Building Up a Real Sector Business Confidence Index for Turkey

Ece Oral, Dilara Ece and Türknur Hamsici[*]

Statistics Department
Central Bank of the Republic of Turkey
İstiklal Caddesi No: 10
06100-Ankara, Turkey

ece.oral@tcmb.gov.tr
dilara.ece@tcmb.gov.tr
turknur.hamsici@tcmb.gov.tr

Abstract

The two major aims of this study are, firstly, to receive valuable insight into the Business Tendency Survey of the Central Bank of the Republic of Turkey and, secondly, to construct a real sector confidence index by using the questions of the Business Tendency Survey. The most important motivation behind constructing a real sector confidence index is to provide an indicator of short-term business conditions for economic policy makers and business managers by examining business managers' views on general business conditions and their future anticipations. The real sector confidence index is constructed in accordance with statistical criteria and economic theory. Afterwards, the performance of the index in tracking the cyclical features of industrial production index is tested.

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[*] The views expressed in this paper are those of the authors and do not necessarily correspond to the views of the Central Bank of the Republic of Turkey.

1. Introduction

There is a growing concern among countries in the short-term economic indicators to monitor the economic developments and provide the economic analysts with the early signals of the turning points in the economic activity. Such indicators are used to help both the government and the private sector decision-makers to check their performance and plan their actions. Recently, countries have begun to improve their indicator system by including indexes from surveys.

The surveys on expectations are primarily designed to signal changes in economic activity and widely used in macroeconomic assessments and forecasts. The advantage of using survey results is that they are available rapidly before the related quantitative measures covering the same types of economic activity are announced. Therefore, they are considered as complementary to the official statistics. The main aim of the business tendency surveys conducted in various ways is to find out the general tendency of the cyclical developments and provide economic decision-makers with the necessary information about future expectations.

The Business Tendency Survey (BTS) of the Central Bank of the Republic of Turkey (CBRT) has been conducted since December 1987. It has been designed with the aim of discovering the tendencies and expectations of the senior managers of the major private sector firms about the recent past and the future course of the economy.

It is generally difficult to follow all the questions in a survey. (Nilsson 2000) states, "The reason why a group of indicators combined into a composite indicator should be more reliable over a period of time than any of its individual components is related to the nature and causes of business cycles". Thus, the responses given to different questions are evaluated collectively by summing them up into a single indicator. The aggregated indicator, which is a function of respondents' current and past evaluations, and future expectations, is called "confidence indicator".

The first study about the confidence index was done by Candemir and Karabudak in 1994. They searched for a monthly and quarterly composite business confidence index and a separate investment confidence index for Turkey using the BTS. The composite business confidence index on the basis of the cross-correlation analysis was constructed by using the survey series related to business outlook, domestic deliveries, domestic new orders received and expected investment expenditures.

The aim of this paper is to form an indicator of short-term business conditions using information obtained from the BTS based on the statistical point of view. We mostly focus on the cyclical performance of the survey indicators and develop a real sector confidence index as an early warning indicator for economic conditions in Turkey. Since the BTS is similar to the surveys in the OECD member countries, the methodology behind our confidence index is mostly based on the idea from the OECD studies (Nilsson 1999). So, our confidence index can be comparable with the ones in OECD, EU and the transition countries.

The paper is organized as follows: All business tendency surveys of Turkey with particular interest in the BTS are introduced in Section 2. The interpretation of the confidence is discussed in Section 3. The methodology for constructing the confidence index is introduced in Section 4. The empirical results are presented in Section 5. The performance of the confidence index is discussed in Section 6. Finally, the main conclusions of the study are drawn in Section 7.

2. Business Tendency Surveys of Turkey

2.1. Description of the Surveys

The CBRT and the Prime Ministry State Institute of Statistics (SIS) are the two state institutions carrying out business tendency surveys in Turkey. Besides these state institutions, Istanbul Chamber of Industry (ICI) conducts the "Economic Situation Assessment Survey", which is similar to the BTS, on its member companies twice a year.

The "Quarterly Manufacturing Industry Tendency Survey" of the SIS has been conducted for twenty-six years with nearly three thousand and five hundred firms from public and private sectors answering the survey questionnaire regularly. The survey reflects the views of the firms in the manufacturing industry on production, sales, stocks, capacity utilization and prices. The second survey conducted by the SIS is the "SIS Monthly Manufacturing Industry Tendency Survey". Participants to this survey, which was started in February 1991, consist of one thousand and two hundred panelists. The monthly survey is a smaller version of the Quarterly SIS Survey. Significant and continuous backward revisions are applied for both surveys.

The "Economic Situation Assessment Survey" of the ICI covers the firms from the private manufacturing industry. It has been conducted twice a year. The semiannual survey belonging to the first half of 2003 had approximately 501 respondents, which correspond to 6-10 percent of the ICI member firms. The survey questions are mainly

concerned with production, employment, domestic sales, financing and international trade.

Finally, the BTS of the CBRT is a monthly survey, which is intended to find out the assessments and the expectations of the senior managers of the major firms in general and on sectoral basis, by asking questions about the past and the future. The BTS, which was firstly launched as a pilot study in September 1987, has been carried out since December 1987. The survey, covering various aspects of the economy, is quite comprehensive. Detailed information about the BTS is given in the following section.

2.2. Business Tendency Survey of the CBRT

The survey is designed to communicate with the senior managers, who have accepted to be a respondent of the survey, from the industrial enterprises that are ranked[1] among the "First 500 Industrial Enterprises of Turkey" and the "Next 500 Major Industrial Enterprises of Turkey" lists prepared by the ICI. The participants comprise the firms from the private companies operating in the manufacturing sector. Sampling method adopted for the BTS is non-probabilistic purposive sampling method. The sample is revised once a year as to cover the new companies included in the ICI's latest biggest firms ranking, and kept fixed thereafter until the next revision.

The economic sectors are classified according to the ICI's sectoral breakdown. The survey covers most of the sectors of the economic activities, namely, mining, food, textiles, forestry, paper products, chemicals, stone, metals, machinery and energy. Machine-vehicle, textile, food and chemistry sectors make up approximately 75 percent of the entire participation in the BTS. Services sector, which has a share of 6.5 percent in GNP, is not represented in the survey.

The questionnaire contains 34 questions with different structures. The first 23 questions are presented in a 3-point Likert scale format listed by "more optimistic – the same – more pessimistic", "more – the same – less", " more than adequate – adequate – less than adequate", "higher – the same – lower", "above normal – normal – below normal", "up – the same – down". Although the first 11 questions search either one of past, present or future information, the questions between 12 and 23 contain information on both the recent trends and expectations explicitly. They are in the form of "up – the same – down" to follow the trend over the past three months and the expected trend over

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[1] The enterprises are ranked according to the sales from production criteria.

the next three months. Question 24 is a multiple-choice question. Questions between 25 and 28 are about ranking some factors.

The BTS has been adopted from the Industrial Trends Survey of the Confederation of British Industry (CBI). Then, question 29, which is a qualitative question about the expectation on wholesale prices (WPI) inflation, was added in 1997. Later, in 1999 and 2000, four quantitative questions (30 - 34) were added on WPI inflation and loan interest rate. Meanwhile, the CBI survey was also revised by adding three more questions, which have not been included in the BTS. The questions of the BTS are about: General business situation in their industry, export prospects, capital expenditures, level of output below capacity, orders (total, domestic, export), stocks of finished goods and raw materials, employment, volume of output, unit cost, prices, production schedule, limits on output and export orders, wholesale inflation rates and loan interest rates. The questions can be found in http://www.tcmb.gov.tr/ikt-yonelim/ankmainengyeni.html.

The number of respondents, which was 256 in 1987, has currently reached 400 firms and the response rate is generally close to 50 percent. By the end of October 2004, the survey has been sent to 850 firms and the response rate has been 51 percent.

The BTS is mainly conducted by means of mailed questionnaires. However, twenty percent of the responses have been collected via electronic mail since January 2002. The timing of the survey has been modified from time to time and the time schedule after the last revision is as follows: For the current month, questionnaires are sent together with an introductory letter in the last week of previous month. The firms are asked to return the completed form by the 2nd of the following month. The firms are reminded via telephone or e-mail in advance. Before January 2004, each month the results of the previous period were revised for the additional responses received after the announcement of the overall results. However, no revision was made for the responses received after 15th of the month following the month of the survey. There has been no revision as of January of 2004. Questionnaires are to be filled up by senior managers. Returns are subject to editing and validation.

The Cronbach α coefficient is used for measuring the reliability of the survey. The answers of the questions have the formation as qualitative and ordinal choices, so Likert scale is used when calculating the coefficient (Dengiz and Özcan 1991, Moser and Kalton 1972). The scaling is done by giving the biggest score to the most optimistic answer and the smallest to the most pessimistic answer. When the coefficient is between 0 and 0.40, 0.40 and 0.60, 0.60 and 0.80, 0.80 and 1, the test is not reliable, less reliable, quite

reliable and highly reliable, respectively (Özdamar 1997). The coefficient based on the first 23 questions of the BTS was calculated as 0.78 by (Dengiz and Özcan 1991). The reliability of the BTS has been recalculated on the data of 523 firms of the private sector in February 2002 (Oral 2002). At this time, in addition to the first 23 questions, 29th and 32nd questions are used for the reliability analysis. (Oral 2002) has calculated the Cronbach α coefficient as 0.8166, which points to a high consistency.

In the monthly report of the aggregated results, the answers of multiple-choice questions are presented in percentages tables. Trends and expectations are identified by net balance method. Net balance is calculated as the differences between the percentages of the respondents giving positive (optimistic, up, above normal) and negative (pessimistic, down, below normal) replies. For the data pertaining to inflation and loan interest rate expectations, descriptive statistics, which include the number of observations, minimum and maximum values, standard deviation, arithmetic mean, median, mode and appropriate mean are reported. The appropriate mean is calculated through comparing arithmetic mean, median, mode, alpha-trimmed mean and by doing outlier and extreme value analysis. The first part of the monthly report consists of the participation table and summary of the monthly developments. The second part consists of the tables and graphs of the percentages and the balances for each question.

With the purpose of receiving valuable insights about the BTS content and making correct interpretation, the relation between questions is explored. The correlation analysis of domestic demand related questions are shown in Table 1 (last three months trend) and Table 2 (next three months trend) and foreign demand related questions in Table 3 (last three months trend) and Table 4 (next three months trend).

Table 1
Trend of the Last Three Months

	New domestic orders (d13-1)	Production (d15-1)	Goods sold (d16-1)	Work in progress (d19-1)
New domestic orders (d13-1)	1	0.98	0.98	0.98
Production (d15-1)	0.98	1	0.98	0.98
Goods sold (d16-1)	0.98	0.98	1	0.98
Work in progress (d19-1)	0.98	0.98	0.98	1

Table 2
Trend of the Next Three Months

	New domestic orders (d13-2)	Production (d15-2)	Goods sold (d16-2)	Work in progress (d19-2)
New domestic orders (d13-2)	1.00	0.97	0.99	0.97
Production (d15-2)	0.97	1.00	0.96	0.98
Goods sold (d16-2)	0.99	0.96	1.00	0.96
Work in progress (d19-2)	0.97	0.98	0.96	1.00

Table 3*
Trend of the Last Three Months

	Export orders (d10)	New export orders (d14-1)	Exported Goods (d17-1)
Export orders (d10)	1.00	0.92	0.89
New export orders (d14-1)	0.92	1.00	0.96
Volume of exported Goods (d17-1)	0.89	0.96	1.00

Table 4
Trend of the Next Three Months

	Export opportunities (d2)	New export orders (d14-2)	Exported Goods (d17-2)
Export opportunities (d2)	1.00	0.81	0.80
New export orders (d14-2)	0.81	1.00	0.97
Volume of exported Goods (d17-2)	0.80	0.97	1.00

*Note that d10 shows this month's trend.

For both, past and future questions related to the groups of domestic and foreign demand, there exist significantly high correlations among the questions within each group. High correlations in Table 1 indicate that the questions related to the developments at the consecutive stages of the production process over a three-month period are equally informative about the direction of the changes in the economic activity. The managers seem to preserve the same structure in their projections for the same variables over the next three months period (Table 2).

Similarly, high correlations between the export related questions (Table 3 and 4) might reflect the opinions of the exporters about the market conditions rather than reflecting the firm's specific events. As a final result of the analysis, Tables 1 to 4 may show that the respondents cannot make a clear distinction between the questions on similar subjects.

Although the survey offers a wealth of information, there is also another point to be highlighted about the information content of the BTS. Table 5 shows that there exists a high correlation between the last and the next three months trends for most of the questions. In other words, answers to the BTS questions on the expectations about the future developments are largely influenced by the last three months' trends.

Table 5
Correlations Between the Last and the Next Three Months' Trends

Employment *(d12-1, d12-2)*	0.84
New orders from domestic market *(d13-1, d13-2)*	0.71
New orders from export market *(d14-1, d14-2)*	0.78
Production *(d15-1, d15-2)*	0.69
Goods sold in domestic market *(d16-1, d16-2)*	0.67
Exported goods *(d17-1, d17-2)*	0.72
Raw- material stocks *(d18-1, d18-2)*	0.59
Work in process *(d19-1, d19-2)*	0.70
Stocks of finished goods *(d20-1, d20-2)*	0.69
Average unit cost *(d21-1, d21-2)*	0.91
Average price for new domestic orders *(d22-1, d22-2)*	0.92
Average price for new export orders *(d23-1, d23-2)*	0.89

Another important point which must be taken into account in the analysis of the results is the "Bias", appeared as permanent optimism or permanent pessimism. Whereas the respondents are systematically pessimistic (except for a few months) in answering questions related with monthly developments of the financial requirement, past-due receivables, amount of the stocks of finished goods, total amount of orders, amount of export orders and three-month averages of the unit costs and prices for new orders received from the domestic market, they are systematically optimistic for the productive capacity over the next twelve months, as well. However, the persistency in optimism or pessimism can be corrected by comparing the gap between the diffusion indices and their long-term averages.

3. Real Sector Business Confidence Index

3.1. What Does Confidence Mean?

(Pellissier 2002) explains confidence "*Theoretically and in the economic sense of the word, business confidence can be described as the degree of sentiment towards risk taking by business for whatever reason. The reaction of business people to their*

economic environment can thus be interpreted as being a function of their perceptions and evaluations of current business conditions and expectations of future eventualities. The level of these two psychological identities of perceptions and expectations impacts directly on the human nature behavior of business people and action taken by business can to a large degree be ascribed to the level of business confidence".

Business tendency surveys provide the necessary data for the measurement of the business confidence. Qualitative and ordinal choice structure of these surveys makes the responses sensitive to the cyclical developments (OECD 2003). In other words, business tendency surveys can give knowledge about future business cycles as contraction or expansion in the economic activity. The indicator constructed as a combination of a set of survey questions in a single composite index is called confidence indicator because it sums up economic agents' assessments and expectations of the economic situation.

There are numerous theoretical and applied researches in the literature investigating the effect of confidence upon economic activity. As an example for theoretical research, (Yew-Kuang 1992) examined whether the business confidence could lead a recession. (Bodo et al. 2000) analyzing the forecasting performance of the business confidence using time series techniques such as ARIMA and cointegrated VAR can be an example for empirical research.

3.2. Business Tendency Survey Questions Related to Confidence

For constructing a real sector business confidence index for Turkey, the survey questions providing qualitative information on the current situation as well as on the expectations for the next three months are used. The most important variables are production, employment, new orders, sales prices, investment plans and limits to production. The variables related to the index are the ones which measure an early stage of production (e.g. new orders), respond rapidly to changes in economic activity (e.g. stocks), measure expectations or draw a picture of overall business condition (e.g. general business condition), measure improvement in economic conditions (e.g. investment expenditures) (OECD 2003).

4. Methodology

The methodology used for the construction of the confidence indicator in this study is the same as the one derived in OECD (Nilsson 1999). The basic steps of this method, which are data preparation, choice of the reference variable and selection of the potential indicators, are explained in the following sections.

4.1. Diffusion Indices

The results of the business tendency surveys can be reported by balances and diffusion indices. The balance is the difference between the percentage of respondents answering *"up"* or *"more optimistic"* to each question minus the percentage replying *"down"* or *"more pessimistic"*. A diffusion index is just an alternative approach of presenting the same information contained in the balances although the scales are different (OECD 2003). In this study the diffusion indices are calculated by the method that (Sutanto 1999) used for Indonesia case. For each question, the scales which are in the form of *"more optimistic - the same - more pessimistic"* or *"up - the same - down"* are coded. The answers indicating improvement (better off) for a particular variable are scored 2, while the answers showing no change are scored 1 and the answers showing a worsening condition are scored 0. The questions affecting the industrial production index negatively are coded with inverted sign. The scores of all firms in the sample are then summed to arrive at the total score (T_s) for a variable. A diffusion index of this particular variable (I_v) is achieved by dividing total score by the number of firms (N) and multiplying it by 100 percent. The formula is given as:

$$I_v = \frac{T_s}{N} * 100\% \qquad (1)$$

4.2. Selection of the Potential Cyclical Series

The economic variable representing the economic activity is called reference series. Since the aim of the index is to forecast the expansion and contraction periods of the economic activity, a key indicator is to be chosen as the reference series for comparison. After the identification of the reference series, the next step is to check the cyclical profile and timing relationship between survey series and the reference series. The diffusion indices from the surveys need not to be detrended since they can be thought to measure period-to-period changes or deviations from trend. (Nilsson 1999) states *"The cyclical profiles of the series in many cases easier to detect because they contain no trend i.e. their long term averages are stable. They may be considered as stationary series"*. At this step, three types of comparison are possible. The first type of comparison uses the diffusion index of the survey series and the changes over the previous period of the reference series. In the second comparison, the diffusion indices of the survey series can be compared with the changes over the same period of the previous year of the reference series. In the third one, the detrended reference series can be compared with the diffusion indices. The trend estimation of the reference series can be done in two different ways.

Whereas the first method applies long term centered moving averages (75 or 60 month), the second method uses OECD adapted Phase-Average-Trend (PAT)[2] method.

At this point it is worth to note that a standard set of series across countries or an individual set of series per country may be used in the construction of the confidence index. Although the use of a standard set of series across countries is a good approach for obtaining international comparability, cyclical series, which perform well in one country, may not work well in another because of the differences in economic structure and statistical system (Nilsson 2000). Therefore, the criteria used for the selection of appropriate series to construct the confidence index can be put into practice for the Turkish case. Standardization and smoothing, seasonality, cross-correlation and peak-trough analyses, volatility, weighting and economic significance are the criteria applied when assessing and selecting the indicators.

(Nilsson 1999) states, *"Standardization or normalization of component series is necessary in order to prevent series with marked cyclical amplitude from dominating the composite indicator…. Standardization of balance series from business tendency surveys is not always performed. The argument for not standardizing such series is the fact that the amplitudes in the different survey series are not so different due to the fact that the same fixed scale is used for all series"*. Therefore, the necessity of the standardization is to be checked.

In order to confirm that all component series have equal "smoothness", the procedure utilized by OECD, namely the "Months for Cyclical Dominance" (MCD) moving average can be used. This procedure ensures that month-to-month changes in the confidence index are not excessively influenced by irregular movements in any one of the diffusion indices. Nevertheless, as stated in OECD's Handbook (2003) *"Business tendency survey series are also relatively smooth compared with quantitative statistics. This is partly explained by the fact that business tendency survey series are less sensitive to disruptive events such as changes in holidays or plant shutdown schedules and unusual weather conditions that will affect quantitative statistics, particularly if they are monthly"*.

Although the respondents are noticed to keep the seasonal effects in mind, the business survey series may exhibit significant seasonality. (Ferenczi and Reiff 2000) state, *"From a business cycle point of view and in case of indicators published for the non-specialist public, seasonality should be treated as statistical noise, be always tested, and if necessary, corrected for"*.

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[2] OECD (2000).

Seasonally-adjusted data are subject to revisions when adding data at the end of the time series. According to (European Commission 2002), business survey data are economic agents' opinion at a certain point in time and revisions of the historical data do not seem to be acceptable. Therefore, before applying seasonal adjustment method, the significance of the seasonality should be tested carefully.

Once the diffusion indices per question for the survey are calculated, they can be seasonally adjusted. The seasonality of the diffusion indices for each question in the BTS is searched each month by the TRAMO-SEATS programs within the Demetra interface (Gomez and Maravall 1998).

In simple cross-correlation analysis, positive cross-correlation with the cycles of the industrial production index is examined. The correlation between variables is assumed to be 'strong' when the correlation coefficient is greater than 0.45 in absolute values. This cut off point is not based on any statistical test (Adamowicz, Dudek and Walczyk 2002).

Peak-trough analysis includes examination of the behavior of the diffusion indices per question in relation to the cyclical turning points[3] of the reference series. The statistics such as mean and median leads, extra or missing cycles in the diffusion indices with respect to the reference series are collected. In this kind of analysis, the median, rather than the mean is usually preferred due to the small number of observations.

The standard deviation from median of the lead for each series being low is important because the leading time of the series at turning points should be consistent.

Before the series are accepted as an indicator according to the statistical criteria, there has to be an economic reason. Therefore, an algorithm describing stages of the production process for Turkey has been derived in Appendix A[4]. This algorithm shows all the stages assumed to be thought by managers before making production decision.

In order to obtain a single composite index, different weights can be assigned to component series. The aim of weighting is to improve reliability by giving higher weight to better components. The weights of the components can be given according to their economic significance or statistical adequacy. Principal component analysis can be used for the selection of the optimal weights. However, such a technique would minimize the contribution of the series that do not act with the other series while the series have a good leading property. This may reduce the reliability of the index because some series

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[3] See Section 5.
[4] We are particularly thankful to Cevriye Aysoy for developing the algorithm based on the BTS questions and her explanations and comments.

perform better in one cycle and others in a different cycle. Therefore, most countries use an equal weighting system (Nilsson 1999).

The general formula for the confidence index is given as:

$$I = \frac{\sum wI_v}{n} \tag{2}$$

where

I = Confidence index,

w = Weight,

I_v = Diffusion index of a variable,

 n = Number of variables

A proxy interpretation of the index magnitude (Sutanto, 1999):

I = 200 (maximum) :   all respondents showing an improvement/ better off.

I = 100   :   number of establishments showing an improvement and worsening   conditions are balanced, or such that the general conditions of respondents are unchanged.

I > 100   :   number of establishments showing an improvement is higher than that showing a worsening condition, or such that the general condition of respondent is better.

I < 100   :   number of establishments showing an improvement is lower than that showing a worsening condition, or such that the general condition of respondent is worse.

However, while interpreting the confidence index there are some important points to be highlighted. Diffusion indices do not give information about the magnitude of the business cycles. Furthermore, intermittent increases or decreases in the index should not be interpreted as indications of expansion or contraction of the economic activity.

5. The Empirical Results

Ideally, the gross domestic product (GDP) of Turkey would be used as the reference series, but it is available only on quarterly basis and there is one quarter of time lag in the publication of GDP estimates. However, industrial production index is available on a monthly basis and the turning points of industrial production index and GDP are closely related. Therefore, the industrial production index, which is an important indicator for the economic activity, is chosen as the reference series for comparison.

The detrended reference series is preferred to be compared with the diffusion indices due to the availability of the relevant series for Turkey. For the cycles of the industrial

production index, the series derived by the cooperative study of the CBRT and OECD is used.

The reference chronology[5] of the industrial production index is given in Table 6.

Table 6
Reference Chronology of the Industrial Production Index

Turning Points		Duration in Months	
Trough	**Peak**	**Deceleration**	**Acceleration**
-	December 1987	-	-
April 1989	May 1990	16	13
November 1991	April 1993	18	17
May 1994	February 1998	13	45
August 1999	August 2000	18	12
April 2001	-	8	-
Mean		14.6	21.8
Median		16.0	15.0

The series of the BTS have the same fixed scale i.e. the amplitudes of the series do not differ from each other (the standard deviations of all series range between 5.3 and 21.1). On the other hand, most of the diffusion indices show MCD values in the range 2-4 (See Table 7). Therefore, smoothing of the diffusion indices is performed but irregular components' effect is found to be little on each of the diffusion indices. Consequently, no standardization and smoothing seem to be necessary.

Seasonality is examined for each of the diffusion indices. Seasonal influences are found to be present in some of the indices. However, in general the seasonal influences have little impact on the identified cyclical patterns. Besides, seasonally adjusted diffusion indices seem only to marginally improve correlations with the reference cycle. Therefore, to keep the work simple, using seasonally unadjusted series are considered to be appropriate for the construction of the real sector confidence index. The seasonality structures of the selected diffusion indices and the confidence index, discussed further in Section 5.6, also provided no evidence against the use of unadjusted series.

The series are selected on the basis of the cross-correlations and peak-trough analysis together with low volatility and economic significance criteria. The results from the cross-correlation, volatility and peak-trough analysis including the number of extra or missing cycles are given in tables 7 and 8.

The diffusion indices are tested for extra and missing cycles (Table 7). Among these indices, 22 series show one extra cycle while few of them miss cycles present in

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[5] See http://www.tcmb.gov.tr/yeni/evds/yayin/oncu_gos/oncu_eng.html

reference series. 10 diffusion indices out of 35 are in line with the cycles of the reference series.

Most of the diffusion indices except for the indices related with prices, the financial requirement (next month), the stocks of finished goods (trend of last three months) and the indices related with exports excluding export opportunities (next three months) are potentially good indicators on the basis of their correlations with the reference series. As it can be seen in Table 8, the correlation coefficients of those series and cycles of the industrial production index are between 0.45 and 0.666. While their mean lead times are between 0 and 9 at all turning points, the median lead times are between 1 and 6 at all turning points. However, among these indicators investment expenditures and stocks of finished goods (trend of next three months) are found to have relatively high volatility. While the average unit cost indices are good indicators in terms of cross-correlation analysis, the trend of the next three months index has high volatility and the last three months trend index has a lagging property instead of leading.

In addition to the statistical criteria, the adopted stages of the production decisions are also examined for the selection of the series. The explanation of the selection algorithm is as follows:

As a first step, we need to think about the decision-making process in supplying goods and services. The firm's management must be concerned with three sets of conditions in order to develop a plan for production: 1) conditions in the economy as a whole, 2) conditions in the industry and especially in competitive firms, and 3) conditions inside the firm (Cyert 1988). In peculiar to Turkish case, the managers try to forecast the general business, economic (i.e. exchange rate, interest rate and inflation) and political conditions. Firm's main decision of how much output to produce depends on the size of domestic and external market demand. In order to decide about the level of the production, the firm should accurately anticipate the market demand and ensure the sufficiency of its production to meet the anticipated demand. As to the suitability of the production decisions with the demand, the level of stocks of finished goods compared to a firm-specific ideal level is a good indicator for the manager's assessment of the current production level. On the other hand, due to the raw material stocks are usually built up parallel to the anticipation of increasing demand, direction of raw material stocks also provides information about firms' assessment of demand conditions. The classification of the market demand as permanent or temporary is fundamental for the firms' decisions. In case of a temporary market demand, the manager will check the level of the stocks. If the manager makes the decision of enough stocks, there is no need for increasing production. Only when the firms are optimistic and feel confident about a permanent demand, they are more likely to install new equipment, add to their capacity and increase the employment since investment is time consuming and costly. Therefore, employment and

investment plans reflect whether the firms anticipate a long lasting upward or downward movement of demand.

Table 7
Irregular Variation (MCD*) and Extra/Missing Cycle Analysis

	Indicators (Diffusion Indices)	Irregular variation MCD*	Extra/Missing cycles
Number of diff.ind.			
d1	General economic situation (compared with previous month)	3	1 extra cycle
d2	Export opportunities (next three months)	4	1 extra cycle
d3	Investment expenditures (next twelve months)	2	-
d4	Capacity utilization (compared with previous month)	4	1 extra cycle
d5	Productive capacity (next twelve months)	3	1 extra cycle
d6	Sales revenues (compared with previous month)	5	1 extra cycle
d7	Past-due receivables (compared with previous month)	3	1 extra cycle
d8	Financial requirement (compared with previous month)	4	-
d9	Total orders (current month)	3	1 extra cycle
d10	Export orders (current month)	4	1 extra cycle
d11	Monthly stocks of finished goods (current month)	4	1 extra cycle
d12-1	Employment (trend of last three months)	2	-
d12-2	Employment (trend of next three months)	2	1 extra cycle
d13-1	New orders from domestic market (trend of last three months)	3	1 extra cycle
d13-2	New orders from domestic market (trend of next three months)	2	1 extra cycle
d14-1	New orders from export market (trend of last three months)	4	1 extra cycle
d14-2	New orders from export market (trend of next three months)	3	1 extra cycle
d15-1	Production (trend of last three months)	3	1 extra and 1 missing cycle
d15-2	Production (trend of next three months)	3	1 extra cycle
d16-1	Goods sold in domestic market (trend of last three months)	3	1 missing cycle
d16-2	Goods sold in domestic market (trend of next three months)	2	1 extra cycle
d17-1	Exported goods (trend of last three months)	3	1 extra cycle
d17-2	Exported goods (trend of next three months)	4	1 extra and 1 missing cycle
d18-1	Raw- material stocks (trend of last three months)	4	-
d18-2	Raw- material stocks (trend of next three months)	4	-
d19-1	Work in process (trend of last three months)	2	-
d19-2	Work in process (trend of next three months)	3	1 extra cycle
d20-1	Stocks of finished goods (trend of last three months)	4	1 extra and 1 missing cycle
d20-2	Stocks of finished goods (trend of next three months)	6	2 missing cycles
d21-1	Average unit cost (trend of last three months)	4	1 extra cycle
d21-2	Average unit cost (trend of next three months)	4	2 missing cycles
d22-1	Average price for new domestic orders (trend of last three months)	4	-
d22-2	Average price for new domestic orders (trend of next three months)	4	-
d23-1	Average price for new export orders (trend of last three months)	4	-
d23-2	Average price for new export orders (trend of last three months)	4	-

* MCD moving average method uses minimum (optimal) order of moving average which is enough to eliminate irregular fluctuation from the data without affecting trend and cyclical movements. This method uses MCD span for which the ratio between the trend and the irregular component is less than 1, i.e. I/C< 1 (where I denotes the irregular component and C denotes the trend cycle component). Generally, 1, 2 and 3 months are used as the moving average order.

Table 8
Characteristics of Diffusion Indices from the BTS

Number of diff.ind.	Indicators (Diffusion Indices)	Mean lead (+) at turning points (TP)			Median lead (+) at turning points (TP)			Standard deviation*	Cross-correlation	
		Peak	Trough	All TP	Peak	Trough	All TP		Lead (+)[7]	Coef.
d1[6]	General economic situation (compared with previous month)	3	6	4	3	6	4	3.6	3	0.551
d2	Export opportunities (next three months)	10	7	9	8	8	8	5.5	5	0.447
d3	Investment expenditures (next twelve months)	5	3	4	-1	3	1	11.4	2	0.500
d4	Capacity utilization (compared with previous month)	3	6	4	3	8	4	4.0	3	0.660
d5	Productive capacity (next twelve months)	-1	3	1	-1	4	1	4.6	1	0.634
d6	Sales revenues (compared with previous month)	2	7	4	3	8	4	4.1	4	0.574
d7	Past-due receivables (compared with previous month)	3	7	5	3	8	6	4.1	4	0.514
d8	Financial requirement (compared with previous month)	6	7	6	3	5	3	11.1	4	0.329
d9	Total orders (current month)	1	7	4	3	9	4	5.3	2	0.666
d10	Export orders (current month)	8	7	7	4	8	6	5.0	3	0.319
d11	Monthly stocks of finished goods (current month)	2	7	5	2	9	5	4.4	3	0.453
d12-1	Employment (trend of last three months)	2	5	3	1	6	2	4.5	2	0.586
d12-2	Employment (trend of next three months)	4	5	4	4	6	4	3.8	3	0.520
d13-1	New orders from domestic market (trend of last three months)	1	6	4	1	9	4	4.5	2	0.658
d13-2	New orders from domestic market (trend of next three months)	3	7	5	3	10	6	4.4	3	0.542
d14-1	New orders from export market (trend of last three months)	8	9	8	6	9	9	3.9	5	0.388
d14-2	New orders from export market (trend of next three months)	11	8	9	11	8	8	5.1	8	0.312
d15-1	Production (trend of last three months)	3	4	3	3	4	3	3.8	2	0.621
d15-2	Production (trend of next three months)	4	6	5	4	6	4	3.7	3	0.556
d16-1	Goods sold in domestic market (trend of last three months)	3	3	3	3	3	3	3.8	2	0.635
d16-2	Goods sold in domestic market (trend of next three months)	3	6	4	3	7	4	4.0	3	0.566
d17-1	Exported goods (trend of last three months)	11	7	9	11	9	9	5.4	5	0.355
d17-2	Exported goods (trend of next three months)	10	8	9	5	9	7	5.4	8	0.325
d18-1	Raw-material stocks (trend of last three months)	-2	2	0	-1	1	1	4.0	2	0.628
d18-2	Raw-material stocks (trend of next three months)	-1	6	2	-2	7	1	5.2	4	0.597
d19-1	Work in process (trend of last three months)	2	5	3	3	5	3	3.7	2	0.620
d19-2	Work in process (trend of next three months)	3	7	5	3	10	6	4.4	3	0.573
d20-1	Stocks of finished goods (trend of last three months)	2	0	1	7	9	9	15.2	-4	0.399
d20-2	Stocks of finished goods (trend of next three months)	27	20	23	27	20	20	18.3	5	0.543
d21-1	Average unit cost (trend of last three months)	-1	1	0	1	1	1	4.1	-12	0.454
d21-2	Average unit cost (trend of next three months)	3	11	7	3	11	3	11.8	14	0.529
d22-1	Average price for new domestic orders (trend of last three months)	5	14	9	3	14	5	12.0	11	0.248
d22-2	Average price for new domestic orders (trend of next three months)	-4	-14	-8	-6	-4	-5	14.1	11	0.317
d23-1	Average price for new export orders (trend of last three months)	-10	-18	-13	-12	-10	-10	13.8	7	0.224
d23-2	Average price for new export orders (trend of last three months)	-6	-7	-7	-7	-7	-7	6.3	7	0.300

* Standard deviation from median of the lead.

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[6] dXY-Z refers to the diffusion index of question XY. Z takes value 1 for last three months and 2 for next three months.
[7] A positive number indicates that the series is a leading, negative lag means a lagging indicator and a zero lag indicates a coincident indicator.

In order to finalize the selection of the series, the information from the assumed production process is combined with the statistical properties of the diffusion indices. Question about general business situation, d1, has no alternative and also has good statistical properties. As given in Section 2.2.9, there are more than one question for domestic demand and exports and they are highly correlated. Choosing one question from each group according to statistical criteria is considered to be appropriate. The goods sold in domestic markets (last three months), d16-1, has equal mean and median lead times at turning points besides its small standard deviation among the domestic demand related questions, so it is chosen as a demand indicator. The diffusion index of this question can also be considered as an indicator of the firm's performance. As foreign demand is considered, the diffusion indices d10, d14, d17 related to the last three months trend and d2, d14, d17 related to the next three months trend are examined respectively. Firms' evaluation of the export prospects over the next three months, d2, has an average lead-time of 5 and a high correlation with the cycle of industrial production index compared to the others. Since the prospects of the amount of export orders received this month, d10, are always pessimistic and there is no significant change in its trend besides its low correlation, it is not appropriate to evaluate this question as a foreign demand indicator. Total amount of orders received this month, d9, is chosen to indicate the strength of the total demand for the firms' product. In order to evaluate the level of the stocks of the finished goods, d11, having a consistent mean and median lead-time at turning points and a lower standard deviation compared to d20-1, is chosen. A firm having the thought of a permanent demand might already have started to increase the volume of its raw-material stocks within the last three months and will increase the level of its investment and employment. As it is mentioned above, the diffusion indices related to the investments in the next 12 months, d3, raw material stocks (trend of last three months), d18-1, and employment in the next three months, d12-2 have good statistical performances. So, they are chosen as the suitable series. Finally, the volume of output, d15-2, is an important series at this stage of forecasting economic activity and has good statistical properties. Having a low cross-correlation with the reference series and/or bad cyclical properties, cost and price questions are not considered in the index.

Finally, the diffusion indices d1, d2, d3, d9, d11, d12-2, d15-2, d16-1 and d18-1 are chosen to construct the confidence index, namely MBRKGE.

The principal component analysis is used to choose the optimal weights. The results of the principal component analysis illustrate that scores have approximately equal weights. In addition, an equal weighting system is used by most indicator systems in operation.

Thus, the composite index is calculated on the equally weighted average of the sub-indices in line with the applications in the EU countries. No base-year adjustment has been made to the index.

As a final point, we would like to turn back to the seasonality issue. According to the Nilsson's (2003) recommendation, seasonal adjustment should be performed at the level of the diffusion indices instead of the aggregate level of the confidence index. Following this recommendation, the adjusted confidence index based on the seasonally adjusted diffusion indices (see Figure 2) is constructed and compared with the unadjusted one. Both of the confidence indices are shown in Figure 1. The figure illustrates insignificant difference, so that the remaining part of the study is based on the unadjusted confidence index.

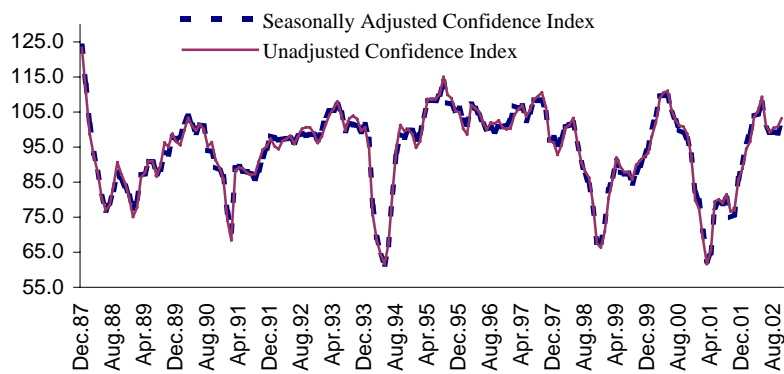**Fig. 1. Business Confidence Index (seasonally adjusted and unadjusted)**
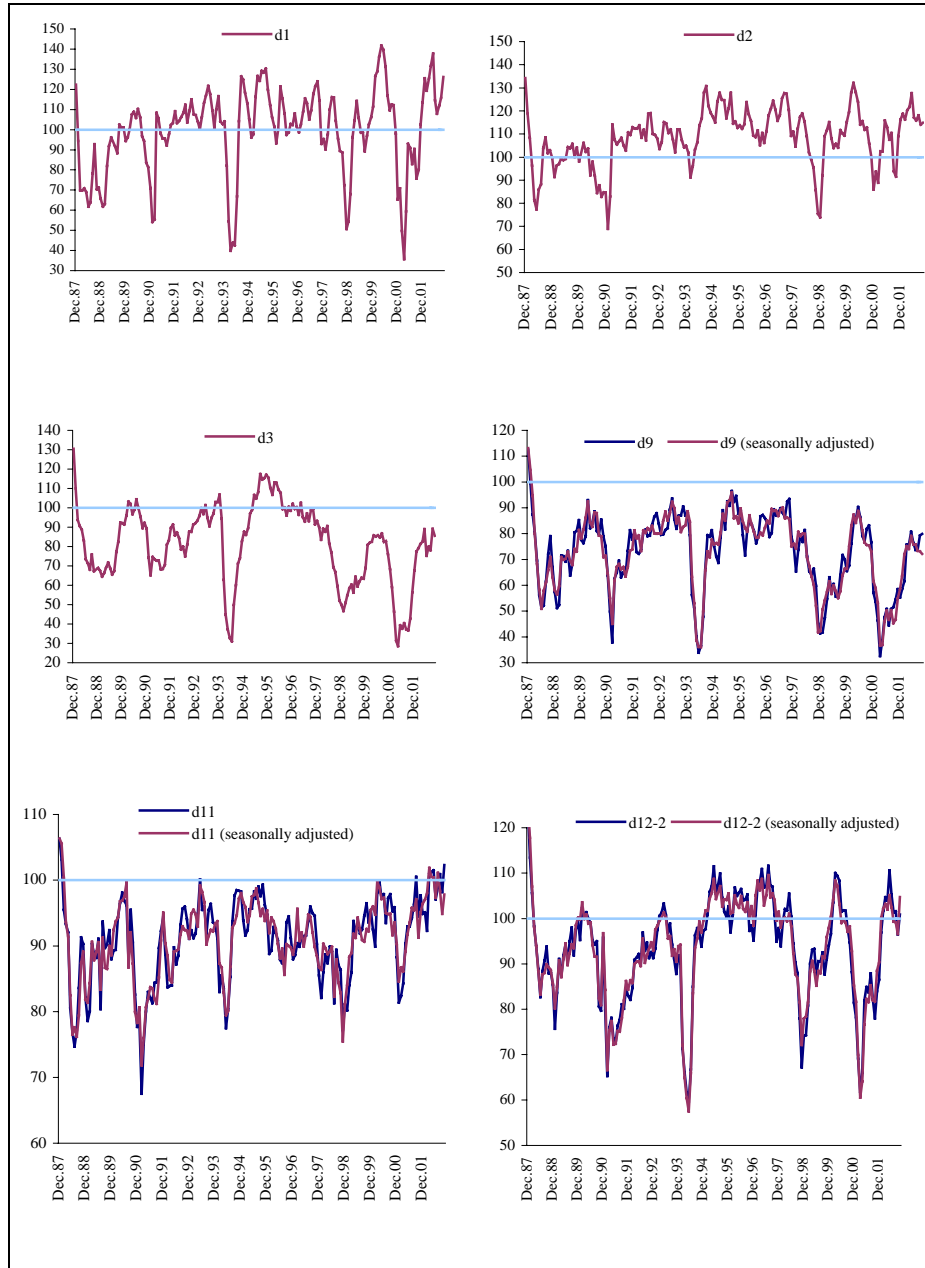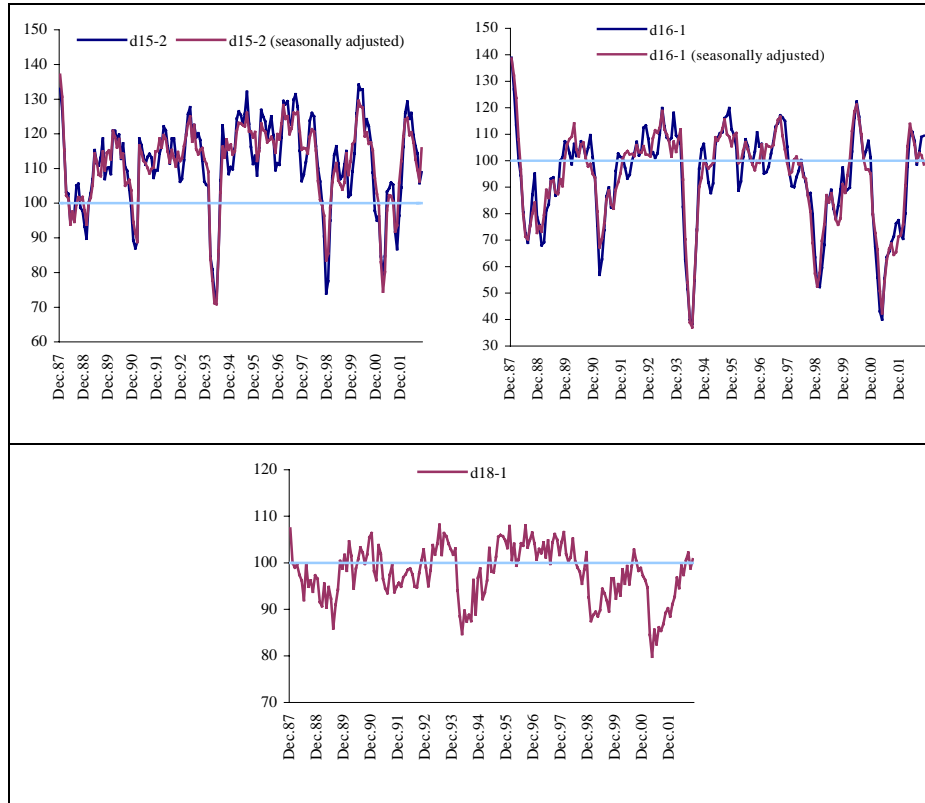
Fig 2. Diffusion Indices of the MBRKGE

Fig 2. Diffusion Indices of the MBRKGE (continued)

* d1, d2, d3, d18-1 do not show seasonal pattern.

6. Performance of the Real Sector Confidence Index (MBRKGE) and its Components

The questions that are used to construct the real sector confidence index are compared with the conventional quantitative realizations to evaluate their degree of consistence with the realizations. The analysis is restricted mostly to the concept of output and the cross-correlation coefficients and the implications of the economic theory are used.

In order to compare the components of the MBRKGE with the evolution of the quarterly quantitative realizations, monthly indices are transformed into quarterly series. This is done by taking the arithmetic mean of the three months in the quarter. The diffusion indices and realizations, showing seasonal pattern are adjusted with TRAMO/SEATS procedure. The cyclical pattern of the quantitative series is obtained by eliminating trend component via HP filter. Besides, year-to-year and quarter-to-quarter changes of the series are also considered. Among the transformations of the related

quantitative series, the highest correlations between the BTS diffusion indices and economic indicators are given in Table 9.

Table 9
The Cross-Correlation Analysis of Quantitative Realizations with the BTS Indices

			Transformation		
Diffusion Index	**Related Quantitative Series***	**Diffusion Index**	**Related Quant. Series****	**Lead*****	**Cross-Corr.**
General economic situation (d1)	Production of Manufacturing (Private)	Quarterly Mean	Q- o- Q % change	1	0.626
Export prospects (d2)	Export Volume of Manufacturing	-	Detrended	0	0.291
Investment expenditures (d3)	Import Volume of Capital Goods	-	Y-o-Y % Change	1	0.713
Total orders (d9)	Import Volume of Intermediate Goods	-	Y-o-Y % Change	0	0.781
Monthly stocks of finished goods (d11)	Changes in Stocks	Quarterly Mean	-	5	-0.462+
Employment (d12-2)	Production Workers (Private)	Quarterly Mean	Q- o- Q % change	0	0.814
Volume of output (d15-2)	Industrial Production Index (Manufacturing)	-	Y-o-Y % Change	2	0.632
Goods sold in domestic market (d16-1)	Private Consumption	Quarterly Mean	Y-o-Y % Change	0	0.797
Raw material stocks (d18-1)	Import Volume of Intermediate Goods	-	Detrended	0	0.533

*Detailed information about the series can be found in Appendix B.
**Q-o-Q represents quarter-to-quarter changes and Y-o-Y represents year-to-year changes.
***A positive number indicates that the diffusion index is a leading and a zero lag indicates a coincident indicator.
+ Note that d11 has coded with inverted sign.

Because of the assumption that recovery in the general economic situation has an immediate impact on production, the assessments of the firms about the general economic situation are compared with the production of private manufacturing and relatively a high correlation (0.626) is found. The sub-item of the foreign trade export volume index, the volume of manufacturing exports is expected to be consistent with the opinion about the export prospects over the next three months compared with the previous month. It is worth to note that export prospects are sensitive to sudden economical changes while export realizations change in the long term. For that reason the relationship between the export prospects and its realization is found to be low (See Figure 3). Investment expenditures are compared to the imports of capital goods finding that the amount of expected investment expenditure displays a parallel pattern with the import volume of capital goods. In order to compensate orders, intermediate goods are generally imported. So, there exists quite high correlation between total orders and imports of intermediate goods. It can be easily seen that the assessment of the monthly

stocks of finished goods, the next three months' trend of total employment, the volume of output and the goods sold in domestic market are reasonably related to changes in stocks, the index of production workers in private manufacturing industrial firms, the industrial production index and private consumption respectively. The firms may increase raw material stocks via importing. There exists correlation of 0.533 between the assessment of raw material stocks and import volume of intermediate goods, which supports this idea.

It is to note that the indices derived from the BTS stand in quite high correlation with the realizations even though the methodology and information sources are varied. As a result of the analysis of index questions, it can be concluded that they are highly consistent with the realizations.

Fig 3. Diffusion Indices of the MBRKGE and the Realizations
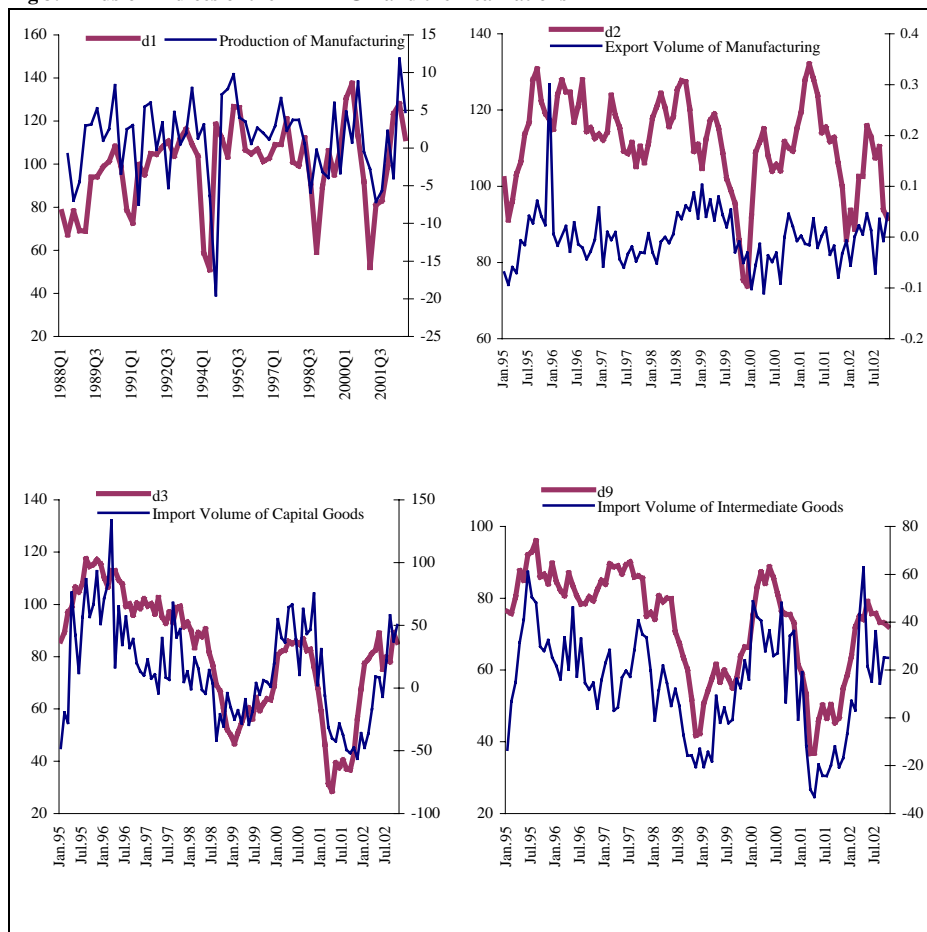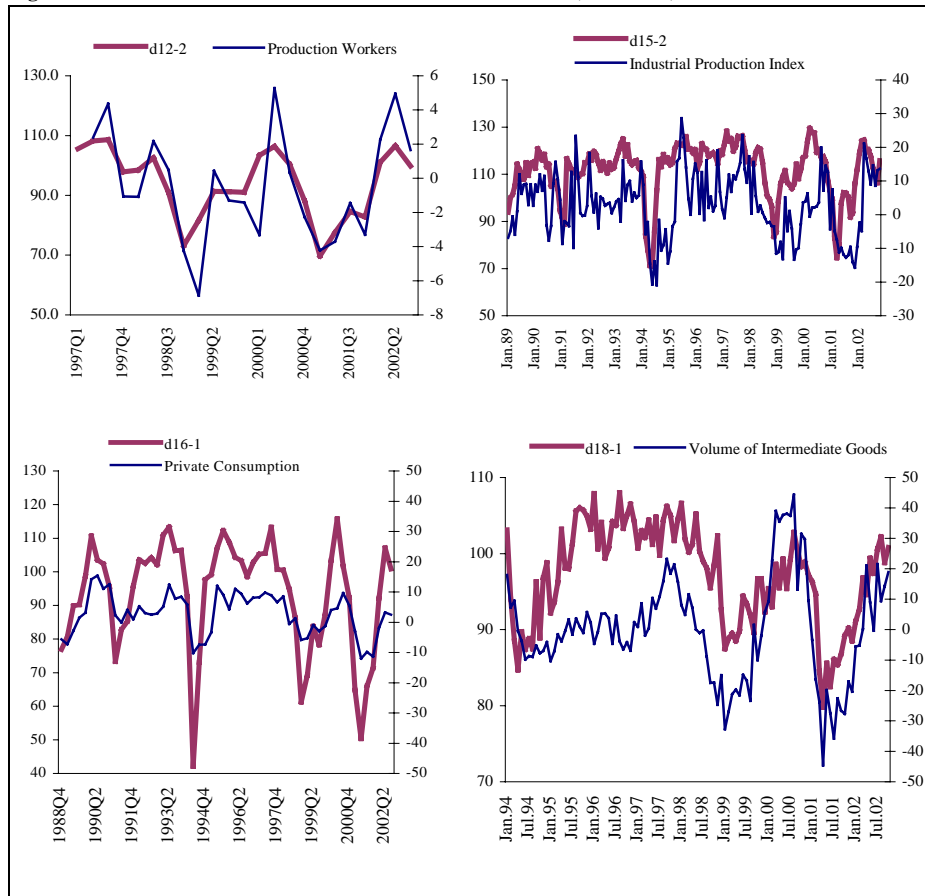
Fig 3. Diffusion Indices of the MBRKGE and the Realizations (continued)

* Quantitative Realizations are plotted in right axis.

After the analysis of the BTS effectiveness by comparing the diffusion indices with the conventional realizations, MBRKGE's performance is tested in the following part. MBRKGE, having the property of leading at the turning points of economic activity, is compared with the cycles of the industrial production index in Figure 4 for illustrating its historical performance. The economic recession between 1988 and 1989, the slump during the Gulf crises in 1990, the currency crisis in 1994, the Asian and Russian crisis of 1997, the financial crisis in February 2001 following on the liquidity crisis in November 2000 and the upturns in 1989, 1992-1993, 1995 and 2000 are forecasted by the confidence index. Therefore, the index seems to be useful for monitoring and detecting changes in economic activity and appears to be precious in terms of conjunctural analysis.

Fig. 4. Business Confidence Index and Cycles of Industrial Production Index
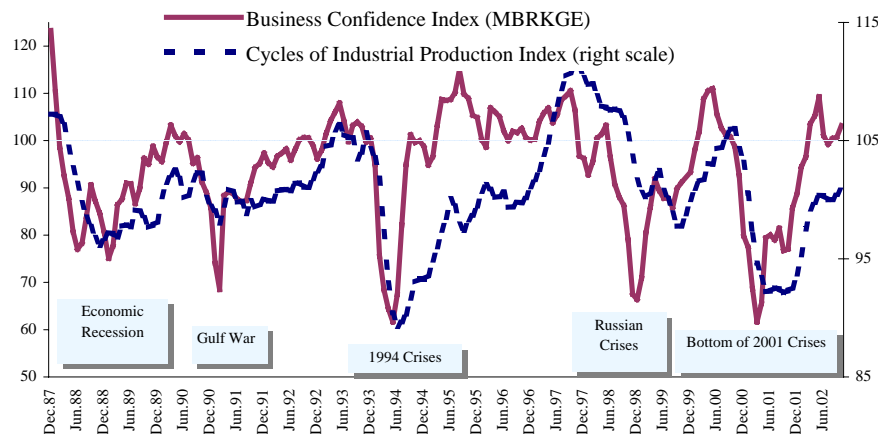
The peak-trough analysis results of MBRKGE are shown in Table 10.

Table 10
Peak-Trough Analysis

MCD	Mean lead (+) at turning points (TP)			Median lead (+) at turning Points (TP)			Standard deviation	Cross-correlation	
	Peak	Trough	All TP	Peak	Trough	All TP		Lead(+)	Coeff
2	2	4	3	3	3	3	3.4	2	0.687

It is found that the real sector confidence index has median lead-times of 3 and 3 at peaks and troughs, respectively. The real sector confidence index can be considered as quite smooth with the MCD value of 2. Cross-correlation result indicates that the MBRKGE is well correlated with the reference cycle at 2-month lead.

As a next step the Granger causality analysis is performed to support the result of cross-correlation in terms of the underlying causality relationship. It is worth to note that Granger causality does not mean any strict cause and effect relation, but simply one variable can be useful in predicting another.

Before the Granger causality analysis, the stationarity of the series are tested by means of Augmented Dickey-Fuller unit root test, with the lag lengths selected with Schwarz Information Criterion (SIC) procedure.

Table 11
Unit Root Tests on MBRKGE and Cycles of Industrial Production Index

	ADF Test Statistic	Lag	1 % critical value	5 % critical value
MBRKGE	-4.656	1	-3.467	2.877
Cyc. of Ind. Prod. Index	-3.818	1	-3.467	2.877

Table 11 shows evidence of stationarity at both of the 1 % and 5 % significance levels.

Table 12
Pairwise Granger Causality Test
Lags 2

| Null Hypothesis	Obs	F-Statistic	Prob
MBRKGE does not Granger cause Cycles*	177	12.6901	0.0000072
Cycles* does not Granger cause MBRKGE	177	9.236400	0.00015

* Cycles of Industrial Production Index

In order to test the Granger causality a vector autoregressive forecasting model with 2 lags[8] is developed. The Granger test strongly rejects the hypothesis of no causality between the MBRKGE and cycles of industrial production index (Table 12). Finding two-sided causality relation indicates the need for considering the feedback effects when MBRKGE is used for forecasting industrial production.

The real sector confidence index is compared with the official composite leading indicator (MBONCU - SUE) of the Turkish economic activity, consisting of four BTS questions and three macro economic series, in Figure 5.

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[8] The lag length is selected as 2 using the Schwarz information criterion and Hannan-Quinn information criterion.

Fig. 5. Business Confidence Index and Leading Indicator of Industrial Production Index
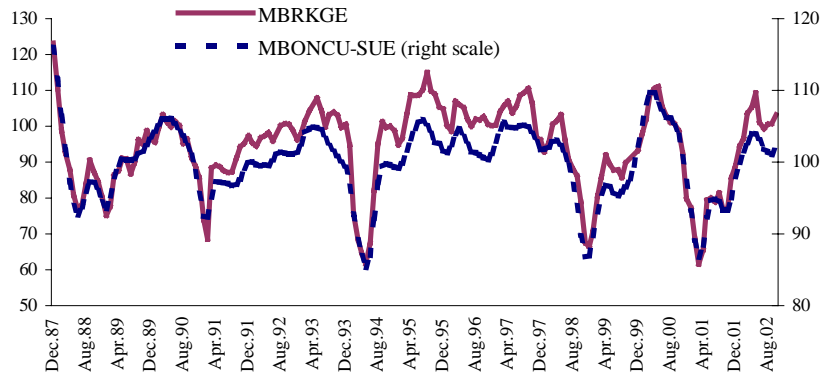
The figure shows that the cyclical turning points of the real sector confidence index are in line with those of the official composite leading indicator. According to the cross-correlation analysis there is a coincident relation between these two indicators with a correlation of 0.9293. However, it is important to note that the composite leading indicator and MBRKGE include some of the BTS questions in common such as export possibilities, stocks of finished goods and total amount of employment. Besides, the diffusion index of the raw material stocks can correspond to the official statistics used in MBONCU-SUE, namely import volume of intermediate goods.

Although industrial production index is chosen as the reference series, the performance of MBRKGE with the cycles of GDP is also examined and illustrated in Figure 6.

Fig. 6. Quarterly Business Confidence Index and Cycles of GDP
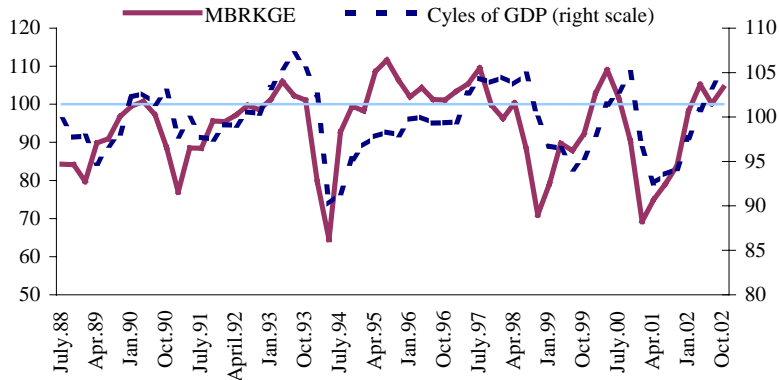
The confidence index is constructed by combining the quarterly averages of monthly index values as well as taking the end of quarter values of the monthly indices (March index for the first quarter, June index for the second quarter, etc.). The cycles of the quarterly GDP is derived by the methodology based on the joint study of the CBRT and the OECD and compared with quarterly index. The index calculated by the end of period values has higher cross-correlation than the index calculated by taking quarterly averages. Besides, the quarterly index constructed by using the quarterly average of monthly values of diffusion indices has a higher cross- correlation coefficient than the one reached by MBRKGE. This finding is in line with the results of (Candemir and Karabudak 1994) and shows that the confidence index provides valuable information about the economic activity on the quarterly basis as well.

7. Conclusion

Business tendency surveys used to predict changes in economic aggregates such as the levels of output, sales, investment or employment, provide valuable information for economic policy makers and analysts. Therefore, they are especially useful for analyzing the business cycle.

The BTS of the CBRT provides early signals of economic changes in Turkey and, for that reason, it is a sound tool for economic analysis. In this study qualitative questions of the BTS are analyzed and a real sector confidence index for Turkey has been developed according to the methodology and procedures of OECD (1997, 2000, 2002, 2003). The computational technique for the diffusion index is similar to that used in Indonesia (Sutanto 1999). Most of the diffusion indices of the related questions are found to be quite reliable and interpretable. In addition, they are proved to be helpful for macroeconomic forecasting.

This study emphasizes on the evaluation of the MBRKGE's performance, the interpretation of the index and the consistency analysis of sub-indices with the realizations. On the basis of peak-through, Granger causality and conjunctural analysis results, MBRKGE has the leading indicator capability for the economic activity and is an indicator for the business confidence based on the BTS.

Although it is clear that the index performs well, the BTS has some limitations: It requires some improvements and is still lacking in a number of respects. The survey has a sampling bias due to the surveyed firms. More than half of the participants of the survey are fixed since the beginning of the survey. The firms are not chosen evolving any

probability sampling techniques and the number of participants in each sector is not equal in proportion and not stable.

It is also worth to note that the real sector confidence index is based on the answers of the private sector firms only. Besides, the BTS does not comprise all the sectors covered in the construction of the industrial production index. Therefore, the results may not accurately represent the entire real business climate. This study shows us that the respondents have perceived the questions on a similar subject in the same manner so that they give close answers. Therefore it is essential to conduct an answering practices survey to have a clear understanding of the underlying basis upon which respondents reply.
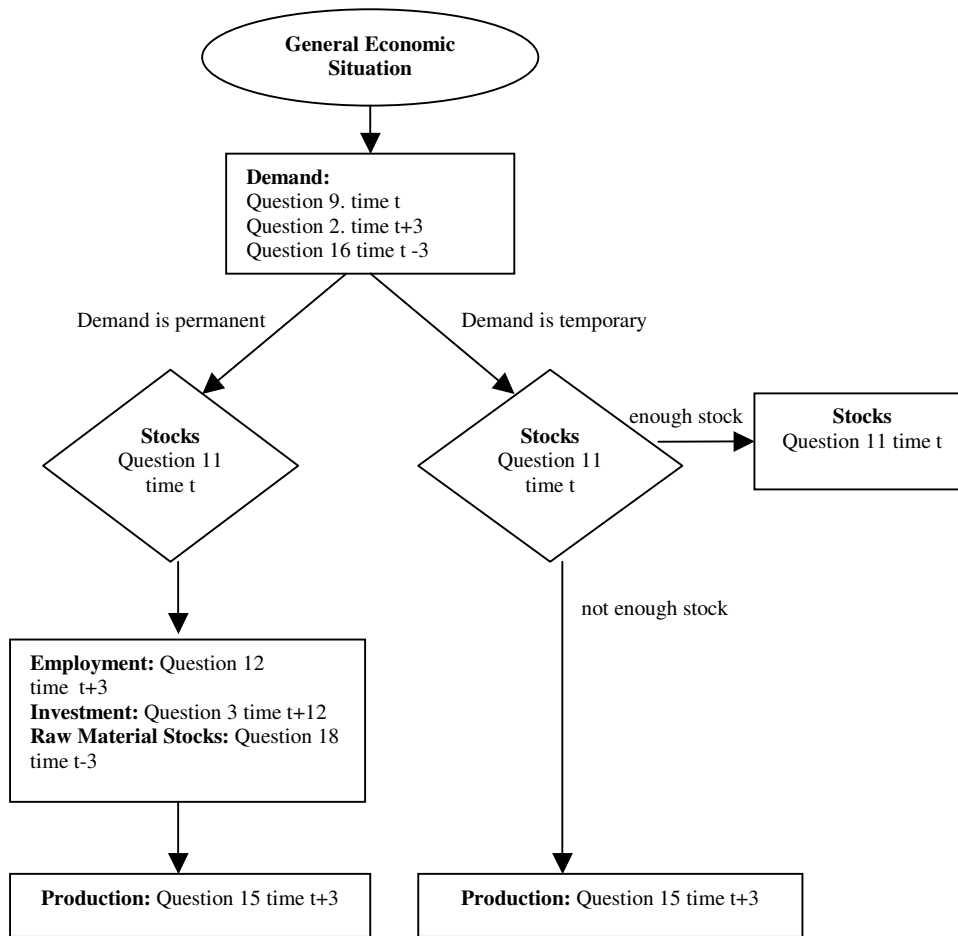
Future expansions include improvement of the survey as a whole and at the sectoral level, so that the number of participants in each sector may be stable and analogous. The real sector confidence index at the sectoral level can be developed. Furthermore, the weighting of each reply according to some criteria such as firm's employment size or production value could be considered in processing the answers.

Finally, it should be mentioned that there is always a possibility to construct different confidence indices based on different criteria. Besides, the explanatory properties of the indices of the MBRKGE must be revised from time to time in order to validate the MBRKGE's performance in the future.

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Appendix A. Stages of Production

General Economic
Situation

↓

Demand:
Question 9. time t
Question 2. time t+3
Question 16 time t -3

Demand is permanent   Demand is temporary

Stocks
Question 11
time t

Stocks
Question 11
time t

enough stock → **Stocks**
Question 11 time t

not enough stock

Employment: Question 12
time t+3
Investment: Question 3 time t+12
Raw Material Stocks: Question 18
time t-3

↓

Production: Question 15 time t+3   **Production:** Question 15 time t+3

Appendix B. Data Descriptions

Questions	**Realizations**
General economic situation $\longrightarrow$	Industrial Production Index, (1997=100) (SIS) (Quarterly), (Private) Manufacturing
Export prospects $\longrightarrow$	Foreign Trade Export Volume Index by ISIC Rev. 3 Classification, (1994=100) (SIS) (Monthly), Export- (Volume) Manufacturing
Investment expenditures $\longrightarrow$	Foreign Trade Import Volume Index by Classification of BEC, (1994=100) (SIS) (Monthly), Import- (Volume) Capital Goods
Total orders $\longrightarrow$	Foreign Trade Import Volume Index by Classification of BEC, (1994=100) (SIS) (Monthly), Import- (Volume) Intermediate Goods
Monthly stocks of finished goods $\longrightarrow$	GNP at fixed prices (1987=100) (SIS) (Quarterly), (Expenditures) Changes in Stocks
Employment $\longrightarrow$	Index of Production Workers in Manufacturing Industrial Establishments, (1997=100) (SIS) (Quarterly), (Private) Manufacturing
Volume of output $\longrightarrow$	Industrial Production Index, (1997=100) (SIS) (Quarterly), (Private) Total Industry
Goods sold in domestic market $\longrightarrow$	GNP at fixed prices (1987=100) (SIS) (Quarterly), (Expenditure) Consumption (Private)
Raw material stocks $\longrightarrow$	Foreign Trade Import Volume Index by Classification of BEC, (1994=100) (SIS) (Monthly), Import- (Volume) Intermediate Goods