, a decrease in PCC (per-capita supply) would have been accompanied by an increase in the inflation-adjusted price per pound. Finally, between the 2013 and 2016, *both* PCC and price per pound increased, a solid indication that demand had also increased.

[2] Personal communication. BLS February, 2019 and June, 2014.

Figure 1. Inflation-Adjusted Retail Lamb Prices (82-84=100) and Pounds Per-Capita Retail Consumption



Although the scatter diagram may give the impression that demand remains relatively static during certain periods, in the marketplace, demand is constantly changing and adjusting to a variety of influences including consumers' tastes and preferences, consumers' incomes, the prices of substitutes, advertising, health concerns, etc. The demand index helps sort and summarize these changes in the simplified form of an index value.

Demand Index Interpretation

When interpreting a demand index, it is important to keep in mind the influence of the base year. Figures 2a-c show the BLS/ERS-based retail lamb demand index using three different base years, 1980, 1990, and 2002 (the year the ALB first began its operations)[3]. Figure 2a indicates that if demand had remained constant at the 1980 level, inflation-adjusted retail lamb prices would have been 20 percent higher in 1990, 29 percent higher in 2002, and 17 percent higher in 2017 than those actually observed in the marketplace. Figure 2b indicates that if demand had remained constant at the 1990 level, inflation-adjusted retail lamb prices would have been 11 percent higher in 2002, and 5 percent *lower* in 2017 than those actually observed in the marketplace – meaning that demand decreased in 2002, but increased in 2017, relative to 1990. Figure 2c indicates that if demand had remained constant at the 2002 level, inflation-adjusted retail lamb prices would have been 14 percent lower in 2017 than those actually observed in the marketplace – again showing an increase in demand in 2017 relative to 2002.

[3] Note that the shading in Figures 2a-c is for the purpose of highlighting the three different base year periods, and does *not* indicate shifts in demand.

Figure 2a. Annual Retail Lamb Demand Index
(1980 = 100)

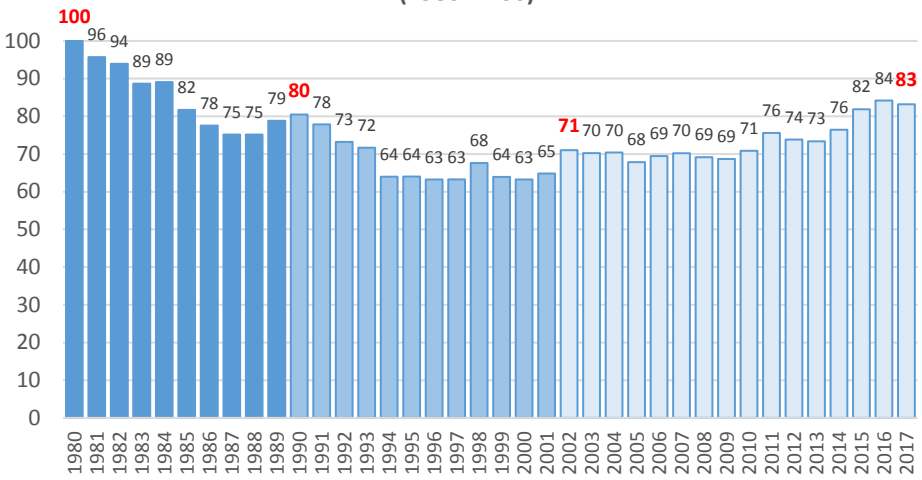


Figure 2b. Annual Retail Lamb Demand Index
(1990 = 100)

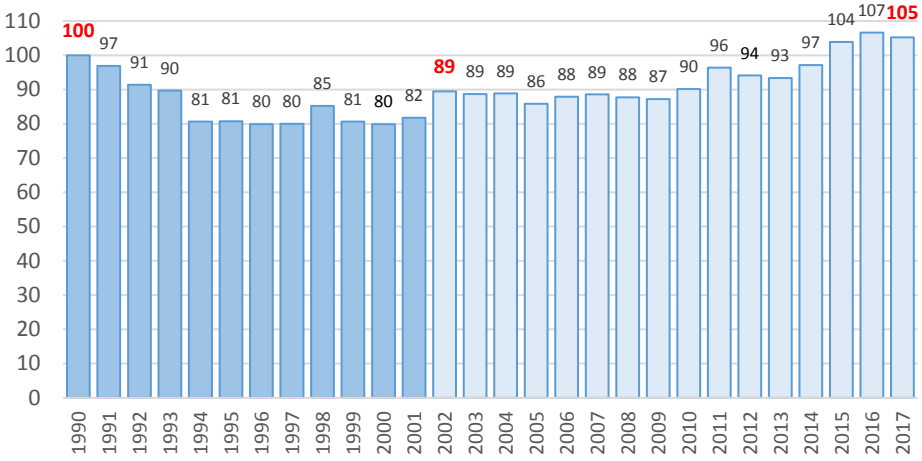
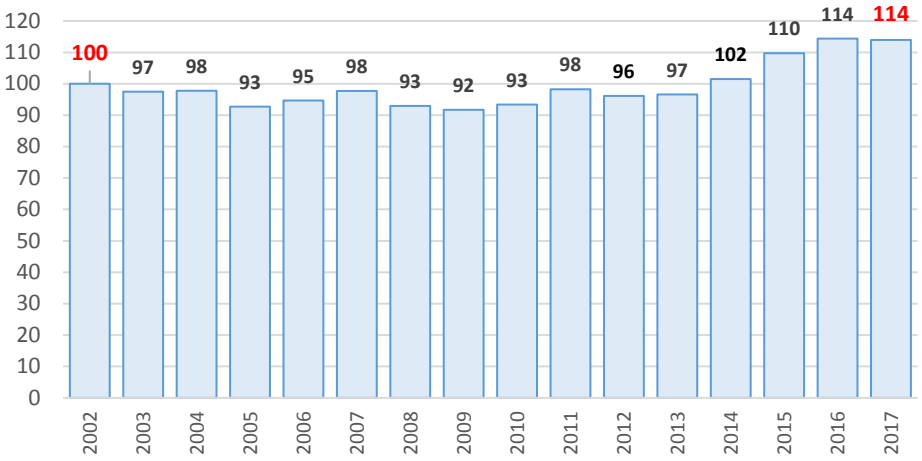


Figure 2c. Annual Retail Lamb Demand Index
(2002 = 100)



Taken together, Figure 1 and Figures 2a-c provide strong evidence of an increase in the retail demand for lamb over the 2015 to 2017 period. The obvious question left unanswered is, however,

What happened to demand during 2018?

An Alternative Approach

An alternative approach to the question of demand in 2018, is to build and alternative demand index using a different data source. The IRI/FL retail scanner data provide such an opportunity.

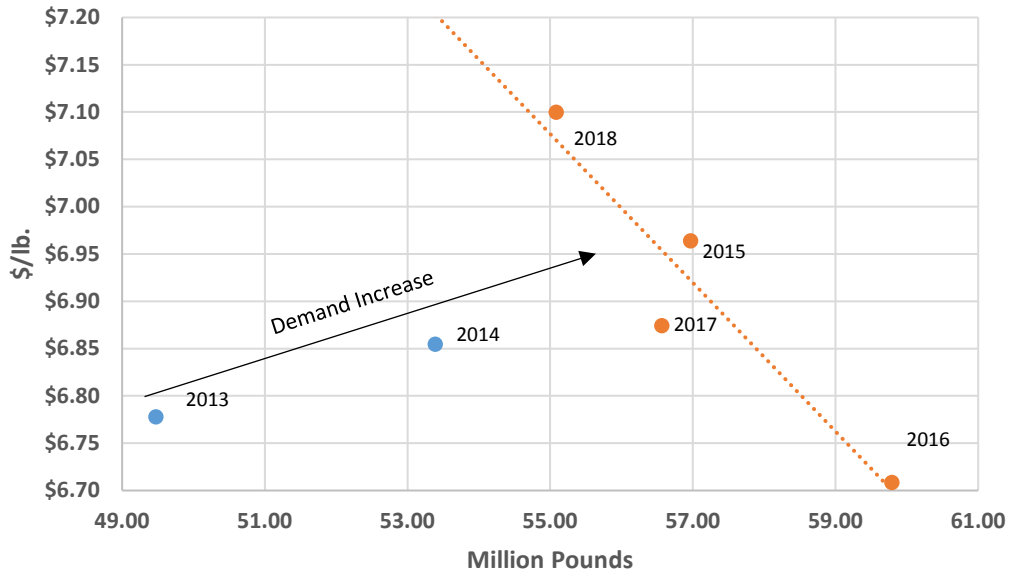
The use of retail scanner data presents both advantages and disadvantages relative to use of the ERS and BLS data for demand index application. The most obvious advantage is that the scanner data provides actual paired price-quantity transactions that allow for the direct mapping of price and quantity information. Other advantages include, 1) the data are volume-weighted and implicitly reflect discount and feature activity, 2) the data can be subdivided by whole muscle "primal" (leg, loin, rib and shoulder), which would allow separate indices to be built for each primal classification, and 3) the data can be sorted regionally, which would allow regional differences in demand to be examined. The foremost disadvantages of the use of scanner data are, 1) the cost of the data, 2) the individual data sets or "pulls" cannot be merged, which in effect limits the scope of a demand index built using the IRI/FL data to 5 to 6 year periods,[4] and 3) the current IRI/FL data set, like the ERS and BLS data sets, does not differentiate between domestic and imported lamb.

A "grocery store" level retail demand index for lamb was built using IRI/FL scanner data for the six-year period, 2013-2018.[5] Figure 3 is a scatter diagram of that data. The data are weighted-average inflation-adjusted retail prices (2013 = 100) in dollars per pound and million pounds purchased annually. The data are national totals aggregated across the eight IRI standard regions - California, West, Plains, South Central, Great Lakes, Northeast, Mid-South, and Southeast. The data are aggregated across the seven retail lamb classifications reported by IRI/FL - leg, loin, rib, shoulder, ground, miscellaneous, and variety. The data are aggregated across country of origin – U.S., Australia, and New Zealand.

[4] Every five to six years, IRI/FL issues "restatements" of the retailers included in their sampling. This assures that a consistent set of retail firms are represented, as new retailers are not added until a full restatement occurs. However, if a retailer included in a particular sampling period opens or closes individual stores during that period, those changes are reflected on an on-going [weekly] basis in the sales reported. (Communication with IRI/FL, March, 2019.)

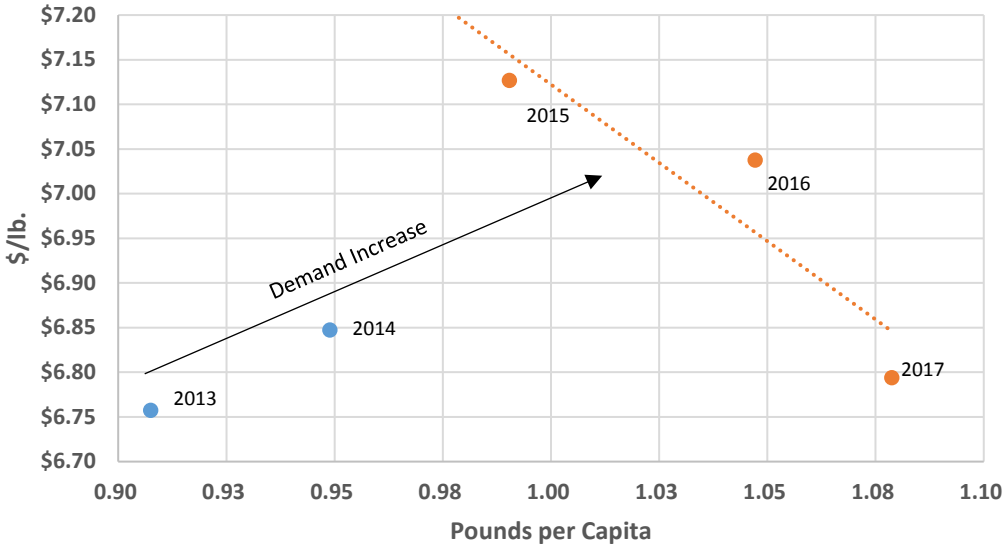
[5] The IRI/FL data used in this study were made available with the generous help and support of the American Lamb Board.

Figure 3. IRI/FL Inflation-Adjusted Lamb Prices (2013 = 100) and Retail Sales Volume (2013 - 2018)



For comparison, Figure 4 shows the inferred BLS inflation-adjusted retail lamb price and ERS PCC for the years 2013–2017.

Figure 4. BLS Inflation-Adjusted Lamb Prices (2013 = 100) and Retail Per Capita Consumption (2013 - 2017)



Note that both the IRI/FL and the BLS/ERS data evidence an increase in demand. Both figures show that both the inflation-adjusted price and the quantity measure were greater in 2014 than in 2013. Both price and quantity were also greater in 2015, 2017, and 2018 relative to 2014 in Figure 3 (IRI/FL data), and in 2015 and 2017 relative to 2014 in Figure 4 (BLS/ERS data). The ordering of the price-quantity relationships for the years 2015-2017, does however, differ between data sets. This difference could reflect such factors as the effect of the ERS per-capita adjustment, the inclusion of FAFH purchases in

the ERS data, the IRI/FL retail outlet cohort from which data were collected, cold storage management of supply, etc.

To provide some additional perspective, Figure 5 shows the IRI/FL sales volume as a percent of total retail disappearance for the years 2013-2018. Figure 6 compares quantity-weighted IRI/FL retail lamb prices to the simple average inferred BLS retail prices. Unlike comparative retail beef prices, where both the BLS Choice Beef and BLS All-Fresh Beef simple average retail prices were consistently higher than IRI/FL quantity-weighted retail beef prices over the period January 2011 - November 2016 (Tonsor and Schroeder, 2017), no consistent relative pattern emerged from the IRI/FL versus BLS retail lamb data considered here (January 2013 – December 2018).

Figure 5. IRI/FL Sales Volume as a Percent of Total Retail Disappearance

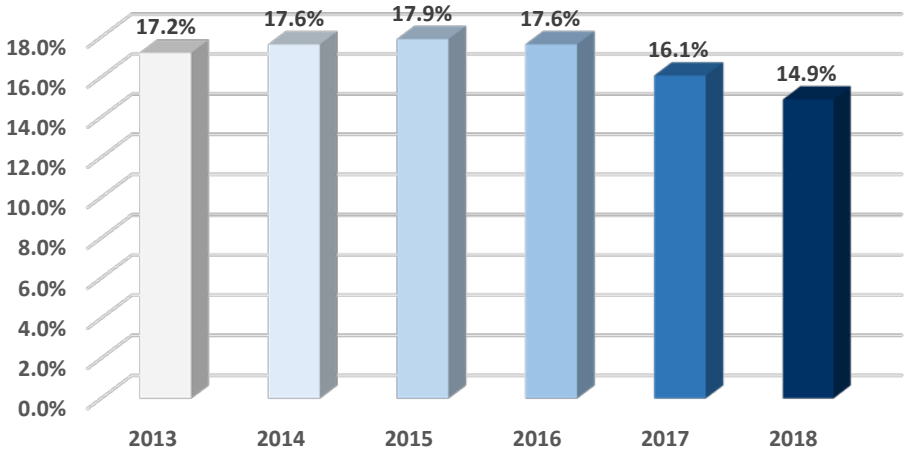
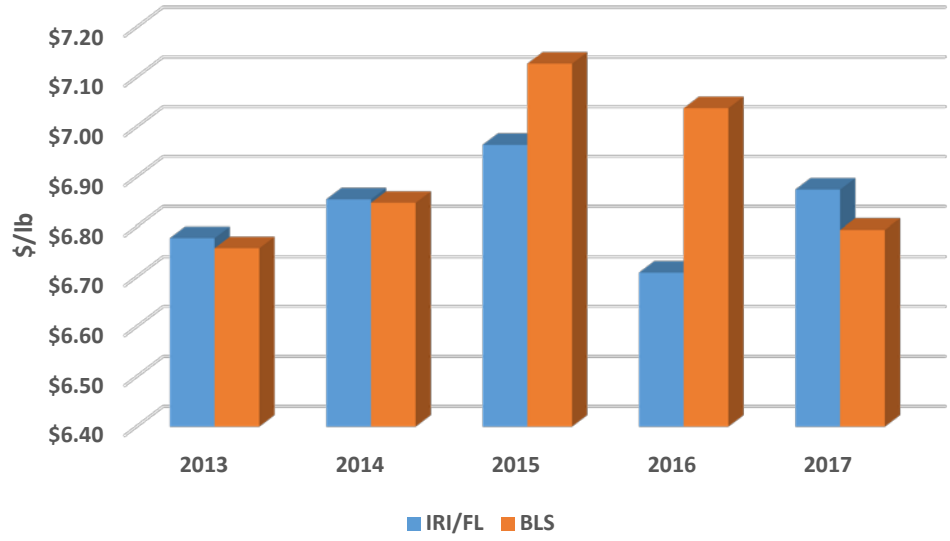


Figure 6. Relative IRI/FL and BLS Inflation-Adjusted Retail Lamb Prices (2013=100)



An Alternative Retail Demand Index

The demand index algorithm requires an estimate of price elasticity – or more precisely, an estimate of price flexibility. The own-price elasticity of demand is a measure of how sensitive the quantity demanded is to changes in price. Price flexibility, on-the-other-hand, is a measure of how responsive price is to changes in volume and can be calculated simply as the inverse of the elasticity of demand. Several studies have found that own-price elasticity estimates derived from scanner-based quantity-weighted price data are generally more elastic than estimates derived from the simple average BLS data (Lensing and Purcell, 2006, Taylor and Tonsor, 2013, Tonsor and Schroeder, 2017, Shiflett and Marsh 2015). Consistent with this observation, an elasticity estimate of -1.65 was used in the development of an annual aggregate IRI/FL-based retail demand index for lamb. The estimate was drawn from analyses conducted in association with two earlier ALB studies (Shiflett and Marsh, 2015 and Marsh and Shiflett, 2017).

The retail lamb demand index developed using IRI/FL data for the period 2013-2018 is shown in Figure 7. The index shows an increase in retail demand over the period. The index indicates that in 2018, retail lamb prices were 12.5 percent higher than they would have been if demand had not increased relative to 2013.

Figure 7. IRI/FL Retail Grocery Demand Index for Lamb (2013=100, *e* = -1.65)

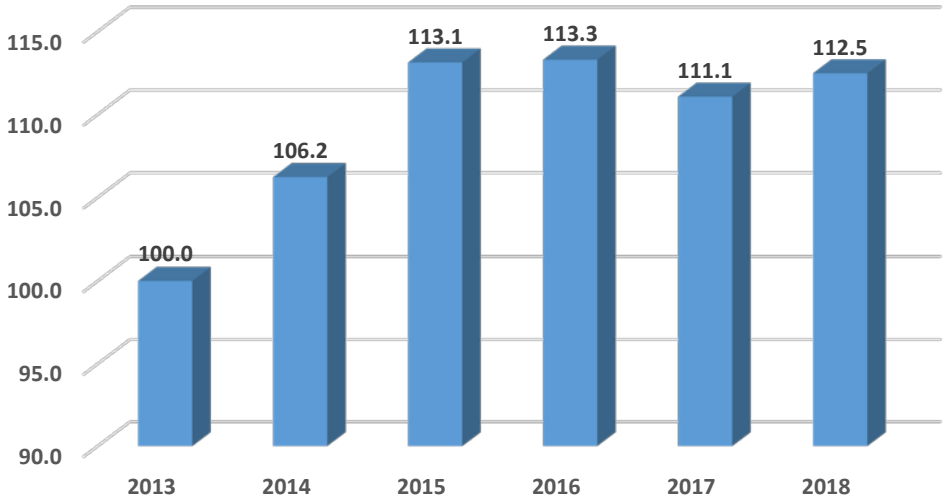
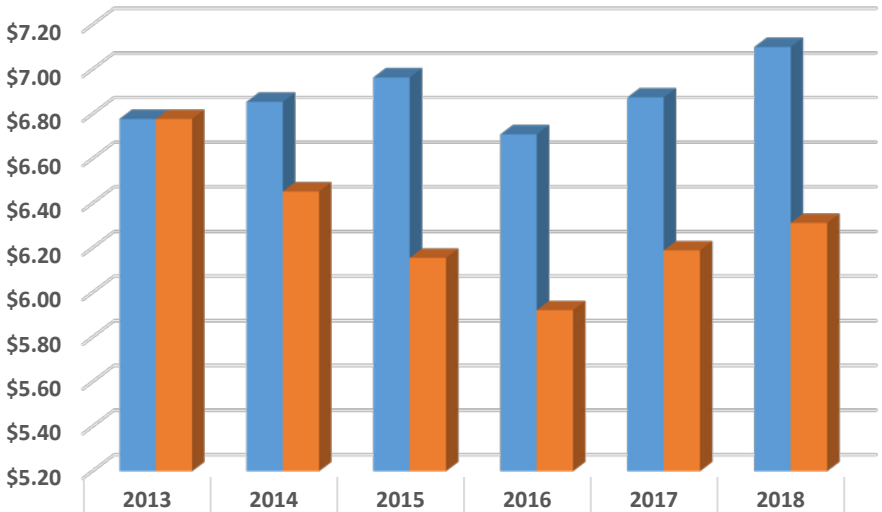


Figure 8 shows the IRI/FL inflation-adjusted demand constant prices for 2013-2018. Given the actual annual sales volume observed, these are the prices that would have been expected if demand in 2014-2018 had remained constant at the 2013 level. Had demand in 2018 been at the same level as demand in 2013, the expected inflation-adjusted retail price would have been $6.31 per pound compared to the actual inflation-adjusted price of $7.10 per pound. In nominal terms, this translates to $6.80 per pound expected, and $7.65 per pound observed (Figure 9).

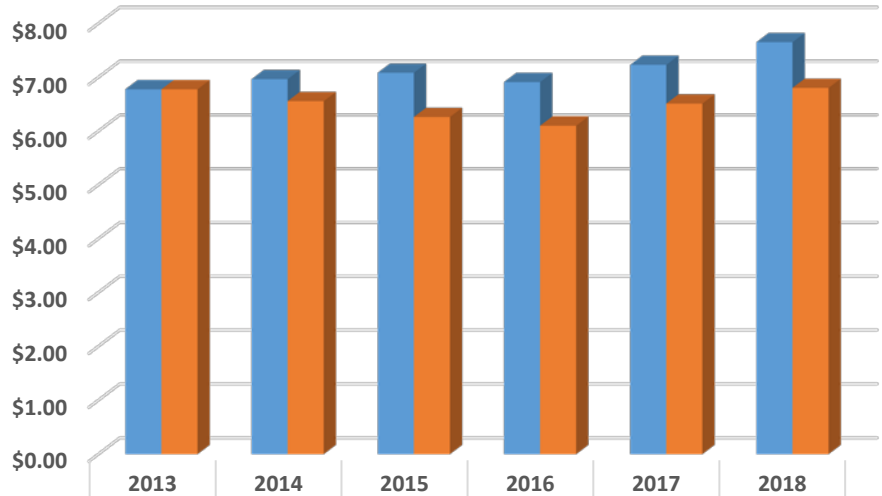
Good news for the lamb industry!

Figure 8. Actual & Expected Inflation-Adjusted Lamb Prices
(2013=100, *e* = -1.65)



	2013	2014	2015	2016	2017	2018
Act real	$6.78	$6.85	$6.96	$6.71	$6.87	$7.10
Exp real	$6.78	$6.45	$6.16	$5.92	$6.19	$6.31

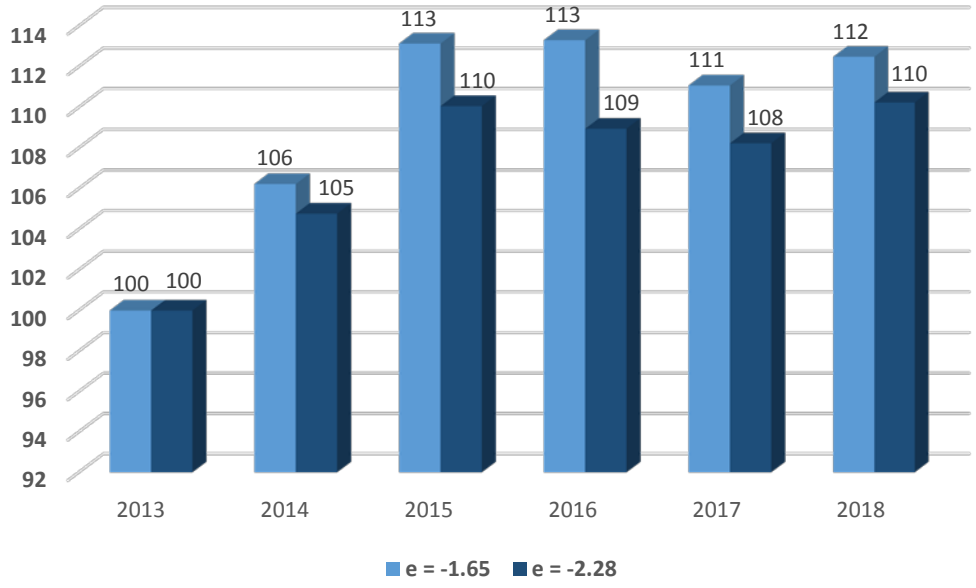
Figure 9. Actual & Expected Nominal Lamb Prices
(2013=100, *e* = - 1.65)



	2013	2014	2015	2016	2017	2018
Act nom	$6.78	$6.97	$7.09	$6.91	$7.23	$7.65
Exp nom	$6.78	$6.56	$6.26	$6.10	$6.51	$6.80

Like demand, elasticity is not static. A cursory comparative analysis of various IRI/FL data sets used in earlier ALB studies, and the most recent 2013-2018 data set used in this study, suggests that own-price elasticity of demand for lamb has become more elastic over time (i.e., that lamb consumers have become more price-sensitive). Figure 10 demonstrates the influence that the elasticity assumption has on the demand index. Note that, in general, the index is fairly robust to changes in the elasticity assumption. The overall pattern of increasing and decreasing demand remains generally consistent, whereas the relative index levels vary slightly with the choice of the elasticity measure. Here, the more elastic measure resulted in sligtly more conservative estimates of change.

Figure 10. Sensitivity of Demand Index to Assumed Own-Price Elasticity (2013=100)



Overall, the message remains the same:

The Retail Demand for Lamb has Increased!

Recommendations

- The IRI/FL Retail Lamb Demand Index should be maintained and updated annually. If/when the BLS resumes publication of the Lamb and Organ Meats CPI, the IRI/FL index should continue to be maintained in addition to, rather than as an alternative for, the BLS/ERS-based index. The IRI/FL index focuses specifically on the retail grocery sector and may provide additional insight, particularly in years when the two indices diverge.

- Quarterly demand indices should be developed and evaluated for usefulness to the lamb industry.

- The IRI/FL data includes seven individual classifications of retail lamb data. Individual indices for each of the four primal classifications (leg, loin, rib, and shoulder), as well as for the ground lamb classification, should be developed and evaluated.

- The IRI/FL data is also reported with regional breakouts that include eight standard regions. Regional indices should be developed and evaluated.

- The development of individual demand indices by country of origin should be strongly considered. A 2017 study prepared for the ALB found that over the study period, (January 9, 2011 – April 17, 2016), U.S. lamb accounted for about 34 percent of the IRI/FL retail grocery sample, Australian lamb for about 54 percent, and New Zealand lamb for about 12 percent. The same study indicated that, for the major retail cut categories, U.S. lamb tended to be priced higher than Australian and New Zealand lamb, and that across cuts and countries of origin, demand for Australian lamb was the most elastic, followed by U.S. lamb, then New Zealand lamb.

- The correlation between retail lamb prices, wholesale prices (domestic and imported), and slaughter lamb prices should be examined and evaluated for both demand signaling and for farmer's share analyses. At a 2018 Committee Leadership Summit held in Denver, CO, Glynn Tonsor, of KSU, cited recent findings that a one percent increase in domestic demand for beef equals a 2.30 percent increase in live cattle prices and a 3.50 percent increase feeder cattle prices (McKendree et al., 2018 as cited by Tonsor, 2018). In addition, Tonsor and Schroeder found that over the period January 2011-November 2016, the IRI/FL price series is more highly correlated with both the 5-market fed cattle price (0.74) and the Choice boxed beef cutout value (0.87) than either the Choice or All-Fresh BLS price series (Tonsor and Schroeder, 2017). Similar analyses may provide valuable insight for the lamb industry.

- Elasticity measures for application to longer-term simple average price demand indices (i.e., the BLS/ERS-based index) and shorter-term weighted average price indices (i.e., annual and quarterly IRI/FL-based indices) should be evaluated more thoroughly, with special attention paid to those periods when general shifts in demand are occurring and may be accompanied by changes in the elasticity of demand (i.e., consumers' sensitivity to changes in price).

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