

## Improving the Real Sector Confidence Index for Turkey as a Leading Macroeconomic Indicator\*

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### Abstract

Reliable and timely information on business conditions is crucial for a Central Bank in order to formulate forward looking monetary policies. For this purpose, the Central Bank of the Republic of Turkey (CBRT) conducts the Business Tendency Survey (BTS) on a monthly basis and a Real Sector Confidence Index (RSCI) is computed from responses given to the questions of the survey. The motivation of this paper is to revise the components of the existing RSCI and test its performance as an indicator of business cycles in Turkey. The questions in BTS are analysed for the period between January 2007 and January 2013 through cross-correlations, Granger causality tests and turning point analyses, along with a reference series in line with the OECD procedure. Industrial Production Index (IPI) is chosen as the reference series. Our findings show that it is possible to construct the index with fewer variables without weakening robustness of the current RSCI as a leading indicator.

Key Words: Business Cycle, Business Tendency Survey, Cross-correlation, Industrial Production Index

### 1. Introduction

In terms of monetary policy decision making, reliable and timely information on the inflationary pressure generated by economic demand is of key importance for a Central Bank. Especially in inflation targeting regimes, monetary policies based on demand management require acceptable knowledge and accurate forecasts of the business conditions, in particular slowdowns and expansions in economic activity. However, it is acknowledged in the literature that it may not be reliable to use only one economic indicator to forecast business activity. Therefore, composite indicators which cover a range of indicators related to economic activity have been developed.

In order to track the trends in business conditions, CBRT started to conduct a monthly BTS in 1987 and a RSCI was constructed in 2005 from the beginning of the series. A comprehensive revision in BTS was made in line with the “Joint Harmonised Business and Consumer Surveys Program” of the EU Commission in 2007.<sup>1</sup>

Oral et al. (2005) conducted the first study about RSCI which constituted the basic formation of the index. In their study eight questions of BTS were selected which are currently utilized in the index. However, in order to maintain its quality, it is important to review the design of RSCI periodically. A revision became necessary especially due to the changes regarding the sample coverage, questions, aggregation and weighting procedure made in 2007. It may also be worthwhile to make further investigation to construct the index with fewer variables while preserving its quality.

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<sup>1</sup> For further information <http://www.tcmb.gov.tr/ikt-yonelim/RSCI-Methodology.pdf>

The motivation of this paper is to revise the components of the existing RSCI and test its performance as an indicator of business cycles in Turkey in the light of the revisions mentioned above. The questions in BTS are analysed for the period between January 2007 and January 2013 through cross-correlations, Granger causality tests and turning point analyses, along with a reference series in line with the OECD procedure. Our findings show that it is possible to construct the index only with the questions of “expectation of production for the next 3 months”, “assessment of total orders for the last 3 months” and “assessment of general business situation” without weakening its robustness as a leading indicator.

## 2. Methodology and Results

The OECD system of “Composite Leading Indicators” (CLI) developed for the prediction of the business cycles is used as a guide and OECD “Cyclical Analysis and Composite Indicators System (CACIS)” software is utilized in designing the new RSCI.

In this respect, the first step in construction of a leading indicator is selection of the reference series that have similar cyclical fluctuations to those of the business cycle. The reference series is usually Gross Domestic Product (GDP). However, due to the availability of GDP series only on a quarterly basis with a lag of one quarter, IPI which is a monthly and more timely released series is preferred.<sup>2</sup> The high correlation coefficient between Turkish GDP and IPI (0.98 for January 2005 and December 2012) also confirms a strong relationship.

Following the selection of reference series, correlations between diffusion indices<sup>3</sup> (DI) derived from the responses to BTS questions as well as the correlations between year-on-year changes and detrended series of DI and IPI are analysed in order to choose the components of the RSCI. Out of 20 monthly questions, all except “stocks of finished goods” are found to have significant correlations with IPI. In addition, correlations among DI regarding the assessments for the last 3 months are found to be above 90 percent for the questions of total, export and domestic orders as well as for production. Similar results are obtained for the same set of questions regarding the assessments for the current month and expectations for the next 3 months.<sup>4</sup>

In order to identify the cyclical patterns of the component series, other factors in the series such as seasonality, outliers, and trends should be filtered, which is called as filtering process. Since seasonal adjustment is not applicable by CACIS software, seasonality in DI is identified by TRAMO-SEATS method in Demetra+, interface. It is observed that 10, out of 20 DI exhibit seasonality.<sup>5</sup>

Following the seasonal adjustment of the DI series, outliers are identified and replaced with the estimated values by TRAMO program in CACIS.

Next step in the process is removing the trend component and smoothing DI and IPI

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<sup>2</sup> The OECD used IPI as the reference series for a long time and later on searched the ways to generate monthly estimates of GDP from quarterly ones and starting from April 2012 found a feasible way to use GDP as the reference.

<sup>3</sup> Diffusion indices are obtained by adding up 100 to rescale the balance values which are calculated by subtracting the percentage of the responses “more pessimistic” from the percentage of the responses “more optimistic”. As an exception DI for stocks is calculated by subtracting the balance value from 100.

<sup>4</sup> Results are not shown but are available upon request.

<sup>5</sup> However, in order to maintain higher quality of seasonal adjustment, time series of more than seven years of data are needed according to “Practical Guide to Seasonal Adjustment with Demetra+ from Source Series to User Communication”. Therefore, seasonality analysis is planned to be repeated at the end of 2013.

series. For this purpose, Hodrick-Prescot (HP) filter<sup>6</sup> is applied to all series twice; firstly for removing the trend and secondly for smoothing the detrended series. After completing the filtering process, cyclical turning points of DI and IPI are identified by simple version of Bry-Boschan algorithm.<sup>7</sup> Peak and trough analyses are conducted both for seasonally adjusted and unadjusted series of DI and IPI. Summary statistics are as follows:

Table 1. Turning Point Summary Statistics for Seasonally Unadjusted Diffusion Indices

Series Name	Targeted	Missed	Av.Lead	Std.Dev.	Correlation	Median Lead	Std.Dev. from Med.
1-Production (trend of last three months)	4	0	6	5.52	0.824	6	5.52
2-Total orders (current month)	3	1	2	2	0.94	2	2
3-Export orders (current month)	3	1	1.5	1.5	0.948	1.5	1.5
4-Monthly stocks of finished goods (current month)	4	1	3.33	2.49	0.688	4	2.58
5-Production (trend of next three months)	4	0	5	4.72	0.834	3	6.35
7-Total employment (next three months)	3	0	5.33	4.71	0.915	2	5.77
11-Total orders (past three months)	4	0	6.5	5.55	0.83	6	5.57
12-Export orders (next three months)	3	0	6.67	5.91	0.834	3	6.95
17-Total orders (next three months)	4	0	5.25	5.13	0.829	3	6.93
18-Export orders (last three months)	4	0	4.5	5.5	0.838	1.5	6.26
19-Domestic orders (current month)	4	1	5.33	4.5	0.941	5	4.51
20-Domestic orders (last three months)	4	0	6.25	5.26	0.782	6	5.27
21-Domestic orders (next three months)	4	0	8.5	6.54	0.831	9	6.56
23-Investment expenditures (next twelve months)	3	1	1	2	0.876	1	2
28-General economic situation (compared with previous month)	4	0	5	4.72	0.79	3	6.35
Reference series: Industrial Production Index	4	0	0	0	1		

Table 2. Turning Point Summary Statistics for Seasonally Adjusted Diffusion Indices

Series Name	Targeted	Missed	Av.Lead	Std.Dev.	Correlation	Median Lead	Std.Dev. from Med.
1-SA Production (trend of last three months)	2	0	2	0	0.844	2	0
2-Total orders (current month)	2	0	0.5	0.5	0.97	0.5	0.5
3-Export orders (current month)	2	0	0	1	0.981	0	1
4-Monthly stocks of finished goods (current month)	3	1	4.5	0.5	0.615	4.5	0.5
5-SA Production (trend of next three months)	2	0	4	1	0.89	4	1
7-SA Total employment (next three months)	2	0	3.5	1.5	0.93	3.5	1.5
11-SA Total orders (past three months)	2	0	2	0	0.857	2	0
12-SA Export orders (next three months)	3	0	6	4.24	0.854	3	5.2
17-SA Total orders (next three months)	2	0	7	4	0.886	7	4
18-Export orders (last three months)	3	0	3.67	4.64	0.835	2	4.93
19-Domestic orders (current month)	3	0	3.67	3.77	0.964	1	4.62
20-SA Domestic orders (last three months)	2	0	2.5	0.5	0.836	2.5	0.5
21-SA Domestic orders (next three months)	2	0	4	2	0.899	4	2
23-Investment expenditures (next twelve months)	2	0	-0.5	0.5	0.906	-0.5	0.5
28-General economic situation (compared with previous month)	2	0	7	3	0.848	7	3
Reference series: Seasonally Adjusted Industrial Production	3	0	-1.67	2.05	0.946		

Since the data covers the period from January 2007 to January 2013, there are 73 monthly observations available for the turning point analysis and only four turning points in seasonally-unadjusted series and three turning points in the seasonally-adjusted series of IPI are detected. The ability of catching the turning points of the reference series with a lead, which is an important performance indicator for the components, is identified by the related lead measures on average and at peak. It is recommended in the OECD CLI guide to prefer series having average lead and peak lead greater than or equal to 2 and peak lead is closer to average lead. Correlation at peak is another important criteria for measuring the reliability of the component and it should be greater than 0.5. Also the percentage of missed turning points of the reference series should not exceed 30 percent. However, due to the small number of turning points, median leads are taken into account together with average leads and DI missing any of the reference turning points are excluded. The performance of the

<sup>6</sup> Before 2008, long term trend was eliminated by Phase Average Trend (PAT) method and series were smoothed by Month for Cyclical Dominance (MCD) moving averages.

<sup>7</sup> For further information, see Bry G., Boschan C. (1971)

survey questions with reference to the above mentioned statistical criteria is summarized in Table 1 and Table 2. The eliminated questions are marked with a cross which points the failed criteria.

Together with the statistical analysis, we take into consideration the aim of the questions in selecting the components of CI. According to “Business Tendency Survey: A Handbook” of OECD, since the main aim of BTS is to capture the dynamics of the decisions in business cycles, questions regarding production, demand and general business conditions are considered among the main components of the decision making process. Hence, DI series regarding the average unit cost and selling prices are considered of secondary importance. Their explanatory power of the business cycles is also found to be less than the main components considering their correlations with the reference series. Therefore, they are not taken into account in designing the new RSCI. As a result, production, total orders and domestic orders for the last three months, production, total employment, export orders, total orders and domestic orders for the next three months and general economic situation questions are found to be both statistically and economically significant and therefore are taken into account in construction of the index.

Pellisier (2002) states that business people react to their economic environment based on their current business situation perceptions, evaluations and future expectations, from which level of business confidence can be measured. In our study, questions of production and orders for the last three months and current general economic situation represent perceptions and assessments whereas questions of production, employment and orders for the next three months represent future expectations.

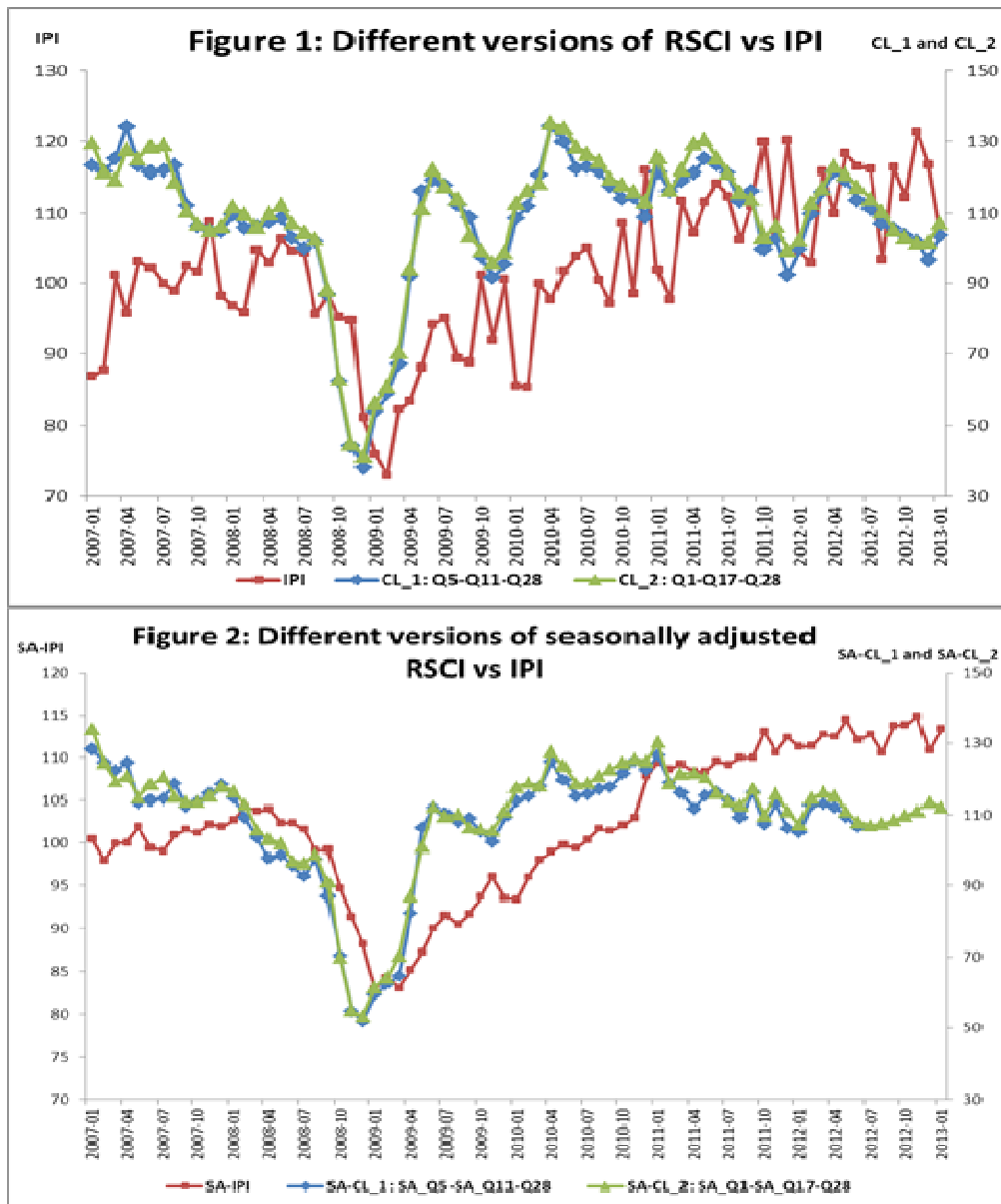
Different versions of the index have been constructed out of questions which satisfy the aforementioned criteria by aggregation using equal weights. In addition, both seasonally adjusted and unadjusted series have been calculated for all versions. We observe that different indices constructed by using different questions show similar performance with reference to IPI. This basically stems from the considerably high correlations among questions asked for the next three months and among questions asked for the last three months. In constructing the final RSCI, we include the question of production which is directly related to IPI and the question of total orders which covers both exports and domestic orders. It's observed that CI is constructed by using a small number of questions in many country practices<sup>8</sup> and our findings show that adding more questions, such as the question of employment expectations, does not make significant contribution to the performance of the index. Therefore it's determined that two different versions of CI could be constructed.

CI\_1: Q5 (production-next 3 months) - Q11 (total orders-last 3 months) - Q28 (general business situation)

CI\_2: Q1 (production-last 3 months) - Q17 (total orders-next 3 months) - Q28 (general business situation)

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<sup>8</sup> e.g. UK, Germany, Austria, Norway and EU Commission.



Other country examples, OECD and EU Commission analysts' researches showed that the CI constructed from BTS questions mainly cover production for future tendency, total order books for current situation and stock of finished goods for its immediate respond to changes in economic activity.<sup>9</sup> However, the question of stocks of finished goods is eliminated from RSCI for Turkey due to its lack of ability to detect the turning points of IPI. Instead, general business situation is included. So, by using same approach from two alternatives CI\_1 is preferred as the final RSCI.

Lastly, the performance of the final RSCI is tested by conducting Granger-Causality (GC) tests and correlation analyses. Results of the GC tests indicated a high causality between new RSCI and IPI (Table 3). Likewise, correlation analysis of new RSCI and y-o-y change of IPI supported the findings with correlation of 0.65.

<sup>9</sup> OECD (2003), Business Tendency Surveys: A Handbook

Table 3: Granger Causality Tests

	Number of Lags	P Value
SA-CI_1* does not Granger Cause SA-IPI	4	0.00000002
CI_1 does not Granger Cause IPI	4	0.0002

\*SA-CI\_1 stands for seasonally adjusted confidence index.

#### 4. Conclusion

Monitoring the cyclical trends in the economy is crucial for the CBRT in terms of monetary policy decision making and this requires producing robust leading indicators. In this paper, we try to construct a new indicator with fewer variables that captures the repercussions of the aforementioned revisions in BTS.

We use the OECD methodology for the construction of the new index. The CACIS software developed by OECD is utilized for the evaluation of the performance of the BTS questions with reference to IPI. The seasonal adjustment procedure is carried out by using the TRAMO-SEATS method.

Our findings confirm that RSCI constructed with the questions of “expectation of production for the next 3 months”, “assessment of total orders for the last 3 months” and “assessment of general business situation” shows a sound leading performance. The performance of the index is tested through Granger Causality and correlation analyses with reference to IPI. The findings also prove that employing three questions of BTS is sufficient to compose a confidence index which works as well as the current one constructed by using eight questions.

#### 5. References

Bry G., Boschan C. (1971) "Cyclical Analysis of Time Series: Selected Procedures and Computer Programs", *NBER Technical Paper 20*, New York.

OECD (2000) “Cyclical Analysis and Composite Indicators System User Guide”, Paris.

OECD (2003) “Business Tendency Surveys: A Handbook”.

Oral, E., Ece D. and Hamsici T. (2005) "Building Up a Real Sector Business Confidence Index for Turkey" *Central Bank Review*. 5.1, 23-54.

Pellissier, G.M, (2002) “Measuring Business Confidence in South Africa”, *26th CIRET Conference*, Taipei.

UNECE (2012). “Practical Guide to Seasonal Adjustment with Demetra + From Source Series to User Communication”.

[http://www.unece.org/fileadmin/DAM/stats/publications/Practical\\_Guide\\_to\\_Seasonal\\_Adjustment\\_final\\_web.pdf](http://www.unece.org/fileadmin/DAM/stats/publications/Practical_Guide_to_Seasonal_Adjustment_final_web.pdf)