

PART III

Level and Growth Rate Leading Indices for Indian Exports

The leading index for the level of future Indian exports comprises the Real Effective Exchange Rate (REER) and a 15-country long leading index. The REER index (RBI, 1993) used is based on export weights and official exchange rates from January 1975 to February 1992 with base 1985=100. (Annual indices are available from 1960.) From March 1992, FEDAI indicative rates are used and the base moves to 1993-94=100. The REER index is basically the weighted average of the bilateral nominal exchange rates of the home currency in terms of foreign currencies adjusted by domestic to foreign relative local-currency prices. The exchange rate of a currency is expressed as the number of units of Special Drawing Rights (SDRs) that equal one unit of the currency (SDRs per currency). A fall in the exchange rate of the rupee against SDRs therefore represents a depreciation of the rupee relative to the SDR. Similarly, a rise in the exchange rate represents appreciation of the rupee. The NEER and REER indices are based on bilateral export weights and total trade (exports plus imports) weights. The weights used for each country are reported in [Table 7](#). The number of countries used is 36 that represent 65-70 percent of total exports/trade during 1975 and 1991. Given that 36 countries are used, the weights are normalized accordingly for constructing REER and NEER indices for India. A large number of countries is used to smoothen out the year-to-year variations in the share of any country and to ensure that the pattern of trade is representative over a long span of time.

The 15 country index is a weighted average of the ECRI long leading indices for 15 economies that trade with India. The 15 countries are the U.S., Canada, Mexico, Germany, France, the U.K., Italy, Spain, Switzerland, Sweden, Japan, Korea, Taiwan, Australia and New Zealand, which collectively account for about half of India's total exports. The weights used in the 15 country long leading index are the percentages of India's exports accounted for by each of these countries in 1995, according to the IMF's Direction of Trade Statistics. The percentage shares given in [Tables 8A](#) and [8B](#) are similar to the ones computed from IMF-Direction of Trade Statistics. This is because the primary source for getting such data is the same. The choice of the year 1995 was based on the fact that it was a relatively recent year where the direction of trade flows was not unduly distorted by the Asian crisis or similar developments. Further, as shown in [Table 8A](#), the weights for the G-7 countries (consuming a little less than half of Indian total exports) do not change substantively across the years.

Three target variables are used:

- Real exports measured by the quantum index of exports;
- Price of exports measured by the unit value index of exports; and
- Total value of exports which is the product of the above two variables.

The leading exports index is used to predict each of these variables. The economic

rationale is very simple. The leading exports index has two basic components – the exchange rate which determines price competitiveness and the 15 country long leading index covering the export markets which determines the cyclical movement of demand in the consuming countries. It follows that both these variables predict the movements in the future level/growth rate of exports.

Traditionally, the leading exports index has been used to forecast exports. In the case of India, we extend the analysis to encompass the price of exports as an additional target variable. The logic is as follows. When the rupee weakens, the unit value of future exports in rupees tends to rise, and vice versa. Further, when demand in the consuming countries rises, so does the price, raising the unit value of the exports. Another motivation for using the unit value series as a target variable is the numerical quotas (rather than value) that many Indian exports like textiles have traditionally faced. The implication is that exporters would try to export higher unit value items.

The analysis is further generalized by using the total value of exports as an alternative target variable. If the economic rationale holds for real exports and the price of exports, it must also be valid for the product of the two.

As noted in the previous section, cyclical declines in the level of exports are relatively rare whereas cyclical movements in the growth rate of exports are more prevalent. Our analysis therefore uses both the level and its growth rate to predict the three target variables in level as well as in growth form. The leading index in growth form is simply the growth rate of the level of the leading index where the growth rate is the “six-month smoothed growth rate” described in the previous section.

The estimations begin in 1975 since REER is not available before this period. The leading index for exports is constructed with base 1992=100. Since the components of the leading index are available monthly, the leading index is estimated on a monthly basis. The target variables are, however, currently available only on a quarterly basis and are converted to monthly series by simple step interpolation, that is, the quarterly series is repeated three times corresponding to the months of the quarter. Although monthly data on the export variables is available up to 1985, this is converted to quarterly to conform to data after 1985 as well as to smoothen the series. The data for the entire period are seasonally adjusted using the Census X-11 procedure.

The reference chronology of the three target variables in level as well as in growth form are determined using the procedure described in the previous section. The turning points of each target variable are evaluated relative to those of the leading index. The results are shown in [Tables 9, 10, 11, 12, 13](#) and [14](#) and [Figures 1 \(A to C\) – 6 \(A to C\)](#). **Note that for all the figures, prefix A denotes the leading index for exports, B denotes the 15 country leading index, and C is REER. The data for the 15 country leading index are available for a longer time period. The corresponding graphs are therefore shown from the early 1960s. Graphs based on REER (A and C) start in the mid 1970s. The figures generally show that ‘A’ i.e., the composite leading index for exports gives the best results in terms of leads. The discussion below is mainly with respect to ‘A’.**

The main findings are as follows:

**III.1 Target Variables: Level and Growth Rate of Quantum Index of Exports :
([Tables 9](#) and [10](#); [Figures 1A](#), [1B](#), [1C](#) and [2A](#), [2B](#), [2C](#))**

- ❑ As shown in [Table 9](#) and Figure 1A, downturns in the level of the quantum index of exports occurred in the following periods:
 - February 1976 to November 1978
 - May 1979 to August 1980
 - February 1989 to May 1990
 - November 1991 to November 1992
 - August 1996 onwards (The end date for this downturn is not assumed to be known since the data for the target series end in 1998, and no clear cyclical trough is evident before the end of the data. Note that in [Figure 1](#), the shaded region depicting the downturn extends to the end of 1998. This is because the chart convention requires that if a cyclical phase (upturn or downturn) has not been identified as having ended, it will be depicted as continuing until the last available data point in the target series. Thus, if the last identified turning point in the target series is a peak, the shaded area will continue until the last data points in the series.)
- ❑ The level of the leading index for exports leads the level of the quantum index 60% of the time at peaks, by an average of 2 months. However, it leads only half the time at troughs, thus resulting in an average lag of 2 months. A final trough in 1998 or later is not included in these calculations, but if we conservatively assume a trough in the quantum index in June 1998, the leading index would lead by 15 months at that trough, but the lead would be longer still if the actual trough turned out to be later. In either case, the leading index would thus lead 60% of the time at troughs as well, and the average lead would become at least 1 month at troughs.
- ❑ [Table 10](#) and [Figure 2](#) report the downturns in the growth rate of the quantum index of exports in the following periods:
 - May 1979 to May 1980
 - August 1987 to May 1988
 - February 1989 to May 1990
 - November 1991 to May 1992

August 1996 onwards (As before, the end date for this downturn is not assumed to be known since the data for the target series end in 1998, and no clear cyclical trough is

evident before the end of the data.)

- ❑ The growth rate of the leading index leads the quantum index growth rate at 100% of peaks and 80% of troughs, with the average lead being 9 months at peaks and 1 month at troughs. Note that a trough in 1998 or later is not included in these calculations, but given the 1997 trough in the leading index, it is likely to have a good lead, perhaps a year or longer, at this trough.

III.2 Target Variables: Level and Growth Rate of Unit Value Index of Exports: [Tables 11](#) and [12](#); [Figures 3A](#), [3B](#), [3C](#) and [4A](#), [4B](#), [4C](#))

- ❑ The identification of turning points in the level of the unit value index of exports revealed the following downswings ([Table 11](#) and [Figure 3A](#)):
 - May 1977 to May 1978
 - May 1985 to February 1986
 - February 1996 to August 1996
- ❑ The level of the leading index leads the level of the unit value index 100% of the time at peaks and also at the one trough, the average lead being 8 months at peaks and 11 months at the only trough. The lead is not calculated for the August 1996 trough in the target series since the date of the corresponding official trough in the leading index series has not yet been determined, and is subject to the availability of more data. However, it has a number of extra cycles, i.e., it is oversensitive, as leading indices often are, turning down ahead of declines in the unit value index that are too small to be called cyclical downturns. As shown in [Figure 3A](#), the 1978-81 downturn in the leading index precedes the 1982 dip in the unit value index although the downswing is not significant enough to be identified as a turning point. Likewise, the 1989-90 downturn in the leading index precedes the 1991 dip in the unit value index and the 1991-93 downturn in the leading index precedes the 1993 dip in the unit value index. Further, the 1994-95 downturn in the leading index also precedes the 1995 dip in the unit value index. All these are classified as extra cycles since these are not “cyclical” downswings although the leading index is predicting these downturns. At the same time, however, in one instance (the 1985-86 cyclical downturn in the unit value index), the leading index dips, but the drop is too small to signal a cyclical downturn. We therefore classify this as a “missed” cycle.
- ❑ Recessions in the growth rate of the unit value index of exports are as follows: ([Table 12](#) and [Figure 4A](#))
 - February 1980 to August 1982
 - May 1983 to November 1985
 - May 1988 to May 1989

- August 1990 to May 1991
 - May 1992 to August 1996
 - February 1997 onwards (The end date for this downturn is not assumed to be known since the data for the target series end in 1998, and no clear cyclical trough is evident before the end of the data.)
- The growth rate of the leading index leads the unit value index growth rate at 100% of both peaks and troughs, with the average lead being 16 months at peaks and 15 months at troughs. Given the early 1997 trough in the leading index, the lead at this last trough in the target series (not included in the calculations) is likely to be well over a year.

III.3 Target Variables: Level and Growth Rate of Total Value of Exports: ([Tables 13 and 14](#); [Figures 5A, 5B, 5C](#) and [6A, 6B, 6C](#))

- The downturns in the level of total value of exports are given below: ([Table 13](#) and [Figure 5A](#))
- February 1977 to November 1978
 - May 1979 to August 1980
- The level of the leading index leads the level of the total value index 100% of the time at peaks and 50% of the time at troughs (there is one lag), the average lead being 8 months at peaks and 3 months at troughs.
- Downswings in the growth rate of the total value of exports are as follows: ([Table 14](#) and [Figure 6](#))
- May 1979 to May 1980
 - February 1987 to May 1988
 - February 1989 to February 1990
 - February 1993 to May 1994
 - February 1996 onwards (The end date for this downturn is not assumed to be known since the data for the target series end in 1998, and no clear cyclical trough is evident before the end of the data.)
- The growth rate of the leading index leads the growth rate of the total value index at 100% of peaks and 80% of troughs, with the average lead being 9 months at both peaks and troughs. Please note that a trough in 1998 or later is not included in these calculations, but given the 1997 trough in the leading index, it is likely to have a good lead, perhaps a year or longer, at this trough.

The downturn periods identified above especially for the growth rates of the quantum index of exports and of the value of exports can broadly be linked with developments on the domestic and international front. The following discussion highlights some of these changes. Although the estimations begin in January 1975, we describe the domestic and global developments since the early 1970s.

In the first half of the 1970s, the international economic environment facing the oil importing developing countries was highly unfavourable after the first oil shock of 1973. For these countries, the problems created by the increased import costs of oil were compounded by the combination of inflation and recession in developed countries. The recessionary conditions in industrialised countries led to a decline in the volume of world trade and the exports of some of the major items like jute manufactures and cotton fabrics were adversely affected. These developments had two effects. First, inflation deteriorated the competitiveness of the exports of developing countries. Second, recession in the industrialised countries affected the demand for goods from developing countries. These, in turn implied a slackening in the volume of exports. Thus, the growth rate of India's exports in volume terms was under 6% during the first part of the 1970s.

During 1975-76 to 1976-77, a series of internal measures, fiscal and administrative, were taken to limit the consumption of oil products and to increase production and thus reduce the dependence on imports. Simultaneously, attempts were made to streamline export policies and procedures. However, the slackening of the international commodity boom and the continued recession in industrial countries dampened an otherwise improved growth rate, which stood at a little less than 11% during 1975-76. Growth in the quantum of exports increased to more than 18% during 1976-77 spurred by the recovery of economic activity and the replenishment of inventories in developed countries.

Soon after, exports slackened in 1977-78 in the wake of recessionary conditions and protectionist tendencies in the major industrial countries. Furthermore, the restrictions placed by the government on exports of certain agriculture based mass consumption goods also added to the worsening of real exports. This is evident from [Table 5](#), when the volume index of exports showed a negative growth of 3.7 percent during 1977-78. Furthermore in level terms also the volume index declined during 1977-78 attaining a level of 93.2 as compared to 96.8 during 1976-77.

Though the growth rate in the quantum index of exports improved to 7.3% during 1978-79, it decelerated in 1979-80 showing a lower growth rate of 6.2%. The reasons for this sluggish performance can be attributed to both the domestic and external environment. At the domestic level, the strong pull of the highly profitable domestic market did not encourage aggressive export orientation. Further, in the area of domestic policy, the emphasis on export promotion had declined compared with the situation in the wake of the oil crisis of 1973. This was made worse by the unfavourable international trading environment compared with the past because of slower growth in world trade and an accompanying increase in protectionism. This period witnessed an increasing resort to a host of measures like quota, excessively restrictive and cumbersome quality control, countervailing duties etc. All these non-tariff barriers limited access to developed country markets and increased the uncertainty facing exporters. The domestic economy also

suffered from severe drought conditions in 1979 as well as the consequences of the global oil price rise.

During the first four years of the Sixth Plan (1980-85) exports in volume terms showed a lower growth. This was a continuation of the performance as witnessed in the latter years of 70s. This has to be viewed against the background of recessionary conditions in the world economy, continuation of protectionist tendencies in world markets and the impact of severe drought conditions in the country during 1979-80 and 1982-83. In volume terms, world trade grew by just 1.5 percent in 1980, stagnated in 1981, and then fell by 2 percent in 1982. (Economic Survey 1984-85). Some of the important markets for India in West Asia faced disturbed conditions and there was also a slowing down in economic activity in these countries, following the decrease in the volume of their oil exports and international prices. Further, lower purchases by East European countries contributed to the slow growth in exports.

The government undertook a series of corrective measures during the course of 1985-86 and 1986-87 to boost the growth of exports and curb the increase in imports. A wide range of exports enhancing initiatives was launched during this period. These resulted in a marked improvement in the growth of real exports which was significant in the face of a sluggish expansion in the volume of world trade. The global economic environment was also affected by the stock market crisis of 1987 and the turmoil in the world foreign exchange market with the US dollar declining against majority of the currencies. On the domestic front, the unprecedented drought of 1987 exerted strain on the balance of payments. It also necessitated additional imports of essential imports and reduced exports of agro-based commodities.

In the early part of the 90s, the country passed through a severe balance of payments crisis. The Gulf crisis coupled with the recessionary trends discernible in some major industrial economies constrained the export growth during 1990-91. The early 90s also witnessed political and economic upheavals in Eastern Europe. These economies had earlier provided a sheltered market for a large variety of Indian goods. The exports growth decelerated during the early 90s as shown in [Table 5](#).

Other factors which accounted for the poor performance in the growth rate of real exports included import curbs introduced during the early 90s in response to the foreign exchange shortage which affected export-related imports. Further, movements in the exchange rate, which were broadly supportive of exports since 1986-87 became adverse thus affecting competitiveness of exports. There was also a slowdown in the expansion of world trade and recessionary conditions in some major industrial countries. Exports were also adversely affected by tight monetary policy that affected export credit and imports of raw materials and components. Moreover, the growth in industrial production could not be sustained once the accumulated inventories were drawn down resulting in a decline in industrial production during 1991-92 thus affecting export surpluses available.

During 1993-94, the growth rate of real exports recovered, reflecting in part the strength of the reforms in trade and industrial policies adopted since 1991. This recovery shows that exports responded positively to the removal of the anti-export bias of a protectionist

environment. This was bolstered by the resurgence in world output, which increased by 3.6 percent during 1994 after a growth of 2.5 percent in 1993. (Economic Survey 1995-96)

This recovery, however, was not sustained for long as there was a rapid decline in the growth from 1996-97 to 1997-98. This decline in export performance must be viewed in the backdrop of a steep decline in non-POL import growth during 1996-97. The decline reflects a modest slowdown in industrial activity compared to the economic dynamism of earlier years. This has been compounded by several external developments, including a fall in import demand by industrial countries, regional groupings of the developed economies and the effect on exports of large movements in cross country exchange rates.

Apart from these, a noticeable decline in the growth of world trade in 1996 and 1997 and appreciation of the rupee in REER terms were other contributory factors. The unprecedented depreciation of the currencies of the competitor countries in Southeast Asia like the Philippines, Indonesia and Thailand was another factor responsible for the decline.

The above discussion has mainly focused on movements in the volume and value of exports. Fluctuations in the unit value index of exports are also an important gauge of changes in exports. For instance, the index grew sharply by more than 20% during 1973-74 and 1974-75 ([Table 4](#)). This reflected the inflation in the industrial countries as a result of the oil price shock of 1973. However, the second half of the 70s witnessed a deceleration in the unit value index. This was mainly due to the recessionary conditions in the industrialized countries. Furthermore, there was a slackening of the international commodity boom leading to a fall in the international prices of important items like tea, coffee & cashew kernels. The index improved (prices of our exports rose) in 1979 following the second oil price shock.

The slow growth in the unit value in the early 1980s was due to the contraction in world demand during this period as discussed earlier. During 1985-86, the marked fall in the international prices of some of the commodities of export interest to India led to a fall in growth of the unit value index. In the 90s, the index began with a low growth rate of less than 6 percent during 1990-91 before accelerating to over 26 percent during 1991-92. This followed the devaluation of the rupee in June/July 1991 by about 18% vis-à-vis the basket of 5 currencies. However, it slowed down thereafter with the average annual growth rate being 12.6 percent during the first half of 90s. During this period, there was a sharp decline in the international prices of manufactured goods including gems, jewellery and textile products, India's major export items.

I I I .4 Evaluation of the Leading Index: Lead Profiles

The hallmark of a cyclical leading indicator is the property that its cyclical turning points lead cyclical turning points in the economy. However, there are no well-known methods to test whether these leads are statistically significant. Furthermore, the leading index for exports covers a small number of cycles. Thus the evaluation of its cyclical leads at turning points by parametric statistical methods is not easy. The need to make a heroic

assumption that the probability distribution of the leads has a standard functional form also precludes the use of parametric tests of statistical significance. The solution is a series of non-parametric statistical tests, which yield the lead profile (Banerji, 2000).

The lead profile is a graphical depiction of the leads in strictly probabilistic terms, that aids meaningful comparisons between two indices or an index and the reference cycle. It can be graphically represented in bar charts or “lead profile charts”. The question answered by this chart is whether the difference between the leads of the two indices (or an index and the reference cycle) is statistically significant.

The advantage of lead profile charts is that these use as input just the information on the length of the leads at each turning point. However, by gleaning statistical inferences from the data rather than relying solely on averages, and by displaying the results graphically, they afford additional insights into the significance of leads.

Another major advantage of lead profiles lies in the explicit statistical inferences that can be made about the significance of leads without making any assumptions about the probability distribution of leads, or any restrictions on sample size. These inferences can be made about the leads of a given cyclical indicator over a reference cycle, such as a set of business cycle turning points. They can also be made about the leads of one cyclical indicator over another, to assess whether one has significantly longer leads than the other. Moreover, it is convenient to put lead profiles in the form of bar charts, for easy and effective visual appraisal of the significance of lengths of leads⁵.

[Figures 7-12](#) show the lead profiles of the composite leading index vs. alternative reference cycles. [Figures 7](#) and [8](#) show the leading index vis-à-vis the quantum index level and growth rate reference cycles respectively and are based on the leads shown in [Tables 9](#) and [10](#). The first bar represents a test of the null hypothesis that the lead of the composite index is zero months, against the alternative that it is greater than zero, i.e. at least one month. Analogously, the second bar represents another test, of the null hypothesis that the lead is one month, against the alternative that it is greater, i.e., at least two months. [Figure 7](#) based on the level shows that the null hypothesis of zero lead cannot be rejected. The growth rate results are more encouraging ([Figure 8](#)) with the confidence level over 90% for leads up to 3 months.

[Figure 9](#) depicts the lead profile of the level of the leading index of exports vs. the level of the unit value of exports. The confidence level is below 90% for all leads. [Figure 10](#) represents the lead profile of the growth rates of these two variables. The confidence level is close to 100% up to 9 months and more than 90% up to 14 months.

[Figure 11](#) gives the lead profile of the level of the leading index of exports vs. the total value of exports. The confidence level is below 80% for all months indicating that the leads are statistically insignificant. The growth rate lead profile in [Figure 12](#) shows that the confidence level is above 95% for up to 4 months and more than 90% for an additional 2 months.

On the basis of the lead profiles, we can conclude that in general, the performance of the

growth rates is better compared to the level variables. Further, in order of performance of the variables, the growth rate of the unit value index ranks first followed by the growth rate of the total value of exports.

⁵ Computation of the lead profile is discussed in Appendix B.