Asymmetric Price Transmission and Volatility Spillovers in Alberta Cattle, Feed Barley and U.S. Corn Markets

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Conclusions

Pairwise Johansen cointegration tests (Johansen 1988) indicated the existence of a long-run relationship in price changes between two feeder cattle markets. Likewise in we found the same results in price changes between two feed grain markets.

Results from univariate GARCH models imply:

- The barley price volatility is the most susceptible to market shocks, while the feeder cattle (800-900lbs) price volatility is found to be the least among all five markets.
- General shocks have larger impacts on feed grain price volatilities than cattle price volatilities.
- Asymmetric effects are only found in cattle price volatilities.
- Results from AG – DCC GARCH models suggest:
  - Supply chain link: Time-varying conditional correlations between feeder cattle and feed cattle price changes dropped substantially at the beginning of the 2001 Canadian BSE crisis.
  - Between cattle and barley markets: The end of 2000 saw a sudden break in the conditional correlation between the two markets.

Background and Objectives

- The Canadian cattle industry has faced a number of shocks over the last decade – BSE, feed price surges and overall consolidation in herd size.
- This study aims to assess the link between the Alberta cattle and the U.S. corn markets.
- Market interdependencies among the aforementioned markets.
- We included the U.S. corn market as Alberta feedlot owners are starting to import U.S. corn as a substitute for barley (Crawford et al 2012), this would potentially create a direct link between the Alberta cattle and the U.S. corn markets.

Methodology (Conditional Correlation)

- To build the time-varying correlation model, we will need to decompose the correlation matrix $R_t$ from the first stage as follows:

$$R_t = D_t^{-1/2}H_t D_t^{-1/2}$$

- Where $D_t = diagonal(D_{111}, D_{222}, D_{333})$ and $D_t = 1.2I$ are the standard conditional variances (or conditional volatilities) estimated from univariate GARCH models from the first stage, and $H_t$ is the variance-covariance matrix.

- $H_t$ can be estimated as the following specification:

$$H_t = eta + (a + b \alpha)t + \epsilon_t$$

- Where $\epsilon_t$ is the vector of standardized residuals from the first stage, $h_t = \epsilon_t^T \epsilon_t$ is an x 1 indicator function (in our case, $k = 5, a, b, g$ are parameter vectors and $d$ denotes the Hadamard product).

- Finally, for any covariance ($h_{ij}I_{W_t \neq j}$) and correlation ($\rho_{ij}I_{W_t \neq j}$), they have the following specifications:

$$\rho_{ij} = \frac{1}{\sqrt{\frac{\sum h_{ij}^2}{\sum h_{ii}^2}} \sqrt{\frac{\sum h_{jj}^2}{\sum h_{jj}^2}}}$$

Data

- Weekly nominal prices from January 4, 1995 to July 24, 2013 of Alberta fed steers, feeder steers (500-600 lbs), and the U.S. corn, from January 4, 1995 to July 24, 2013 are used in this study.
- Data used for model estimation is in price changes, hence, $\Delta P_t = \ln P_t - \ln P_{t-1} \times 100$.

Results (Conditional Correlation)

- Asymmetric price transmission and volatility spillovers in the Alberta cattle, feed barley, and U.S. corn markets.