Forward Looking Surveys for Tracking Indian Economy: An Evaluation

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Abstract

With more economic activities coming in the ambit of organised sector, business tendency surveys have become more informative and handy in tracking and anticipating macroeconomic changes as input in monetary policy formulation. This paper discusses the efficacy of forward looking surveys in India. The lead performance of major business tendency surveys in India is also evaluated for the period Q1:2004–05 to Q4:2013–14. It is found that the Reserve Bank's quarterly Industrial Outlook Survey with focus on stratified frame with good size/sectoral representation and significant portion of regular respondents, outperforms other surveys in gauging short-term movements and turning points in the economy.

Keywords: Business tendency surveys, leading indicators, monetary policy, forecasting

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The views expressed here are those of the authors and are not necessarily shared by the institution to which they belong.

I. Introduction

Movements in level of activities in organized business sector of an economy provide a preclude to aggregate economic activities in a market economy. As official statistics, including national accounts, provide backward-looking information on performance at sectoral / overall level, the data gap for real-time analytical needs of policy-makers is sought to be met by conducting business and consumer tendency surveys. These surveys have intrinsic utility in providing policy makers and economic agents with more timely qualitative information on business sentiment that may be driving business conditions and decisions including for the foreseeable future. Most of the central banks rely on forward-looking corporate surveys to get idea on decisions made on the future course of business which would affect major sectors / aggregate economy.

The value of business tendency surveys lies in providing reliable lead information on the macroeconomic performance, especially the direction of change. In addition to seeking assessment of the current situation and expected development relating to their own companies, respondents in these surveys are often also asked about their perception on sectoral / general business conditions. The survey questions are generally qualitative which give flexibility to seek opinion on variables that capture early stages of production, quickly respond to changes in economic activity and are often difficult to measure through conventional methods. The main summary indicators are (a) balance of opinions (or net response) and (b) confidence indicators (based on the relative size of respondent firm in the related sector and economic importance of the sector).
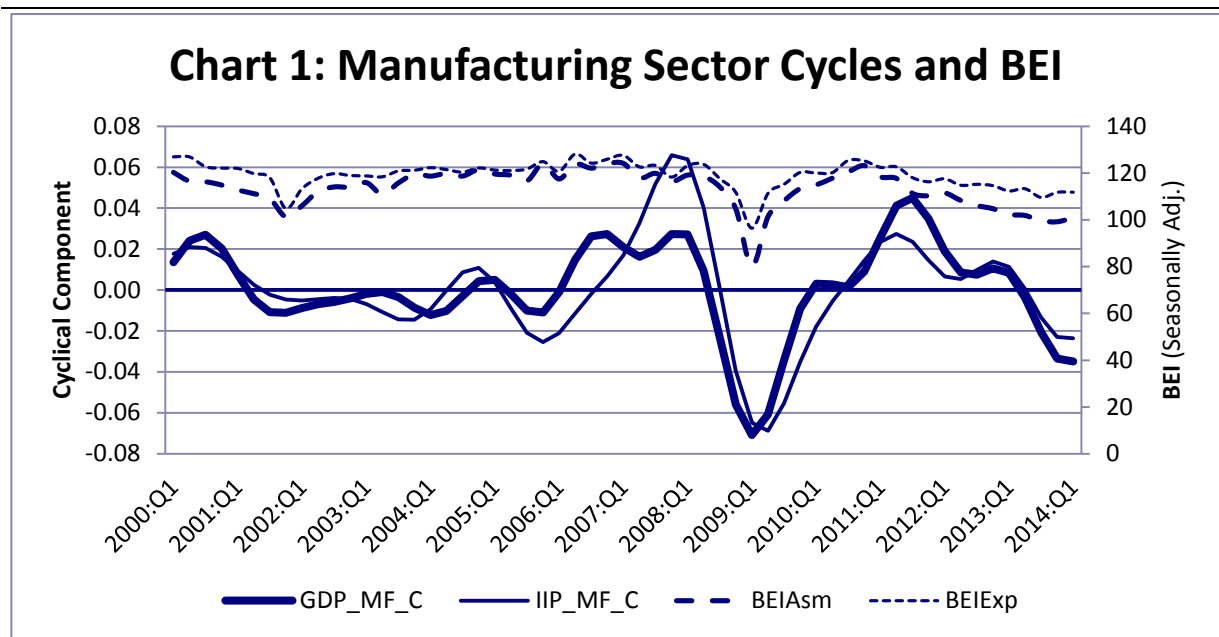
We attempt to relate the relevance of various survey indicators in assessing short-term changes in the Indian manufacturing sector, *i.e.*, to evaluate the past performance of various business tendency surveys conducted in India in tracking the movements in the sector. The remainder of this paper is organised in four main sections. Section II presents a snapshot of the business tendency surveys conducted in India. Section III evaluates the tracking performance of these business tendency surveys using alternative statistical techniques and major conclusions are presented in Section IV.

II. Business Tendency Surveys in India: A Snapshot

In India, the Reserve Bank of India (RBI) has been conducting a comprehensive quarterly Industrial Outlook Survey (IOS) for the Indian manufacturing sector since 1998. The Indian economy is continually evolving as increasingly more activities in the economy are being channelised through the organised business sector. Analysis of business cycle indicators is an obvious requirement given that macroeconomic structure has changed over the years and there are nearly a million working companies. The sector-wise no. of active companies in India in June 2014 is given in Table 1. As regular data on many conventional business cycle indicators (*e.g.*, comprehensive monthly/quarterly/annual variables related to employment, housing starts) used in developed economies are not available, IOS supplements other variables for business cycle analysis and provides useful input in the assessing macroeconomic conditions for formulation of macroeconomic policies, especially monetary policy.

IOS captures the assessment of business sentiments for current quarter and expectations for ensuing quarter, based on qualitative responses on a set of parameters pertaining to the demand, financial, employment and price situation. The survey schedule is canvassed among a panel of 2,000 private sector manufacturing companies (updated annually), mostly with paid-up capital above Rupees 5 million, representing a good mix of size and industry groups. Over the years, the response rate had lied between 65–78 per cent. Analysis is based on net response of each parameter which is calculated as the percentage difference between the optimistic response and pessimistic response (no change is ignored). Also, a Business Expectation Index (BEI) is compiled as weighted average of net responses on nine select performance parameters (for both assessment and expectations) which gives a single snapshot of the industrial outlook in each quarter.

Chart 1 presents the business cycles in India's manufacturing sector since 2000 along with seasonally-adjusted BEI for both assessment of prevailing quarter and expectation for the ensuing quarter. The cyclical components of GDP/IIP manufacturing have been estimated using the Christiano-Fitzgerald Band Pass Filter. It may be seen that the manufacturing cycle is in sync with BEI. Taking into account the data release lag for IIP and GDP, it may be broadly concluded that the survey index provides useful lead information on movements in the level of activities in India's manufacturing sector. More detailed examination of the relationship between the survey-based confidence indices and the official estimates is presented in the next section.

Chart 1: Manufacturing Sector Cycles and BEI

It may be mentioned that other agencies also conduct business expectation surveys for the Indian manufacturing sector, of which, regular results are available from (a) Business Confidence Survey of the National Council of Applied Economic Research (NCAER) and (b) Business Optimism Survey of M/s Dun and Bradstreet (D&B). In addition, Markit Economics' survey-based HSBC Purchasing Managers' Index (PMI) is available on monthly basis, which provides view on current assessment but does not give respondent's perception on future path. A summary of Business Tendency surveys conducted in India is presented in Table 2.

Corporate Sector in India: An Overview

Table 1

	Economic Activity	No. of Companies		
		Private Limited	Public Limited	Total
I	**Agriculture and Allied Activities**	**21,949**	**2,821**	**24,770**
II	**Industry**	**311,027**	**25,694**	**336,721**
	Manufacturing	191,264	17,886	209,150
	Construction	98,040	5,336	103,376
	Electricity, Gas & Water companies	10,978	1,729	12,707
	Mining & Quarrying	10,745	743	11,488
III	**Services**	**555,746**	**33,455**	**589,201**
	Business Services	221,988	9,789	231,777
	Trading	140,329	6,220	146,549
	Real Estate and Renting	67,328	3,776	71,104
	Community, personal & Social Services	57,126	3,847	60,973
	Finance	38,836	8,236	47,072
	Transport, storage & Communications	29,523	1,458	30,981
	Insurance	616	129	745
IV	**Unclassified ***	**21,912**	**2,105**	**24,017**
	Total	**910,634**	**64,075**	**974,709**

* Companies having invalid National Industrial Classification (NIC) code of economic activity have been categorized as Unclassified.

Source: Ministry of Corporate Affairs, Govt. of India

Major Business Tendency Surveys conducted in India

Table 2

Agency	Index	Frequency	Methodology of index calculation
Reserve Bank of India (RBI)	Business Expectation Index	Quarterly	Composite indicator calculated as weighted average of industry wise net response on nine select parameters, *viz.,* overall business situation, production, order books, capacity utilisation, exports, inventory of raw material, inventory of finished goods, employment and profit margin
M/s Dun and Bradstreet (D&B)	Business Optimism Index	Quarterly	Composite indicator capturing aggregate behavior of all six indices, *viz.,* volume of sales, net profit, selling price, new orders, inventory levels and employees
National Council of Applied Economic Research (NCAER)	Business Confidence Index	Quarterly	The index is based on four indicators, *viz.,* overall economic conditions, financial position of the firms, current capacity utilisation and present investment climate
HSBC-PMI (Markit Economics)	Purchasing Managers' Index	Monthly	Composite indicator based on five individual indices, *viz,* new order, output, employment, supplier delivery time and stock of item purchased

III. Tracking Performance of Business Tendency Surveys in India

In this section, an attempt has been made to examine whether business tendency surveys are useful in assessing the aggregate-level changes in the Indian manufacturing. Taking quarterly periodicity, GDP-manufacturing and IIP-Manufacturing are taken as reference series, since they reflect economic performance of the organised sector, and their statistical relationship with business confidence indices is evaluated. Since PMI and IIP data are released on monthly frequency, we take their three-month average and construct the quarterly series to match with the data frequency of GDP as well as other survey indices. Chart 2 (panel) provides a sense of how well these survey indices have served to signal changes in the manufacturing sector's growth.

We now proceed to empirically evaluate the tracking performance of business confidence indices vis-à-vis movements in official estimates relating to manufacturing sector.

III.1 Correlation of Business Confidence Indicators with Reference Series

Using survey-based confidence indicators since 2004–05, when compilation methodology for all series are consistent, correlations between business outlook indices and annual growth in the reference series (all series seasonally unadjusted) are presented in Table 3. It is found that as compared to the other business confidence indicators, BEI has higher correlation with both the reference series, both in case of assessment indices and outlook indices.
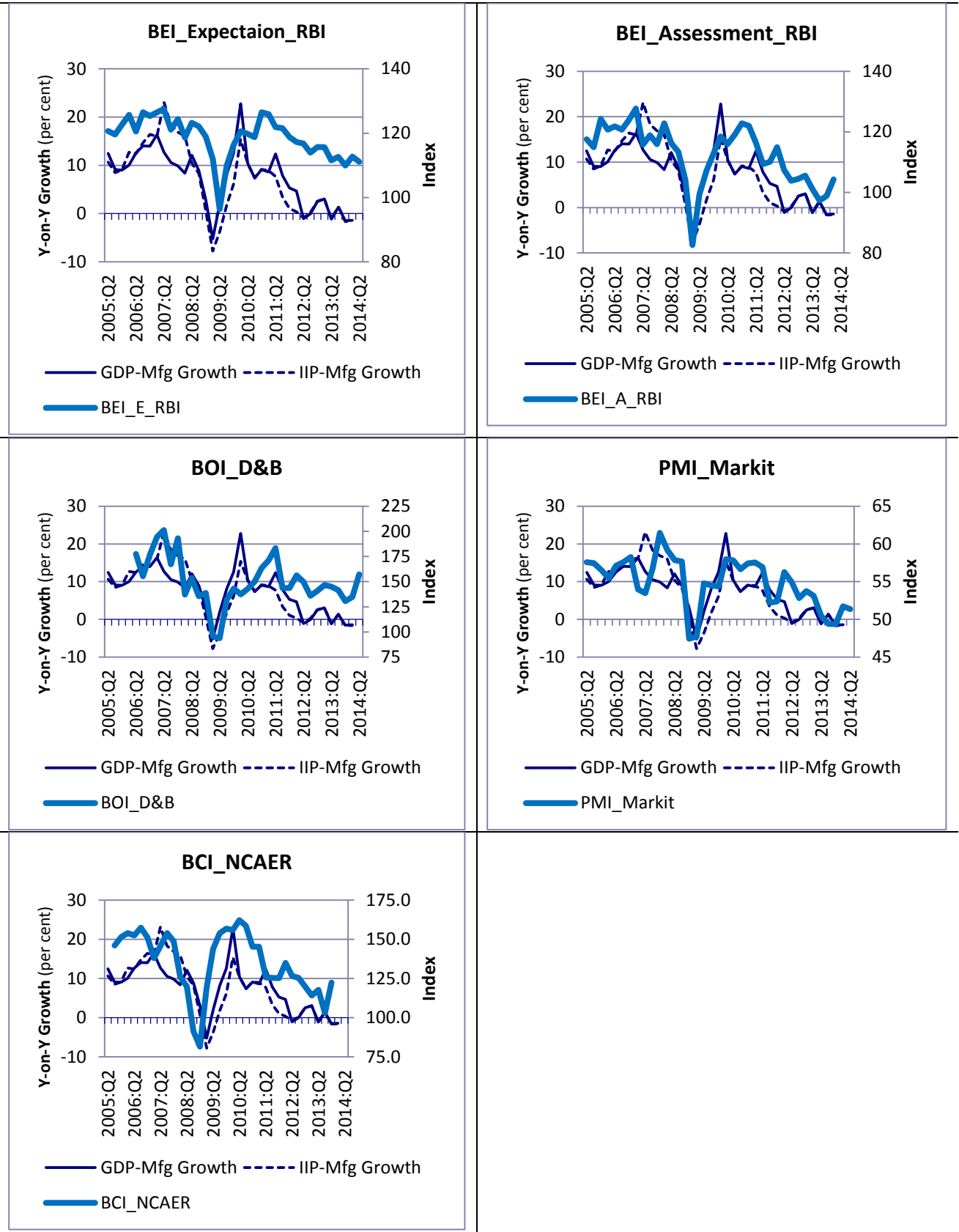
Cross-correlation of various Business Assessment / Expectation Indices with
GDP / IIP – Manufacturing   Table 3

Reference Series	Outlook Indices			Assessment Indices	
	BCI (NCAER)	BOI (D&B)	BEI-Exp (RBI)	BEI-Asm (RBI)	PMI (Markit)
GDP-Manufacturing	0.55	0.57	0.67	0.81	0.67
IIP-Manufacturing	0.50	0.73	0.76	0.82	0.68

Annual Growth in Manufacturing – GDP & IIP and Movements in Business
Assessment/Outlook Indices

Chart 2

BEI_Expectaion_RBI

BEI_Assessment_RBI

BOI_D&B

PMI_Markit

BCI_NCAER

III.2 Quarters for Cyclical Dominance (QCD)

QCD indicates the number of quarters at which the average amplitude of the trend-cycle component will overtake the irregular one and, therefore, measures short-term volatility in a macroeconomic time series. It indicates the minimum number of quarters before a directional change in the time series can be interpreted with reasonable confidence as a directional change in economic sentiment. It is defined as the shortest span of quarters for which the I/C ratio is less than unity, where I is the average q-on-q-change (without considering the sign) of the irregular component of the series and C is the trend-cycle component of the series. Higher QCD implies higher volatility in the time series. The convention is that the maximum value of QCD should be 2. It is estimated that all the five business confidence indices met this criteria (Table 4) during the reference period.

Business Confidence Indices and their QCDs	Table 4

Business Confidence Index	Quarters of Cyclical Dominance
BCI (NCAER)	1
BOI (D&B)	1
BEI-Exp (RBI)	1
BEI-Asm (RBI)	2
PMI (Markit)	1

III.3 Directional Analysis

Fisher's Exact (FE) test uses contingency tables to determine whether the survey indicators predict the direction of change in realization in the reference series. The null hypothesis is that the direction of change in a forecast and that in the realisation are independent. A rejection of the null hypothesis therefore implies that the survey indices are useful predictors of actual change in the reference series. To capture the direction of changes, we define

$\Delta R_t = R_t - R_{t-1}$, where R_t denotes the percentage change in the reference series in time t.

$\Delta F_t = F_t - F_{t-1}$ direction of change, where F_t denotes the level of the survey index.

The observed significance level for the usefulness of the forecast is given by:

$$\frac{\sum_x \binom{n_{10}+n_{11}}{x}\binom{n_{00}+n_{01}}{n_{01}+n_{11}-x}}{\binom{n}{n_{01}+n_{11}}}$$

for x taking values from n_{11} to $n^* = \min(n_{10}+n_{11}, n_{01}+n_{11})$, where

$n_{00} =$ number of forecasts for which $\Delta F_t > 0$ and $\Delta R_t > 0$
$n_{01} =$ number of forecasts for which $\Delta F_t \leq 0$ and $\Delta R_t > 0$
$n_{10} =$ number of forecasts for which $\Delta F_t > 0$ and $\Delta R_t \leq 0$
$n_{11} =$ number of forecasts for which $\Delta F_t \leq 0$ and $\Delta R_t \leq 0$
n = total number of forecasts

The results of the FE test for directional analysis are presented in Table 5. It indicates that the test statistic is significant for RBI's BEI (for both assessment and expectation), in predicting the direction of annual change of GDP-manufacturing whereas, in case of IIP change, RBI's BEI (expectation) turns out to well-predict the direction of change.

Significance-level probability (FE test) for Direction of Change Synchrony   Table 5

Index	Test Probability Manufacturing Sector growth (y-on-y)	
	GDP	IIP
BCI_ NCAER	0.11	0.38
BOI_D&B	0.48	0.59
BEI_Exp_RBI	0.00	0.01
BEI_Asm_RBI	0.04	0.13
PMI	0.16	0.30

The null hypothesis is that the direction of change in the Business Confidence Index is independent of the change in reference series. A rejection of null hypothesis (i.e., p<0.05) implies that the index is useful predictor of actual change in the reference series, which is available with a lag.

III.4 Signal-to-Noise approach

The ability of the survey indices to provide an early signal on an impending change in growth in the reference series can be evaluated through signals approach of Kaminsky-Reinhart (2000), modified by Teresita Bascos-Deveza (2010). For assessing the predictive ability of business indices, an impending change can be considered as a signal if change in an index deviates from its "normal value" beyond a "threshold". The threshold could correspond to some pre-determined value of the survey index (*e.g.,* 5 per cent, 10 per cent, etc.). For this exercise, the quarterly survey indices are transformed to a binary variable for each of the threshold value. The effectiveness of

the index in signaling an impending change for the current quarter is evaluated and the performance of the variable in predicting a change is examined through

(a) Noise-to-signal ratio (*i.e.*, percentage of wrong signals to the percentage of correct signals issued by the index);

(b) conditional probability of large growth (the probability of an higher change occurring during the current quarter given that the index emitted a signal); and

(c) unconditional probability of higher growth (the probability of higher change in the current quarter).

Details of the method are given in the Annex. If the conditional probability of higher change increases as the threshold increases, then the predictive power of the survey index in projecting a possible larger change is confirmed. This approach also provides estimates of the probability of "higher change" given the value of the survey index in any given quarter.

The results of modified signals approach (Table 6) indicate that the conditional probability of higher change increases for BCI_NCAER, BEI_Asm_RBI and BEI_Exp_RBI as the threshold increases for both the reference series. This confirms the predictive power of these indices in projecting a possible larger change in the manufacturing sector. This is, however, not confirmed in case of other survey indices. The noise-to-signal ratios indicate that BOI_DNB has highest noise among the indices considered. The ratio is found lower in relation to IIP-Manufacturing when compared with GDP-Manufacturing, which is explained given that GDP also includes relatively unorganised manufacturing, whereas the business tendency surveys focus on the organised sector. The noise-to-signal ratios for IIP-Manufacturing indicate that BEI_Asm_RBI, BEI_Exp_RBI and PMI_Markit contain more signal for the first few buckets, indicating their utility in tracking the manufacturing sector's performance.

Signals Approach Probabilities of Higher Manufacturing Growth *vis-à-vis* Business Confidence Indices

Table 6

Business Confidence Index Threshold	Prob.(Higher manf. growth if Index>Threshold)		Noise-Signal Ratio	
	GDP-MF	IIP-MF	GDP-MF	IIP-MF
BCI_NCAER				
−10%	0.40	0.66	0.95	1.05
0%	0.40	0.68	0.90	0.95
10%	0.40	0.67	0.97	1.00
20%	0.40	0.68	1.12	0.94
30%	0.40	0.74	1.05	0.71
40%	0.40	0.76	0.88	0.62
50%	0.60	0.73	0.40	0.75
60%	0.00	1.00	0.00	0.00
BOI_D&B				
30%	0.41	0.68	1.02	0.95
40%	0.36	0.67	1.24	1.00
50%	0.38	0.73	1.17	0.73
60%	0.31	0.75	1.58	0.67
70%	0.22	0.63	2.45	1.20
80%	0.20	0.60	2.80	1.33
90%	0.33	0.67	1.40	1.00
100%	0.00	0.00		
BEI_Exp_RBI				
0%	0.39	0.38	1.08	0.95
5%	0.39	0.69	1.08	0.91
10%	0.39	0.70	1.11	0.86
15%	0.37	0.69	1.19	0.89
20%	0.44	0.75	0.90	0.67
25%	0.57	0.86	0.53	0.33
BEI_Ass_RBI				
0%	0.38	0.39	1.08	0.95
5%	0.38	0.82	1.12	0.69
10%	0.36	0.71	1.23	0.80
15%	0.41	0.71	1.00	0.83
20%	0.56	0.89	0.56	0.25
25%	1.00	1.00	0.00	0.00
PMI_Markit				
50	0.85	0.69	0.92	0.90
52	0.45	0.71	0.86	0.80
54	0.41	0.67	1.01	1.00
56	0.29	0.75	1.68	0.67

If conditional probability of higher growth increases as the threshold increases, then the predictive power of the survey index in projecting a possible final increase is confirmed.

IV. Conclusions

In this attempt to relate the lead properties of business tendency surveys with the actual movements in India's manufacturing sector performance, we investigate whether these indices provide a comprehensive understanding of the direction of change by predicting the direction of increase/decrease in the reference series and whether they give correct signals at various thresholds. Here, we have not judged the compilation aspects of business confidence indices which summarise various survey results, and treat the indices compiled by agencies as given.

It is found that while all surveys capture broad movements during the study period, the BEI based on the quarterly Industrial Outlook Survey (IOS) of the Reserve Bank outperforms other confidence indicators in tracking movements in the sector for both current assessment and ensuing changes. This is true for all the statistical evaluation methods employed here, *viz.*, the simple correlation, the direction analysis and the "signal" approach. IOS is a comprehensive survey with highest coverage among major business tendency surveys and its design takes into account both size and sectoral composition. While BEI is based on nine IOS parameters, IOS collects perceptions on around twenty parameters relating to demand, financial, employment and price situation, many of which are not measurable in quantitative terms but are very useful in business cycle analysis. These provide useful lead information on short-term movements in Indian manufacturing for policymakers as well as for practitioners in financial markets and business.

Annex: Predictive Ability of Business Survey Indices – Noise to Signals Approach

The ability of survey indices to provide an advance warning signal on an impending increase in growth in the reference series can be evaluated through signals approach of Kaminsky-Reinhart (2000) modified by Teresita Bascos-Deveza (2010) as follows:

When an indicator of economic growth deviates from its "normal value" and assumes an "extreme value" beyond a certain threshold, it can be considered as a warning signal of an impending increase in economic growth. The values corresponding to some pre-determined value of the survey index (e.g,: 10%, 20%, and so on) may be considered as the possible thresholds. For each threshold value, the quarterly values of the indicator were transformed to a binary variable as follows:

Let Y_t be the survey index. Let I_t be a binary variable defines as,

$$I_t = \begin{cases} 1, & if\ Y_t > T \\ 0, & if\ Yt \le\ T \end{cases}$$, for T= 10%, 20%, 30 %, 40 % etc., or any predetermined threshold level for the survey index value.

The effectiveness of the index in signaling an impending increase in growth for the current quarter is evaluated as follows: We define

i.   **A** as the number of quarters when the survey index did not issue a signal (I_t = 0) and no increase in growth occurred during the current quarter.

ii. **B** as the number of quarters in which the survey index failed to issue a signal. This means that the indicator did not signal an increase in growth (I_t = 0) and there was actual increase in growth during the current quarter.

iii. **C** as the number of quarters in which the survey index issued a bad signal or noise. A bad signal is when the indicator signal an increase in growth (I_t = 1) and no increase occurred during the current quarter.

iv. **D** as the number of quarters in which the survey index issues a good signal. A good signal is when the index signal an increase in growth (I_t = 1) and growth actually increased during the current quarter.

The performance of the survey index in predicting an increase in growth was examined in the following way:

i.   Signal = D/ (B+D) measures the percentage of correct signals issued by the survey index;

ii. Noise = C/ (A+C) measures the percentage of wrong signals issued by the survey index;

iii. Noise to Signal = {C/ (A+C)}/ {D/ (B+D)} measures the ratio of the percentage of wrong signals (Noise) to the percentage of correct signals (Signal) issued by the index;

iv. Conditional probability of higher growth = D/(C+D) measures the probability of an increase in growth occurring during the current quarter given that the index emitted a signal;

v. Unconditional Probability of higher growth = (B+D)/(A+B+C+D) measures the probability of higher growth in the current quarter.

If the conditional probability of higher growth increases, as the threshold increases, then the predictive power of the survey index in projecting a possible increase in growth will be confirmed. Moreover, the significance of this approach lies in its capability of providing estimates of the probability of an "increase in growth" given the value of the survey index in any given quarter.

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