The Problem of Widespread "Basis" and "Flat Price" Risk in Agricultural Commodity Markets

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Stable's research covers the widespread issue of "basis" and "flat price" risk within the agricultural commodities sector. This article defines the term "basis" to describe the difference between a cash market price and the corresponding futures market price with "flat price" risk defined as the risk where the market operator is exposed to the full spot price of a commodity. The article drills into the level of coverage that liquid futures contracts offer in the agricultural commodity markets and highlights the shortcomings in the sector. Overall, Stable finds that only 16% of global agricultural commodity markets are covered by liquid futures markets. This provides a significant issue for risk management in the sector with widespread "basis" and "flat price" risk occurring. A case study on the organic corn market highlights the challenges of price risk management in a relatively new product within the market where no exchange-traded contract exists. This is in contrast with the conventional corn market, which has some of the most established futures contracts in the agricultural commodities sector. Another case study examines the recent price volatility in beef, which was caused by plant closures during the COVID-19 pandemic. The move in prices has disrupted the once tightly knit relationship between the Chicago Mercantile Exchange (CME) live cattle futures and the price of beef, leaving industry participants without a suitable hedging tool for their price exposure. Stable concludes that the market is in need of a modern, targeted solution for the age-old problem of "basis" and "flat price" risk within the agricultural commodities sector. Stable is working hard to find a lasting solution to this issue for the industry.

Introduction

The definition of the term "basis" in academic literature can vary widely across asset classes. In the commodities sector, the term is commonly understood as the difference between a cash-market price and the corresponding futures market price. The risk of basis can be caused by unforeseen fluctuations in the cash-market price versus the futures price and is therefore an inherent challenge within risk management strategies. In addition, within the agricultural commodities space a number of markets operate without any form of liquid futures markets. This leads to another type of price risk, which is described as "flat price" risk. In this article, we highlight the definition of "basis" risk within the agricultural commodity sector and identify markets where "flat price" risk is most prevalent. We then highlight two markets where arguably both "basis" risk and "flat price" risk exists: organic corn and cattle & beef.

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Defining "Basis" Risk in Agricultural Commodities

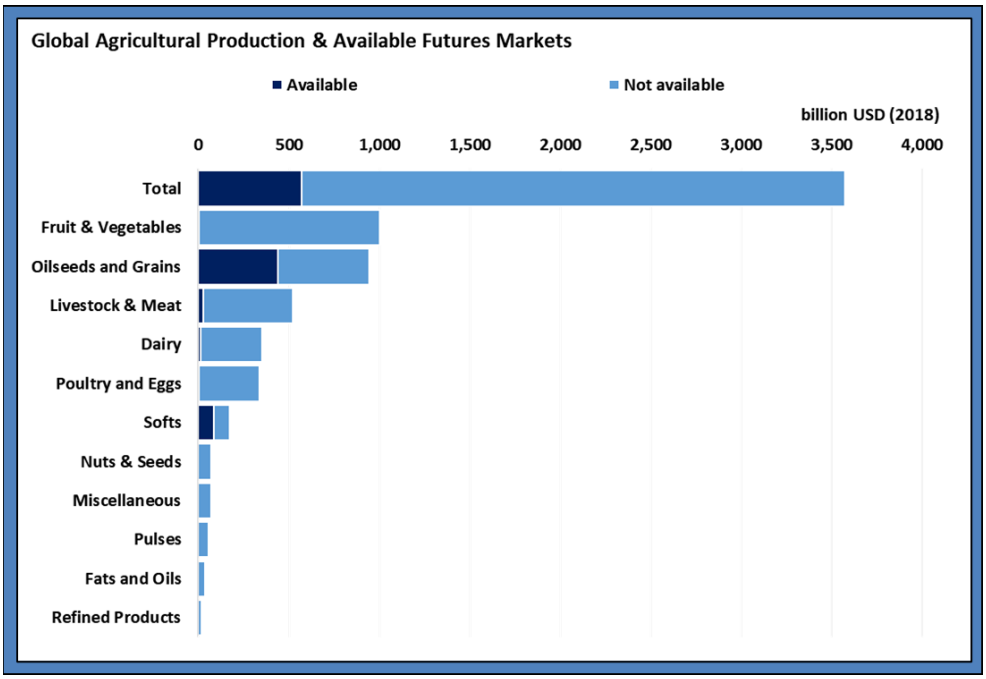
We can make a distinction between at least four types of "basis" risk occurring commonly in agricultural commodity markets. These center around four primary differences between the cash price and the futures price: specification, time, location and price movement. The first of these is "product quality basis risk," which occurs when there are differences in grade, quality, or other specifications from the standardized futures contract specification. The second of these is "calendar basis risk," which arises when the delivery date of a local cash trade differs from the expiration of the futures market contract. "Location basis risk" occurs when the underlying asset's point of sale differs from the futures market delivery point, resulting in a difference in logistics costs. Lastly, "price basis risk" occurs when a cash price does not move in conjunction with the corresponding futures market price, which can occur when there is a difference in information flow or price reporting frequency.

Managing the exposure to these types of "basis" risk is particularly challenging in agricultural markets. There is high variability among product specifications; and due to many producing and consuming regions having restricted access to global flows, a significant portion of agricultural commodity trading happens on a local basis. These factors mean that many agricultural commodities can have exposure to one, or even all four, of the listed types of basis risk. This can cause a significant level of volatility in the basis values and create difficulty hedging these products on liquid futures exchanges.

Outside of Futures Markets

The definition of "basis" risk includes those markets that have relevant liquid futures markets available for hedging purposes. Liquid futures exchange contracts, however, are not available in all commodity markets. According to Stable's research, currently only 16% of the value of global agricultural production is covered by operational futures contracts. This is calculated by matching relevant products and futures markets based on product specification, factoring in traded volumes. This means that there are a wide number of agricultural markets where there are no futures market hedging options available to market participants. The risk when exposed to the absolute price of a commodity is described as "flat price" risk. As per Stable's research, the greater part of the world's agricultural commodity markets is fully exposed to price volatility, and therefore "flat price" risk is widespread.

Figure 1
Global Agricultural Production & Futures Markets Scope for Hedging



Sources: Stable Research, Food and Agriculture Organization (FAO) of the United Nations, and Bloomberg.

In terms of futures contract coverage by sector, the oilseeds and grains markets have the highest coverage with 46% of the global value of production covered by futures contracts. This is closely followed by the softs sector, which is made up of sugar, cotton, cocoa and coffee, with over half of the production value covered by liquid futures contracts. Outside of these markets, however, in the meat and livestock, dairy and fresh produce markets, very little coverage exists in the form of futures contracts. These markets have obstacles such as a lack of product standardization and storage restrictions, which could make launching futures contracts challenging. Within these markets, the primary risk management tools available are bespoke, often costly and imperfect solutions, such as cross-hedging, over-the-counter products and long-term physical contracts.

Established Product, New Approach - The Case of Organic Corn

In some markets, despite there being a long history, new farming practices can emerge and lead to a significant level of both "basis" risk and "flat price" risk between physically identical products. After being domesticated over 7,000 years ago, corn has developed into one of the most important crops globally (Pruitt, 2016). Conventional corn markets are well-established and sophisticated with futures contracts in the U.S. originating in the 19th century (CFTC, 2022). Organic corn, on the other hand, is a relative newcomer. Although traditional farming practices—almost by definition—go way back, the organic space began emerging in the 1930's in response to synthetic fertilizer production after the First World War (Kuepper, 2010). Increasing organic demand through the sixties and seventies encouraged a more

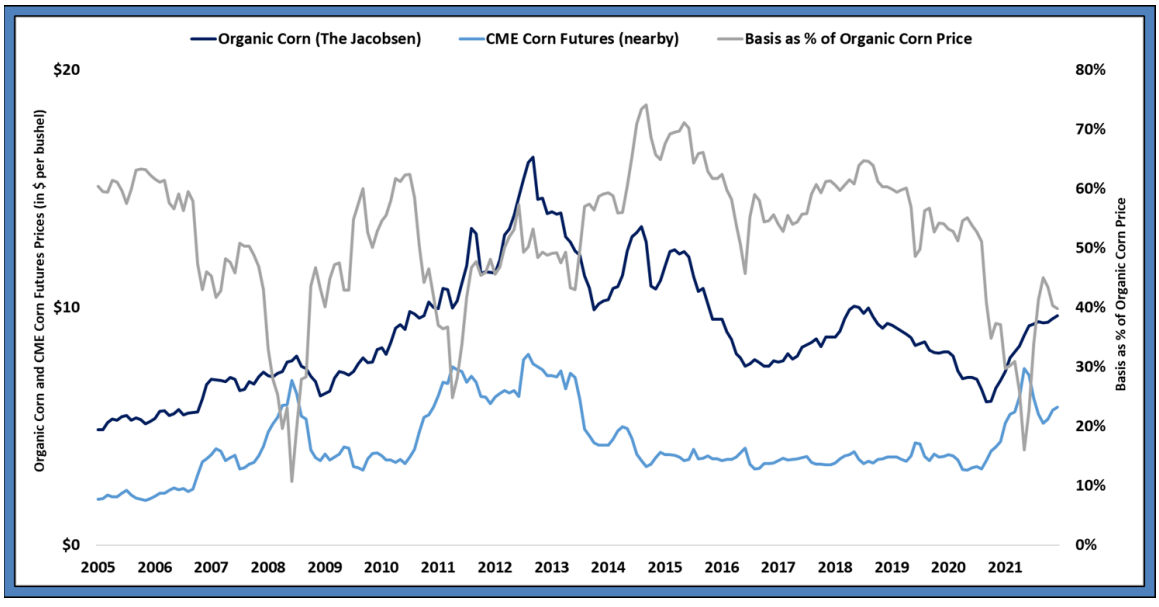
sophisticated marketplace with longer supply chains. And third-party organic certification arrived in 1973 (in California), primarily regulating against the use of synthetic fertilizers and pesticides (Lotter, 2003).

Despite organic and conventional corn being physically identical, they are to all intents and purposes completely separate markets. The main reasons for this are the criteria for certification, which, among other things, require a three-year transition period during which yields suffer without an organic premium to compensate (USDA, 2022). This produces an economic hurdle for farmers wanting to expand their organic area. Moreover, it is a disincentive to convert acreage back to conventional use. More recently, between 2008 and 2019, the U.S. organic corn area grew 7.5% annually to reach 319,953 acres harvested with the number of operations increasing by 89%, according to the United States Department of Agriculture's (USDA's) National Agricultural Statistics Service. The 2016-2019 period alone saw production expand by a further 50%.

Alternative Farming Practices, Conventional Hedging Tools

As the market develops over time, so too should concern over the lack of suitable price risk management tools. The nearest hedging option to those in the organic corn space are conventional corn prices, which the United States Federal Crop Insurance Corporation uses as a benchmark for coverage programs. Conventional futures (such as those offered by the CME Group) are occasionally traded by organic market participants, but the strategy is arguably ill-advised.

Figure 2
Organic Corn versus Conventional Corn Price Difference



Sources: The Jacobsen[1], the CME Group, and Stable Research.

The "basis" between the two corn market prices, or in this case the organic premium, can vary substantially. Recent years' price movements illustrate their separation and the "basis" risk inherent

when cross-hedging with corn futures. The 2016-2020 period saw conventional prices flatline while imbalances in the organic sector resulted in price volatility. More recently, conventional corn prices spiked due to, among other things, strong Chinese demand, a poor Brazilian harvest and drought impacting major competing markets. While organic corn prices rose during this time, they did not jump nearly as much and were insulated from co-movements in other sectors. This resulted in the organic premium almost disappearing entirely in May 2021, which is significant considering organic corn prices were three times those of conventional corn a few years earlier.

Methods in the organic grain space may compound the above concerns. Organic corn farmers in the Midwest are usually wedded to a rotation, most often with hay, and rarely exceeding two years of corn in any four years (Brock *et al*., 2021). While it is true that conventional corn is often rotated, synthetic fertilizers offer more flexibility to react to market prices – as the perennial focus on the corn/soybean ratio might suggest. This is also evidenced by empirical work highlighting negative cross-price elasticities of conventional U.S. corn and soybean acreages in the short run (Kim and Moschini, 2018). Without the ability to hedge effectively, more rigidity in organic practices can increase risk at the farm level. It may also lengthen bullish or bearish price trends in organic markets. Compared to a more flexible and mean-reverting conventional space, such differences should provide caution for those considering a cross-hedge between these separate markets. They may look the same; they may taste the same; but in both price and practice they are not the same.

Butchering the Term "Basis": The U.S. Cattle and Beef Markets

Although the traditional definition of "basis" is outlined in the first section of this article, there are examples when the term is used for the difference in price between two related products. In the case of the livestock and the meat industry, "basis" is used as a way to describe the relationship between the price of the animal and the price of the meat that it produces. While a futures contract exists for live cattle futures on the CME, no futures contract exists to directly manage price risk for the boxed beef cutout. With no clear-cut risk management tools available, market participants who are exposed to the price of beef could face significant levels of "basis" risk to the CME cattle futures, or perhaps pure "flat price" risk exposure to beef prices.

Typically, participants manage risk in a variety of ways from strategically timed procurement decisions (sometimes storing the product in a freezer until needed) to agreements between the buyer and seller to purchase set volumes at set prices over a period of time. In some cases, participants will deploy imperfect cross-hedging strategies using existing futures products that are sufficiently correlated to beef prices (CME Group, 2020).

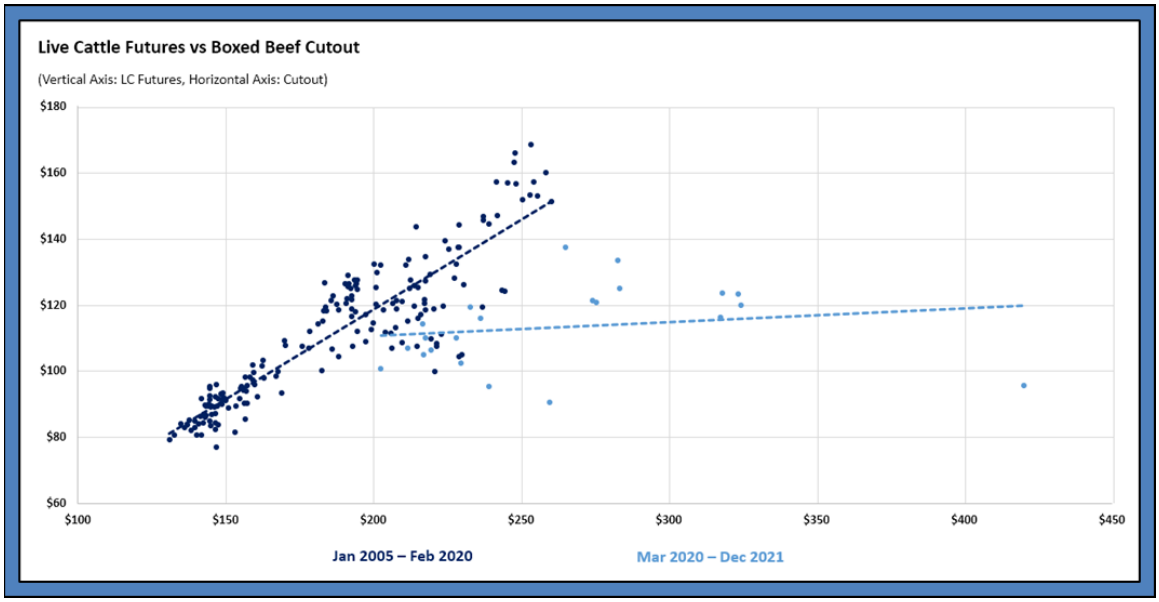
Over time, the literature around managing beef price risk with live cattle futures has shifted. While the argument originally suggested that using live cattle futures could be an effective hedging tool for hedging beef, recently consensus has switched to the contrary. Live cattle futures are now viewed as a relatively ineffective hedging tool for beef price risk, particularly when it comes to individual cuts of beef (Mattos *et al*., 2003). Despite this, there are those who still use live cattle futures to hedge the boxed beef cutout.

Pandemic Disruption Impacts the "Basis"

Recently, pandemic disruptions in the industry have rendered the use of live cattle futures as a beef price hedging tool even less effective. Fundamental disruptions in the market supply chain in the first half of 2020 caused the relationship between the beef and cattle price to breakdown.

Prior to March 2020, cattle and beef prices exhibited a reasonably correlated relationship that was periodically disrupted by short term, exogenous shocks. Indeed, the monthly correlation of live cattle futures and boxed beef cutout prices between January 2005 and February 2020 was over 90%. However, following the disruption of slaughter facilities during the pandemic, this relationship broke down. Between March 2020 and December 2021 the correlation fell to just 16%. Figure 3 shows the breakdown in this relationship.

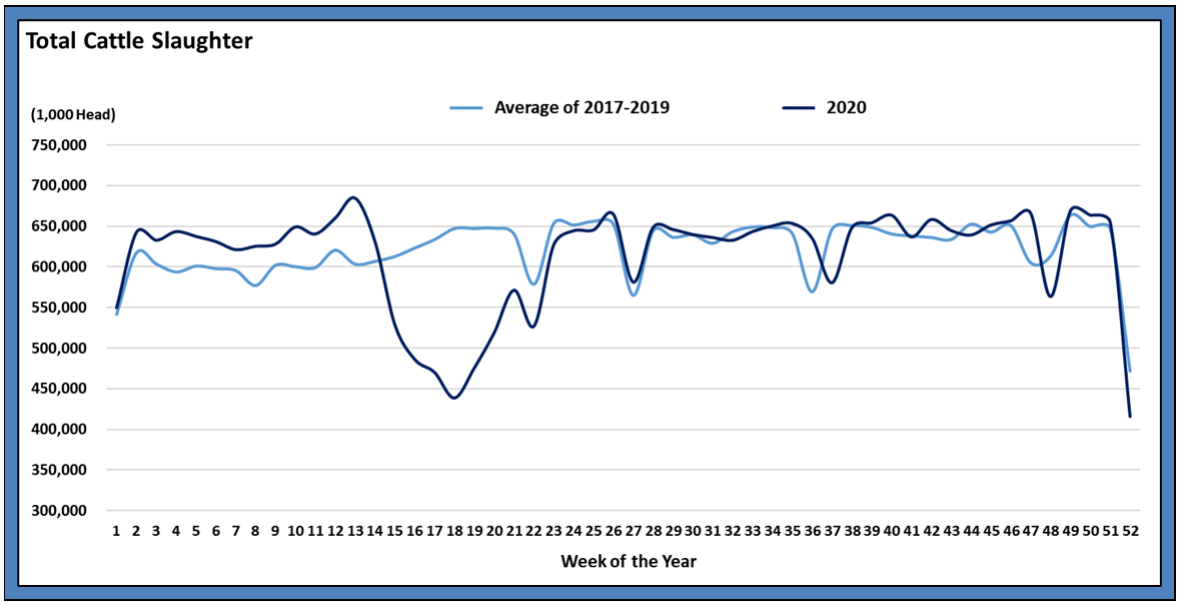
Figure 3
Live Cattle (LC) Futures versus Boxed Beef Cutout Prices (in $ per 100 pounds)



Sources: Stable Research, USDA, and the CME Group.

The breakdown in the relationship was fundamentally driven by disruptions in the meat packing and processing industry. Over the course of a few months in 2020, more than two dozen livestock processing plants closed due to issues related to COVID-19, for periods ranging from a few days to several weeks. In some cases, the closures were due to COVID-19 outbreaks among workers at the plants; in other cases, workers stopped going to work out of fear of catching the virus. This led to severely reduced capacity across many of the plants that remained open. Overall, processing capacity was reduced by more than a third from the end of March 2020 to the beginning of May 2020, when slaughter numbers hit their lowest levels. The USDA estimates that daily capacity at U.S. cattle and hog facilities declined as much as 45% at some points in May of 2020.

Figure 4
Total Cattle Slaughter: Same Period Comparison of 2020 versus Average of Previous Three Years



Sources: Stable Research and USDA.

The decline in slaughter capacity created a backlog of animals that would take months to work through. This was a particular challenge for livestock producers, who scrambled to slow the weight gain of animals already in the pipeline for slaughter. This capacity reduction created an oversupply of animals available for slaughter, driving the price of fed cattle down. The reduction in processing capacity not only impacted slaughter levels, but also reduced beef production. This restricted the supply of available beef on the market to fulfill existing orders. As a result, there was an even greater shortage of beef available on the spot market, which helped drive up the negotiated boxed beef cutout price.

This temporary shock breakdown in supply and demand and consequent price correlation illustrates the fragile nature of the use of hedging models for fundamentally different products. The "basis" or even "flat price" risk during this period would have become almost impossible to manage. Indeed, the beef market serves as an excellent example of a market that has lacked adequate tools to manage price risk in the past.

A Modern Solution to an Ongoing Problem

As evidenced by the two markets highlighted in this article, both "basis" risk and "flat price" risk are widespread throughout the agricultural commodities markets. The historic institutions of futures markets have stood for a long period to serve a number of markets with hedging solutions, and yet only serve just over 15% of agricultural commodities. This results in businesses in these markets relying on often imperfect solutions to preserve their crucial bottom line. This can mean relying on and hoping that historical correlations will hold true to future correlations, which can be destructive when these assumptions break down. As we have seen with both organic corn and cattle and beef, this can happen,

resulting in unmanaged price volatility, causing problems for businesses throughout the commodities supply chain.

In short, to solve the problems noted in this article's case studies, our firm has created a 21st century solution to help manage agricultural commodity price risk. Our advanced technology enables us to deliver liquidity into commodities where no futures markets exist. We do this by offering our clients option-based contracts, with settlement upon 3rd party indexes that are tightly correlated to their price risk exposure. We complement cutting-edge technology with specialized market expertise to provide timely and accurate hedging solutions that enable our clients to minimize basis or flat price risk.[2]

Endnotes

1 The Jacobsen is the leading provider of organic and non-Genetically Modified Organism (non-GMO) grain prices globally.

2 We invite readers to visit www.stableprice.com to learn more about the risk management solutions that we provide.

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Paola Luporini arrived at Stable in 2021 to lead the building out of Stable's global fundamental supply-and-demand (S&D) balance sheets: mapping the global agricultural commodity markets through data and building the infrastructure for a 21st century technology platform. Previously she worked as a senior analyst at S&P Global Platts, with prior experience as a trader at Italpreziosi in the metals markets and Raizen, covering the sugar markets, in Sao Paulo.

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Sam Horsfield joined Stable in 2021 to build out Stable's understanding of the global grains markets, writing content and managing the global grains S&D and trade flow analysis. Previously Horsfield worked at Tesco as a Commodity Analyst in the oilseeds markets following the completion of a M.Phil. in Economics at Cambridge University.

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Sakshi Mehta works in Stable's research team in London, supporting the building of global fundamental S&D balance sheets and leading Stable's market sizing project. She recently received her Master's degree in Economics and Strategy for Business from Imperial College Business School, U.K., and has previous experience working at Ernst & Young as a Financial Service Risk Management Analyst.

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Having joined Stable 3 years ago, Joe Brooker leads the research team with a focus on sourcing price discovery in opaque commodity markets and expanding Stable's global fundamental market analysis to support the growth of Stable's products. Booker has previously been a senior sugar analyst at S&P Global Platts having started out at ADM in their London sugar trading team. Between those roles, he covered the research of the African sugar markets at ED&F Man.

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