REAL SECTOR CONFIDENCE INDEX FOR TURKEY

Emel Dinçer
Central Bank of the Republic of Turkey

UNECE Seminar on the Role of National Statistical Offices in the Production of Leading Composite and Sentiment Indicators
Geneva, 8-10 December 2015
NEED FOR A LEADING INDICATOR

- Reliable and timely information on business conditions is crucial for a Central Bank in order to formulate forward looking monetary policies.

- Especially in inflation targeting regimes, monetary policies based on demand management require accurate forecasts of the business conditions, in particular slowdowns and expansions in economic activity.

- However, no single indicator can capture the fluctuations in overall economic activities.

**Real Sector Confidence Index (RSCI)** was formed as a composite index in which the responses given to different questions of the Business Tendency Survey (BTS) are evaluated jointly.
Central Bank of the Republic of Turkey (CBRT) started to conduct the monthly BTS in 1987.

To produce indicators that will show the short-term tendencies in the manufacturing industry, considering the assessments of the senior managers about the recent past, current situation and their expectations regarding the future course of business conditions.

Questions were reviewed, the questions which are not covered in the ‘Industry Survey’ of EU were excluded. Similar questions were fully harmonized and two different survey forms prepared to be conducted monthly and quarterly.

The scope of the survey units was extended in collaboration with the Turkish Statistical Institute (TURKSTAT).

Weighting procedure was started to be implemented in aggregating the results.
SURVEY QUESTIONS OF BTS

2 Survey Forms:

Monthly

- Trends, Expectations
- Trends, Current, Expectations
- Fixed Investment Expenditures
- Unit Cost (Trends, Expectations)
- General Course of Business
- Interest Rate on Loans
- Production
- Sales Orders (Overall, Domestic, Export)
- Employment
- Stocks of Finished Goods
- Selling Prices (Overall, Domestic)
- Capacity Utilization Rate
- Producer Price Inflation Rate

Quarterly

- Factors Limiting Production
- Level of Production Capacity
- Period of Production Assured by Sales Orders
- Competitiveness (Domestic, Inside EU, Outside EU)

2 Survey Forms:

22 Questions

January, April, July, October

28 Questions
RESPONSES OF BTS

Optimistic:
- Increased
- Will Increase
- Above Normal
- More Optimistic
- More than Sufficient
- Improved

Indifferent:
- Remained Unchanged
- Will Remain Unchanged
- Normal for the Season
- Remain Unchanged
- Sufficient
- Remained Unchanged

Pessimistic:
- Decreased
- Will Decrease
- Below Normal
- More Pessimistic
- Not Sufficient
- Deteriorated

Balance: The difference between the weighted percentage of ‘optimistic’ and ‘pessimistic’ responses
RSCI\(^{(\ast)}\) is a summary indicator which is constructed by the joint evaluation of responses given to different questions of BTS for the purpose of tracking the general views of the real sector representatives about general economic outlook.

- Total sales orders (current situation)
- Stocks of finished goods (current situation)
- Production (next 3 months)
- Employment (next 3 months)
- Total sales orders (last 3 months)
- Export orders (next 3 months)
- Fixed capital investment expenditures (next 12 months)
- General course of business

- **Diffusion indices (DI)** for these questions are calculated by adding up 100 to the aggregated balance values.
- Principal component analysis to choose optimal weights illustrated that scores have approximately **equal weights**.
- RSCI is computed by taking the arithmetic average of these sub-indices.

\(^{(\ast)}\) Based on: Ece Oral, Dilara Ece and Türknur Hamsici (2005) ‘Building Up a Real Sector Business Confidence Index for Turkey’, Central Bank Review. 5.1, 23-54
RSCI is interpreted as follows:

- **RSCI = 100**: A stable outlook to the economic activities.
- **RSCI > 100**: An optimistic outlook to the economic activities.
- **RSCI < 100**: A pessimistic outlook to the economic activities.
REVISING THE RSCI

- **Study in 2013**
  
  Emine Meltem Baştan, Gülsüm Çınar Dolgun and Özgül Atılğan Ayanoğlu (2013) ‘Improving the Real Confidence Index for Turkey as a Leading Macroeconomic Indicator’

- **Revisions in BTS in 2007**
  - Sample coverage
  - Questions
  - Aggregation and weighting

- **Purpose**
  - to review the components of the existing RSCI
  - to test its performance as an indicator of business cycles in Turkey
  - to construct the index with fewer variables while preserving its quality

- **Methodology**
  - OECD System of Composite Leading Indicators (CLI)
  - OECD Cyclical Analysis and Composite Indicators System (CACIS)

- **Period**
  January 2007- January 2013 (73 months)
METHODOLOGY

- Reference Series
- Component Series

Pre-Selection

- Seasonal Adjustment
- Outlier Detection
- De-trending, Smoothing and Turning Point Detection

Filtering

- Cross Correlation Analysis
- Peak-Trough Analysis
- Economic Significance

Evaluation

Performance

- Correlation with Reference Series
- Granger Causality Test
• **Reference Series**

- GDP series are available on a *quarterly* basis with a *lag of one quarter*
- **Industrial Production Index (IPI)**, released *monthly* and *more timely*
- The *high correlation* coefficient between GDP and IPI for Turkey also confirms a strong relationship (0.98 for January 2005 - December 2012).
- Both seasonally adjusted and unadjusted IPI series are used

• **Component Series**

- **Diffusion indices (DI)** derived from the responses of BTS questions are used
- Both seasonally adjusted and unadjusted DI series are used
- Responses to *monthly* questions are taken into consideration
FILTERING

- Seasonality is identified by TRAMO SEATS method in Demetra +
- Outliers are identified and replaced by the estimated values by TRAMO program in CACIS
- Hodrick - Prescot (HP) filter is applied to all series twice, firstly for removing the trend and secondly for smoothing the de-trended series
- Cyclical turning points of DI and IPI are identified by simple version of Bry-Boschan algorithm
- 4 turning points in seasonally unadjusted series and 3 turning points in seasonally adjusted series of IPI are detected
EVALUATION

- **Cross Correlation Analysis:**
  - Correlations between DI
  - DI and year-on-year changes of IPI
  - De-trended series of DI and IPI

  - High correlations between DI for total, export and domestic sales orders as well as production
  - ‘Average unit cost’ and ‘selling prices’ have low correlations with IPI
  - ‘Stocks of finished goods’ have very low correlations with IPI

- **Peak-Trough Analysis:**
  - Applied both to seasonally adjusted and unadjusted series of DI and IPI
## Summary Statistics for Seasonally Unadjusted Diffusion Indices

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Production (trend of last three months)</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td>5.52</td>
<td>0.824</td>
<td>6</td>
<td>5.52</td>
</tr>
<tr>
<td>2-Total orders (current month)</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0.94</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3-Export orders (current month)</td>
<td>3</td>
<td>1</td>
<td>1.5</td>
<td>1.5</td>
<td>0.948</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>4-Monthly stocks of finished goods (current month)</td>
<td>4</td>
<td>1</td>
<td>3.33</td>
<td>2.49</td>
<td>0.688</td>
<td>4</td>
<td>2.58</td>
</tr>
<tr>
<td>5-Production (trend of next three months)</td>
<td>4</td>
<td>0</td>
<td>5</td>
<td>4.72</td>
<td>0.834</td>
<td>3</td>
<td>6.35</td>
</tr>
<tr>
<td>7-Total employment (next three months)</td>
<td>3</td>
<td>0</td>
<td>5.33</td>
<td>4.71</td>
<td>0.915</td>
<td>2</td>
<td>5.77</td>
</tr>
<tr>
<td>11-Total orders (last three months)</td>
<td>4</td>
<td>0</td>
<td>6.5</td>
<td>5.55</td>
<td>0.83</td>
<td>6</td>
<td>5.57</td>
</tr>
<tr>
<td>12-Export orders (next three months)</td>
<td>3</td>
<td>0</td>
<td>6.67</td>
<td>5.91</td>
<td>0.834</td>
<td>3</td>
<td>6.95</td>
</tr>
<tr>
<td>17-Total orders (next three months)</td>
<td>4</td>
<td>0</td>
<td>5.25</td>
<td>5.13</td>
<td>0.829</td>
<td>3</td>
<td>6.93</td>
</tr>
<tr>
<td>18-Export orders (last three months)</td>
<td>4</td>
<td>0</td>
<td>4.5</td>
<td>5.5</td>
<td>0.838</td>
<td>1.5</td>
<td>6.26</td>
</tr>
<tr>
<td>19-Domestic orders (current month)</td>
<td>4</td>
<td>1</td>
<td>5.33</td>
<td>4.5</td>
<td>0.941</td>
<td>5</td>
<td>4.51</td>
</tr>
<tr>
<td>20-Domestic orders (last three months)</td>
<td>4</td>
<td>0</td>
<td>6.25</td>
<td>5.26</td>
<td>0.782</td>
<td>6</td>
<td>5.27</td>
</tr>
<tr>
<td>21-Domestic orders (next three months)</td>
<td>4</td>
<td>0</td>
<td>8.5</td>
<td>6.54</td>
<td>0.831</td>
<td>9</td>
<td>6.56</td>
</tr>
<tr>
<td>23-Investment expenditures (next twelve months)</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0.876</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>28-General economic situation (compared with previous month)</td>
<td>4</td>
<td>0</td>
<td>5</td>
<td>4.72</td>
<td>0.79</td>
<td>3</td>
<td>6.35</td>
</tr>
<tr>
<td>Reference series: Industrial Production Index</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Summary Statistics for Seasonally Adjusted Diffusion Indices

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1-SA Production (trend of last three months)</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0.844</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2-Total orders (current month)</td>
<td>2</td>
<td>0</td>
<td>0.5</td>
<td>0.5</td>
<td>0.97</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>3-Export orders (current month)</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.981</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4-Monthly stocks of finished goods (current month)</td>
<td>3</td>
<td>1</td>
<td>4.5</td>
<td>0.5</td>
<td>0.615</td>
<td>4.5</td>
<td>0.5</td>
</tr>
<tr>
<td>5-SA Production (trend of next three months)</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>0.89</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>7-SA Total employment (next three months)</td>
<td>2</td>
<td>0</td>
<td>3.5</td>
<td>1.5</td>
<td>0.93</td>
<td>3.5</td>
<td>1.5</td>
</tr>
<tr>
<td>11-SA Total orders (last three months)</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0.857</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>12-SA Export orders (next three months)</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>4</td>
<td>0.886</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>18-Export orders (last three months)</td>
<td>3</td>
<td>0</td>
<td>3.67</td>
<td>4.64</td>
<td>0.835</td>
<td>2</td>
<td>4.93</td>
</tr>
<tr>
<td>19-Domestic orders (current month)</td>
<td>3</td>
<td>0</td>
<td>3.67</td>
<td>3.77</td>
<td>0.964</td>
<td>1</td>
<td>4.62</td>
</tr>
<tr>
<td>20-SA Domestic orders (last three months)</td>
<td>2</td>
<td>0</td>
<td>2.5</td>
<td>0.5</td>
<td>0.836</td>
<td>2.5</td>
<td>0.5</td>
</tr>
<tr>
<td>21-SA Domestic orders (next three months)</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>0.899</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>23-Investment expenditures (next twelve months)</td>
<td>2</td>
<td>0</td>
<td>-0.5</td>
<td>0.5</td>
<td>0.906</td>
<td>-0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>28-General economic situation (compared with previous month)</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>3</td>
<td>0.848</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Reference series: Seasonally Adjusted Industrial Production</td>
<td>3</td>
<td>0</td>
<td>-1.67</td>
<td>2.05</td>
<td>0.946</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SELECTING THE COMPONENTS OF RSCI

According to OECD CACIS User Guide:

- Only series with correlation at peak > 0.5
- Drop series missing more than 30 % of all turning points
- Drop series having average lead and peak lead < 2
- Average lead should not be too different than the median lead
- Standard deviation from the mean or the median should be low

Selection Criteria of RSCI:

- ‘Stocks of finished goods’ have low correlations with IPI
- DI missing to capture any turning points are excluded
- Capturing the turning points of the reference series with a lead is considered
- Median leads are taken into account together with average leads
- Standard deviation from the mean or the median is considered
- Economic significance is considered
There must be an economic rationale for expecting a leading relationship with the reference series.

According to the ‘Handbook of Business Tendency Surveys’ of OECD, since the main aim of BTS is to capture the dynamics of the decision in business cycles, questions regarding production, demand and general business conditions are considered the main components of the decision process.
Constructing the Final RSCI:

- **Production** series are directly related to IPI and have good statistical properties.

- **Total sales orders**, indicator of demand conditions, cover both export and domestic orders, export orders do not have good statistical properties.

- **General course of business** question is unique and have good statistical properties.
ALTERNATIVES OF RSCI

Two Different Versions of CI:

<table>
<thead>
<tr>
<th>CI_1</th>
<th>Production - next 3 months</th>
<th>Total orders - last 3 months</th>
<th>General course of business</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI_2</td>
<td>Production - last 3 months</td>
<td>Total orders - next 3 months</td>
<td>General course of business</td>
</tr>
</tbody>
</table>

Figure 1: Different versions of RSCI vs IPI

Figure 2: Different versions of seasonally adjusted RSCI vs IPI
RESULTS

- CI_1 and CI_2 exhibit similar performances

- Other country examples, OECD and EU Commission analysis showed that CI constructed from BTS questions mainly cover *production for future tendency*, *total order books for current situation* and *stocks of finished goods* for its immediate respond to changes in economic activity.

- Questions of ‘total sales orders for the current situation’ and ‘stocks of finished goods’ are eliminated due to poor statistical properties

- Question of production for the next 3 months included
- Question of total sales orders for the last 3 months included to cover past evaluations
- General course of business included due to economic significance and performance
PERFORMANCE OF RSCI

- High correlation with the new RSCI (CI_1) and y-o-y change in reference series (IPI): 0.65

- Hypothesis of no causality between CI_1 and IPI is rejected

<table>
<thead>
<tr>
<th>Correlation with Reference Series</th>
<th>Granger Causality Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI_1 does not Granger cause IPI</td>
<td>4</td>
</tr>
<tr>
<td>SA_CI_1(*) does not Granger cause SA_IPI</td>
<td>4</td>
</tr>
</tbody>
</table>

(*) SA implies that the series is seasonally adjusted
CONCLUSION

It is possible to construct the RSCI only with the questions of

- Expectation of production for the next 3 months
- Assessment of total sales orders for the last 3 months
- General course of business

It has the leading capability of the developments in economic activities
THANK YOU

CENTRAL BANK OF THE REPUBLIC OF TURKEY
STATISTICS DEPARTMENT