



2010 CAES Workshop on Risk Management

April 12, 2010, Robson Square, Vancouver

Presentation Abstracts

Session 1: Time Series Methods for Price and Yield Analysis

Title: **The Term Structure of Implied Forward Volatility: Recovery and Informational Content in Selected Agricultural Futures Options**

Speaker: Thorsten M. Egelkraut, Agricultural and Resource Economics, Oregon State University

Co-authors: Philip Garcia and Bruce J. Sherrick, Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign

Abstract: The study assesses the volatility and price information contained in selected agricultural futures options with respect to two important dimensions, forecasts of future levels of volatility and forecasts of the direction and magnitude of changes in future volatility. Options with different maturities are used to recover the implied forward volatility, a volatility forecast for non-overlapping future time intervals, and to generate the term structure of future volatility. Analyzing five commodities - corn, soybeans, soybean meal, wheat, and hogs – we find that the implied forward volatility dominates forecasts based on historical volatility information for the nearby interval of the term structure where predictive accuracy is affected by the commodity's characteristics. Unbiased and efficient corn and soybeans market forecasts are attributable to the well-established volatility during critical growing periods. For soybean meal, wheat, and hogs volatility is less predictable, and investors appear to demand a risk premium for bearing volatility risk. For more distant time intervals of the term structure, the implied forward volatility is less able to predict the direction and magnitude of future volatility changes, but continues to contain meaningful information.

Title: **Modeling Yields with Mixture Distributions and GARCH Processes**

Speaker: Alan Ker, University of Guelph

Co-author: Satheesh Aradhyula, University of Arizona

Abstract: We model yields using a mixture of two Normal Distributions. The variance parameters are modelled as separate GARCH processes. This mixture distribution is very flexible and can accommodate the common empirical properties found with yield data (e.g. negative skewness). Yield realizations may be thought to come from one of two distributions; one representing yields in catastrophic years; and one representing yields for regular years. As a result the catastrophic distribution would be of smaller mass and on the lower tail of the regular distribution -- again consistent with empirical yield data. This model will be extended to include climate change variables in the GARCH processes as well as in the function representing the mixing parameter.

Title: **Examining the Link between Futures Market Liquidity and Funding Liquidity: The Case of Cotton Merchants in March 2008**

Speaker: Joseph Janzen, University of California-Davis

Co-author: Colin Carter, University of California-Davis

Abstract: Supply and demand fundamentals do not appear to explain the dramatic spike in cotton prices in February and March 2008, when futures prices rose nearly 30% in just two weeks. Why were futures prices so volatile and what were the consequences for market participants? Part of the answer lies in the interrelationship between funding liquidity and market liquidity. Cotton merchants who used futures to manage price risk incurred severe losses due to margin calls on futures positions. These losses occurred because merchants were liquidity constrained; they did not have access to sufficient credit in order to ride out market volatility until prices returned to fundamentally justified levels. The trades that merchants had to make to limit losses resulted in a sudden drying up of market liquidity, with bid-ask spreads widening dramatically. This forced prices higher, causing further losses to constrained short hedgers. Building on the work of Brunnermeier and Pedersen (2009), I describe an equilibrium model of futures trading that explains the empirically documented relationship between market liquidity and funding liquidity described above.

Title: Speculation in the Futures Market and Spot Price Volatility: The Case for Rice

Speaker: Ali Doroudian, Land and Food Systems-UBC

Abstract: This work evaluates the impact of speculation in the Rice futures market on spot price volatility in the United States. Speculation is captured by sudden movements in trading volume and open interest. Granger Causality tests and Forecast Error Variance Decomposition (FEVD) methods are used to study this impact. Spot price volatility is modeled as GARCH (1,1). The trading volume and open interest values are detrended by subtracting from a four week average. The detrended values were then partitioned into expected and unexpected components using the ARIMA model. The movement in the unexpected components of trading volume and open interest were then tested to see whether they Granger cause spot price volatility. Whereas Granger causality only points to the statistical significance of the variables, FEVD captures their economic significance. The FEVD method was used to determine whether the past values of the unexpected component of trading volume and open interest predict the future values of spot price volatility. The ordering of variables in the FEVD method was also taken into account. Trading volume Granger causes spot price volatility, but the value is not significant. FEVD, however, indicates that the past values of trading volume are important in predicting the future values of spot price volatility.

Session 2: Mixed

Title: Experience Attributes and Willingness-to-Pay: The Case of Anjou Pears

Speaker: R. Karina Gallardo, School of Economic Sciences, Tree Fruit Research and Extension Center, Wenatchee, Washington

Co-authors: Eugene M. Kupferman and Chris Sater, Department of Horticulture and Landscape Architecture, Tree Fruit Research and Extension Center, Wenatchee, Washington

Abstract: Appearance characteristics are crucial for consumer's initial purchasing decision, yet experience attributes, such as eating quality are determinant for repeated purchases. Anjou pears posit an interesting case to analyze the interactions between experience attributes and willingness-to-pay (WTP). The pear industry faces multiple challenges to obtain and deliver consistent quality, as most methods used for other temperate fruits to ensure uniform quality throughout the year, cannot be applied to winter pears. Two sensory tests and choice experiments were conducted to analyze how alternative postharvest conditioning (i.e., ethylene conditioning) affected eating quality characteristics of Anjou pears, and how different eating quality characteristics affected an individual's stated WTP. We found that pears kept in cold storage for 70 days and conditioned for 4 days exhibited a firmness of 1.12 kg and taste panelists showed an intention to pay a premium of \$0.20/lb when compared with the sample that did not received any treatment. Similarly, pears kept in cold storage for 169 days and conditioned for 2 days exhibited a firmness of 1.41 kg and panelists showed an intention to pay a premium of \$0.29/lb. Results show that ethylene conditioning could be promising for the pear industry, as it helps developing the target firmness and the whole set of sensory characteristics most appreciated by pear consumers.

Title: A Real Option Approach to RINs Pricing

Speaker: Nicholas D. Paulson, Department of Agricultural and Consumer Economics at the University of Illinois at Urbana-Champaign

Co-authors: Mindy Mallory, and Scott Irwin, Department of Agricultural and Consumer Economics at the University of Illinois at Urbana-Champaign

Abstract: The Energy Independence and Security Act (EISA) of 2007 established an annual floor on the volume of biofuels used in the domestic fuel supply of the United States. The mandate levels, established through the Renewable Fuel Standard (RFS), are based on a hierarchy of biofuel types and increase each year to a total of 36 billion gallons in 2022. Renewable Identification Numbers, or RINs, serve as the accounting mechanism used to determine whether these mandates are being met. A RIN is created for each gallon of biofuel produced. The RIN can then be used directly towards the mandate of the obligated party (i.e. a fuel blender) physically blending the biofuel, or separated from the biofuel and used by another obligated party towards meeting their own mandate level.

RINs, and the markets for their trading, began in September of 2007. The value of RINs have been extremely volatile due to a number of both market and institutional factors. Participants in the ethanol industry, from the production level to the fuel blenders, have had to become familiar with the new regulations related to the fuel mandates and use of the newly developed RINs accounting, reporting, and trading systems. The significant increase in the blending requirements outlined in the EISA, which took effect in early 2008, dramatically impacted the valuation of RINs.

To date, research on the RINs market in the academic literature has been sparse. This can be attributed to the lack of publicly available data on RINs pricing and trading. Moreover, through 2009, the RFS mandates were

met due to positive economic conditions for fuel blending. However, the outlook for 2010 and future years is much different. Mandates for the use of more advanced biofuels, such as biodiesel and cellulosic ethanol, have a greater potential to be binding. Furthermore, the component of the overall mandate that can be met with traditional biofuels, such as corn-based ethanol, continues to increase.

Working from the perspective of US fuel blenders, we employ option pricing methods to analyze the RINs market using a unique data set of average daily RINs price from across the US. The value of a RIN is modeled as a function of current and expected blending margins, and the component(s) of the overall mandate to which it can be applied. We also provide an overview of the RFS and RINs market as an additional contribution.

Title: Effects of Fertilizer, Technology, Weather, and Biodiversity on Canola Productivity

Speaker: Richard Carew, Agriculture and Agri-Food Canada, Summerland, BC

Co-author: Elwin. G. Smith, Agriculture and Agri-Food Canada, Lethbridge, Alberta

Abstract: Canola producers in the Canadian prairies are faced with production risk and making optimal input choices stemming primarily from adverse weather conditions. Flexible functional forms are examined within a Just-Pope framework to measure how the marginal effects of inputs and technology affect canola output and yield variance. This study is based on a panel data set of canola production risk districts in Manitoba comprised of improved measures of biodiversity indices (e.g., Margalef, Shannon), weather and technology.

Title: Are the European Carbon Markets Efficient – Replication Project

Speakers: Peter Bell, UBC and Hugh Scolah, University of Victoria

Co-author: G. Cornelis van Kooten, University of Victoria

Abstract: We replicate and extend the paper from Review of Futures Markets titled “Are the European Carbon Markets efficient?” by Markellos and Daskalakis (2008). The financial econometric techniques used allow us to assess informational efficiency based on asset price histories. We use end of day spot prices from several classes of claims including: first and second period credits, assets traded on ICE, EEX, BlueNext, and Dow Jones. Profitability of trading strategies is presented. The statistical results achieved debate the random walk hypothesis and simple interpretations of market efficiency. The trading results are used to characterize the situation: if you had credits to distribute, how should you do it? (A replication of Markellos paper: Review of Futures Markets, Vol. 17, No. 2, pp. 103-128, 2008; Results will be extended.)

Session 3: Commodity Marketing

Title: Comparing Returns for Grain Corn Production under Various Marketing Strategies

Speaker: Richard Vyn, University of Guelph, Ridgetown Campus

Abstract: For corn producers, decisions regarding the marketing of their crop can be very difficult to make due to uncertainty and to a lack of information regarding the relative effectiveness of various marketing tools. This research addresses this issue through the development and use of a simulation model to compare the returns from a set of specific marketing strategies for corn producers in Ontario. This simulation model uses historical pricing data to determine returns from these marketing strategies, which include tools such as cash sales, forward contracts, basis contracts, futures contracts, and options. Overall, the results indicate that pre-harvest marketing strategies for corn that use futures contracts and options are most effective relative to the baseline strategy of selling the entire crop at harvest. These strategies were found to return a higher average price than strategies using only cash sales, particularly in years where the pre-harvest prices are greater than the costs of production.

Title: Investigation of the Linkages among Agricultural, Oil, and Exchange Rate Markets

Speaker: Julieta Frank, University of Manitoba

Co-author: Philip Garcia, University of Illinois-Urbana-Champaign

Abstract: Research suggests that modeling interdependencies between agricultural markets and macroeconomic factors is complex. For instance, results of the direction of causality from exchange rates to prices are mixed and highly dependent on the specification of the model used. Also, failure to include important markets can hamper estimation of the linkages between markets, and reduce the likelihood of developing predictive relationships. We investigate the linkages among corn, soybeans, wheat, and cattle prices, crude oil prices, and exchange rates.

Improved understanding of these relationships and their magnitude could be used to develop marketing strategies, and could provide policy makers with added insights into the effect of new policies to related markets.

Title: **Spatial elements of the procurement strategies for Canola Crushers in Western Canada**
Speaker: Derek Brewin, University of Manitoba
Abstract: This paper develops a model of profit maximizing crushing plants and simulates possible implications of changing strategies on market and Nash equilibriums among rivals if the number of firms increase or strategies shift. Implied spatial price patterns are then identified and linked to differing canola procurement strategies. These patterns would be testable against actual prices.

Title: **"I Think That's a Good Price"**
Speaker: Kara Gray, Canadian Canola Growers Association
Abstract: Canola marketing options have multiplied since canola came onto the scene in the 1970s, but farmers still have many things to consider when trying to manage their marketing and pricing risk. Volatile basis levels limit the efficacy of hedging as a risk management tool. Going beyond cash-in-the-pit pricing and hedging on the commodity exchange, canola buyers now offer a variety of contract options. Farmers have the option to grow and forward price mainstream and specialty varieties. While many of these contracts offset risks of farm-gate price movement, they also pair farmers with effective monopsonies, where contract performance can affect bottom lines. The current menu of canola marketing options will be compared and their implications for managing risk will be discussed.

Session 4: Risk Management

Title: **Cross Hedging Alfalfa Using Corn Futures Contracts**
Speaker: Shannon Neisberg, Washington State University
Abstract: Pacific Northwest ports have about a seventy percent market share of the 1.5 million metric ton export market to Pacific Rim countries with Japan being the primary destination port. In turn, this export market represents approximately \$106 million to \$282 million in Pacific Northwest hay purchases, depending on yearly average hay price. Hay exporting firms privately contract with hay producers to discover price and secure supply in early spring and take delivery of hay for export processing and shipping throughout the year. The exporting firms do not have offsetting sale contracts because the importing countries prefer to discover price through open market competition throughout the year. As a result hay exporting firms face early season price discovery risk in setting producer contract terms and carry substantial inventory value risk throughout the holding period. The purpose of this research is to evaluate the potential of cross-hedging Washington alfalfa hay price with nearby and next year CME Group corn futures contracts as a risk management tool. The results identify seasonality in the alfalfa corn futures price relationship with a stronger relationship in the summer followed by a weakening relationship into the winter and early spring. The 2008 to 2009, alfalfa – corn futures price relationship experienced market shocks namely an increased ethanol mandate impacting corn futures price and unprecedented price volatility in the alfalfa market. Additional work is needed to determine if controlling for these market shocks would increase the effectiveness of the hay-corn cross hedging strategy.

Title: **Behavioral Dimensions of Decision Making in Grain Marketing**
Speaker: Fabio Mattos, University of Manitoba
Co-author: Stefanie Fryza, University of Manitoba
Abstract: The Canadian Wheat Board (CWB) is the sole marketer for wheat and barley produced in western Canada, offering producers several pricing alternatives with distinct combinations of return, risk and cash flow. In the context of grain marketing it is traditionally assumed that producers make logical and strategic decisions based on their preferences and risk-return tradeoffs. However, empirical research questions this assumption by finding that individuals deviate from logical and strategic decisions. The objectives of this research, in the context of pricing alternatives and risk management for CWB crops, are to gather a better understanding of how farmers make marketing decisions, examine types of behavior that might affect their decision making process, assess how much the price obtained from their marketing strategies compare with prices that could have been obtained if they had chosen other strategies offered by the CWB, and discuss ways to help farmers improve their decision making process. A unique dataset made available by the CWB will be used in this research, allowing us to follow exactly what choices producers made, what market conditions were prevalent during the period they made their decisions, and what price they received at the end of the crop year.

Title: Price Volatility, Margin Calls and Hedging Decisions

Speaker: Alfons Weersink, University of Guelph

Co-author: Getu Hailu, University of Guelph

Abstract: The recent rise in crop prices that occurred in the fall of 2006 was the beginning of an unprecedented level of volatility in agricultural markets since 1970s'. Corn prices on the Chicago Board of Trade (CBOT) rose from less than \$2 per bushel in September of 2006 to almost 4 times that price in the spring of 2008. Similar price spikes occurred in the soybean market and the wheat market but within a shorter time frame. While the large jump in prices may have 'benefited farmers' who had seen years of declining real and nominal prices, the sudden change in the market caused havoc for consumers, particularly the urban poor in developing countries. Higher food prices in developing countries spawned concerns over the "silent tsunami" that was spreading over the less fortunate who could not afford adequate nutrition. In an attempt to deal with the food crisis, answers were sought to what caused the sudden change in commodity markets.

A number of factors contributed to the rise in prices experienced in 2007-2008 (Weersink *et al.*, 2008). The stock-to-use ratio had fallen to historic lows for most crops as production levels had flattened over the years in response to continued low prices. Poor harvests then occurred in some major exporting countries along with the culmination of several demand-side forces. The US dollar fell relative to other currency increasing the purchasing power of commodity buyers. These buyers were increasingly from countries such as China and India which were experiencing GDP growth that was several times the global average. In addition, renewable fuel mandates, particularly in the US, represented a new demand source that now diverts over one-third of the US corn crop.

Speculators were and continue to be a popular target for explaining dramatic price swings experienced in the commodity markets. It became common for political leaders and media to argue that commodity index investors (CITs) and other large institutional investors exerted a destabilizing influence on prices, particularly after a submission by Michael Masters to a US Senate sub-committee in the summer of 2008 (Masters 2008). Although there is some debate about whether commodity index traders have caused the change in agricultural commodity prices, or whether the volatility in agricultural commodity prices attracted CITs, there is an agreement that these markets have become more volatile. Subsequently, there have been demands for regulatory intervention to lessen the impacts of speculative trading on the assumption that the actions of index traders destabilize commodity prices.

Given the increase in commodity price volatility to rise, it is important to explore the effect of the rise in futures price volatility and market-to-market risk (liquidity risk) on risk management by agricultural producers. The purpose of this study is to examine the implications of a rise in volatility for the risk management performance of the futures market. Specifically, we aim to answer the question: What are the implications of the anomalies (price convergence problems) between futures and cash prices and the recent extreme futures price volatilities on optimal hedging strategies by crop producers? We theoretically derive optimal hedge ratio and then simulate under alternative values for the model parameters. The optimal hedge ratio is derived by extending the model developed Pannell *et al.* (2008) who used mean-variance framework. We consider a two-period model with three-trading dates.

We showed that the aversion to mark-to-market risk reduces the optimal hedge ratio. As well, a rise in the level of volatility of the futures prices has a negative influence on the optimal hedge ratio. Thus, if the alleged destabilization effect of CITs takes the form of higher market volatility, it makes the derivative markets less reliable and more costly as risk management tools for producers, grain elevators, and processors alike. Further, the intermediate losses as a result of high margin calls may force producers to terminate their hedging programs, and in the extreme cases businesses may be forced to shut down. The result is consistent with the observation that small and mid-sized elevators were disappearing during high commodity prices volatility, and big grain elevators were refusing to buy crops in advance from farmers because of costly hedging. Producers who are using futures hedges must be aware of the possibility for liquidity risk (*i.e.*, fund required for margin financing) resulting from a margin call if the futures price moves significantly "against" a hedge position before contract expiration date.

Title: Canadian Pork Industry - What Lies Ahead?

Speaker: Ken McEwan, University of Guelph- Ridgeway Campus

Co-authors: Randy Duffy and Lynn Marchand, University of Guelph- Ridgeway Campus

Abstract: This paper will review historical and current pig inventory numbers, live pig and pork flows, total production, slaughter capacity, and consumption levels within Canada. Further, profitability will be investigated from both a producer and processor perspective relative to the U.S. Canada's reliance on international trade will be examined along with some of the current industry issues which include: feed costs, slaughter capacity, COOL, and exchange rate fluctuations. The paper will conclude with 1 or 2 different market hog price forecasts.