

# THREE ESSAYS ON AGRICULTURAL PRICE VOLATILITY

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## ABSTRACT

The three essays of this dissertation cover issues of understanding and managing price uncertainty across the meat value chain and related futures market. The first essay discussed the implications of recent change in retailing industry's pricing strategy; the second essay described a State Space Model approach estimation of the joint distribution of cash-futures prices and a simulation-based Conditional-VaR approach determination of optimal futures exposure determination in contrast with minimum variance hedge ratio when preference free optimal hedge ratio does not exist; the third essay described the empirical changes in the hog price volatility summarized by a series of long memory GARCH model of the absolute return series in view of the recent industry structural change.

The first essay investigated the impact of two coexisting retail price strategies for selling perishable products on the volatility of both the farm-level price and the retailer's margin. The two strategies included the traditional High-Low strategy and the Every-Day-Low-Price (EDLP) pricing strategy. In contrast to non-perishable consumer products, perishable products, which are often of very inelastic demand, obtain their price fluctuations mainly through supply side shocks. A two-retailer model was developed to examine the volatilities of grocery retailers' margin and producer price due to supply shocks for a perishable product. Results indicated a volatility difference exists between EDLP and High-Low retailers' marginal revenue when the two pricing strategies coexist,

and as the market share of EDLP format increases this margin volatility difference deepens and farm-level price volatility also increases.

The second essay proposed a state space model based estimation of the cash-futures price dependence relationship and a coherent C-VaR-approach optimal futures exposure determination based on simulated data in response to situations where the preference-free optimal hedge ratio no longer exists and the minimum variance hedge ratio is not appropriate. The State Space Model serves as an alternative method to other joint distribution estimation methods. The determined optimal futures exposure showed that the minimum variance hedge ratio discourages hedging. Parallel analyses using existing constant minimum conditional variance (MCV) hedge ratio models and a time-varying MCV ratio based on Multivariate GARCH models was also conducted for comparison. The C-VaR approach optimal futures position exposure reported different optimal futures positions for the “short hedge” and the “long hedge” situations.

The third essay analyzed the historical change of the realized price volatility defined as the weekly hog price absolute return from 1973 to 2008 using long memory effect in the mean and variance process. The ARFIMA-FIGARCH/IGARCH Model results confirmed a significant long memory effect in the absolute return for a period around the end of the 1990s with documented structural change. I found no significant long memory effect for any other period. The model result also showed a significant ARCH-M effect that is explained as a fierce industry structural adjustment leading to a more dramatic price volatility change.