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USDA ERS Meat Price Spread Data Product Review

Contractor and Cooperator Report

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Abstract

The meat price spread data published by the Economic Research Service is an important product monitoring vertical market price relationships. The price spread data are used by a wide array of market observers spanning policy makers, market analysts, and academic researchers. This study proposes modifications to the beef and pork price spread data to modernize the prices utilized to better reflect current industry trade practices. Assessment of using retail scanner as an alternative to Bureau of Labor Statistics retail price data is suggested. We also recommend periodic review of the spread data procedures be conducted as changes in livestock and meat markets occur.

The views expressed are those of the authors and should not be attributed to the Economic Research Service or USDA.

USDA ERS Meat Price Spread Data Product Review

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BACKGROUND

One of the most widely used data products published by the Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA) is the farm-wholesale-retail meat price spread series. Price spread data for beef and pork are published on the web dating back to 1970 and broilers back to 1980 (ERS, USDA 2018); though the history of the beef and pork spread calculations date back to at least 1949 as directed and authorized in *The Research and Marketing Act of 1946*.

Over the years, the meat price spread data have undergone a variety of modifications because of changes in the marketplaces the series attempts to reflect. For example, beef and pork price spread calculation procedures were modified in 1969 to better reflect retail product price specials (Duewer 1969). Prior to 1980, ERS collected primary retail price data directly from cooperating retailers for constructing spreads, but this was revised to using published Bureau of Labor Statistics (BLS) retail price data since 1980 (Hahn 2004). Major changes were also made in 1990 to several components of beef price spread reporting data sources (White et al. 1991). Such changes often provide revised data that goes back in time several years if feasible to enable data users to compare the revised series to the old series (e.g., Marsh 1992). This is a valuable strategy since this data product is often used for time series trend or change analysis.

Procedures for constructing the meat price spread data products have been relatively unchanged since 2000. In contrast, marked changes have occurred in livestock and meat markets over the last two decades, motivating this project to review procedures used in the price spread data product calculations. The purpose of this cooperative agreement was to review the methods, procedures, source data, and presentation of the ERS Meat Price Spreads data product.

Objectives

The review team's task in evaluating the price spread data product was to:

1. Provide perceptions of the usefulness of the data product.
2. Discuss alternative methods that might be used in developing estimates for the product.
3. Provide insights on alternative data sources that might be of use in developing estimates.
4. Discuss presentation of the data product.

MEAT PRICE SPREAD DATA PRODUCT PURPOSE AND IMPORTANCE

The first step in launching a review of the meat price spread data compiled by ERS is to understand the purpose of what the data are intended to measure and illustrate. Hahn (2004) discusses in detail how the meat price spread data are calculated. The goal of beef and pork margin products are to reflect price differences at major market segments for the industries at farm, wholesale, and retail grocery levels of the supply chain. The wholesale-to-retail spread is the difference between the wholesale price and the retail price. The farm-to-wholesale spread is the difference between the wholesale price and the net farm price (net farm price is the gross farm price minus the value of byproducts per unit). The total spread is the sum of the farm-wholesale and wholesale-retail spreads, which can also be calculated by subtracting the net farm price from the retail price.

Compiling such data requires obtaining reliable and representative estimates of market prices for livestock, wholesale meat, and retail meat products. Primary price data collected by USDA's Agricultural Marketing Service (AMS) for farm and wholesale and by BLS for retail products are currently used to compile the price spread calculations. The general purpose of the meat price spread data product is to provide market information across the three major vertical sectors to interested users. Uses of the price spread data are described next to illustrate the breadth of value the data provide.

Importance

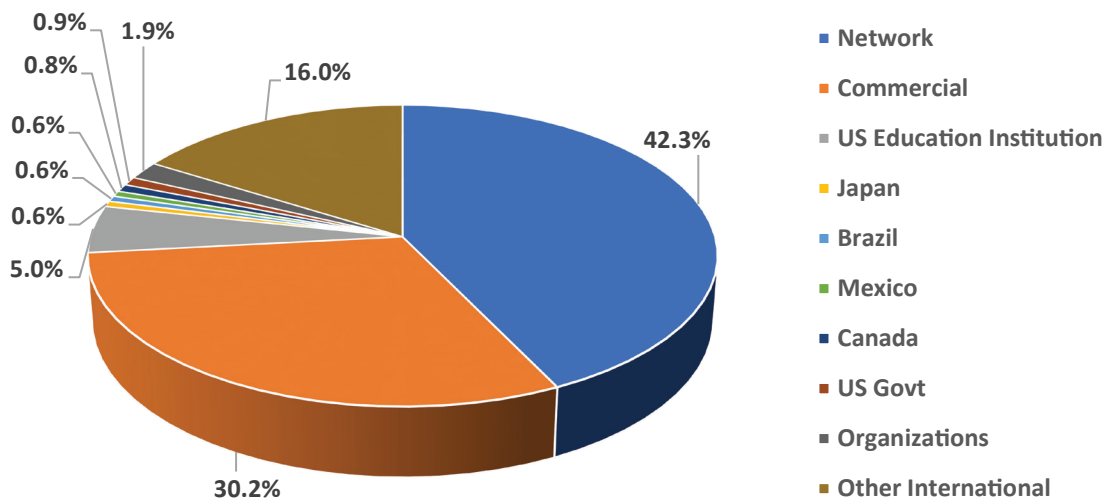
The ERS meat price spread data are used for informing producers, retailers, food service, consumers, analysts, consultants, investors, academe, government agencies, market regulators, and policy makers about livestock and meat vertical market price relationships. We identified several examples of uses of ERS meat price spread data:

1. Policy briefings – meat price spread data are frequently cited in agricultural policy briefings summarizing the state of livestock and meat industry market price relationships (e.g., Schnepf 2013).
2. Market regulatory review – meat price spread data are used to review market activity by regulators to help assess market performance and describe the market environment (e.g., Grain Inspection Packers and Stockyards Administration, USDA 1996; United States Government Accountability Office 2018).
3. Market outlook information – market outlook often refers to price spread information to help understand and explain past and prospective livestock and meat market conditions (e.g., Meyer 2009; Meyer 2010; Riley 2015; Pouliot and Schulz 2016; *Western Livestock Journal* 2018).
4. Published research – a host of academic researchers, research organizations, and governmental agencies use meat price spread data in testing various hypotheses or illustrating specific market trends (Bessler and Akleman 1998; Brester, Marsh, and Atwood 2009; Hahn 2004; Hahn 1990; Hall, Schmitz, and Cothorn 1979; Marsh and Brester 2004; Mathews et al. 1999; Marsh 1992; Rojas, Andino, and Purcell 2008; RTI 2007; Ward 1988).

- Corporate earnings reports – meat industry production, processing, retailing, and food service companies often reference meat margin or price spread data in earnings summary reports (e.g., McCormick & Schmick’s Seafood Restaurants, Inc. 2009; Singh 2017; TB&P 2013).

The web page containing the price spread information (ERS, USDA 2018) is the second most visited data page of the Market and Trade Division of ERS with more than 100,000 visits over the 2016-17 fiscal year. The distribution of types of users of the web site containing the spread data over the 2014-17 are summarized in Figure 1. The most common web visitor is *Network* domains mostly from the U.S. representing 42% of web visits. *Commercial* web visits are next at 30% and US *Educational Institutions* represent 5% of the data site visits.

Figure 1. Meat Price Spread Data Web Page Visitors by Domain, 2014-17



Source: Unpublished data provided to authors by ERS, USDA

The wide array of users of meat price spread data reveal its importance as an indicator of changes in livestock and meat markets over time. Likewise, the myriad of uses of the price spread data demonstrates its importance and value to industry, government, and academe. In light of widespread use of the price spread information, it is imperative that the information be accurate and representative of what it is intended to measure.

The sheer number of uses and users also makes defining the specific intended use of the product and its purpose ever more important. For example, if the intended use of the price spread data is to demonstrate how farm producers are faring relative to wholesalers or retailers, the current data product is not well suited for that. However, it has at times been used for that purpose (e.g., Taylor 2002). High and increasing price spreads often lead to controversy as producers tend to blame low livestock prices on high price spreads, and consumers blame high retail prices on high price spreads. Increasing price spreads can both inflate retail prices and deflate farm prices (Pouliot and Schulz 2016). Brester, Marsh, and Atwood (2009) discuss other misuses of the price spread data.

Price spreads are also referred to as “marketing margins,” and are defined as “... the costs of performing marketing functions required to get live animals from the producer to the consumer” (Ikerd and Ward, 1983). This definition is intuitive since it recognizes that cost must be incurred, and reflected in the final product price, in transforming live animals into consumable products. If the intended use of the price spread data is to demonstrate how marketing costs between farm, wholesale, and retail markets are changing over time, the current data product is at best a rough indicator of that. As we discuss later, the prices in current spread calculations are not representative of the prices farmers sell livestock for or retailers receive for meat they sell.

Occasionally, “gross margin” is mistakenly substituted for price spread. The two are different. A gross margin is the difference between dollars paid and dollars received by a participant in the marketing system. For example, a rough calculation of a gross margin for a meat packer is meat revenue plus by-product value minus livestock cost. Because the gross margin only applies for one specific stage in marketing, e.g., meat packing, it does not include other costs, such as transportation, that are included in the price spread. The price spread essentially lumps together costs for several segments, while gross margins apply only to costs for specific segments (Ross 1984).

Determining the farm-to-retail spread is cumbersome because a representative “market basket” of meat products at retail must be first developed. The price spread data is calculated based on composite meat products with definitions remaining constant throughout the series. This means that although grocery stores are selling increasing quantities of boneless and value-added meat products, the definitions of the meat products used in the price spread data calculations remain constant over time. In addition, the definitions of the composite products remain constant within the supply chains so that farm and wholesale prices are all reported given the composition of products sold at retail. Because price spread calculations are made using constant definitions, the data serve as a barometer of marketing margins for an industry and are not intended to represent any one production system or particular supply chain within an industry.

Furthermore, it is widely recognized retailers tend to have sticky prices relative to wholesale and farm level suggesting spread data at any point in time are unlikely to reflect contemporaneous marketing costs. Likewise, meat packer and livestock producer margins fluctuate over time as market leverage ebbs and flows meaning price spreads between wholesale and farm levels are not precise reflections of marketing costs at any point in time. Over a long-run horizon, price spread data should, if accurately codified, reflect marketing costs plus economic profits. However, because of rigidities and lags present, at any point in time, the spreads are not useful for monitoring short- or likely even intermediate-run marketing cost changes.

There is little, beyond cautionary disclaimers and complete transparency in procedures, ERS can do to curtail misunderstanding or misuses of price spread data. Our assumption in preparing this report is that the intended purpose of the price spread series is to provide a consistently calculated set of broad market valuations at the farm, wholesale, and retail levels that approximately portray how aggregate prices across these levels are changing relative to each other. The data are of use to industry participants to monitor and anticipate change in the industry. They are not measures of economic well-being for any industry segment.

RECOMMENDATIONS FOR CREATING A NEW MEAT PRICE SPREAD DATA PRODUCT

Given the importance of meat price spread data outlined previously, here we describe the nature and components of an effective meat price spread data product. We describe how an effective spread data product could be built using existing public and private data with a focus on being pragmatic. We start from scratch without trying to tweak the existing price spread data products, by formulating how we would calculate such a data product if we launched it today. Our purpose here is not to calculate the new product, but to describe how we would do it with associated justification.

If we were launching a new farm-to-retail price spread product we would:

1. Clarify the explicit objective and goals of the product.
2. Have a process in place that accurately aligned with contemporary industry practices and transactions to ensure prices or values used at each market level were as representative as feasible of the composite of market values of the products at each stage.
3. Leverage available data and information best spanning the diverse set of items produced in the U.S. meat industry.
4. Have a formal review process in place to sustain the effort.

Relative to what we perceive as the intended purpose of the spread data, we identify and discuss in this report, ways we believe the price spread data could be made most representative. We especially discuss this representativeness relative to what livestock producers actually get paid and what retailers actually receive for retail meat.

The goals of any project can change over time. As we understand it, the current ERS effort has a goal of reflecting the value of an animal at various points in the marketing chain in response to *The Research and Marketing Act of 1946* directive for USDA to determine the costs of marketing agricultural products. Presuming this goal persists, changes in the way livestock are valued and marketed at the farm level, changes in wholesale value adding, and growth in share of livestock yielding products ultimately moving through food service and export channels rather than domestic, retail channels are essential to consider in election of what market values to use at each stage of the marketing chain. Given the number and intensity of these industry changes since *The Research and Marketing Act of 1946* a reasonable question is if this goal remains valid? Answering that question is beyond the scope of this report.

Here we lay out examples for developing spread data products that we believe would be both more straight forward and representative of current industry livestock and meat valuation than existing approaches. Consider for example, beef (Table 1) and pork (Table 2) price spread data by market level:

Farm Level

- Live FOB feedlot pricing of fed cattle has largely been replaced by formula priced cattle. Live FOB plus delivered dressed negotiated pricing represents only approximately 20% of fed cattle marketings, whereas formula carcass trade represents almost 60% of the trade. We recommend using the all steers and heifers (beef type cattle) Total all Grades dressed price reported in the National Week Fed Cattle Comprehensive report by AMS. This price combines negotiated, formula, contract, and negotiated grid for cattle sold on a dressed basis which represents about two-thirds of overall fed cattle purchases. The remaining one-third are live-based prices and as such would need to be converted to a carcass basis if included with the comprehensive carcass base prices, which is probably not necessary since live pricing is declining in relative importance over time and estimating dressing percentage could induce unnecessary error. The comprehensive price overall represents the most accurate overall net price packers pay producers for cattle.
- Hogs are almost all priced on a carcass or dressed basis. Thus, similar to fed cattle we recommend using the National Daily Direct Hog Prior Day Report – Slaughtered Swine (LM_HG201) producer sold total (sum of Negotiated; Other Market Formula; Swine or Pork Market Formula; Other Purchase Agreements; and Negotiated Formula) weighted average net carcass-based price for the farm level hog price.

Wholesale Level

- The most comprehensive wholesale boxed beef price series to use would be the comprehensive boxed beef price reported in the LM_XB463 report. The price data compiled in this report reflect all quality grades, negotiated and formula trade, and domestic and export sales and, as such, is the most comprehensive wholesale beef value report available.
- Wholesale pork is a bit different than wholesale beef, we recommend using the weekly pork carcass cutout price reported in the National Weekly Pork Report FOB Plant – Negotiated Sales (LM_PK610). Formula sales are also an important component of wholesale pork sales but to use the current weekly USDA report for formula pork prices (LM_PK620) one would have to construct the carcass equivalent price from a set of individual product prices which would rapidly increase the complexity and problems with periodic missing data to the point we expect it would be prohibitive. Export pork wholesale sales are reported in yet another weekly pork report (LM_PK640) but again no overall carcass price is quoted by AMS and constructing one would be cumbersome at best.

Retail Level

- At the retail level the complexity certainly increases because of the number of different products involved and alternative market outlets. Ideally the retail level would include grocery store, food service, internet on-line shopping, and export sales to more completely capture the “end user” value of meat products.
 - Food service data are not available and cannot be feasibly estimated given information currently available publically, so eliminating this important outlet is unavoidable.
 - For internet on-line shopping, some type of internet data scraping and collection could be considered and is worth continuing to revisit as feasibility seems likely to improve over time. However, without sales volumes to accompany prices, all that could be collected from internet sources would be prices and they would not be able to be volume-weighted making them of limited use.
 - Relative to retail grocery prices, we recommend using scanner data instead of current BLS retail price data. Rojas, Andino, and Purcell (2008) include a summary of literature documenting upward biases in BLS retail prices. The authors note this bias leads to an understatement of retailer response to changes in wholesale beef prices which alters the empirical evidence used to initiate legislation around firm behavior in the vertically-connected U.S. meat-livestock industry. Lensing and Purcell (2006) note key differences in demand elasticity estimates from using quantity-weighted average retail beef prices rather than simple-average prices. Quantity-weighted prices were lower and more volatile. The authors summarize implications concluding (p. 239): “if the errors in elasticity calculations using BLS data are confirmed to be as big in more complete analyses as they appear to be in this limited effort, much of our historical demand analysis may need to be rethought and redone.” Brester and Wohlgenant (1993) note (p. 355): “It is often the case that (economic) welfare analyses are sensitive to the choice of demand elasticities.” This highlights importance of retail prices being accurate reflections of actual transactions occurring.

Table 1. Example Schematic of Recommended Beef Price Spread Calculation Data Sources

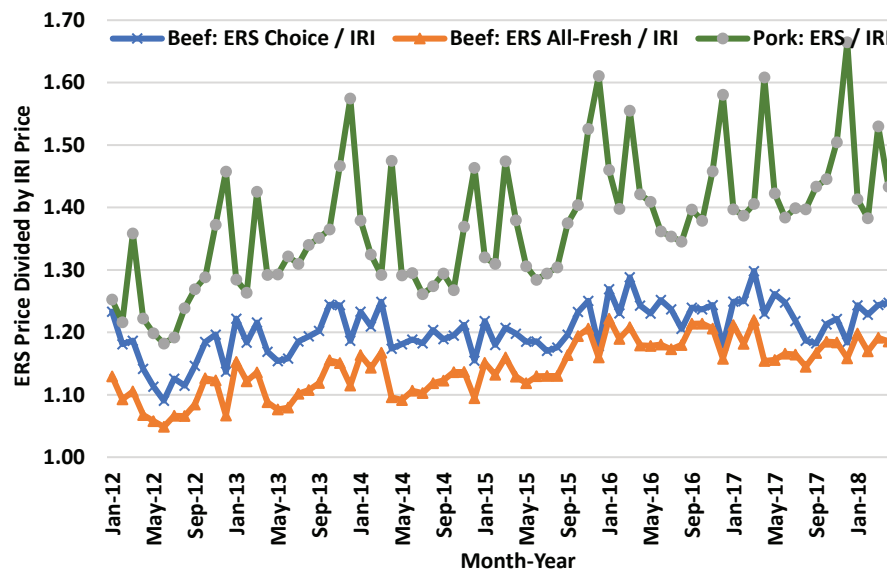
Market Level	Price Data Source
Farm	Price: All Steers and Heifers (Beef Type Cattle); Purchasing Basis Dressed; Total all Grades Report: National Weekly Fed Cattle Comprehensive
Wholesale	Price: Weekly National Comprehensive Boxed Beef Cutout Value Report: AMS LM_XB463
Retail	Price: Monthly Weighted Average IRI/Freshlook Scanner Price Adjustment: Perhaps with adjustment for exported products Report: Obtained from IRI/Freshlook

Table 2. Example Schematic of Recommended Pork Price Spread Calculation Data Sources

Market Level	Price Data Source
Farm	Price: National Daily Direct Hog Prior Day Report – Slaughtered Swine; carcass basis; Producer Sold Average Net Price Report: LM_HG201
Wholesale	Price: National Weekly Pork Report FOB Plant – Negotiated Sales Report: AMS LM_PK610
Retail	Price: Monthly Weighted Average IRI/Freshlook Scanner Price Adjustment: Not clear what to do with exported pork adjustments since it is not included in the negotiated wholesale price report. Report: Obtained from IRI/Freshlook

- Recently, comparing volume-weighted scanner prices with BLS prices over the January 2011-November 2016 period, Tonsor and Schroeder (2017) found scanner prices to be lower on average and more variable, consistent with past studies. For this report, we updated this comparison to cover the January 2012-April 2018 period. As shown in Figure 2, ERS retail beef and pork prices are persistently higher than scanner prices which reflect the volume of products sold. Perhaps most concerning is the upward bias in ERS/BLS prices grew substantially over the period pointing to an issue that is growing in importance. The bias in BLS data we consider large enough to render the spread data calculated using BLS retail price data misleading. The bias is not systematic, over time or product, to be able to simply make an adjustment to BLS price data because the bias varies pointing to an area in need of additional research.

Figure 2. Monthly Average ERS/IRI Retail Beef and Pork Price Ratios, Jan. 2012-April 2018



Source: Author calculations and Beef Checkoff, 2018

- Related to the recommendation of replacing BLS retail price data with scanner prices ERS might consider one of two alternative strategies to make that more cost effective. First, ERS could consider partnering with BLS to collect retail meat price data from scanner data to replace the current way BLS collects meat price data. This would presumably save BLS costs of data collectors and those cost savings could be put toward scanner data collection that includes volumes sold. Alternatively, ERS could partner with meat industry associations that currently subscribe to proprietary scanner data source providers. For instance, the beef checkoff, in coordination with VMMEAT Solutions and original IRI/FreshLook data, currently posts monthly reports of the average (volume-weighted) retail price of beef, chicken, pork, turkey, lamb, and veal (Beef Checkoff 2018). Partnering with such private organizations already subscribing to scanner data sources would likely make it less costly for ERS to acquire.

- Relative to exported product, we know several beef and pork products have quite different export values relative to domestic, which is why they are exported. The challenge is export prices cannot be feasibly collected. Instead, wholesale values are all that would be available for exported products. Realize, the values of exported products are bundled into farm level prices and they are included in the composite reported wholesale beef cutout price, but not directly in the wholesale pork carcass cutout price that we recommend using. So, to calculate an appropriate retail level price to use in spread comparisons for beef, the retail valuation should have an estimated export value of meat products from the carcass subtracted back out. Otherwise, the composite retail value would be over-stated relative to farm and wholesale. This may be a small overall adjustment that does not warrant considerable time and effort, but this is worth vetting further before finalizing a procedure to deal with exported products in retail valuation. For pork, any export adjustments would need to be made to both wholesale and retail prices, which may imply making such an adjustment is not worth considering in pork.
- There is the question of what to do with offal and by-products in the spread data. If one moved to dressed carcass valuation at the farm level and continued use of boxed beef and net pork carcass cutout at wholesale, there is no need to include offal and by-product values in the spread calculations as these products are removed from the carcass prior to carcass valuation. That is, offal and by-product values could essentially be ignored since they would not be included directly in any of the farm, wholesale, or retail valuations. Their values are implicitly included in the farm value of the carcass, but unless one has a way to include a packer markup on byproducts from farm to wholesale, the values associated with byproducts on margins cannot be estimated with any degree of confidence. If byproduct and offal values (including hides) were ignored they would be considered as sold by the packer for essentially the same values paid to the producer for them. Since farm values of byproduct and offal are unknown anyway, and only wholesale prices are quoted, and often times sporadically, this would notably simplify the margin calculation between especially farm and wholesale, with minimal loss in value spread information content.

RECOMMENDATIONS ON PRESENTATION / PUBLICATION OF MEAT PRICE SPREAD DATA PRODUCT

- We recommend the intended purpose of the meat price spread series be added in a visible place on the ERS Meat Price Spreads web site (<https://www.ers.usda.gov/data-products/meat-price-spreads/>). We do not see an explicit purpose of the products described on the web site. This would illuminate intent of producing price spread data and could reduce misuses or at least condition them.
- We recommend adding discussion on the ERS web site of how to correctly interpret the information provided with associated limiting disclaimers. Users of the data product are not well versed in the nuances of the product and how it should or should not be used so without these disclaimers, it is more likely to be misunderstood.
- We recommend providing a complementary data series where the dollar values used to calculate the price spread data are adjusted for inflation. Purcell et al. (1999) provides the rationale for doing so and summarized by stating, “Removing the influence of inflation and then examining the patterns is a more nearly correct way to look at the spreads.”
- We recommend documenting the current processes of generating the price spread data. This includes sources of underlying raw data, constant definitions used, calculations, assumptions, etc. Beyond providing clarity to spread data the generation process, this documentation would be helpful in subsequent reviews of the data product and may identify potential pitfalls before they arise. Two examples of this type of documentation are the “Detail of Procedures for Estimating Historic and Projecting Future Fed Cattle Finishing Returns” on the Ag Manager website (<https://www.agmanager.info/detail-procedures-estimating-fed-cattle-finishing-historical-and-projected-returns>) and the “Procedures for Estimating Returns” files on the Iowa State University Estimated Livestock Returns website (<http://www2.econ.iastate.edu/estimated-returns/>).

PROCEDURE FOR PERIODIC REVIEW OF MEAT PRICE SPREAD DATA PRODUCT

Periodic review of any effort can be valuable to assure procedures are current, accurate, and in-line with the project's goals. We believe an informal, perhaps even internal review is needed annually with a more formal, external review being conducted perhaps every five years.

Having a system of red flagging any issues such as changing definitions or reporting procedures in source reports and missing or thin source data would go a long way in reducing the need to make "on the fly" changes to the price calculations. With sufficient lead time changes to calculations could be cross checked using more rigorous methods.

Annual reviews could be focused on minor issues such as double-checking for errors, improving procedures to add efficiencies, etc. Other data and information series throughout the U.S. meat-livestock industry are updated annually which could be considered in these annual reviews. For instance, USDA AMS uses yield surveys of meat packers to assess estimates of how individual products relate to primal and ultimately whole carcass estimates. This is a simple yet appropriate example of information already gathered by a collaborating USDA agency which may have value in an annual review. On balance this annual assessment could likely be internal in nature and not overly taxing yet valuable to proactively address minor aspects of the project. A similar such review occurred with the Iowa State University Estimated Livestock Returns Series with an update being released beginning with the January 2019 estimates. All cost parameters remained the same but the lean hog price used was changed to be more reflective of total revenue received by producers. Data was back-dated to reflect this "new" price. Prior to the change, the series had been using the producer sold negotiated price (roughly 6% of the producer sold market over the last 15 years and becoming even thinner in recent years). Beginning January 2019, the weighted average of the producer sold negotiated, other market formula, and swine or pork market formula purchase types (roughly 75% of the producer sold market over the last 15 years) plus the added income from premiums from packer buying programs (i.e., difference between base prices and net prices) is being used. A full discussion of the change was included in the "Procedures for Estimating Returns" files (e.g., Procedure for Estimating Returns Farrow to Finish, <http://www2.econ.iastate.edu/estimated-returns/Farrow%20to%20Finish%20Procedure.pdf>). The goal of this derived price series is to provide the total revenue for an Iowa producer selling in a manner representative of Iowa producers.

Furthermore, USDA AMS occasionally publishes new price reports that contain more representative, comprehensive, or relevant data for the meat price spread data product. Examples include the comprehensive fed cattle price report presented in Table 1 or the comprehensive hog price report planned to be published by AMS beginning early 2019. As such reports become available, ERS is encouraged to review and adopt those that are most appropriate in the meat price spread data product.

Less frequently, more extensive reviews could focus on bigger-picture aspects such as whether the ERS outputs remain valid, if underlying procedures are appropriate, etc. A similar such review occurs with the Iowa State University Estimated Livestock Returns Series in which peri-

odically, the procedures are evaluated and revised to more accurately reflect the enterprises the model is trying to represent. While price changes are incorporated monthly, production variables (e.g., feed ration formulation, feed efficiency, daily gain, death loss, placement and marketing weights, etc.) are revised periodically (5-7 years) to reflect changes in livestock production technology. The procedures were last updated in 2014. After such a revision a report is released that provides a comparison of how the updated returns series would have looked over a past period under the new procedures (e.g., Revised Estimated Returns Farrow to Finish, <http://www2.econ.iastate.edu/estimated-returns/Revised%20Estimated%20Returns%20Farrow%20to%20Finish.pdf>). This is done for purposes of easing, for users, the transition for from the previous procedures to the new procedures for estimating returns.

Beyond external reviews, ERS is encouraged to leverage existing opportunities for garnering feedback on the status, value, and accuracy of the retail meat prices output. One key example is the opportunity presented by the annual USDA Data Users meeting. This meeting often has several USDA agencies involved as formal presenters with non-USDA parties present as attendees providing feedback and suggestions. This existing forum presents one, of likely multiple, specific opportunity ERS could leverage to systematical use in gaining feedback on the retail meat price effort.

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