



WHITE PAPER

The Flaw of Averages: A Study of Agricultural Equipment Values



Dealers faced with the challenge of valuing equipment for trade-in or resale are constantly dealing with numbers as they determine valuations.

One common approach in this situation is to look at averages.

Iron Solutions, with the largest database of agricultural equipment retail and auction transactions in the North American market, studied the validity of the use of averages in the valuation of agricultural equipment.

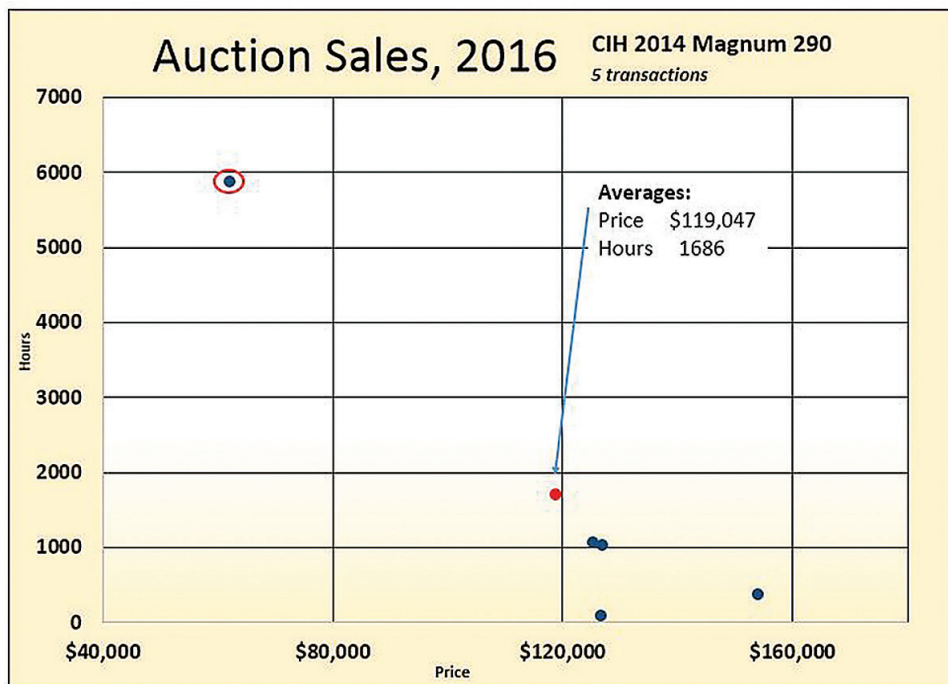
Cameron Hurnard, Iron Solutions' Director of Data Services and Software Development, remarked, "In some instances, the use of averages can provide good information and be revealing. However, in many cases, averages are misleading and can lead to major errors in valuation."

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“The problem with averages is that outliers, sparse data points, or wide variation or dispersion in data can completely throw off figures, making the average number non-representative of the overall values.”

To illustrate these points, Cameron selected very popular and moderately popular 2014 model-year tractors from John Deere and CIH. He analyzed selling prices from transactions occurring between January 1, 2016 and December 1, 2016. Auction sold prices were collected from the Iron Solutions database, TractorHouse.com, MachineryPete.com, RitchieBrothers.com and BigIron.com.

The impact of outliers is examined first. The graph below, which represents Auction transactions for a CIH 2014 Magnum 290 tractor during 2016, has an outlier data point which significantly impacts the average use and hours. If the one outlier data point is excluded, the average price changes from \$119,047 to \$133,247, or 12%. Average hours are even more heavily impacted, declining -62%, to 640 hours.



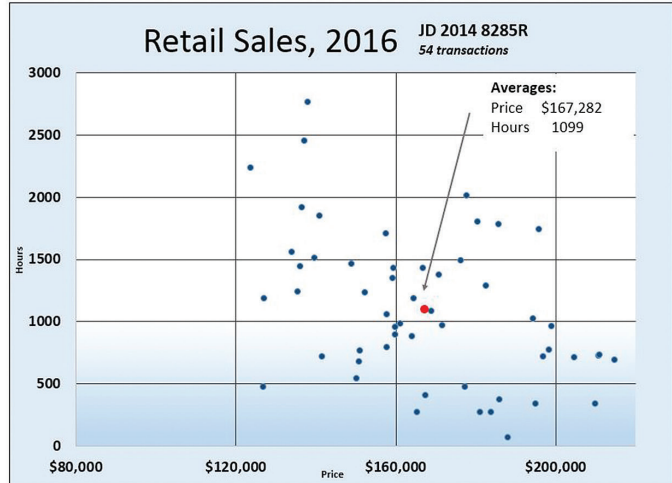
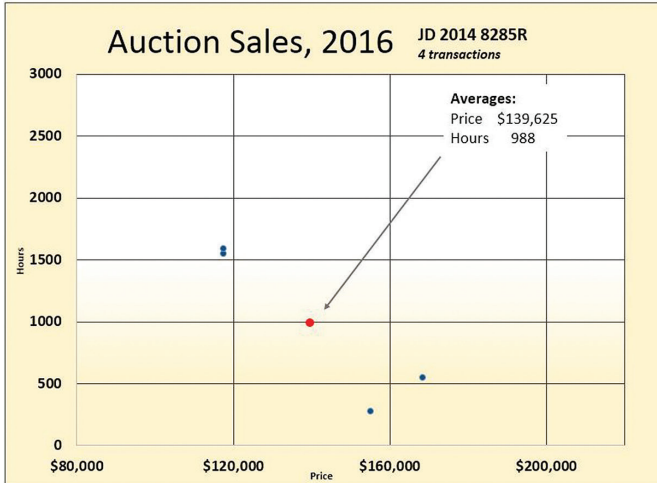
Average price with outlier:
\$119,047

Average price without outlier:
\$133,247

12% variance

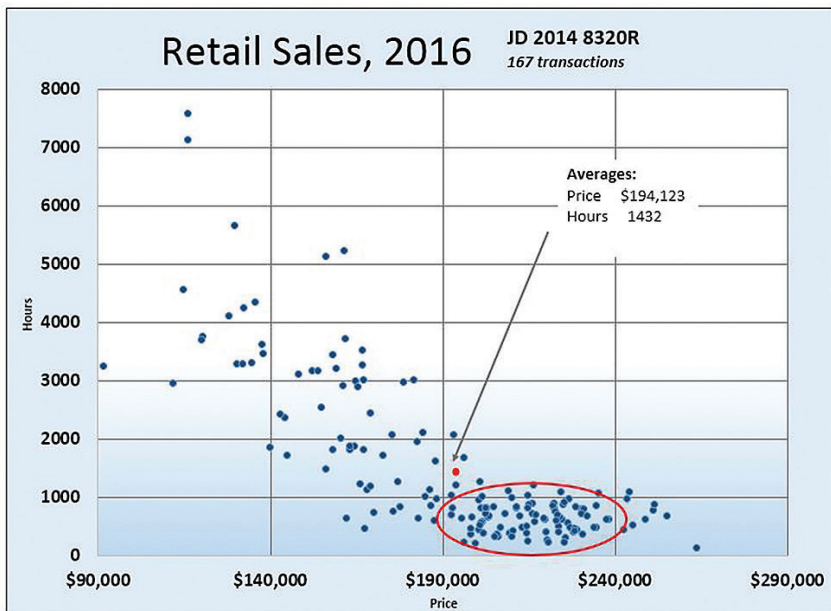
Widely dispersed data presents another problem. The two graphs below show auction and retail transactions during 2016 for a John Deere 2014 8285R tractor. The graph on the left, with few and widely-varying auction result transactions, gives an average of \$139,625. However, this average is clearly unrelated to any of the actual sales prices, which range from \$62,250 to \$154,000. The graph on the right has 54 retail sales transactions, but the prices here also vary considerably. The differences are driven by the different options, hours, and regions where the equipment was sold.

In this situation, the average cannot capture the tremendous variation on prices. Only a tool like the Official Guide allows adjustment and valuation of the many different options, hours and regions available for this model. (This model has at least 35 options, so the total possible number of combinations of those options is 34,359,738,367. It is easy to see why comparison of the different sold prices on varying models can be a challenge.)



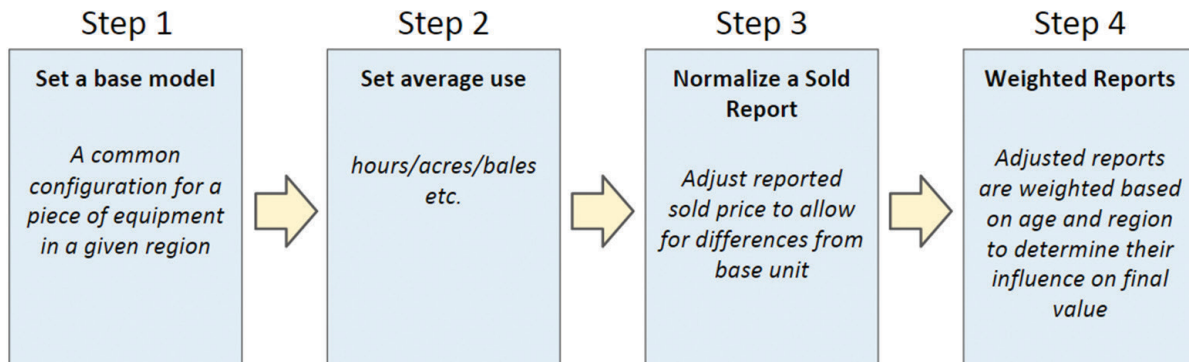
The graph below contains another illustration of how an average cannot capture the importance of the dispersion of sold transaction values. For the 167 retail transactions for this JD 8320R, the average value is \$194,123 with 1432 average hours. But deeper study of the data shows that 54% of the transactions are clustered between \$190,000 and \$240,000, with average hours on this large group of sales at 722 hours. Knowledge of this dispersion gives a different perspective on the average values of similar machines.

Normalization, which is a process that allows an “apples to apples” comparison of different pieces of equipment, addresses the challenges found in the variation in equipment that can confound averages. It helps assure that any variance in value for particular model is attributed to the underlying base unit itself. Adjustments for the different options can then be made to that base price, providing values that are fair and comparable. Iron Solutions normalizes all retail sales transactions it receives.



A flowchart depicting the steps Iron Solutions uses to normalize the data from a sales transaction is shown below.

Normalization: Highlighting Changes in Base Unit Value

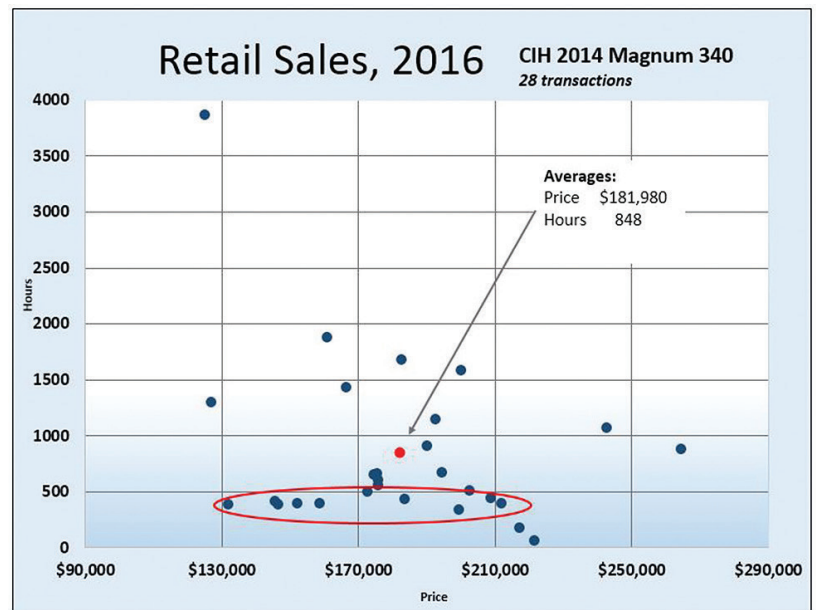


As a further illustration, normalized retail transactions for a CIH 2014 Magnum 340 tractor were charted. The scatter plot diagram shows, circled in the red oval, the wide variation in values for the same tractor with hours in the 400 range. Sold prices ranged from \$131,000 to \$212,000, a 62% variance. Use of the IronGuides® Official Guide valuation tool, with its ability for the user to adjust for specific options, provides an understanding of the differences in this equipment and its underlying market value.

In summary, while the use of an average value can appear to deliver an easy, quick estimate, averages distort the actual valuation because of the impact of the multiple variations that inevitably occur. As Sam Savage, a well-known lecturer on risk modeling and regular contributor to Harvard Business Review said,

“Decisions made based on averages are wrong on average.”

IronGuides® Official Guide process accounts for those variations and delivers a reliable valuation tool.



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Contact Iron Solutions today for more information on our data and the tools we provide to help customers turn trusted data into profitable decisions.

1.877.266.4766 | sales@ironsolutions.com | www.ironsolutions.com