Competitive Position and Price Integration of Black Sea Region Wheat

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Introduction

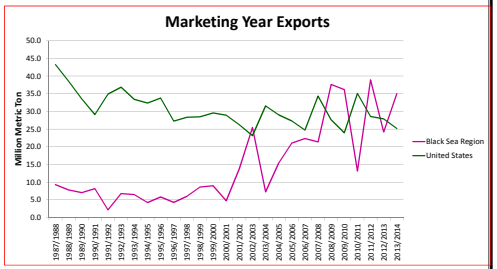
• **The Black Sea Region, consisting of Russia, Ukraine and Kazakhstan, has become a significant influence in the world wheat market. Wheat exports from this region have increased from approximately 4.7 million metric tons in the 2000/01 marketing year to nearly 39.0 million metric tons in the 2011/12 marketing year.**

• **What does this mean for United States wheat exports?**

The Black Sea Region is a major competitor of United States wheat exports, especially into North Africa, the Middle East and Europe.

•**What has been the response?**

The CME Group introduced a Black Sea Wheat Futures contract in the spring of 2012.



•**Other information?!**

Research Objective

• **Determine if the Black Sea Region milling and feed wheat prices are co-integrated with U.S. and European wheat futures market prices.**

Methods

• **Test for Stationarity in wheat selected prices.**
• **Test for Co-integration of selected wheat prices.**

Data

- Weekly average price for NYSE-LIFFEE European milling wheat futures
- Weekly average price for Kansas City Board of Trade hard red winter wheat futures
- Weekly average price for Black Sea region exports of milling quality wheat - Novorossiysk Milling Wheat (11.5% protein)
- Weekly average price for Black Sea region exports of feed quality wheat

Results of Tests of Stationarity for Weekly Black Sea Wheat by Type (Milling & Feed types) and Comparable Price Series (European milling wheat and KCBT wheat futures)

A. Price Series:

EUMillP - Weekly average price for European milling wheat
KCBTP - Weekly average price for Kansas City Board of Trade Hard Red Winter Wheat Futures
BSXMillP - Weekly average price for Black Sea region exports of milling quality wheat
BSXFeedP - Weekly average price for Black Sea region exports of feed quality wheat

B. Test Equations (SHAZAM Econometrics Analysis Software)

(1) $\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + [\sum^{p}_{j=1} \gamma_j \Delta Y_{t-j}] + \varepsilon_t$ ⇨ With constant (drift), but no time trend

(2) $\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 t + [\sum^{p}_{j=1} \gamma_j \Delta Y_{t-j}] + \varepsilon_t$ ⇨ With constant (drift) and with time trend

C. Table 1: Results of Statistical Tests for Non-Stationarity

Price Series	Test Eqn. (1) $\alpha_1 = 0$	Test Eqn. (1) $\alpha_0 = \alpha_1 = 0$	Test Eqn. (2) $\alpha_1 = 0$	Test Eqn. (2) $\alpha_0 = \alpha_1 = \alpha_2 = 0$	Test Eqn. (2) $\alpha_1 = \alpha_2 = 0$	Analysis Findings
	Test stat vs Critical value (10%)	Test stat vs Critical value (10%)	Test stat vs Critical value (10%)	Test stat vs Critical value (10%)	Test stat vs Critical value (10%)	
EUMillP	-2.69 < -2.57 Stationary	3.76 < 3.78 Non-stationary	-2.29 > -3.13 Non-stationary	2.50 < 4.03 Non-stationary	3.61 < 5.34 Non-stationary	Cannot conclusively reject null H_o of a unit root for EUMillP weekly price series (i.e., EUMillP is likely non-stationary)
KCBTP	-2.30 > -2.57 Non-stationary	2.95 < 3.78 Non-stationary	-1.87 > -3.13 Non-stationary	1.97 < 4.03 Non-stationary	2.64 < 5.34 Non-stationary	Cannot reject null H_o of a unit root for KCBTP weekly price series (i.e., KCBTP is non-stationary)
BSXMillP	-1.72 > -2.57 Non-stationary	1.84 < 3.78 Non-stationary	-1.91 > -3.13 Non-stationary	1.65 < 4.03 Non-stationary	2.11 < 5.34 Non-stationary	Cannot reject null H_o of a unit root for BSXMillP weekly price series (i.e., BSXMillP is non-stationary)
BSXFeeP	-1.86 > -2.57 Non-stationary	2.02 < 3.78 Non-stationary	-2.19 > -3.13 Non-stationary	1.95 < 4.03 Non-stationary	2.62 < 5.34 Non-stationary	Cannot reject null H_o of a unit root r BSXFeedP weekly price series (i.e., BSXFeedP is non-stationary)

Issue #1: After taking first differences for each of these variables, each is consistently stationary from a statistical sense using these same tests. So, taking first differences of these data (i.e., $\Delta Y_t = Y_t - Y_{t-1}$) causes these price series to each become stationary (i.e., the expected result).

Issue #2: Since each of these price series is non-stationary, it is appropriate to test to see if they are cointegrated, i.e., if the differentials between them over time forms a stationary time series. In other words, is the following equation stationary:

$\upsilon_{t,EUMillP - KCBTP} = \varepsilon_{t,EUMillP} - \varepsilon_{t,KCBTP}$

Cointegration:

Issue #1: These price series are not closely and conclusively cointegrated. However, there seems to be more likelihood of cointegration between a) EUMillP and KCBT, and b) BSXMillP and BSXFeedP than otherwise. KCBTP and BSXFeedP are more closely associated (but not necessarily cointegrated) than are other price series.

Issue #2: The lack of cointegration of Black Sea export milling and feed wheat prices with KCBT futures or Euro Milling futures may be due to the fact that the grain industry in the Black Sea region doesn't rely on futures markets for price risk management and price discovery. Hence, there is more likelihood of dis-association of Black Sea cash wheat prices from other world wheat markets – especially the KCBT wheat futures and the Euro Milling wheat cash prices (which I am assuming are more closely tied to wheat futures markets in the U.S. and Europe.

C. Table 2. Results of Statistical Tests for Cointegration (i.e., Stationarity of contemporaneous price series differences)

Price Series	Test Eqn. (1) Z-Test	Test Eqn. (1) T-Test	Test Eqn. (2) Z-Test	Test Eqn. (2) T-Test	Analysis Findings
	Test stat vs Critical value (10%)	Test stat vs Critical value (10%)	Test stat vs Critical value (10%)	Test stat vs Critical value (10%)	
EUMillP = f(KCBTP)	-16.57 > -17.1 Non-stationary NOT cointegrated	-2.95 > -3.04 (barely) Non-stationary (barely) NOT cointegrated	-16.59 > -23.4 Non-stationary NOT cointegrated	-2.86 > -3.50 Non-stationary NOT cointegrated	Cannot reject null H_o of a unit root for EUMillP – KCBT (difference is non-stationary) ⇨ EUMillP & KCBT may or may not be cointegrated
KCBTP = f(EUMillP)	-17.14 < -17.1 (barely) Stationary ARE cointegrated	-2.98 > -3.04 (barely) Non-stationary (barely) NOT cointegrated	-17.64 > -23.4 Non-stationary NOT cointegrated	-2.99 > -3.50 Non-stationary NOT cointegrated	Cannot reject null H_o of a unit root for KCBT – EUMillP (difference is non-stationary) ⇨ EUMillP & KCBT may or may not be cointegrated
EUMillP = f(BSXMillP)	Test not applicable	-1.86 > -3.04 Non-stationary NOT cointegrated	Test not applicable	-2.37 > -3.50 Non-stationary NOT cointegrated	Cannot reject null H_o of a unit root for EUMillP – BSXMillP (difference is non-stationary) ⇨ EUMillP & BSXMillP are NOT cointegrated
BSXMillP = f(EUMillP)	Test not applicable	-1.43 > -3.04 Non-stationary NOT cointegrated	Test not applicable	-3.38 > -3.50 Non-stationary NOT cointegrated	Cannot reject null H_o of a unit root for BSXMillP – EUMillP (difference is non-stationary) ⇨ EUMillP & BSXMillP are NOT cointegrated
EUMillP = f(BSXFeedP)	Test not applicable	-2.17 > -3.04 Non-stationary NOT cointegrated	Test not applicable	-3.17 > -3.50 Non-stationary NOT cointegrated	Cannot reject null H_o of a unit root for EUMillP – BSXFeedP (difference is non-stationary) ⇨ EUMillP & BSXFeedP are NOT cointegrated
BSXFeedP = f(EUMillP)	Test not applicable	-1.90 > -3.04 Non-stationary NOT cointegrated	Test not applicable	-3.14 > -3.50 Non-stationary NOT cointegrated	Cannot reject null H_o of a unit root for BSXFeedP – EUMillP (difference is non-stationary) ⇨ EUMillP & BSXFeedP are NOT cointegrated
KCBTP = f(BSXMillP)	Test not applicable	-2.06 > -3.04 Non-stationary NOT cointegrated	Test not applicable	-2.66 > -3.50 Non-stationary NOT cointegrated	Cannot reject null H_o of a unit root for KCBTP – BSXMillP (difference is non-stationary) ⇨ KCBTP & BSXMillP are NOT cointegrated
BSXMillP = f(KCBTP)	Test not applicable	-1.90 > -3.04 Non-stationary NOT cointegrated	Test not applicable	-3.14 > -3.50 Non-stationary NOT cointegrated	Cannot reject null H_o of a unit root for BSXMillP – KCBTP (difference is non-stationary) ⇨ KCBTP & BSXMillP are NOT cointegrated
KCBTP = f(BSXFeedP)	-13.39 > -17.1 Non-stationary NOT cointegrated	-2.60 > -3.04 Non-stationary NOT cointegrated	Test not applicable	-3.46 > -3.50 (barely) Non-stationary (barely) NOT cointegrated	Cannot reject null H_o of a unit root for KCBTP – BSXFeedP (difference is non-stationary) ⇨ KCBTP & BSXFeedP are NOT cointegrated
BSXFeedP = f(KCBTP)	-12.13 > -17.1 Non-stationary NOT cointegrated	-2.46 > -3.04 Non-stationary NOT cointegrated	-21.06 > -23.4 Non-stationary NOT cointegrated	-3.33 > -3.50 Non-stationary NOT cointegrated	Cannot reject null H_o of a unit root for BSXFeedP – KCBTP (difference is non-stationary) ⇨ KCBTP & BSXFeedP are NOT cointegrated
BSXMillP = f(BSXFeedP)	Test not applicable	-2.97 > -3.04 (barely) Non-stationary (barely) NOT cointegrated	Test not applicable	-3.03 > -3.50 Non-stationary NOT cointegrated	Mixed evidence: Cannot reject null H_o of a unit root for BSXMillP – BSXFeedP (difference is non-stationary) ⇨ BSXMillP & BSXFeedP may or may not be cointegrated
BSXFeedP = f(BSXMillP)	Test not applicable	-3.10 < -3.04 Stationary ARE cointegrated	Test not applicable	-3.13 > -3.50 Non-stationary NOT cointegrated	Mixed evidence: Cannot reject null H_o of a unit root for BSXMillP – BSXFeedP (difference is non-stationary) ⇨ BSXMillP & BSXFeedP may or may not be cointegrated

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Selected Poster prepared for presentation at the Agricultural & Applied Economics Association's 2013 AAEA & CAES Joint Annual Meeting, Washington, DC, August 4-6, 2013