Consistent price scenarios for models of various regional scales - an exploration of options

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One price?

What will the wheat price be?

OECD – FAO Agricultural Outlook:

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>307</td>
<td>284</td>
<td>268</td>
<td>267</td>
</tr>
</tbody>
</table>

Probably only if you can put it on the right scale
This presentation is about different scales of prices

Scales of prices:
- **Prices of different commodities** (producer, consumer, quality)
- **Frequency** (yearly, monthly, daily)
- **Geographic extent** (int. commodity markets, EU average, national)
International
- OECD-FAO Agri. Outlook
- FAO
- Worldbank

USA: Wheat, no. 1, hard red winter, ordinary protein, export price delivered at the US Gulf port for prompt or 30 days shipment;
USA: Wheat, no. 2, soft red winter, export price delivered at the US Gulf port for prompt or 30 days shipment;

Europe
- European Commission

EU + member countries:
Feed wheat;
Breadmaking common wheat;
Durum wheat;
### International
- OECD-FAO Agri. Outlook
- FAO
- Worldbank

### Europe
- European Commission

### National
- Commodity exchange
- Statistik Austria
- FADN

**Austria Producer Prices (average):**
- Soft wheat
- Durum wheat

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## Conceptual ideas

- How do these prices relate?
- Quality scale:
  - Substitutability
- Regional Scale: Price spreads & time lags due to
  - Transportation costs
  - Transaction costs, imperfect information

Magitudes mainly an empirical question
Empirical method

- Nature of price relation
  - Correlated?
  - Unit Root?
  - Cointegrated?
  - Granger Causality?
- If Unit Root&Cointegrated -> VECM -> VAR
- VECM&VAR assumptions
  - Normality
  - Homoscedasticity
  - No serial correlation

How can I find out how forecast prices relate to regional observed prices?

Forecast is predetermin: Forecast does not react to prices:

Singel equation regression sufficient
Example Austria:
  - EU prices exogeneous for Austria (use instead of predictions)

Regression without AR-terms:
\[ P_{AT} = c + b_1 P_{EU} + D_{month} + u \]

Regression with AR-term(s)
\[ P_{AT} = c + b_1 P_{EU} + D_{month} + \sum_{i} b_i P_{AT-i} + u \]

Use log prices scaled to 1 in 2004, determine number of lags with AIC
Results: single equation regression

<table>
<thead>
<tr>
<th></th>
<th>with AR</th>
<th>without AR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ar1</td>
<td>1.31</td>
<td>19.36</td>
</tr>
<tr>
<td>ar2</td>
<td>-0.54</td>
<td>-5.06</td>
</tr>
<tr>
<td>intercept</td>
<td>0.11</td>
<td>2.64</td>
</tr>
<tr>
<td>Price.EU</td>
<td>0.34</td>
<td>1.24</td>
</tr>
<tr>
<td>Jan</td>
<td>0</td>
<td>-0.73</td>
</tr>
<tr>
<td>Feb</td>
<td>-0.01</td>
<td>-1.22</td>
</tr>
<tr>
<td>Mar</td>
<td>-0.02</td>
<td>-2.29</td>
</tr>
<tr>
<td>Apr</td>
<td>-0.04</td>
<td>-3.83</td>
</tr>
<tr>
<td>May</td>
<td>-0.06</td>
<td>-4.75</td>
</tr>
<tr>
<td>Jun</td>
<td>-0.06</td>
<td>-4.74</td>
</tr>
<tr>
<td>Jul</td>
<td>-0.06</td>
<td>-4.96</td>
</tr>
<tr>
<td>Aug</td>
<td>-0.04</td>
<td>-3.29</td>
</tr>
<tr>
<td>Sep</td>
<td>-0.02</td>
<td>-1.9</td>
</tr>
<tr>
<td>Oct</td>
<td>-0.01</td>
<td>-1.36</td>
</tr>
<tr>
<td>Nov</td>
<td>0</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Steers with AR

Steers without AR

Accuracy of with and without AR

Scaling-errors for the period 06/13-06/14

<table>
<thead>
<tr>
<th></th>
<th>[RMSE with AR]</th>
<th>[RMSE without AR]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>-0.05</td>
<td></td>
</tr>
<tr>
<td>Young Bulls</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Cows</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td>-0.06</td>
<td></td>
</tr>
<tr>
<td>Heifers</td>
<td>-0.13</td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Oats</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Steers</td>
<td>-0.10</td>
<td></td>
</tr>
</tbody>
</table>

RMSE = Root Mean Squared Error

<table>
<thead>
<tr>
<th>Negative: with AR has less errors</th>
<th>Positive: without AR has less errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSE with AR: -0.05</td>
<td>RMSE without AR:</td>
</tr>
</tbody>
</table>

25.09.2014
**Conclusions**

**Monthly and yearly prices:**
- Predictions are predetermined -> singel equation regression sufficient for down-scaling (might add more explanatory variables)

**Monthly prices:**
- Including AR terms:
  - reduces RMSE (in the near future)
  - narrow CI for near future
  - widen CI for longer term
Outlook:
- Use ex-post forecast, historic simulation or backcasting values and run regressions with regional prices or commodities of various qualities.
- Down-scale from yearly to monthly data (compare Mixed Data Sampling (MiDaS) regression methods (Gyhsels et al. 2007)).

Results: Nature of time data
- **Correlation:** Between 84% (eggs) and 98% (barley, maize, YoungBulls); all significant.
- **Unit Root:**
  - ADF no UR: Wheat.AT, Wheat.EU, Oats.EU, YoungBulls.EU
  - KPSS no UR: Eggs.EU, Oats.EU
- **Granger Causality:**
  - not EU->AT: Eggs, Heifers, Oats, Steers, Young Bulls.
  - AT->EU: Oats
- **Not Cointegrated:** Eggs, Maize, steers
- **Tests weak (#obs&assumptions). Eyeball-Test&Theory suggest integration.**