*Nowcasting Global Growth**

Incoming data suggests that global growth is losing steam in the first and second quarter of 2022. Estimates and forecasts of global GDP growth are on an annual basis. This article attempts to bridge the gap between the availability of and the arrival of global GDP estimates and higher frequency indicators of global economic activity.

Introduction

The year 2022-23 has begun on a sombre note. The global economy was on the cusp of recovery when it was hit by a mammoth geopolitical shock. The escalation of geopolitical tensions has also led to a broad-based increase in global commodity prices with the potential of keeping elevated inflation persistent and undermining global trade and growth.

Available high frequency indicators suggest that global growth is losing steam in the first and second quarters of 2022. It is in this backdrop that this study attempts to gauge global growth outcomes on an ongoing basis based on incoming data. These findings can be considered as indicative and would get firmed up as more experience is gained with these nowcasts that are based on actual releases of official data. They are intended to fill the gaps in the availability of estimates and forecasts of global GDP growth which are currently on an annual basis.

The rest of the study is organised into four sections. Section II deals with some stylised facts. Section III discusses the analytical framework of the study and data construction while section IV presents the main findings. Section V concludes the study.

II. Stylized Facts

The global economy grew by 6.1 per cent in 2021 – the highest in six decades but is now projected to decelerate to 3.6 per cent in 2022 and 2023 (WEO, April 2022), and 2.9 per cent in 2022 and 3.0 per cent in 2023 (GEP, June 2022).[1] This has prompted some to expect the current decade to be "crawling 2020s" (Chart 1).

After the double shock of Covid-19 and the Russia-Ukraine war, inflation rates have exceeded expectations, surging to their highest levels in decades in many countries, while economic growth forecasts are rapidly deteriorating.

Early high frequency data provides a mixed picture: as per available data, global IIP and trade volume slowed-down in March 2022; composite global PMI index accelerated marginally in May 2022 after two consecutive months of deceleration during March-April, driven mainly by expansion in new orders – both manufacturing and services (Chart 2). GDP data released so far for Q1:2022 point to contraction and deceleration.

Global food and energy prices have skyrocketed resulting in higher and more broad-based inflation than in several decades. Brent crude oil hit an average of US $120.7 per barrel in June 2022 so far – the highest since the June-August 2008 average of US$ 129.9 per barrel. The current oil price shock has been described to be one of the biggest in decades (Chart 3). There have since been revisions and

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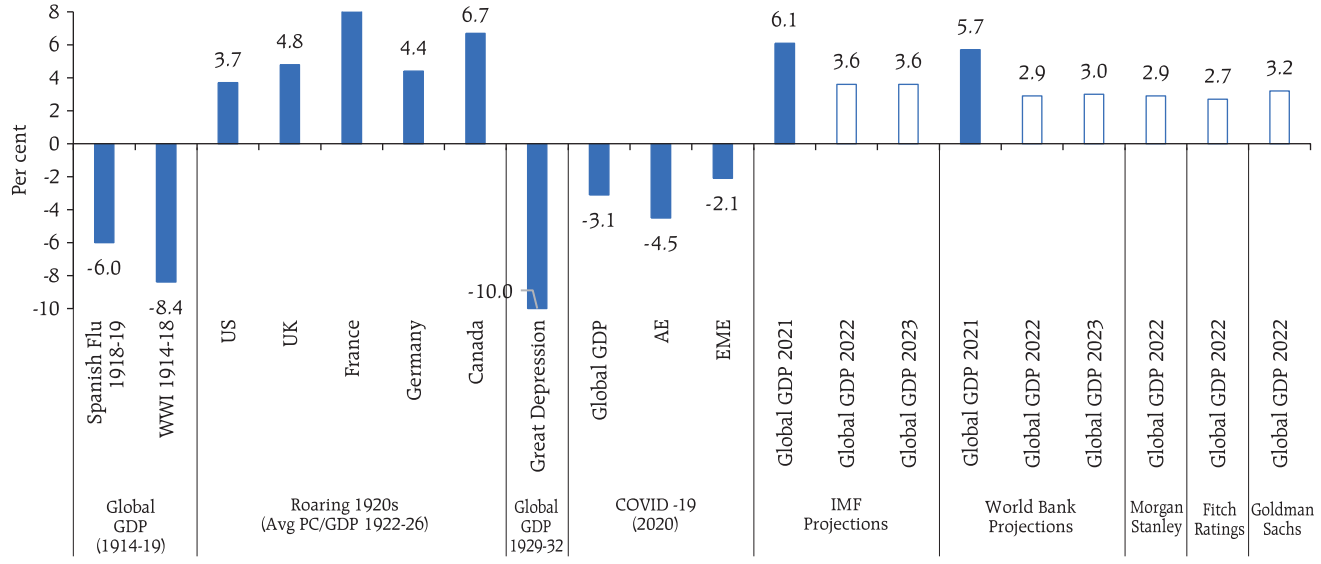
[1] Independent estimates/forecasts place global GDP growth for 2022 in a range of 2.7-3.3 per cent. According to Morgan Stanley, global GDP growth for 2022 could be down to 2.9 per cent (May 11, 2022), and 2.7 per cent, according to Fitch Ratings (March 21, 2022), and 3.2 per cent as per Goldman Sachs (January 31, 2022). The consensus global economic growth is only 3.3 per cent, down from 4.1 that was expected in January (Financial Times, May 02, 2022).

Chart 1: Roaring 1920s and Crawling 2020s?

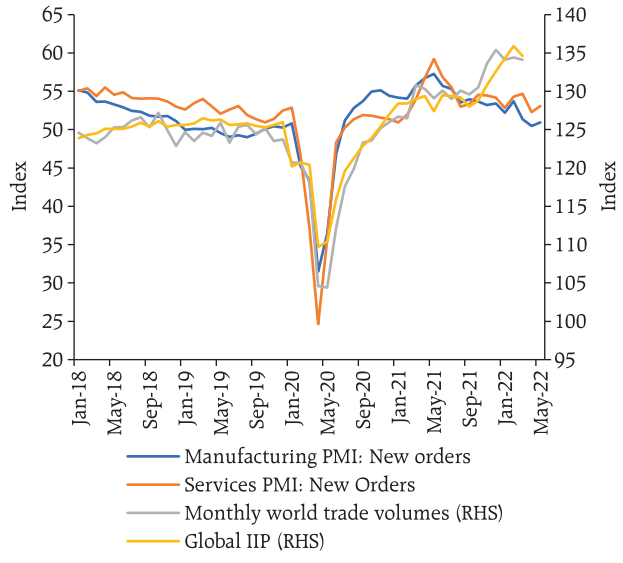


Source: IMF, WB, Maddison Historical Data, Morgan Stanley, Fitch Ratings and Goldman Sachs.

projections of oil prices - Environmental Investigation Agency (EIA): US $105.22 per barrel for 2022; Goldman Sachs: US $135 per barrel for 2022; Morgan Stanley: US $115 per barrel in Q2 and US $150 per barrel for the rest of 2022.

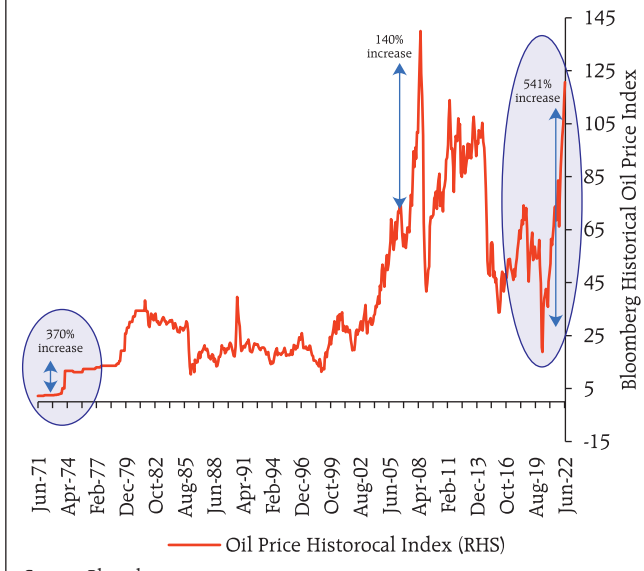
Meanwhile, global food prices – measured by both the Food and Agriculture Organisation (FAO) and the International Monetary Fund (IMF) were at an all-time high in April 2022 and expected to remain elevated due to supply disruptions (Chart 4: a-b).

Chart 2: Global Economic Indicators



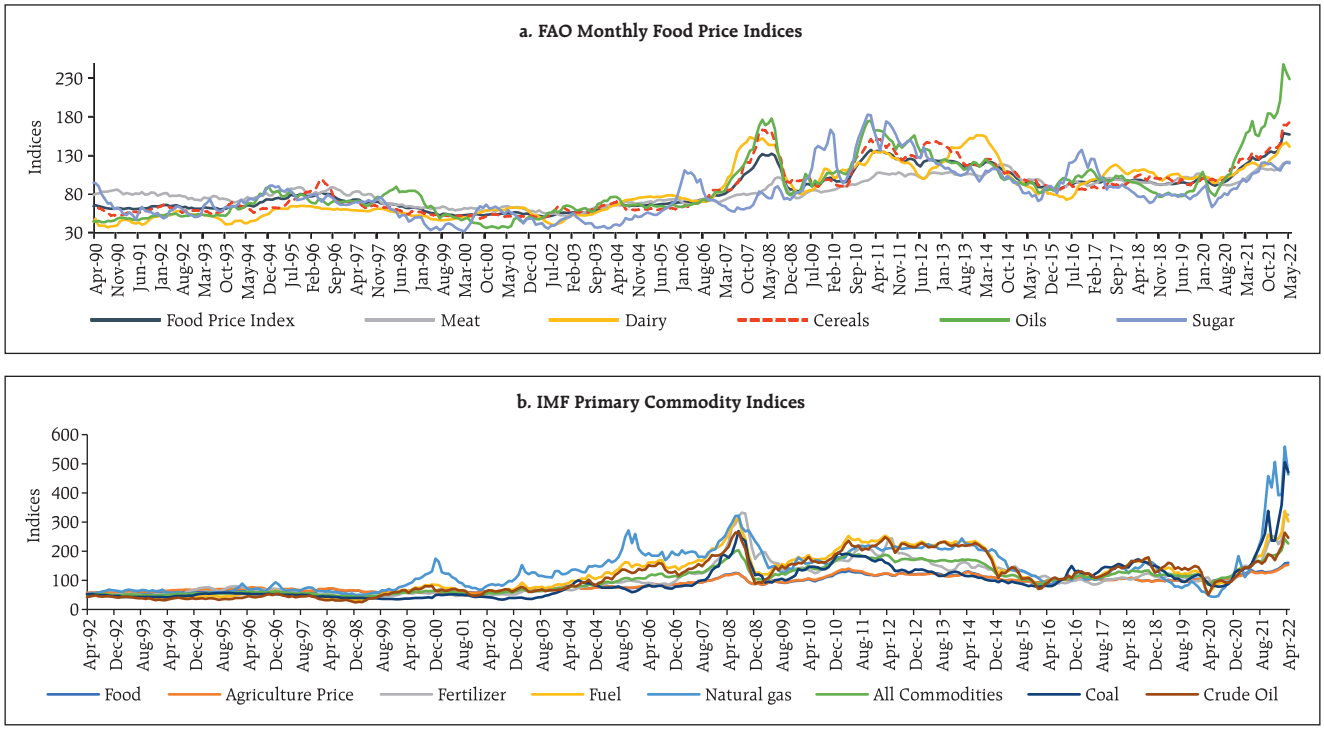
Source: Bloomberg, IHS Markit.

Chart 3: Oil Shocks Since 1970s



Source: Bloomberg.

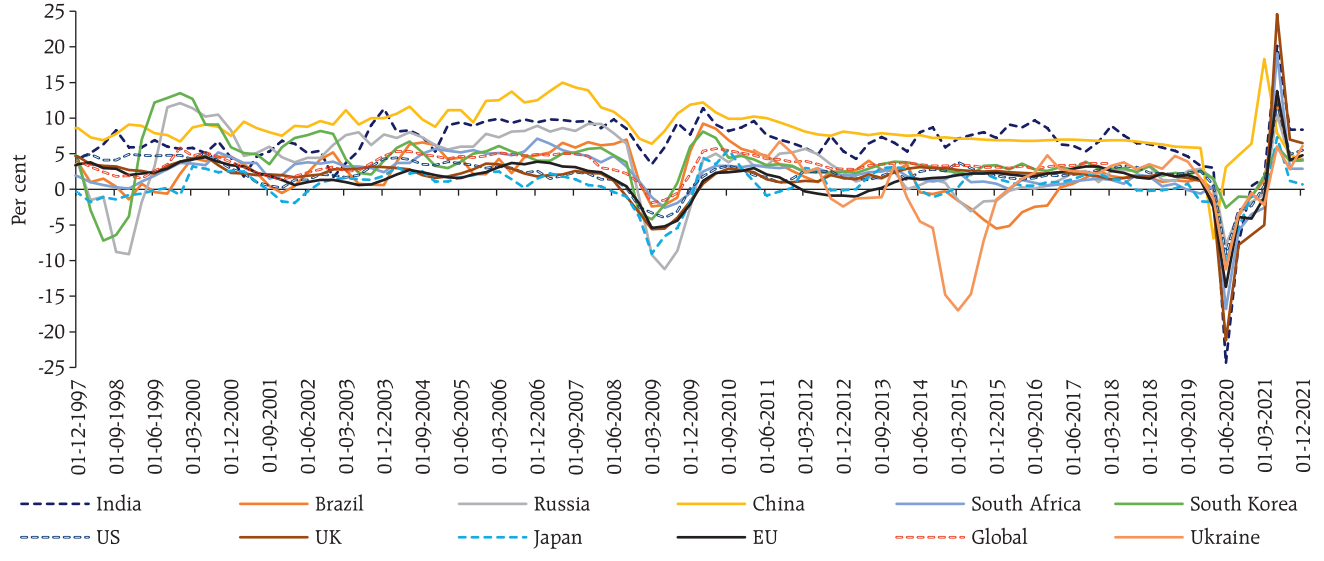
Chart 4: Food Price at All Time High



Source: FAO and IMF.

In this uncertain environment, high correlation between India's GDP growth and those of major economies suggests that business cycles across countries have become highly synchronised (Chart 5; Annex Table 1).

Chart 5: Quarterly GDP Growth: Global and Select Countries



Source: OECD Database.

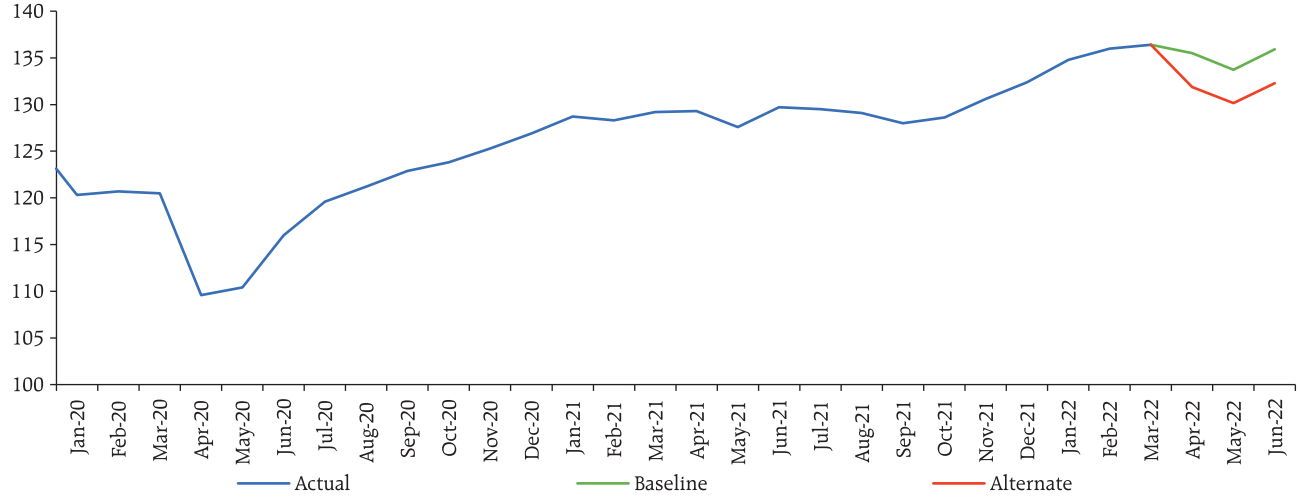
III. Analytical Framework

As stated earlier, this study aims to nowcast global GDP growth for Q1:2022 and Q2:2022 to test the waters for the possibility of generating these nowcasts on a regular basis. Two approaches have been adopted in the exercise. In the first, the dataset on global GDP, compiled by the Organization for Economic Co-operation and Development (OECD), covering 48 countries (both OECD and non-OECD members) comprising more than 80 per cent of the global GDP in purchasing power parity terms (PPP) at 2015 prices is used. The latest update covers data till Q4:2021. So far, GDP data for Q1:2022 have been released by 35 countries accounting for 61 per cent of global GDP. For the purpose of these nowcasts, 35 countries are considered as representative of global GDP.

In the second exercise (Annex Box 1), several candidate indicators such as global index of industrial production (IIP), trade volume and purchasing managers index (PMI) that are known to be highly correlated with global GDP are tested for their ability to predict global GDP growth. In an autoregressive integrated moving average (ARIMA) framework with exogeneous regressors, global IIP emerges as the strongest predictor of global GDP growth. The data on global GDP from Q1:2012 to Q4:2021 is computed by aggregating real GDP for 69 countries currently available in the CEIC database. The data for global IIP is available till March 2022.

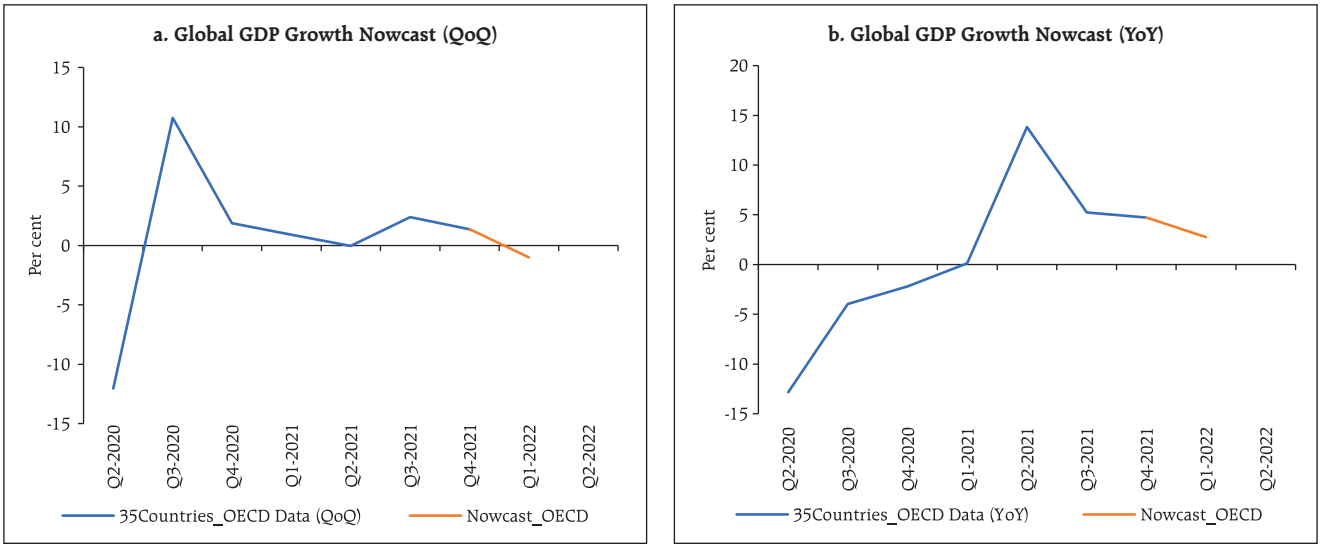
Two alternate scenarios are considered for the forecasting exercise. Under the baseline scenario, global IIP during April-June 2022 is assumed to grow at the same year-on-year rate as during the previous six months. The alternative scenario assumes a much slower growth rate of 2.0 per cent for April-June 2022 to capture risks to the global economy (Chart 6).

Chart 6: Forecast Scenarios: Global IIP



Note: *Baseline* - Year-on-year growth observed over last six months, *i.e.*, 4.8 per cent in case of global IIP, to continue over April-June 2022.
Alternative - Year-on-year growth of 2 per cent in global IIP to prevail over April-June 2022.
Source: Authors' Estimate.

Chart 7: Global GDP Nowcast: OECD 35 Countries



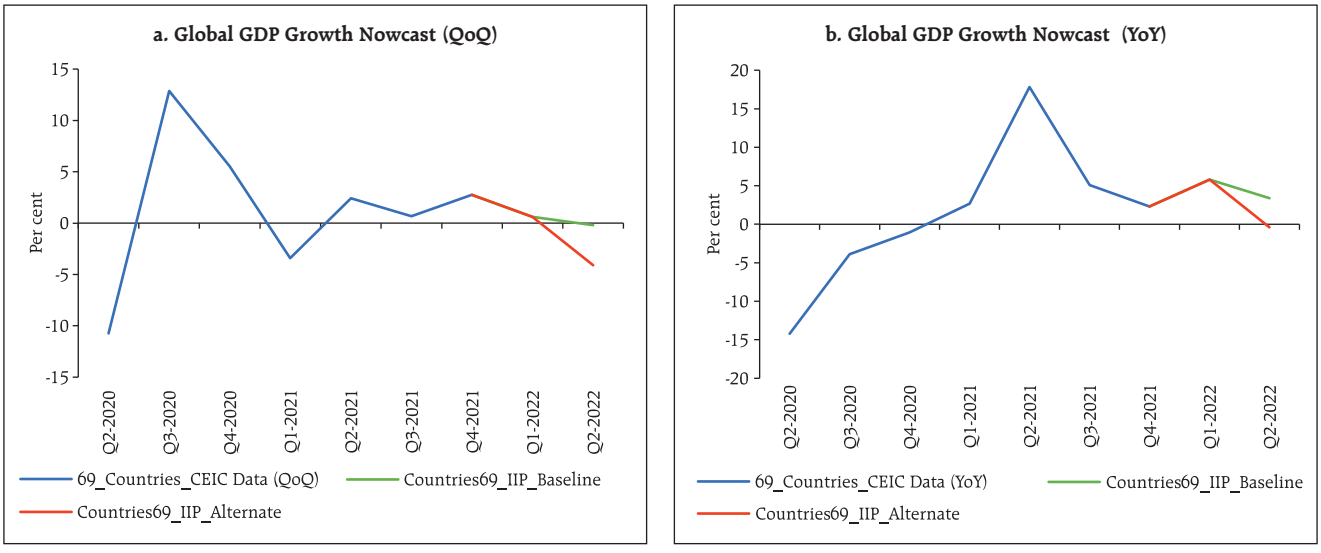
Source: OECD Database. Authors' Estimates.

IV. Empirical Results

As it emerges, extension of OECD database to Q1:2022 using Q1:2022 GDP growth rates for 35 countries indicates that the momentum of global GDP growth during Q1:2022 has lost steam sequentially and annually, possibly entering contractionary zone (Chart 7: a-b).

As regards the model-based forecasts of global GDP for Q1:2022 and Q2:2022, global GDP growth momentum seems to have decelerated in Q1:2022 and is likely to contract in Q2: 2022. The decline is expected to be much sharper under the alternative scenario (Chart 8: a-b; Annex Box 1).

Chart 8: Model-based Global GDP Forecasts



Source: CEIC Database. Authors' Estimates.

V. Conclusions

Global growth has lost momentum over the first half of 2022 as evident from incoming data. The outlook is fluid and uncertain. In this highly uncertain environment, our endeavour will be to track global GDP and subsequently inflation on as contemporaneous basis as possible so as to keep all stakeholders forewarned and forearmed.

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Annexure

Annex Table 1: Global Business Cycle Synchronised

Correlation t-Statistic Probability	Brazil	China	EU	France	Germany	India	Japan	Russia	South Africa	South Korea	UK	US
Brazil	1.000000											

China	0.497090	1.000000										
	5.613086	-----										
	0.0000	-----										
EU	0.544231	0.249360	1.000000									
	6.356102	2.522920	-----									
	0.0000	0.0133	-----									
France	0.584671	0.299770	0.947656	1.000000								
	7.061255	3.078720	29.08027	-----								
	0.0000	0.0027	0.0000	-----								
Germany	0.553643	0.216334	0.892030	0.796970	1.000000							
	6.514017	2.171043	19.33747	12.92789	-----							
	0.0000	0.0324	0.0000	0.0000	-----							
India	0.518318	0.362708	0.708751	0.736044	0.640190	1.000000						
	5.938407	3.813487	9.843697	10.65351	8.165082	-----						
	0.0000	0.0002	0.0000	0.0000	0.0000	-----						
Japan	0.579368	0.274057	0.747261	0.682808	0.767948	0.586956	1.000000					
	6.964616	2.792097	11.01776	9.157064	11.74736	7.103305	-----					
	0.0000	0.0063	0.0000	0.0000	0.0000	0.0000	-----					
Russia	0.627636	0.356325	0.570734	0.488322	0.551026	0.360806	0.621377	1.000000				
	7.899164	3.736519	6.810127	5.482703	6.469759	3.790481	7.770437	-----				
	0.0000	0.0003	0.0000	0.0000	0.0000	0.0003	0.0000	-----				
South Africa	0.739933	0.378438	0.814346	0.831452	0.714570	0.781106	0.709375	0.686589	1.000000			
	10.77753	4.005851	13.74779	14.66270	10.00812	12.25697	9.861128	9.252746	-----			
	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-----			
South Korea	0.425728	0.275254	0.433585	0.369448	0.423474	0.254370	0.490276	0.705305	0.465000	1.000000		
	4.609888	2.805290	4.714446	3.895437	4.580131	2.577074	5.511572	9.748209	5.146276	-----		
	0.0000	0.0061	0.0000	0.0002	0.0000	0.0115	0.0000	0.0000	0.0000	-----		
UK	0.520931	0.148332	0.919973	0.928858	0.792646	0.755726	0.726769	0.487598	0.849164	0.387007	1.000000	
	5.979460	1.469613	22.99564	24.56806	12.73831	11.30663	10.36691	5.472048	15.75385	4.112330	-----	
	0.0000	0.1449	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	-----	
US	0.481672	0.147455	0.885833	0.877897	0.751477	0.626659	0.719967	0.494236	0.733476	0.409412	0.900533	1.000000
	5.385283	1.460722	18.70537	17.96302	11.16004	7.878904	10.16444	5.570405	10.57292	4.396777	20.29359	-----
	0.0000	0.1474	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-----

Annexure Box 1: Model-based Global GDP Forecasts

In order to forecast global GDP growth, several candidate indicators, such as global index of industrial production (IIP), trade volume and purchasing managers index (PMI), that are known to be highly correlated with global GDP, are analysed for their predictive ability. The data on global GDP was computed by aggregating real GDP (in constant US dollar terms) for 69 countries obtained from the CEIC database. Data on other indicators were obtained from CPB Netherlands, Bloomberg and IHS Markit. Table B1 shows the contemporaneous correlation between global GDP and such indicators. Global GDP was found to be highly correlated with global IIP and global trade volume.

Next, these indicators are subjected to the *Granger Causality test* in order to assess their ability to forecast global GDP growth. Results are shown below in Table B2. Global IIP and PMI indicators *Granger cause* global GDP indicating useful forward-looking information contained within these variables.

Taking cognizance of the above results and the slow-moving nature of GDP, the forecasting problem is approached using an autoregressive integrated moving average (ARIMA) framework with exogeneous regressors. In the first step, a baseline model is estimated to forecast global GDP. Since the GDP data was found to be stationary in both QoQ and YoY terms, the model identification was restricted to finding the appropriate AR and MA lag length. Allowing for additional seasonal AR and MA lags in the model, a grid-search method and Akaike information criterion (AIC) was used to identify the appropriate lag length in line with standard practices. The model was estimated over a training sample from 2012Q1:2019Q4.

Table B1: Correlation Between Global GDP and Global Indicators

S. No.	Indicators	Global GDP QoQ (%)	Global GDP YoY (%)
1.	Global IIP@	0.635***	0.740***
2.	Global Trade Volume@	0.536***	0.771***
3.	Global PMI – Inputs	0.268*	0.690***
4.	Global PMI – New Orders	0.414***	0.589***
5.	Global PMI – Headline	0.423***	0.571***

Note: Based on quarterly data sample from 2012Q1 to 2021Q4.
***, **, * indicate statistical significance at 1%, 5% and 10% level, respectively.
@ Taken in QoQ (%) or YoY(%) terms depending on target GDP indicator.

Table B2: Granger Causality Test

S. No.	Hypothesis	Global GDP QoQ (%)	Global GDP YoY (%)
1.	Global IIP@	4.817***	3.160**
2.	Global Trade Volume@	1.270	1.504
3.	Global PMI – Inputs	1.262	1.078
4.	Global PMI – New Orders	2.798**	4.102**
5.	Global PMI – Headline	2.761**	3.877**

Note: The above table shows the F-statistic against the hypothesis that "Variable X does not granger cause Global GDP". The granger causality test was conducted considering upto 4 lags and 5 per cent level of significance. Based on quarterly data sample from 2012Q1 to 2021Q4.
***, **, * indicate statistical significance at 1%, 5% and 10% level, respectively.
@ Taken in QoQ (per cent) or YoY (per cent) terms depending on target GDP indicator.

In the second step, several candidate models were estimated by augmenting the univariate model selected in the first step with global trade, IIP and PMI indicators. Splitting the data into a train and test sample, each such model is estimated over the training sample from 2012Q1:2019Q4 and assessed over the testing sample *i.e.*, from 2020Q1:2021Q4. The forecast accuracy over the test sample is measured using the root mean squared error (RMSE) metric. Based on adjusted R-squared, model AIC criterion and out-of-sample RMSE over a rolling sample, model augmented with global IIP is selected as the final model to forecast global GDP.

Finally, a simple scenario-based forecasting analysis is considered to incorporate the headwinds facing the global economy, *viz.*, ongoing Ukraine-Russia war, a slowdown in China and surging commodity prices, for which, two alternate scenarios were incorporated in the forecasting exercise. Under the baseline scenario, global IIP is assumed to grow at the same rate in the April-June 2022 period as observed over the last six months in year-on-year (YoY) terms. In contrast, the alternative scenario assumes a slower 2 per cent YoY growth rate for April-June 2022 period encompassing the risks to the global economy. Respective growth paths thus obtained for

(Contd.)

global IIP are used to forecast global GDP under the two alternative scenarios.

The model-based forecasts of global GDP for Q1:2022 and Q2:2022 are provided below in Table B3. Under the baseline scenario, global GDP growth momentum seems to have decelerated in Q1:2022 and is likely to contract in Q2: 2022, *albeit* by only 0.2 per cent. The decline is expected to be much sharper under the alternative scenario. This translates into a sequential slowdown as seen in the forecasts of global GDP growth. Note that global industrial production grew at an average of 4.8 per cent over the last six months, thus, providing an impetus to global GDP. Overall, however, Global GDP growth is expected to slow down under both the scenarios.

Table B3: Model-based Global GDP Forecasts

		GDP QoQ (per cent)		GDP YoY (per cent)	
		Baseline	**Alternative**	**Baseline**	**Alternative**
1.	Q1:2022	0.6 [-5.7, 7.0]	0.6 [-5.7, 7.0]	5.8 [1.2, 10.4]	5.8 [1.2, 10.4]
2.	Q2:2022	- 0.2 [-6.5, 6.2]	- 4.1 [-10.5, 2.4]	3.4 [-3.4, 10.1]	- 0.4 [-6.8, 6.0]

Note: The above table shows the point forecasts for global GDP growth. 95 per cent prediction intervals are provided in the parentheses. Source: Authors' estimates.