Forcasting Commodity Prices using a Global Vector Autoregressive Model

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Aims of the paper and the GVAR Model

Main aims of the papers:

a) Forecasting wheat commodity prices
b) Validate a new Global Vector Autoregressive Model (Gutierrez, Piras, Roggero, 2014)

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A GLOBAL VECTOR AUTOREGRESSION MODEL FOR THE ANALYSIS OF WHEAT EXPORT PRICES

Luciano Gutierrez, Francesco Piras, and Pier Paolo Roggero

Food commodity price fluctuations have an important impact on poverty and food insecurity across the world. Conventional models have not provided a complete picture of recent price spikes in agricultural commodity markets, and there is an urgent need for appropriate policy responses. Perhaps new approaches are needed to better understand international spill-overs, the feedback between the real and the financial sectors, as well as the link between food and energy prices. In this article, we present the results from a new worldwide dynamic model that provides the short and long-run impulse responses of the international wheat price to various real and financial shocks.

Key words: Global dynamic models, price analysis, wheat market.

JEL codes: C12, C15, G14, Q14.
Models

- Single equation (Moore, 1917, Sarle, 1925, Ezekiel 1927, Hopkins 1927)
- Multi-equation models (Wright and Williams 1982, Deaton and Laroque 1992)
- Spatial equilibrium and interregional competition models (MacAulay, 1978, Martin and Zwart, 1975)
- Box-Jenkins and exponential smoothing methods (Schmitz and Watts, 1970, Bourke 1979)
- ARCH and GARCH models (Bernard et al., 2006, Ramirez and Fadiga, 2003).
Wheat main competitors and Global VAR

- Argentina
- Australia
- Europe
- Canada
- Russia
- USA
- ROW

VECMX model

TRADE (Foreign)

relationships
Domestic, Foreign and Global Variables

• Domestic (endogenous) variables:
  ➢ wheat export prices in country i
  ➢ wheat stock to utilization ratio in country I
  ➢ fertilizer price
  ➢ bilateral exchange rate local country i / US$
  ➢ consumer prices in country i

• Foreign (weakly exogenous) variables:
  ➢ trade weighted average export prices
  ➢ trade weighted average wheat stock to utilization ratios
  ➢ trade weighted average exchange rates
  ➢ trade weighted average consumer prices

• Global (exogenous) variables:
  ➢ Oil price
  ➢ Weather variables
GVAR MODEL ESTIMATION

1. Step: Single country VARX (VECMX) parameter estimation

2. Step: All individual country models are stacked and linked by using trade weight matrices

3. Step: Solving the model and obtaining the Global VAR model as

\[ y_t = b_0 + \sum_{i=1}^{p} F_i y_{t-i} + \sum_{i=0}^{q} B_i x_{t-i} + v_t \]
Main advantages in using a GVAR model

- First, the model is specifically designed to analyze market fluctuations and interactions between countries/regions.
- Secondly, the GVAR lets us model the dynamism in wheat export prices caused by the effects of country-specific and foreign-specific variables.
- Thirdly, the GVAR model has proven to be especially useful for describing the dynamic behaviour of economic and financial time series.
- Finally, the model is mainly based on Vector Autoregression methodology which has usually been known as a natural tool for forecasting.
## Forecast results 2012.2-2014.6 (1)

Tab.1 MAPE statistics for one-month-ahead, $h=1$, forecasts

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>GVAR</th>
<th>AR</th>
<th>ARt</th>
<th>VAR</th>
<th>VECMX</th>
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<tbody>
<tr>
<td>Argentina</td>
<td>4.713</td>
<td>9.566</td>
<td>9.194</td>
<td>5.549</td>
<td>5.963</td>
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<td>6.662</td>
<td>13.642</td>
<td>13.529</td>
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<td>5.864</td>
<td>8.429</td>
<td>9.326</td>
<td>5.056</td>
<td>4.653</td>
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<tr>
<td>Russia</td>
<td>6.600</td>
<td>11.272</td>
<td>10.682</td>
<td>6.218</td>
<td>8.409</td>
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<tr>
<td>USA</td>
<td>5.674</td>
<td>9.943</td>
<td>10.308</td>
<td>20.453</td>
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<tr>
<td>AVG</td>
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<tr>
<td>WAVG</td>
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## Forecast Results (2)

Tab.4 MAPE statistics for twelve-months-ahead, $h=12$, forecasts

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Main conclusions

• Two main advantages in using a GVAR model to predict wheat export prices:

A) GVAR model generally produces more precise forecasts than benchmarks models as VAR or VECMX models only based on domestic variables.

B) Thus it seems that there is an advantage in modelling the interdependencies among the main export countries in forecasting and predicting turning points of wheat prices.
Future work.. New structural analysis

- El Niño Southern Oscillation (ENSO) impact

Impact of ENSO on Wheat prices:
+1°C above the mean
MANY THANKS

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