**Table A11: Results of Intercept Constancy Tests for Select Commodity Prices.**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
| Commodity | |  |  |  |  |  |  |  | Shift Type |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| Maize |  | 0.056 | 0.006 | 0.835 | 0.995 | **0.030** | 0.008 | 0.050 | Exponential |
|  |  |  |  |  |  |  |  |  |  |
| Soybeans |  | **0.021** | 0.029 | 0.030 | 0.644 | **0.045** | 0.206 | 0.807 | Logistic |
|  |  |  |  |  |  |  |  |  |  |
| Oil |  |  | 0.328 |  |  |  | 0.047 | 0.024 | Undetermined |
|  |  |  |  |  |  |  |  |  |  |
| Freight |  | 0.792 | 0.332 | 0.764 | 0.955 | **0.027** |  |  | Exponential |
|  |  |  |  |  |  |  |  |  |  |
| Ethanol |  |  | 0.369 | 0.176 |  |  | 0.781 | 0.718 | Logistic |
|  |  |  |  |  |  |  |  |  |  |
| Climate Index | | 0.196 | 0.648 | 0.037 | 0.734 | 0.319 | 0.987 | 0.805 | — |
|  |  |  |  |  |  |  |  |  |  |

**Note:** The column headed  includes approximate -values for a test of the null hypothesis in (15) obtained by including third-order terms in the trend variable in testing equation (14). Columns headed , , and  record -values for the testing sequence in (17), as proposed by Lin and Teräsvirta (1994). Similarly, the column headed  includes approximate -values for a test of the null hypothesis in (19) obtained by including fourth-order terms in the trend variable in testing equation (14). Columns headed  and  report -values for the testing sequence in (21), as proposed by Lin and Teräsvirta (1994) Escribano and Jordà (1999). Bolded numbers in the  and  indicate that the null hypothesis of no intercept shifts is rejected at the 0.05 significance level. Underlined numbers in the columns headed , , and  and, likewise,  and , indicate the minimal -value in the testing sequence. The final column indicates the likely nature of the intercept shift as determined from the testing sequences.

**Table A2: Single-Equation Model Assessment and Diagnostic Test Results.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
| Measure |  | Maize | Soybeans | Oil | Freight | Ethanol |
|  |  |  |  |  |  |  |
| No. Shifts | | 1 | 2 | 1 | 1 | 1 |
| Shift Type |  | GEXP | LOGIT | LOGIT | GEXP | LOGIT |
|  |  | 4 | -- | -- | 2 | -- |
|  |  | 0.943 | 0.944 | 0.970 | 0.920 | 0.885 |
|  |  | 0.054 | 0.046 | 0.079 | 0.054 | 0.067 |
|  | | 0.993 | 0.991 | 0.967 | 0.977 | 0.968 |
| AIC |  | -2.960 | -3.299 | -2.224 | -2.973 | -2.528 |
| HQC |  | -2.895 | -3.248 | -2.197 | -2.926 | -2.468 |
| AR(4) |  | 0.714 | 0.595 | 0.568 | 0.753 | 0.388 |
| AR(6) |  | 0.780 | 0.458 | 0.142 | 0.870 | 0.638 |
| AR(12) |  | 0.333 | 0.590 | 0.076 | 0.056 | 0.797 |
| ARCH(6) |  | 0.959 | 0.458 | 0.142 |  |  |
| ARCH(12) |  | 0.845 | 0.590 | 0.001 |  |  |
|  |  | 0.132 | 0.799 | 0.515 | 0.083 | 0.168 |
|  |  | 0.073 | 0.469 | 0.675 | 0.078 | 0.251 |
| LJB |  | 105.46 | 121.20 | 181.53 | 324.07 | 16.75 |

**Note:** The effective sample size, *T*, is 323 observations. No. of Shifts indicates the number of intrinsic intercept shifts estimated for each equation. Shift Type indicates whether the intercept shift is of the generalized exponential (GEXP) or logistic (LOGIT) form.  indicates the estimated value for the  parameter in the generalized exponential shift function, determined by simple grid search.  is the unadjusted , and  is the residual standard error.  is the ratio of the respective standard error from the shifting-mean model relative to the constant intercept model. AIC is the Akaike Information Criterion, and HQC is the Hannan-Quinn Information Criterion. AR(*j*), *j* = 4*,* 6*,* 12, is the -value from an *-*version of the LM test for remaining autocorrelation up to lag *j*. Entries for ARCH(*j*), *j* = 6*,*12 are similarly defined for ARCH errors up to lag **. Entries for  are -values from an *-*version of an LM test for remaining intercept shifts based on using third-order terms in . Likewise, values for  are -values from an *-*version of an LM test for remaining intercept shifts based on using fourth-order terms in . LJB is the Lomnicki-Jarque-Bera test of normality of the residuals (critical value from the  distribution is 13.82 at the 0.001 significance level).

**Table A3: Single Equation Lagrange Multiplier Test Results for Excluded Variables.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  |  | Null Hypothesis |  |  |  | -value |
|  |  |  |  |  |  |  |
|  |  |  | | |  |  |
|  |  | No Lagged Ethanol Price Effects in Maize Price Eqn. | | |  | 0.073 |
|  |  | No Lagged Maize Price Effects in Soy in Maize Price Eqn | | . |  | 0.178 |
|  |  | No Lagged Oil Price Effects in Soy Price Eqn. | |  |  | 0.165 |
|  |  | No Lagged Ethanol Price Effects in Soy Price Eqn. | | |  | 0.096 |
|  |  | No Lagged Climate Extreme Effects in Soy Price Eqn. | | |  | 0.832 |
|  |  | No Lagged Maize Price Effects in Oil Price Eqn. | |  |  | 0.608 |
|  |  | No Lagged Soy Price Effects in Oil Price Eqn. | |  |  | 0.858 |
|  |  | No Lagged Ocean Freight Rate Effects in Oil Price Eqn. | |  |  | 0.490 |
|  |  | No Lagged Ethanol Price Effects in Oil Price Eqn. | | |  | 0.724 |
|  |  | No Lagged Climate Extreme Effects in Oil Price Eqn. | | | | 0.160 |
|  |  | No Lagged Maize Price Effects in Ocean Freight Rate Eqn. | | |  | 0.409 |
|  |  | No Lagged Soy Price Effects in Ocean Freight Rate Eqn. | | |  | 0.072 |
|  |  | No Lagged Ethanol Price Effects in Ocean Freight Rate Eqn. | | | | 0.074 |
|  |  | No Lagged Climate Extreme Effects in Ocean Freight Rate Eqn. | | | | 0.070 |
|  |  | No Lagged Soy Price Effects in Ethanol Price Eqn. | | |  | 0.960 |
|  |  | No Lagged Climate Extreme Effects in Ethanol Price Eqn. | | | | 0.250 |
|  |  |  |  |  |  |  |

**Note:** In all instances the null hypothesis is that lagged values of the variable indicated should be excluded from the equation indicated. Entries in the column headed -values are approximate  from an *-*version of an LM test of the indicated null hypothesis. All tests were performed in a manner consistent with the diagnostic testing framework for smooth transition models outlined by Eitrheim and Teräsvirta (1996).

**Table A4: SM-VAR Estimation Results**

|  |
| --- |
|  |
| Panel A: Maize Price, |
|  |
|  |
|  |
|  |
| Panel B: Soybean Price, |
|  |
|  |
|  |
|  |
| Panel C: Oil Price, |
|  |
|  |
|  |

**Table A4: Continued**

|  |
| --- |
|  |
| Panel D: Ocean Freight Rate, |
|  |
|  |
|  |
|  |
| Panel E: Ethanol, |
|  |
|  |
|  |
|  |
| Panel F: Climate Extreme Index, |
|  |
|  |
|  |
|  |

**Note:** Asymptotic heteroskedasticity robust standard errors are given below parameter estimates in parentheses; is the squared correlation

between actual and fitted values for each equation;  **denotes the  **equation’s residual at time , .

**Table A5: SM-VAR Summary Statistics.**

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| System Covariance Matrix: |
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| , where |
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|  |
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|  |
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|  |

**Note:** AIC is the system Akaike Information Criterion and HQC denotes the system Hannan-Quinn Criterion. A subscripted SM-VAR refers to the model estimated as a shifting-mean vector autoregression and a subscripted VAR refers to a standard VAR model without intercept shifts. **** denotes the likelihood system **** defined by Magee (1990); while  indicates the relative contribution to **** of theintercept shifts.  indicates the estimated correlation matrix, and  is a diagonal matrix with the square root of each equation’s estimated error variance on the main diagonal. , , , , , . 