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Price Discovery: A Literature Review

WHAT IS PRICE DISCOVERY?

Price discovery is the process of buyers and sellers arriving at a transaction price for a given quality and quantity of a product at a given time and place. Price discovery involves several interrelated concepts:

- Market structure (size, location, competitiveness)
- Market behavior (procurement/ pricing mechanisms)
- Market information and price reporting (timeliness, reliability, frequency, type of information)
- Futures markets and risk management alternatives

Price discovery is frequently confused with price determination. These two are related but different concepts. Price determination is the interaction of supply and demand which determines the market price level. Problems with price discovery usually occur when there is either a strong demand for beef coupled with a large supply of beef or there is a weak demand and small supply. At other times price discovery is generally efficient (Ward and Schroeder).

Why is it important?

Price discovery provides the means for achieving price determination and therefore the equilibrium supply and demand for the market. Without this producers do not know what the final consumer demand is for a product. Consumers establish value for a product at the retail level; this value must then be transmitted back through the supply chain to the producer. This signal of value is communicated through price for a given quality of product.

In the past discussions about price discovery have included ways of identifying quality differences in cattle and carcasses. If cattle could be segregated

and paid on these differences a signal would be sent back to producers about what attributes are important to consumers.

HISTORY

Over the last 15 years the fed cattle market in North America has changed. **Market structures** have changed as the retail, packing and feedlot industries have become more consolidated and the average size has increased, with larger national and even global operations. Managing supplies in these large operations is costly. The predictable flows of cattle can improve scheduling for these plants which translates into reduced costs. **Market behavior** has changed as pricing mechanisms have moved from being predominantly on a live basis to a rail basis, in an effort to more accurately capture quality and send the appropriate price signal back to the cow/calf producers. Emphasis on quality and yield grade through grid premiums and discounts has grown. The market has moved from being cash dominated to contracts, formulas and to a lesser extent packer owned as managing supplies on both the buy and sell side has become more important. **Market Information** has had to adjust to the evolving needs and demands created by these changing structures and behaviors. As trade has moved away from open markets to selling directly to packers there is limited market transparency in some areas. Use of **futures markets** and **risk management** strategies have become mainstream for many of these large operations as volatile commodity markets for both inputs and outputs put margins at risk. In some cases, financing is dependent upon a risk management strategy that includes Alternative Marketing Arrangements (AMAs) or price insurance.

A GROWING CONCERN?

Increased use of AMAs have been driven by: (1) price can be connected to quality and yield information sending a stronger price signal through the supply chain than buying on the average; (2) improved efficiencies through planning supply movements that translates into reduced costs for both the feeder and the packer; and (3) economics drive packer and feedlot decisions to use one marketing arrangement over another. Grid deals may occur more frequently when there are large premiums on quality cattle; while forward contracts may be more popular when supplies are tight. Hence, the current market situation will play a role in how fed cattle are traded.

Marketing Costs

No market is a free market. There are costs to using different pricing mechanisms, including the cash market. All price mechanisms whether through the cash market, contract, or formulas have risk, transaction costs and varying levels of information available to participants. Uncertainty in the quality of the final product represents risk to the packer. If the packer is risk adverse they will pay less for the product they have less information about. For the feedlot the cash market can be risky in that animals may not be marketed in the most optimal week, this is of particular concern if using a time sensitive product (CRS, 2003).

Research by Koontz (2014) indicates that the opportunity costs of participating in the cash market are potentially high. Cash markets can be relatively disorderly and expensive to use. Making use of formulas or forward contract reduces these costs. Animals are marketed in a timelier manner so that animal performance is improved and feedlots are more efficient.

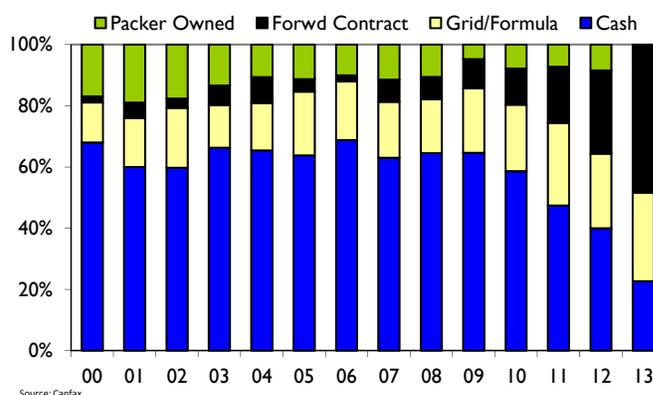
AMAs not only have benefits of sending clearer price signals about what the marketplace prefers and does not prefer. But they also have costs associated with them, in order to fully benefit from a grid sorting is necessary, feed rations may

need to be adjusted to eliminate over-finishing and other non-specification cattle.

Thinning Cash Trade

Cash markets for fed cattle are thinning in North America. Grid cattle tend to be based off the cash price with premiums and discounts for quality. There are a growing number of grid cattle (29% in 2013 up from 17.6% in 2008) that are based on a thinning cash trade (23% in 2013 down from 64.5% in 2008). But the biggest growth has been in contract cattle at 48% in 2013, up from 7.3% in 2008, which have no price reporting mechanism.

Alberta Fed Cattle Procurement Mix



If quality cattle are increasingly moved through AMAs, then where are the poorer quality cattle being sold? Are they making up the cash market and therefore becoming the base price for the better quality cattle? This concern relates directly to the type of base price used for a grid. This can be alleviated by tying the base price to the boxed beef market. However, the boxed beef market in North America is experiencing the same thinning as they also move to more forward contracts.

Thin cash markets are not new to agricultural commodities. The size of the fed cattle cash market continues to be larger than that for hogs, dairy products, egg, and poultry products in the US. There are strong economic incentives for these commodities to trade through alternative means from the cash market. While individual firms (both feeders and packers) have benefited from these changes, the market has not necessarily (Koontz 2014).

The Free Rider Problem

A public good is something where consumption by one individual does not impact the consumption of that good by another individual. They are non-excludable. Cash markets and market information are public goods. This makes them vulnerable to being overused and underprovided for if left to the marketplace. Even when businesses sell copyrighted information through subscriptions, free-riding (the using of information without paying for it) is notorious. Free-riding prevents the collection and provisions of these services from being larger and more robust.

Cash markets fall victim to the tragedy of the commons, as the market thins and information is used by a growing number of cattle under AMAs. Formula and grid cattle free-ride on a base price discovered in the cash market. Other up and down stream users also use this information.

The US Market

In the US, the CME live cattle futures are frequently used for price determination in commodity markets. In a futures contract all the terms are standardized (volume, grade, etc.), making it a tool where price is the focal point. Changes in supply and demand information are quickly reflected in price.

To be successfully used as a risk management tool, the futures contract must be highly correlated with the underlying cash market. With the basis between the cash and futures, more predictable and less variable than the cash price. It is assumed that the futures market converges with the cash market as it expires and therefore is a good indicator of the cash market. However, in volatile markets this is not always the case. In 2008-2010, cash and futures for the grain markets did not converge creating price risk for producers using the futures as a risk management tool. This has not been as much of an issue in the live cattle contract as with grain. It is clear that US cash market participants rely on price information from the live cattle futures; with the futures market contributing to price discovery.

For many areas in the US where cash reporting is becoming a rarity they are still able to base their grid prices off of a five state average, the futures or another alternative. Some states have not had cash reporting for 30 years. So does the market still work? Many analysts say yes, but it is different than what it used to be. But simply going to the CME futures market for price discovery information does not solve the issues related to having a thin cash market.

The Canadian Market

The Canadian cattle market is different from the US in that using the futures as a proxy for the cash market raises issues. Number one, there is still the exchange rate risk, requiring producers to hedge the dollar as well as the live or feeder cattle futures. Second, there is still basis risk which fluctuates with local supply and demand situations as well as transaction costs of doing business across the border. This can include trade barriers and a 'thicker' border which prevents prices from arbitraging.

In addition, cattle price insurance programs (like CPIP) rely upon cash price reporting for their settlement index. As cash trade thins to the point that fed cattle prices are not reported some weeks, concerns are raised about the viability of these programs. Particularly as historical data is needed to calculate program premiums and coverage levels.

A cash price is needed to calculate cash to futures or cash to cash basis. The basis is a key measure in evaluating the Canadian market performance relative to the US. It is used to evaluate damages incurred by producers in trade action suits like Country of Origin Labelling (COOL) and hence, accuracy is of critical importance. While the shrinking numbers of grid/formula cattle depend on the cash market for a base price; the growing numbers of contract cattle depend on the futures market and accurate historical data to negotiate basis levels.

Consequently, increasing cash trade in Canada is a priority. The question is how to go about doing this. The proportion of cash cattle in the market will fluctuate with market signals. While the cash trade was at a low of 23% in 2013, it is expected to increase in 2014 as cash prices in the first quarter have been higher than what many producers were able to contract for. This bull market is expected to have cattle feeders use price insurance more, which gives them the ability to take advantage of the upside in the cash market. Economics will always be the driving factor behind the proportion of cash trade in the market. However, these swings in market incentives do not address the concern about what to do when cash trade is so small that prices cannot be reported. *How can a price insurance program be maintained if there is no cash trade? How can COOL be shown to damage the Canadian market without price reporting?*

MARKET INFORMATION

The primary function of markets is to coordinate the allocation of scarce resources among differing production alternatives. Markets must communicate information about relative consumer demands for products back to those in control of the product.

Broadly defined, market information includes all data and analysis used by market participants to make decisions. Availability of and access to market information has been found to impact price discovery in cattle markets (Schroeder et. al. 1997). The goal of public data is to achieve as close as possible, equal market information for buyers and sellers. The absence of current market information creates market inefficiencies (Anderson et. al. 1998).

In fact, Anderson et. al. (1998) found the loss of public information hurt production efficiency and therefore increased feeding costs and impacted feeders more than packers. Ward et al. (2001) showed additional information on forward contracting was associated with lower, less variable cash prices and higher contract prices and

increased marketing efficiency. In October 2013 when USDA was temporarily shut down, the industry was reminded that transparency of market information is valuable and comes with a cost.

The information needs of various users depend on the sector, market structure and participants behavior. Changes within the industry mean participants' market information needs have changed and market information has not always kept pace. Increased use of AMAs requires different information than a cash market.

In 1996, USDA received the recommendation that contract or formula pricing premiums and discounts, based on carcass merit, should be captured and reported. And that a negotiated grid pricing structure be developed, with the base price and spreads determined by competitive bidding between buying interests. In October 1996 AMS started reporting national summaries of carcass premiums and discounts for fed cattle on a weekly basis. It was noted at the time that several potential base prices can be used and that premiums and discounts vary widely. Consequently, even with enhanced market information cattle feeders must understand the options for choosing base prices, premiums and discounts and the trade-offs within grids, especially for quality cattle (Schroeder et. al. 1997).

The US has more market information in this area than Canada particularly around: grid premiums and discounts, weekly reporting of forward contract numbers from packers. While some of this information is only available with a time delay, the question is would there be value to the Canadian market to enhancing current market information reporting in these areas or others?

Timeliness and Accuracy

When mandatory price reporting was introduced into the US in 2001 the focus was on accurate market information. Many of the price reports are available on a time delay of one week or more.

However, they continue to struggle with accuracy as there are incentives for industry to find ways of not reporting, by changing contracts just enough to no longer fit within USDAs definitions. Consequently, many private data providers have continued to flourish providing more timely market information to producers and industry partners. There is a role for both private and public data. Both timely information that can be used in negotiations and more accurate information published on a delayed basis that is available for price insurance programs, development of risk management models and other research.

Quality of Voluntary data

The unwillingness of some firms to report prices voluntarily raises the question among data users on if market reports are representative of actual trade. However, the bigger issue is not having cash cattle to report, at all. A mandatory system will not help if there are no cash cattle out there. In the US, under mandatory price reporting they are experiencing the same issues as Alberta simply because there are no cash cattle. The voluntary price reporting system by Canfax for fed cattle has been highly accurate over the years with the price reporting reflecting internal packer averages.

This is not to say it is without risks. Any voluntary system is at risk if producers choose to report when they receive a low price but do not report when they receive a high price. When the cash market is so thin, small changes can create swings in the average.

US RESEARCH

Research is being done by Dr. Stephen Koontz at Colorado State University with funding from the National Cattlemen's Beef Association (NCBA) is looking at proposed actions to address thinning fed cattle cash trade. While incomplete there are a wide range of alternatives to explore with varying levels of effectiveness and flexibility.

Industry communication is the most flexible and least expensive, but it also provides limited incentive to change current behaviour. A move to **basis trading** off the live cattle futures, like the grain market, has the added issue of the exchange rate and does not address Canadian market concerns. **New Trading Customs** could create a common practice of picking up cash cattle within seven days or giving cash cattle preference over AMAs within the slaughter week. This may be too flexible and difficult to enforce. Improved **Market Information** on supply and demand 3-6 months out could reduce the risk for those on the cash market. However, this does not address the risk of their only being one bidder even if there is a demand hole. While leveling the playing field in terms of asymmetric information, it would raise substantial competitiveness issues and may enhance market leverage and market power issues. **Employing market-makers** by paying feeders to provide cattle to the cash market and compensating them based on a bid system that values the cash market requires a funding source but is conceivable. Developing **permits or certificates** requiring cattle feeders to trade a percentage of their cattle on the cash market would require an enforcing body.

CONCLUSION

All pricing mechanisms have pros and cons. No one pricing mechanism (cash, contract, grid, etc.) has been proven to be better or more effective than another in all market situations. Therefore, the choice of one pricing mechanism over another will vary depending on the fed cattle characteristics, quality, location, and relationship between the feeder and packer.

Just as economics determines if the beef industry expands or liquidates. Ultimately, economics will determine the amount of cash cattle.

It has been noted that no matter what pricing mechanism is used, the volume used by one pricing mechanism affects the other mechanisms and therefore the availability and cost of information becomes the important factor for

price discovery across different pricing mechanisms (CRS, 2003).

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