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Data Science in Economics and Finance: The Need for Quality Data and Nowcasting

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Abstract

Economics is guided by statistical tools and other variables, which ultimately means that the macro sphere depends on data. Given the data one is not only interested in forecasting but also rely on nowcasting. Thus there is a need to access quality data. Economic decisions are handicapped on the count of 'reliability of data' and the nature of dynamism in the economy. Thus even the recent decision of the Central Bank to move to Centralised Information Management System (CIMS) is to actively depend on quality data which helps in effective forecasting. The paper makes an attempt to lay thrust on quality data which can enhance nowcasting.

Keywords: Statistical tools, data, nowcasting, reliability of data, dynamism, Central Bsnk

Introduction

Economics itself builds upon constant flow of data. The shift in the recent years is on reliability of data. The developments in Data Science has also changed the nature of forecasting. In financial portfolios also, organisations do not look upon single set of parameters, but different ratios, to understand the growth of the enterprise. In these days of fast technological developments and transactions, there is a greater flow of data – so the focus is on reliability and management of data. Economic activities are auto-correlated, in the sense one needs to understand the dynamic nature of activities and factor flows. Thus when quality data is ensured, one can also have a relook into the lags in data interpretation.

The objective of the paper:

- (i) To understand the real need for quality data in economic terms
- (ii) To highlight basic economic tools and AI technologies to enhance nowcasting

Methodology

- (i) To provide an overview of data collection in economic study from 1947-48 to 1993-94
- (ii) Data study from 1993-94 onwards

Data Source: Secondary source primarily from RBI Bulletin

Scope of the Study

Economic conditions are now guided by big data. Thus business and financial parameters can be interpreted to study not only about profitability but also the welfare aspects. Thus in the present scenario the focus is on quality of data. Another inherent drawback of data is lags from collection of raw data to estimation and to policy making. Thus the use of analytics and VAR methods can help economies to face challenges of dynamism.

Fiscal and Monetary instruments

Fiscal policy primarily focuses on the role of government and government schemes. The governments work beyond the concept of 'welfare state' and thus policy decisions are based on data. Budgetary allocations for various sectors require data and a relative analysis is done. Paradoxically there are lags in the process of collection of data. The factors could be the availability of raw data at district level itself. Even that data one needs to check authenticity, regarding any Expert Group in the process

- the time taken to collect the data
- the financial allocation to collect the data
- the cost of collecting data
- the cost and time taken for dissemination of data for analysis

All these pertinent questions may be answered by the developments in data science. Data in itself has become the fulcrum for economic growth. Thus the quality of data determines the growth of the economy. The governments of today bank on Direct Benefit Transfer. This itself means identification of families, the existence of bank accounts, possibility to track records, in effect, the required benefits is transferred to the beneficiary. In fact data science and AI together can bring about transparency in the system. Economists even argue high volume transactions can be checked through data management and AI.

Monetary policy refers to the role of banking system in regulating the economy. Over the years the Central Bank had been preparing Annual Reports which deals about internal and external economy. The lags are generally faced when the monetary authority wants to undertake corrections in controlling inflation. The impact of corrections by monetary authority and the data from constituents take time. Another discerning factor is the availability of data –reliability and publication. In which case, the Central Bank makes use of provisional data; but one needs to reduce the lags in data collection and dissemination. Due to expanse of economic activity, there is greater flow of data – and the data flow from specific sectors are closely monitored

by monetary policy. It could be with reference to Deep Tech Startups, where fiscal and monetary tools can be judiciously intervened to analyse growth of Startups and source of data¹.

Macro Economics Outlook

The RBI Bulletin bring out the changes in the macro economic variables in the Indian economy. A look of the data from the time of independence reveals that the focus is on Current Account (under Balance of Payments)². For forecasting one is interested in the items of various accounts. Thus there is need to look into changes in Current Account items till 1993-94. Though India's liberalisation process began in 1991-92, the focus on Capital Account was in 1993-94. Thus there was a shift to convertibility under Capital Account. In short, to analyse:

I Macro Economic variables (1947-48 to 1993-94)

II Changes from (1994-95 to 2017-2018)

From an economic perspective one is interested not only about the variables that affect growth dynamism; but also the factors that affect internal and external balance frequently. This directly depends upon the nature of government policy. Thus the reforms till 1993-94 was primarily on Current Account of BoP. Interestingly most of the variables under economic growth are also auto-correlated; thus when economic liberalism enters more variables are studied in open economy model. The major area where development in Data Science can contribute to monetary studies is reducing the time lags from data collection to policy decision-making. There are various rounds of surveys, but decisions are more pertinent only when there is final data and not provisional data. The items under Current Account and Capital Account are inter-linked. Thus when we depend on provisional data for one set of variables, we are forced to look into provisional data for other variables too. This will push back the period of study. From 1993-94, not only capital account liberalisation started in India, but the period was also followed by integration of markets³. The integration depends on inflow and outflow of factors which are reflects on the volume of data flows. The developments in the new millennium was on the volume of trade, investment and growth.

1 Macro Economic variables (1947-48 to 1993-94)

A high-level committee was constituted by the Government of India under Dr C Rangarajan, and later there was a shift to Capital Account convertibility in 1993-94⁴. This not only means a more liberalised environment but also collating of large volume of data. The Dollar-Rupee exchange rate during 1992-93 (March-June) hovered between Rs 29.19 and Rs 31.38; however, a perceptible change was witnessed in 1994-95 when the exchange rate was closer to Rs.32 against the dollar. Thus the transition years from 1992-93 to

¹ The growth of service industry are to be monitored as data flows are of critical importance to forecasting.

² Primarily the focus is on Current Account, but after liberalisation both Current Account and Capital Account are of importance

³ The institution of European Union, formation of WTO, impact of global financial crisis are all linked the study of inflows and outflows

⁴ RBI Annual Report (1992-93)

1994-95 can be said towards a closer look of data when service sector and external sector saw perceptible shifts. Thus data and developments in data science can help to analyse the growth trajectory.

The Annual Report of RBI (1948-49), though a short note touched upon the deficits under current account. Thus the role of data and data science can be seen from the purview of ‘deficits’ as one particular variable and its impact over the years. India has for long faced the problem of current account deficit, and now with the role of analytics one can arrive at a ‘near’ solution. Thus the task before the governments is to make changes in exports and imports where again analytics is at play. The decade of 1970s is considered to be difficult years for the Indian economy. In this context it must be noted that there was a remarkable growth in exports in 1972-73, but in understanding about data; one should analyse those factors that help growth in critical time.

TABLE 1: INDIA’S MAJOR EXPORTS

COMMODITY	1968-69	YEAR			RS CRS
		1969-70	1970-71	1971-72	1972-73
Eng Goods	69	91	126	111	130
Iron&Steel	79	87	91	41	42
Iron Ore	88	93	117	105	110
Chemicals	24	30	36	35	41
Jute	218	207	190	265	250
Cotton	101	116	118	116	150

TABLE 2: INDIA’S MAJOR IMPORTS

COMMODITY	1968-69	YEAR			RS CRS
		1969-70	1970-71	1971-72	1972-73
Food	372	293	242	169	128
Raw Cotton	90	83	99	113	91
Cashewnuts	31	28	29	28	32
Mineral Oils	133	138	136	195	204
Chemicals	283	195	192	218	248
Iron&Steel	86	82	147	238	217

From the above table, Table 1&2, one would be able to infer India’s principal exports and imports and in the later years, the policies of export promotion and import substitution was followed. With the use of econometric tools, one can make forecasting; and with the use of developments in data science we can have an analytical understanding and understanding through analytics. Thus when we formulate time series data through developments under data science, one can also understand about the pattern of change in the variables.

TABLE 3: INDIA'S BOT

ITEMS	YEAR		RS CRS
	1989-90	1990-91	
Exports	27681	32553	
Imports	35416	43193	
Trade Balance	-7735	-10640	

The above, Table 3, clearly reveals that India continued to face high Balance of Trade (BOT) deficit in the pre-liberalisation period. An analysis from 1987-48 to 1990-91 also reveals that there was little structural changes. The factors attributing to it include closed nature of the economy, lack of capital flows and imports necessary to bring the nation to the 'take-off' stage. Thus the pattern of change in the variables could be of relevance in data science, as this can have impact on other sectors. In this context BOT has been analysed because developing countries depend on imports⁵ and for further analyses and items the percentage change can also be noticed.

II Changes from (1994-95 to 2017-2018)

The period from 1994-95 marks a clear structural change giving importance to all round growth by understanding the character or skill of the workforce. Whenever the character of workforce changes, it leads to diversification of the economy. This would mean factors leading to growth⁶ in various stages of development have to intrinsically analysed in order to satisfy the needs of forecasting and nowcasting. Thus the focus on understanding data should not only be on real growth rates; also on other factors such as technology, financial inclusion, pattern of consumption and externalities which cause disruptions in the economic framework. The nature of changes in the first few years after capital account liberalisation can be of relevance. In the external front, there was formation of European Union and WTO and in the internal front, there was entry of greater foreign investment and a scope for diversification of the economy. In this context the Annual Report of RBI (1998-99) clearly mentions that measures have been taken to bring about orderliness in foreign exchange market in the aftermath of vulnerabilities in the external sector.

TABLE 4: KEY INDICATORS OF INDIA'S BOP

ITEMS	1990-91	YEAR			in %
		1995-96	1996-97	1997-98	
Exports/GDP	6.2	8.9	8.6	8.5	
Imports/GDP	9.4	12	12.3	12.2	
Invisibles/GDP	-0.1	1.5	2.6	2.3	
CAD/GDP	-3.2	-1.6	-1.2	-1.3	
FI/GDP	0.03	1.3	1.5	1.3	

⁵ Here under the use of data science and forecasting there can be a comparison of important components.

⁶ Flow of capital also leads to flow of technology and a liberalised system of payments can foster economic development and diversification

GDP- Gross Domestic Product; CAD- Current Account Deficit; FI- Foreign Investment

The Table 4 gives an overview of economic development of India in the post-liberalisation period. From the point of view of understanding data, the scope is to analyse the cause of trade deficits and thereby there could be a policy for infrastructure development. The period after liberalisation is also a case for diversification of portfolios and thus the economy has shifted from foreign direct investment to institutional investment. A comparison between receipts and payments of invisibles has a direct bearing on CAD.

The trends in BOP in the three years preceding 2011-12 shows the contribution of inward foreign investment. This adds as a cushion because this period is the aftermath of global financial crisis and the consequent fall of contribution from service sector. This becomes the critical period of growth⁷. An interesting development in the external sector front is to rein in deficits under current account and sustained flow from invisibles has an indication to this direction. However, concerns still continue as regards to deficits under BOT. After 2014, in real terms there was a focus on financial infrastructure. The economy now has already been built on strong fundamentals, it is now only to increase the pace of development. The perceptible increase in the overall growth rate over the last few years is an indicator. Thus data science and analytics can widely track the changes in consumption, production and distribution pattern and contribute to price stability in the long run. The large volume of data when analysed, gives the 'dashboard' of an economy; the internal and external balance can be investigated. The period between 2014-15 and 2017-18 is more of a stabilisation process – identifying critical areas and strengthening positive areas of growth. The BOT continues to be of concern [see Appendix], with faster rise in imports reflecting on CAD. In 2015-16, trade balance was at deficit standing at \$130079 (US\$million) and in 2017-18 it was at deficit \$160036 (US\$million). In 2016-17, there was a large effort in containing the trade balance and another positive aspect is the increase in investment over the years.

Conclusion

Thus in the present day of data driven economy, the continuous changes in the economic and non-economic factors are to carefully analysed for 'nowcasting'. The prime reason data science is warranted is to bring about quality research which can enhance forecasting tools. Again the data collected from source should constitute a diversified population so that it helps a macro economic study.

Notes:

1. The tables referred to are from RBI Annual Reports
2. The objective is to understand about key economic variables and to give focus on data science. In the area of dynamism, the analysis should be how it can help in decision-making.

⁷ A closer look at the Indian economy developments reveals that infrastructure development was for, both the development of agriculture and industry. The Tenth Plan document specifically talks about diversification. However economic upheavals and greater imports affects the benefits from infrastructure growth.

3. For the purpose of this article only important time periods are analysed primarily to show changes in variables in both pre and post liberalisation period which can have relevance in interpreting data.

APPENDIX 1: INDIA'S BALANCE OF PAYEMENTS

(US\$ million)					
	2015-16	2016-17	2017-18	2018-19	2019-20 (P)
1	2	3	4	5	6
A. CURRENT ACCOUNT					
1 Exports, f.o.b.	2,66,365	2,80,138	3,08,970	3,37,237	3,20,431
2 Imports, c.i.f.	3,96,444	3,92,580	4,69,006	5,17,519	4,77,937
3 Trade Balance	-	-	-	-	-
	1,30,079	1,12,442	1,60,036	1,80,283	1,57,506
4 Invisibles, Net	1,07,928	98,026	1,11,319	1,23,026	1,32,850
a) 'Non- Factor' Services of which :	69,676	68,345	77,562	81,941	84,922
Software Services	71,454	70,763	72,186	77,654	84,643
b) Income	-24,375	-26,302	-28,681	-28,861	-27,281
c) Private Transfers	63,139	56,573	62,949	70,601	76,217
5 Current Account Balance	-22,151	-14,417	-48,717	-57,256	-24,656
B. CAPITAL ACCOUNT					
1 Foreign Investment, Net (a+b)	31,891	43,224	52,401	30,094	44,417
a) Direct Investment	36,021	35,612	30,286	30,712	43,013
b) Portfolio Investment	-4,130	7,612	22,115	-618	1,403

[the above table adapted from RBI Annual Report 2019-2020]

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