Determining Proper Confidentiality for Multiple Time of Day Reports

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Introduction

An agency of the U. S. Department of Agriculture (USDA) has designed a new confidentiality approach in order to maximize the amount of information published in response to a mandatory reporting law–while protecting the identity of reporting entities. The approach is based on the randomness of actual reported data. Procedures have been established for constantly reviewing the reported data for any systematic departures from the present randomness.

This paper will describe the extent that a traditional confidentiality approach limited publication and the analyses performed in developing the novel new approach will be illustrated. To set a background, the paper will briefly discuss market conditions which led to such strict reporting and publication requirements. Although the new legislation covers cattle, hogs, lambs, and meat products, most examples in this paper will focus on cattle for simplicity sake.

Background of the new Law

In the past three years, the Livestock and Grain Market News Branch of the Agricultural Marketing Service (AMS) of the USDA has had unprecedented constraints and challenges in designing and implementing a Mandatory Price Reporting system. This system requires large livestock slaughter plants to report all of their various purchase transactions within designated time periods and the AMS to summarize and quickly release reports based on those transactions, with many reports required one hour after the data are received. Many of the challenges were technical–to ensure proper company data security and to validate reported data in such a timely manner–but others were more practical concerns of communications with the affected companies and data users who had requested the information. Major challenges came in designing the data definitions and collection forms needed to properly create the large number of new reports specified or implied by the Livestock Mandatory Price Reporting Act of 1999.

The law was passed due to concerns about the increasing concentration of companies buying from producers. By 2000, more than 90 percent of the Federally inspected slaughter of cattle, hogs, and sheep in the country was performed in 114 slaughter plants. Even though the 114 plants were owned by some 65 different companies, four companies slaughtered about 80 percent of all fed cattle and fed lambs and 55 percent of all hogs. Livestock production itself had become more concentrated. About 116 feedlots accounted for 40 percent of all fed cattle, with the remainder from more than 97,000 feedlots. About 45 percent of the hog inventory was owned by 110 operations, with 77,150 operations making up the rest of the producing industry.

One reason for the concentration was the fact that food marketing procedures and consumer purchase preferences in the United States had drastically changed. The meat trade had largely shifted from shipping carcasses for future cutting into retail cuts to shipping "boxed" products such as loins, steaks, etc. Slaughter and shipping operations are most efficient when standard size and quality animals are being slaughtered. To assure consistent qualities and supplies, livestock packers increasingly entered into private marketing arrangements with producers. Formula pricing, basing actual payment on factors such as "grade" (the condition and amount of fat on the animal) and yield (the percentage of usable meat compared to total weight); forward contracting, arranging for delivery on a specific date such as 10 days later; and other incentive agreements offer benefits to operators who produce a sufficient supply of desired quality animals. In addition, packers own some animals through subsidiary operations.

Existing Information System

AMS had a long standing Livestock Market News service, providing timely information for relatively small marketing areas around the country. Reporting was on a voluntary basis but AMS had taken steps, such as verifying details of sales transactions with both buyers and sellers before compiling and releasing price reports, to ensure quality price information. However, the special purchase arrangements were not included in AMS reports.

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Many special arrangements were originally priced based on some relationship to open market prices. However, purchases of hogs for slaughter shifted from 80 percent or so open market transactions to 20 percent in just a few years and arrangements became less tied to the market. Small operators, without the volume to qualify for such special arrangements, felt that they were receiving lower prices and were not privy to true price information.

The United States Congress expressed concerns about the lack of full price information and the possible concentration impacts by passing the new Act. It required livestock packers above certain size limits to submit detailed information on all purchases to AMS and established detailed reporting requirements such as swine purchases three times a day (purchases up to 10:00 a.m., from 10:00 a.m. to 2:00 p.m., and total daily purchases by 7:00 a.m. the next morning), cattle purchases twice a day, lamb purchases once a day, and similar requirements for meat sales. There were many other technical publication requirements such as reporting lowest and highest net prices in addition to average prices, plus carcass weights and quality measures of the animals purchased. The Act required operations to report similar quality information for the livestock slaughtered from their owned supplies, but no price information was to be associated.

AMS faced many daunting challenges in creating a system to receive and validate all data reported by the companies and to issue statistical summaries within an hour. Some 91 different reports were designated to be created by AMS, many containing information not previously collected. AMS had to develop a system which was simple enough to implement that all affected plants could be trained to use the system, which had sufficient safeguards to protect integrity of the data being transmitted, and which allowed for quick data review, validation, and summary. Data also had to be securely archived since the law established an ongoing audit requirement of all reporting companies.

AMS had many meetings with industry representatives to clarify basic operations which were needed to implement the law. Specific technical meetings were held with companies in order to fully understand contract details for each type of acquisition arrangement being used. This also presented an opportunity for the companies to determine how they could best adjust their internal accounting systems to lessen the impact of the new reporting requirements.

Because of the considerable background work to create a reliable, secure information technology system and to clarify the definitions and reporting details, the final implementation rule was not issued in the *Federal Register* until December 1, 2000 (the law had been enacted on October 22, 1999). With the reporting complexities, the final rule was 78 pages.

Wording in the Act prevented AMS from requiring companies to report any new data until the mandatory system was in operation and, once the system was released, from continuing to request any former voluntary information for parallel comparisons. This made it difficult to test and finalize new report formats. As a result, AMS was not able to start operations of the new system until April 2, 2001. As of that date, many planned new reports still could not be released until AMS was able to evaluate actual data in order to determine final formats.

Basic Confidentiality Requirements

Even though the law mandated reporting by the large companies, AMS was to develop procedures to protect the confidentiality of all reporting entities. The specific wording of the Act was:

> "The Secretary shall make available to the public information, statistics, and documents obtained, or submitted by, packers, retail entities, and other persons under this subtitle in a manner that ensures that confidentiality is preserved regarding–
>
> (1) the identity of persons, including parties to a contract; and
>
> (2) proprietary business information."

Since the Act did not specify exact limitations or procedures, AMS turned to the Federal statistical community for assistance. AMS specifically studied the Federal Committee on Statistical Methodology Statistical Policy Working Paper Number 22 for best practices. AMS staff members then had a number of meetings with statisticians in the National Agricultural Statistics Service (NASS) of USDA. Based on those discussions, AMS decided to adopt a "3/60" rule. That is, no aggregates would be published unless they were composed of reports from at least three entities with no entity having more than 60 percent of any total.

Before operations began, it was known that some data would need to be withheld under the 3/60 rule due to the nature of purchases. For example, plants slaughtering steers and heifers might be variously purchasing (1) steers or (2) heifers or (3) mixed lots of steers and heifers. Thus, there could be multiple active buyers but not three or more buyers of any of the three classes above. However, to ensure the greatest level of confidentiality, AMS applied the 3/60 rule to every data cell. AMS also took two additional steps as a further confidentiality guarantee. **AMS did not (and still does**

not) publish how many plants or companies are represented in a published aggregate. Secondly, AMS did not distinguish between blank cells and cells that were suppressed due to confidentiality.

Once the program began, the 3/60 confidentiality rule had even more impact than would have been predicted. Many data cells had to be suppressed within reports that were released and some reports could not be issued at all. Industry participants were extremely upset about the lack of data. For example, in the first 1½ months of operation, 24 percent of all daily reports could not be issued due to confidentiality. Most National daily summary reports could be issued but fewer regional summaries. However, some observers assumed that all blank cells were being suppressed and calculated that more than 90 percent of the data were being withheld.

It was obvious that reports were not going to be beneficial in providing improved information about price relationships with so much data suppressed. There were even rumors that one member of Congress might introduce new legislation to bypass confidentiality and require reporting of all plant data.

Detailed Analysis Approach

Since AMS was collecting, validating, and archiving all reported data, a complete data base was available for in-depth study of purchase patterns. AMS was able to plot or graph numbers of reports and volume percentages actually received by region, by date, by data element. Figure 1 below illustrates the market activity in one of the smallest regions during a 12 trading-day period.

There is considerable information in this data display. Nine plants, owned by 5 different companies, purchased cattle through negotiated (open market) arrangements during the period. No plant was successful every day but three plants purchased 11 of the 12 days and three other plants had purchases on seven days. Only two of the 12 days had identical combinations of plants successfully purchasing. Two plants purchased once each during the 12-day period. Both are physically located outside the region but made contacts in the region when they needed additional animals.

Data relationships were tallied at both the plant and company level. For the most part, plants operate independently of other plants in the same company. Buyers are logically seeking to purchase as many animals as possible close to their physical plant location. However, to keep plants operating efficiently, they are actively pursuing supplies over broad areas and multiple buyers from the same company might be in contact with some of the same producers. One interesting aspect in Figure 1 is that there were two days (day 2 and day 8) in which only two companies were successful in purchasing cattle but the companies on day 8 were different than the ones on day 2.

Figure 1. Illustration of daily cattle negotiated purchases activity in one region

Regional Activity Summary 1/

	Plant								
Day	A	B	C	D	E	F	G	H	I
1	X		X	X		X	X	X	
2			X	X		X			
3			X	X		X	X	X	X
4	X		X	X	X	X	X	X	
5	X		X			X	X	X	
6	X		X		X	X	X	X	
7			X			X	X	X	
8		X						X	
9	X		X	X	X	X	X	X	
10	X		X	X		X		X	
11			X	X		X		X	
12	X		X			X		X	

1/ X indicates that the specific plant did purchase cattle.

Examination of actual purchase data led to a new way of looking at confidentiality. The approach is best expressed as a question:

When are proprietary data not unique?

Purchasing livestock is a continuous process. Its attributes are:

1. Prices are determined by market conditions, not by fixed company policy. A company wants to procure the full supply needed for efficient daily slaughter plant operation. Price offers on a particular day will depend upon the prevailing price level, how many animals have already been procured, and how many more animals are needed of a particular weight and quality.

2. There are many possible suppliers so there are usually alternatives available to each buyer. A typical plant report will include animals from multiple producers. In addition, animals are continuously becoming ready for market, or are already ready but awaiting an acceptable price offer, so it is not analogous to a crop producer with perishable ripe fruit or vegetables who must market immediately.

3. Livestock can be purchased in many different quantities. Therefore, an AMS published total such as 400 steers might be comprised of animals from one

supplier and one buyer, or several smaller lots purchased by multiple buyers.

4. In the case of fed cattle, companies will normally not make much distinction between buying lots of steers, or heifers, or mixed lots of steers and heifers. In fact, the reported data illustrated a random pattern for purchases of the various types of lots. Likewise, purchases of dairy and beef cows and bulls demonstrated randomness across classes.

5. Most companies do employ a combination of the various purchase practices on a regular basis and they will adjust the mix of practices as needed to acquire the supply of animals needed.

New Confidentiality Proposal

After compiling and reviewing the reporting frequencies and concentration percentages from the first 54 days of operation (the amount of data that had been collected as of the analysis period), a new proposed approach took shape. This is referred to as **3/70/20** and is composed of analysis of three factors. It permits publication of data if:

> there are "normally" at least <u>3</u> companies operating (at least 50 percent of the time during the past 60 days),
> no company had more than <u>70</u> percent of the volume purchased during the same 60-day period, and
> issuing all planned reports would not have exposed a particular company more than <u>20</u> percent of the time during the 60-day period.

Based on the randomness within the purchasing patterns and the fact that releasing aggregates does not in itself identify that fewer than 3 companies might be represented in a total, the new approach permits publication of most reports specified by the new law. However, there are some special contract arrangements used by only one or two companies for which publication still will not be permitted.

Using a 60-day measuring period for determining confidentiality allows AMS to reflect the normal marketing patterns utilized by the industry rather than forcing strict confidentiality constraints on time periods as short as four hours. The 60-day period does buffer the impact of holidays and other unusual marketing situations, while being short enough to account for seasonality during the year. It might be helpful to add some additional comments on the thinking behind each of the three factors in the new confidentiality rule.

Keeping the guideline of 3 entities avoids situations in which there might regularly be only 2 participants and each company could determine the competitor's information by subtracting their portion from the aggregated totals. If there is only one company successfully operating on a particular day, that company will realize the fact since the aggregate will be equal to their total, but other companies will not be able to determine that same fact. If the presence of less than 3 firms starts to approach 50 percent, AMS analysts would determine if this marketing area is now being dominated by only 2 companies or if there still is a random relationship involving several different companies even though there were only 1 or 2 reports many times during the past 60 days.

Shifting to a volume percentage of 70 percent, rather than 60, does give a little more latitude for a company expanding market share without data being suppressed. Even if a company reached the 70 percent level, the randomness represented by having 3 companies at least 50 percent of the time would render it difficult for anyone to identify how much data belonged to specific companies. In addition, the 70 percent got away from the negative reaction being associated with the 3/60 standard keeping reports from being released.

The 20 percent limit for an individual company being present by itself would be very significant if market participants shifted to shorter operating or purchasing weeks. For example, if only one company purchased every Tuesday, other companies would soon realize that fact but the 20 percent limit would prevent Tuesday reports from being released. The Tuesday data would be included in the next day's report. This roll up approach has become the standard operating procedure for issuing lamb, cow and bull beef, and carcass lamb reports since there are very few companies purchasing.

It is important to clarify the AMS calculation and suppression procedures. The data used for determining confidentiality triggers are <u>company</u> activities, even though individual plants might be operating independently of other plants owned by the same company. For cattle, the key determinant is if the company had <u>any</u> purchases rather than looking at each class of animals purchased, based on the relationships that showed purchases of the various classes are random.

Implementation of the new Approach

In publishing the final rule on December 1, 2000, AMS announced that confidentiality would be protected but the 3/60 procedure was not a specific aspect of the final rule. Therefore, AMS did not have to go back through all rule making procedures such as announcing for comment, summarizing comments, and then announcing a final change. Instead, they were able to use a more expedited procedure for shifting to the new confidentiality procedure.

There were many key activities in order to implement the new confidentiality approach in less than 2 months from its inception. Those activities included:

June 29, 2001	Peer review memo from NASS evaluating the proposal presented to the USDA Chief Economist. The memo was provided to all participants in an Office of Management and Budget (OMB)/USDA meeting that afternoon.
July 2, 2001	Release of Livestock Mandatory Price Reporting Review Team Report which included confidentiality as one review item. Public meeting which included industry, Congressional, and OMB representatives held to present and discuss the Review Team report.
July 10, 2001	"Heads Up" memo sent to the Federal Interagency Confidentiality and Data Access Committee for information and comment.
July 13, 2001	OMB requested that the issue be handled through the Executive Order 12866 Federal Regulations Review procedures.
July 18, 2001	Meeting of the Federal Interagency Confidentiality and Data Access Committee.
July 25, 2001	Informational memo from the OMB Chief Statistician to all members of the Interagency Council on Statistical Policy.
August 3, 2001	USDA press release issued with a follow-up *Federal Register* notice.
August 20, 2001	New confidentiality approach implemented.

In addition to the activities enumerated above, there were many other important activities during the same period. AMS held additional meetings with National representatives of major livestock and meat industry organizations to clarify questions and informed all reporting firms through a combination of face-to-face and telephone contacts. Lawyers and program officials for OMB and USDA held an additional mid July meeting to clarify jurisdictional issues.

Perspectives from a Year Later

With the new approach, AMS has been able to publish nearly all originally requested animal purchase reports but some adjustments have had to be made. Daily activity for forward contract cattle purchases is so low that only a weekly cumulative report (which meets 3/70/20) is released. All swine purchases are reported on a daily basis (and meet 3/70/20) except for "Packer sold, detailed arrangements." Aggregating together all Packer sales arrangements daily does meet 3/70/20 and that aggregate is released rather than details of the various types of transactions. Fed lamb purchases are too thin to be reported daily and purchases are accumulated until they meet 3/70/20 and reported at that time. That information is repeated, and clearly labeled, daily until enough future purchases have been made to issue a new report.

A combination approach is used for the meat trade reports; some cuts can normally be reported daily but others can be shown only after aggregation for multiple days. All original planned steer and heifer boxed beef reports are being released except for "Weekly Forward Sales past 21 days," weekly "Export," and weekly "Forward Contract." A comprehensive boxed beef cutout report, which includes all boxed beef sales for steer and heifer cuts, will be released in the near future. Boneless and Boxed Cow cuts reports will be released soon utilizing aggregation methods in conjunction with 3/70/20 requirements. A special feature has been added for boxed beef reports which contain some trades not shown because of not meeting the confidentiality guidelines. The following statement is included at the bottom of each report: *Items that have no entries indicate there were trades but not reportable because they did not meet the daily 3/70/20 guidelines.*

In addition to being able to issue most data series on a consistent basis by using the 3/70/20 confidentiality approach, AMS has taken other steps to provide useful information to all sectors of the industry. Weekly reports contain recaps of the purchases during the past week, along with trend information. National Daily Hog and Pork and National Daily Cattle and Beef Summaries have been created which compile, on a single Web page, data from multiple reports, in tabular and graphic formats, to provide a quick glance at changes in market volumes and prices. These summaries also have embedded the Web links to each of the data series being referenced.

AMS has built a rolling summary feature into the analysis system such that the average number of market participants, the percentage of volume accounted for by the largest participant, and the number of times (if any) that each participant has been the only entity represented in a total during the past 60 are constantly available. Thus, AMS analysts have an early warning if any of the series are moving close to the confidentiality triggers.

Conclusion

There have not been concerns expressed by industry participants about the new approach once it was in operation. Thus, it can be concluded that, under the conditions that exist for this industry, reports can occasionally be issued which contain data for only one company. To take a broad view, implementation of the new AMS confidentiality approach turned out to be a specific application of an Informed Consent approach. Companies had been thoroughly briefed on the confidentiality and publication approach and realized that they still receive anonymity, even if they are the only company represented in a specific report.

The Last Word

In an interesting sidelight, a series of wire stories near the end of 2001 carried some producer complaints--from two aspects. First, even though the former system did not cover data about the total extent of the market, buyers and sellers were often in telephone contact with AMS Market News personnel and felt they were getting good market insights from these exchanges. Secondly, the former voluntary system provided a flow of information throughout the day (although the amount of data behind the reports was much thinner and did not include formula and contract transaction information). Thus, some people feel that information coming out every 4-5 hours or so is "old data." AMS is studying the possibility of providing reports that include voluntary reported information derived from feedlots and other sales representatives. These reports would cover sales during periods, such as late afternoon, for which mandatory information is not quickly available.

References

Allen, Rich (2002). "Designing a Secure Data Collection, Summary, and Publication System for One Hour Turnaround," United Nations Economic Commission for Europe Seminar on Statistical Information Systems, Geneva, Switzerland, April 2002.

Collins, Keith, et al (2001). "LMPR Review Team Report Team Report to the Secretary of Agriculture on the Livestock Mandatory Price Reporting System," U.S. Department of Agriculture, Office of the Chief Economist.

Kirkendall, Nancy, et al (1994). "Report on Statistical Disclosure Limitation Methodology," Statistical Policy Working Paper 22, Federal Committee on Statistical Methodology, Statistical Policy Branch, U.S. Office of Management and Budget.

U.S. Congress (1999). "Livestock Mandatory Reporting Act of 1999," Public Law 106-78, 113 Stat. 1188, 7 USC 1635-1636h.

U.S. Department of Agriculture (2000). "Livestock Mandatory Reporting: Final Rule," *Federal Register*, Vol.65, No. 232, pp 75464-75542, December 1, 2000.