

Seasonal Quality Premiums for Wheat: a Case Study for Northern Germany

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Abstract - Seasonal variations of the price premium for bread and feed wheat indicate opportunities to profitably adjust grain marketing strategies of farmers that harvest (and store) both qualities. We estimate the seasonal pattern of price premiums on the German market using a vector error correction approach, which accounts for multivariate autoregressive conditional heteroscedasticity of the error terms. Results indicate a significant downward trend for the seasonal premium, with the trend's magnitude depending on the average quality of harvested wheat. If farmers separately store both bread and feed wheat, they should tend to sell bread wheat before they sell feed wheat, particularly in years of low average wheat qualities.

INTRODUCTION

Theoretical and empirical studies on optimizing farmers' marketing of grain generally use dynamic optimization techniques to find the optimal selling date for grain stocks in a season (Blakeslee, 1997; Fackler and Livingston, 2002; Loy and Piniadz, 2009). These models assume a homogenous grain quality for all volumes marketed. In addition to the literature on optimal grain marketing, a number of papers analyse the price relationship between various qualities of grain and show significant price differences, for instance between bread and feed wheat (e.g. Larue, 1991; Uri and Hyberg, 1996; Espinosa and Goodwin, 1991; Parcell and Stiegert, 2003). Quality characteristics such as the protein content and the falling number have significant impact on the price relationship, which may affect the production and marketing of wheat, particularly when the price relationship exhibits dynamic behavior over the marketing season.² The purpose of this paper is to estimate the magnitude of the seasonal pattern of the price premium and to explore, from a farmer's perspective, the marketing opportunities that follow from it. We thus contribute to the literature on estimating wheat (quality) price premiums and on optimal wheat (grain) marketing. To the best of our knowledge, this paper represents a first attempt to derive managerial implication from the seasonal pattern of the price premium. Methodologically, we employ a multivariate approach that considers the specific time series properties of the processes under study. We estimate a vector error correction model (VECM) with multivariate autoregressive conditional heteroscedasticity (MGARCH).

DATA AND METHOD

We apply our model to data from Northern Germany, where the marketing season starts in August after harvest and ends in July of the following year. Collecting weekly producer prices of bread and feed wheat and aggregating those data for the past seventeen years (see Figure 1) clearly indicates a falling trend for the price premium during the marketing season. The average premium starts at about 10 Euros per ton and drops to about four Euros per ton towards the end of the season. Considering the average price level of feed wheat, this change of about six Euros per ton during the season accounts for approximately five percent of the average feed wheat price, or about 12 percent of the contribution margin per ha over the 1994/95 to 2010/11 period. The seasonal behaviour of the price premium implies that farmers should sell bread wheat before they sell feed wheat. We combine the studies by Karaman et al. (2009), Goodwin and Smith (2009), and Hollins et al. (2006) by looking at the premium between bread and feed wheat using a VECM model and investigating the seasonal pattern of the bread-feed-wheat-price-relationship. The final model specification includes two quality factors (protein content and falling number), a demand indicator (wheat used for human consumption), and an interaction term between a seasonal trend and the falling number variable. The following Equation captures the vector error correction specification of the price premium model.

$$\Delta P_t = \Pi P_{t-1} + \gamma Z_{t-1}^{1,2,3} + \Psi Z_{t-1}^2 ST_{t-1} + \sum \Gamma_i \Delta P_{t-1} + u_t$$

To consider conditional heteroscedasticity of the error term, we add a multivariate GARCH (MGARCH) component to VECM. We use a restricted Baba-Engle-Kraft-Kroner specification, which excludes cross correlations for the volatility.³ The variance equations include a seasonal trend variable.

RESULTS

We find a significant downward trend for the seasonal premium, with the trend's magnitude depending on the average quality of harvested wheat. If farmers separately store both bread and feed wheat, they should tend to sell bread wheat before they sell feed wheat, particularly in years of low average wheat qualities. Adjusting the marketing strategy by using the information on the seasonal price premium and its determinants could be profitable. If farmers decide to sell wheat at various dates in the season, and if farmers have both qualities in store, bread

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² Karaman et al. (2009) first mentioned potential seasonal dynamics of the quality premium.

³ See Serra et al. (2011) for more details on the specification.

wheat should be sold first, and feed wheat should be sold last, on average, for given selling dates. This recommendation is more profitable in years with a low quality harvest (short supply of bread wheat) due to unfavourable weather conditions during harvest. However, due to the volatility of the premium, this recommendation should be double-checked at the actual selling date to consider uncertain deviations from the observed seasonal trend. The deviation can offset the recommended temporal sequence of selling bread and feed wheat. Though we do not explicitly derive information on the optimal selling date, the negative trend of the price premium indicates the convergence of prices for various qualities over the season. Compared to a situation with identical seasonal price patterns for bread and feed wheat, the convergence of prices implies that farmers should sell feed (bread) wheat later (earlier) in the season. To quantify this effect, traditional models simulating optimal wheat marketing strategies would need to consider the estimated seasonal trend in the premium (or the differences in the seasonal patterns of prices), as well as the estimated random deviations of the premium between bread and feed wheat to derive estimated optimal selling dates. We leave this task to future research.

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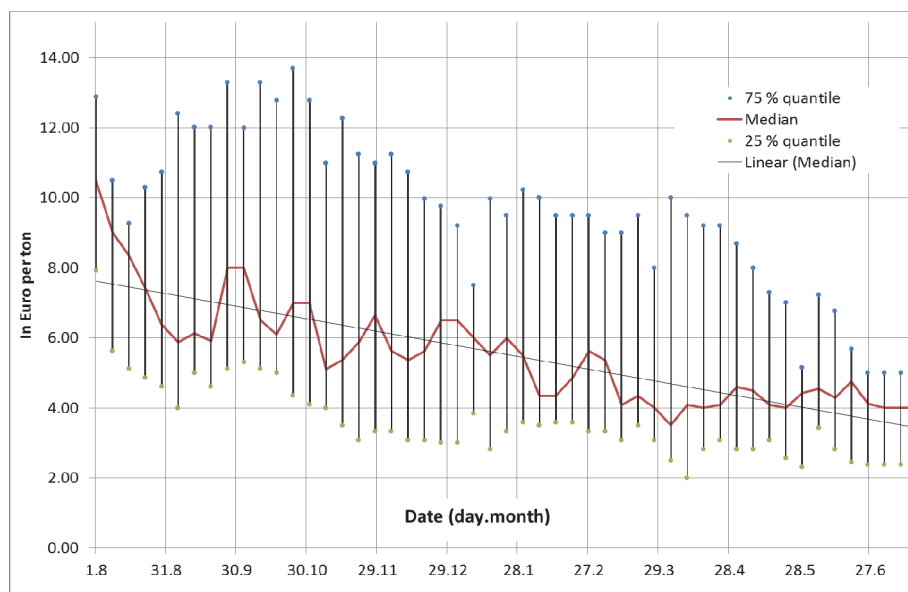


Figure 1. Average price premium for wheat during the marketing season from 1994 to 2011 $\phi(P^B - P^F)$.

Legend: Price premium = price for bread wheat – price for feed wheat.

Linear: linear trend for the median. Source: Own calculations based on data from Landwirtschaftskammer Schleswig-Holstein (2012).