Modeling Euro Area Industrial New Orders

Heinz Dieden (European Central Bank, DG Statistics)*
Gabe de Bondt (European Central Bank, DG Economics)
Sona Muzikarova (European Central Bank, DG Economics)
Istvan Vincze (European Central Bank, DG Statistics)

As published in ECB Occasional Paper No. 149, June 2013

Joint EU/OECD Workshop on Recent Developments in Business and Consumer Surveys; Brussels, Belgium, 14-15 November 2013
1. Motivation

2. ECB indicator on euro area new orders

3. Model

4. Results

5. Conclusions

6. Publication
I. Motivation

- **Eurostat discontinued industrial new order series in mid-2012**

- **Although, industrial new orders historically a relevant indicator for many users and uses!**

- **ECB fills the emerged data gaps at euro area level**
Target: Fill gap for euro area industrial new orders (m-o-m % changes from seasonally adjusted data)

- For countries that continue the data collection: set-up of regular data transmission from NSIs to the ECB
- For countries that discontinue the data collection: model-based proxy for new orders
- Regular production at monthly frequency
I. Motivation (cont’d)

(cyclical component, standardised percentage deviation from trend)

Sources: Eurostat and ECB calculations using a one-sided band pass filter.
2. ECB indicator on euro area new orders

- Euro area aggregates, if > 60% country coverage

- Published monthly (timeliness around $t+55$), e.g. in Monthly Bulletin, Statistical Data Warehouse

- Country weights: Eurostat’s weighting scheme for industrial turnover for base year 2010 = 100

- Working-day and seasonal adjustment performed by NSIs, otherwise by ECB
2. ECB indicator on euro area new orders (cont’d)

(index, 2010=100; seasonally and working day adjusted)

Eurostat data (discontinued)

ECB indicator on industrial new orders

(month-on-month percentage changes)

Eurostat data (discontinued)

ECB indicator on industrial new orders

“ECB Experimental statistics based on national data”
Numerous breakdowns:

- **Total excluding heavy transport equipment**
  (NACE Rev2 Division 30; e.g. ships, aircraft, railway)

  (3 month-on-3 month percentage changes; seasonally and working day adjusted)
Numerous breakdowns:

- **By origin of order**
  - **Domestic and non-domestic**

*(index 2010=100; seasonally and working day adjusted)*
Numerous breakdowns:

• By “Main Industrial Groupings”
  • Capital Goods, Consumer Goods, Intermediate Goods,

(3 month-on-3 month percentage changes; seasonally and working day adjusted)
3. Model

- Lack of theoretical/empirical underpinning for the modelling exercise → **agnostic** approach

- Drawing from a **variety of data sources** (both, surveys and hard statistics)

- Ensure robustness at country level and across new order subgroupings
3. Model (cont’d)

• **DG ECFIN’s survey in manufacturing**
  • “Do you consider your overall order books to be *(above normal – normal - below normal)*?”
  • Stock concept

• **Purchasing Managers’ Survey in manufacturing**
  • “Level of total orders this month compared with one month ago?” *(higher – same - lower)*
  • Flow concept

• **Eurostat data on industrial turnover**
  • Quantitative monthly data from all Member States; indices *(2010=100)*; seasonally adjusted
  • \( \Delta \) Order books = new orders – sales – cancelled orders
3. Model (cont’d)

New orders model:

\[ NO_t \text{ m-o-m growth} = \beta_0 + \beta_1 (\Delta_3 ECFIN_t) + \beta_2 (\Delta_3 ECFIN_t) + \beta_3 (PMI_t \text{ residuals}) + \beta_4 (\Delta PMI_t \text{ residuals}) + \beta_5 (TO_t \text{ m-o-m growth}) + \beta_6 (TO_{t-1} \text{ m-o-m growth}) + \beta_7 (NO_{t-1} / TO_{t-1}) + \beta_8 (NO_{t-1} \text{ m-o-m growth}) + \beta_9 (NO_{t-2} \text{ m-o-m growth}) + \varepsilon_t \]

...where the variables are represented by monthly series:

- **NO** – Total manufacturing working to order
- **ECFIN** – Total order book levels
- **PMI** – Purchasing manager index surveys in manufacturing
- **TO** – Total turnover index – manufacturing
4. Results

- All three cohorts of variables matter for explaining euro area m-o-m new order growth
- Economically sound coefficients and healthy residual behaviour
- Tailored restriction sets stemming from free estimations
  - Insignificants at 0
  - The sum of turnover variables cannot exceed 1
- Restrictions jointly tested by the Wald test for statistical viability

- Total new orders: 50% of m-o-m growth explained
- Other subgroupings: 30% for MIG Capital Goods to 70% for MIG Intermediate Goods m-o-m growth explained

- Index level: model explains 98% of variation in new orders
- Out-of-sample forecast (est. over 5-years to dynamically forecast 10-years): explains 97% of variation
4. Real-time forecasts

- Real-time exercise based on limited data availability
- Model re-estimated once up to Jan. 2009 for all countries that have discontinued the collection of new orders, using historical data vintages instead of final releases
- Forecasts aggregated with real-time hard data of continuing countries
- ECB indicator clearly closer to final data than Eurostat initial release
5. Conclusions

- Model proves robust across countries, new order subgroupings, frequencies as well as out-of-sample

- Formal checks show that the ECB indicator leads industrial production but not vice versa

- Important for cross-checking production data, especially during times with heightened uncertainty

- ECB indicator provides invaluable information on the origin of demand

⇒ All in all, ECB indicator relevant for conjunctural analysis of the euro area economy
6. Publication

- **ECB Occasional Paper Series** (No 149, June 2013)
  - “Introducing the ECB Indicator on Euro Area Industrial New Orders”

- **ECB Monthly Bulletin**
  - July 2013 edition; **Box 9** (pages 65-68):
    - “Introducing the ECB Indicator on Euro Area Industrial New Orders”
  - Statistical Annex, Page S52, Table 5.2.4, col 1-2:

- **ECB Statistics Pocket Book**
  - Page S52, Table 3.3

- **ECB Statistical Data Warehouse (SDW)**

- **HAVER Economics**: EUDATA database; code: S025OCNO@EUDATA
Thanks a lot for your attention!

Questions?
Reserve slides
Discontinued: DK, FR, IE, CY, LU, MT, SI, LT, LV and the UK

Continued:

- Euro area: BE, DE, GR, EE, ES, IT, NL (will stop as of Jan-2014), AT, PT, SK and FI
- Non-euro area: BG, CZ, HU, PL, RO and SE

Euro area coverage rate of above 80% (2012), around 70% (2013) and about 65% from 2014 onwards.
2. ECB indicator on euro area new orders (cont’d)

Numerous breakdowns:

• By origin of order
  - Non-domestic and split into euro area and non-euro area

(3 month-on-3 month percentage changes; seasonally and working day adjusted)
Numerous breakdowns:

- By “Main Industrial Groupings”
  - Consumer Goods: Durable and non-durable

(3 month-on-3 month percentage changes; seasonally and working day adjusted)
3. Model (cont’d)

• **DG ECFIN’s survey in manufacturing**
  - Headline survey indicator
  - Available for all countries
  - In levels and delta

• **PMI surveys in manufacturing**
  - Auxiliary survey indicator
  - Data gap (available only for DE, IE, GR, ES, FR, IT, NL, AT)
  - In residual levels and delta
    - $\text{PMI}_t = \beta_0 + \beta_1 (\Delta_3 \text{ECFIN}_t) + \varepsilon_t \Rightarrow$ extract residuals
    - $\Delta \text{PMI}_t = \beta_0 + \beta_1 (\Delta \Delta_3 \text{ECFIN}_t) + \varepsilon_t \Rightarrow$ extract residuals
  - Capitalise on any extra information available on the top on ECFIN surveys
4. Out-of-sample forecasts

- 5-year estimates (1997-2002) to dynamically forecast 10 years (2003-2012)
- Dynamic forecast uses previously est. values of lagged dependent variable

Eurostat official statistics (based on March 2012 release)
Model est. in-sample (up to March 2012)
Out-of-sample forecasts (based on model est. up to Dec. 2002)
## Overview of determinants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Macroeconomic determinant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surveys</strong></td>
<td></td>
</tr>
<tr>
<td>$\Delta_3 ECFIN$</td>
<td>Three-month change in managers’ assessment of the current level of orders books</td>
</tr>
<tr>
<td>$\Delta\Delta_3 ECFIN$</td>
<td>Three-month change in managers’ assessment of the current level of orders books (1st difference)</td>
</tr>
<tr>
<td>PMI residuals</td>
<td>Manufacturing PMI new orders index</td>
</tr>
<tr>
<td>$\Delta$PMI residuals</td>
<td>Manufacturing PMI new orders index (1st difference)</td>
</tr>
<tr>
<td><strong>Hard data</strong></td>
<td></td>
</tr>
<tr>
<td>$TO_{t-1}$ m-o-m growth</td>
<td>Industrial turnover index in manufacturing (corresponds to market sales of goods or services)</td>
</tr>
<tr>
<td>$TO_{t-1}$ m-o-m growth</td>
<td>Industrial turnover index in manufacturing (1 period lagged)</td>
</tr>
<tr>
<td>$NO_{t-1} / TO_{t-1}$</td>
<td>New orders to industrial turnover ratio (1 period lagged)</td>
</tr>
<tr>
<td><strong>Variables that improve dynamics</strong></td>
<td></td>
</tr>
<tr>
<td>$NO_{t-1}$ m-o-m growth</td>
<td>Lagged dependent variable (by 1 period)</td>
</tr>
<tr>
<td>$NO_{t-2}$ m-o-m growth</td>
<td>Lagged dependent variable (by 2 periods)</td>
</tr>
</tbody>
</table>
Surveys

- PMI surveys in manufacturing (shifted in level by +50) LHS
- ECFIN surveys (third-differenced, shifted in level by +100) LHS
- Industrial new orders (m-o-m growth rate) RHS
- Industrial new orders (3m-o-3m growth rate) RHS

Graph showing trends over time from Aug-97 to Aug-11.
New order breakdowns results available

**Euro area**

**New orders breakdown**

- Industrial new orders
- Industrial new orders (excl. heavy transport equipment)

  **Main industrial groupings (MIG)**

  - Industrial new orders - capital goods
  - Industrial new orders - intermediate goods
  - Industrial new orders - consumer goods
  - Industrial new orders - consumer durable goods
  - Industrial new orders - consumer non-durable goods

  **By origin of demand**

  - Industrial new orders - domestic
  - Industrial new orders - non-domestic
  - Industrial new orders - non-domestic (Euro area)
  - Industrial new orders - non-domestic (Non-euro area)

**EU non-euro area**

**New orders breakdown**

- Industrial new orders
- Industrial new orders (excl. heavy transport equipment)

  **By origin of demand**

- Industrial new orders - domestic
- Industrial new orders - non-domestic
New orders as leading series: impulse responses

- Based on BVARs consisting from new orders (excl. heavy transport) and industrial production (excl. constr.)
- Unexpected temporary shock in orders followed by significant delayed adjustment in production (but orders do not react to shock in production)

Log level

Log change