A nowcast of 2021-22 GDP growth and forecast for 2022-23 based on a Factor Augmented Time Varying Coefficients Regression Model

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Abstract

In this paper we have used our recently updated Factor Augmented Time Varying Coefficients Regression (FA-TVCR) model (Bhattacharya, Chakravartti and Mundle, 2019; Bhattacharya, Bhandari and Mundle 2021) to nowcast GDP growth for 2021–22 and forecast it for the year 2022-23. Our GDP growth nowcast for 2021-22 is 9.9 per cent, somewhat higher than the RBI projection of 9.5 per cent. The forecast for 2022-23 is 5.2 per cent. Factoring in an inflation rate of 5 per cent, this would translate to a nominal GDP growth rate of 10.2 per cent which is lower than the RBI projection of 12.3-13 percent but slightly higher than the 15th Finance Commission projection of 9.5 percent.

[1] We are grateful to Bornali Bhandari for her valuable contribution in preparing this paper.

[2] The views expressed here in the working paper are that of Authors. Authors can be contacted at rudrani.bhattacharya@nipfp.org.in and sudipto.mundle@gmail.com

I. Introduction

The spread of the Covid–19 pandemic to India and the stringent nation-wide lockdown of March 2021 delivered a massive negative shock to the economy. Gross Domestic Product (GDP) growth, which had already been declining following the dual shocks of demonetisation and the ill-prepared Goods and Services Tax roll out, declined by an unprecedented 24.6 per cent in Q1 of 2020–21. Lifting of the lockdown, combined with demand pump-priming by a very large fiscal deficit and massive liquidity infusion, then led to a sharp recovery from 2020–21: Q2 onwards. High frequency indicators indicate that the recovery has persisted through September and October 2021 despite the disruption of the second Covid–19 wave during the April–June period.

However, as many commentators have pointed out, the aggregate V shaped recovery masks an underlying dualistic recovery pattern. Industrial and services activity in the organized sector has been growing rapidly. But severe scarring of economic activity in the unorganised sector resulted in continuing decline and stagflation in this sector. In other words, a K shaped rather than a V shaped recovery. Distress among workers and the self-employed in the unorganised sector, the poorest income groups, has led to a decline in the aggregate marginal propensity to consume. Hence, consumption has remained the weakest among the demand side growth drivers compared to government final consumption expenditure, capital expenditure and net exports, which is still negative but rising.

A key question that arises is how economic activity will perform for the rest of the year, setting the baseline for subsequent economic performance over the medium and long term. In this paper we have used our recently updated Factor Augmented Time Varying Coefficients Regression (FA- TVCR) model (Bhattacharya, Chakravartti and Mundle, 2019; Bhattacharya, Bhandari and Mundle 2021) to nowcast GDP growth for 2021–22 and forecast it for the year 2022-23. The rest of the paper is organised as follows: part 2 discusses India's recent growth experience; part 3 presents the FA-TVCR model, its estimation and its performance to predict turning points in India's GDP growth; part 4 presents the nowcast-forecast for Q3, Q4 and annual 2021–22 GDP growth based on the model. Part 5 re-estimates the model with annual frequency data to forecast GDP growth for 2022-23. Part 6 concludes.

II. India's recent growth experiences

Kar and Sen (2016) and Subramanian & Felman (2019), among others, have discussed the sharp economic slowdown post 2011–12. There were years of high growth within this period too. Thus, real GDP growth rose from 5.5 per cent in 2012–13 to 8.3 per cent growth in 2016–17. However, growth declined monotonically thereafter for the next four years and contracted by a massive 7.3 per cent in 2020–21. While muted growth in investment and exports may have mainly accounted for the slowdown post 2011–12, along with the 'twin balance sheet' problem of stressed assets (Subramanian & Felman, 2019), other factors made it worse post 2016–17.

The demonetisation shock in November, 2016 followed by a second shock of the ill-prepared roll out of the Goods & Services Tax in July, 2017 in a space of eight months, severely dented India's growth momentum. This was followed by a third major shock, bankruptcy of the Infrastructure Leasing & Financial Services in 2018, which reverberated through the entire financial sector and further disrupted growth. The economy was still reeling under these repeated shocks when the Covid-19 pandemic struck India in March 2020.

The sudden announcement of a stringent, nationwide lockdown on 25th March 2020, among the most stringent world-wide, led to one of the sharpest contractions in India's economic history (Hale et al. 2020). Real GDP contracted by an unprecedented 24.4 per cent in 2020–21:Q1 on a year-on-year (y-o-y) basis. The contraction moderated to (-) 7.4 per cent in 2020: Q2 with gradual unlocking of the economy from June 2020. The economy recorded positive growth of 0.5 per cent growth in Q3 and 1.64…. per cent on Q4. Thanks to the base effect of the sharp contraction in Q1 of 2020-21, the 'bow string effect (Mundle 2020), the economy registered a very high y-o-y growth rate of 20.1 per cent in 2021–22:Q1. This was despite the severe second Covid-19 wave during this period.

However, this recovery was uneven across firms (Bhandari et al. 2021) and labour markets (Desai, Deshmukh & Pramanik 2021; Desai & Pramanik, 2021). While there is still a gap between large and small firms, recent evidence from NCAER Business Expectations Survey of September 2021 suggests that firms' business sentiments may now be converging (NCAER 2021). The key question for policy and business decisions now is what to expect for economic performance during the rest of this financial year and the financial year 2022-23. The nowcasting-forecasting exercise in this paper has addressed this question.

III. Model and Estimation

III.1 The Model

Nowcasting of quarterly y-o-y GDP growth essentially implies predicting the y-o-y GDP growth for a given quarter Q_t, using information from high frequency indicators (we use monthly indicators for our analysis) for the same quarter. The estimation process consists of the following steps:

(i) Depending on the flow of information for the set of monthly indicators for months i, where i=1,2,3 span quarter Q_t , the nowcasting is conducted for "2 months ahead", "1 month ahead" and "zero month ahead" of GDP data release by the statistical agency of the country. Since high frequency indicators are released with different lags on different dates in a month, addressing the "ragged-edge data" problem at the end of the sample period is a major challenge in the nowcasting methodology. We convert monthly indicators into quarterly frequency by forecasting the observation/s unavailable for the month/s in a particular quarter to handle the ragged-edge data problem.

(ii) When a monthly indicator Y_i is available till month i=1 in quarter Q_t, we forecast the values for i=2 and 3 in quarter t using Seasonal ARIMA (p,d,q)(P, D, Q) model:

$$\phi(L)\Phi(L^s)(1-L)^d(1-L^s)^D Y_i = \theta(L)\Theta(L^s)\epsilon_i \dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

where L is the lag operator ($LY_i = Y_{i-1}$); s is the seasonal period and hence s ranges from 1-12 for monthly data; $\phi(L) = 1 - \phi_1 L - \phi_2 L^2 - \cdots . - \phi_p L^p$ is the non-seasonal autoregressive (AR) operator; $\Phi(L) = 1 - \Phi_1 L - \Phi_2 L^{2s} - \cdots . - \Phi_P L^{Ps}$ is the seasonal AR operator; $\theta(L) = 1 - \theta_1 L - \theta_2 L^2 - \cdots . - \theta_q L^q$ is the non-seasonal moving average (MA) operator; and $\Theta(L) = 1 - \Theta_1 L - \Theta_2 L^2 - \cdots . - \Theta_Q L^Q$ is the seasonal MA operator. Similarly, d represents the number of differencing required to remove the non-seasonal unit root. Here ϵ_i is the *i.i.d* error with zero mean and variance σ^2. The Seasonal ARIMA structure is optimally chosen using X13-SEATS Seasonal Adjustment Programme of U.S. Census Bureau. Again, when a monthly indicator Y_i is available till month i=1 and 2 in quarter Q_t, we forecast the values for i=3 in quarter Q_t using the same method. No forecasting of a monthly indicator is required when information is available for all the three months spanning quarter Q_t.

(iii) Once information for all the three months spanning the quarter Q_t are obtained, the monthly series is converted to quarterly frequency. The quarterly y-o-y growth of the indicator is then derived.

(iv) Assuming that a set of unobserved factors determine the performance of the observed monthly indicators, the static factors are estimated from y-o-y growth in the set of monthly indicators converted to quarterly frequency using Principal Component Analysis (Stock and Watson, 2020). The first k numbers of factors which explain at least 80% of variation in the data are chosen.

(v) Next, we regress quarterly y-o-y growth in GDP available till quarter Q_{t-1} on the k number of factors till quarter Q_{t-1} and one period lagged GDP growth where the regression coefficients are assumed to vary over time. Finally, using the estimated coefficient and the values of k factors obtained for the quarter Q_t from the set of monthly indicators, the nowcast of the GDP growth for Q_t is obtained.

The details of the regression model are as follows:

Measurement equation:

$$y_t = X_t'\beta_t + \epsilon_t \qquad (2)$$

where X_ts is a $(k+1 \times 1)$ vector consisting of k number of chosen factors F_t and one quarter lagged GDP growth.

Transition equation

$$(\beta_{t+1} - \bar{\beta}) = \mathbf{G}(\beta_t - \bar{\beta}) + \mathbf{v}_{t+1} \quad (3)$$

Here the regression coefficients β are not unknown constants but latent, stochastic variables that follow a time series structure, estimated by Kalman Filter (Hamilton,1994; Kim and Nelson,1999). We assume that G represents a Vector Auto Regression (VAR) structure. Equations 2,3, and 4 represent the state-space form of the time-varying parameter model, with state vector $\mathbf{s}_t = \beta_t - \bar{\beta}$

III.2 Data

The target variable in our analysis is the quarterly y-o-y growth rate of aggregate GDP in India. The GDP data are sourced from the Central Statistical Organisation, Ministry of Statistics and Programme Implementation (CSO, MOSPI) for the period 2004-05:Q1 to 2020-21:Q4. The set of monthly indicators used in the analysis are the same as in Bhattacharya et al. (2021). The high frequency dataset consists of 29 monthly indicators which have been listed in Appendix A. The monthly indicators are taken for the period April, 2004 to October, 2021. The data sources, along with their date of periodic release are given in Appendix A, Table A.1.

It should be pointed out that while monthly time series data is available for some indicators from 2004-05 onwards, some additional monthly indicators are available for shorter periods, including a few since 2014-15. Accordingly, the model has been estimated separately for two separate periods: Specification I estimates the model for the period 2007-08:Q1 to 2021-22:Q1 using only 19 indicators. Specification II estimates for the period 2015-16:Q1 to 2021-22:Q1 and includes a larger set of 28 indicators, i.e., those available since 2004-05 plus those that are available from 2014-15 onwards. Bhattacharya et al. (2021) found that while Specification I better captures the massive GDP contraction in Q1:2020-21, Specification II captures the recovery pattern better. Hence we have retained both specifications for this exercise.

We test for stationarity of quarterly y-o-y growth rates of the high frequency indicators using Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test with the null hypothesis of presence of unit root in the series. We also employ Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test with the null hypothesis that the series is stationary around a constant or a deterministic trend against the alternative hypothesis that the series contains unit root. All variables are found to be stationary by either one or both the tests, except for CPI inflation and growth in air cargo movement.[3]

[3] The unit root test results are available from the authors on request.

III.3 Estimation of Specification I

We first apply static factor analysis to summarise the information about the performance of the economy from quarterly y-o-y growth rates of monthly indicators converted to quarterly frequency. The full sample or long period analysis in Specification I includes 18 high frequency indicators.[4]

The factors extracted information from these 18 indicators are then estimated using Maximum Likelihood Method. The number of factors estimated are 3.[5] Table 1 reports factor loadings, i.e., the correlation of each of the indicators with the estimated latent factors. The factor loadings give the variance explained by the data associated with each factor. As a rule of thumb, in our analysis a factor loading with value 0.6 or more is taken to indicate that the factor extracts sufficient variation from that variable. Table 1 suggests that the factor F1 extracts variations from growth in sales of passenger cars, cargo handled in major ports, electricity demand, exports of goods, GST revenue, IIP, non-oil merchandise imports, net tax revenue, production of two wheelers and production of commercial vehicles.

Table 1: Loadings of variables in estimated factors

Variable (YoY growth, %)	*F1*	*F2*	*F3*
Passenger Car Sales	0.95	-0.04	-0.04
Cargo Handled in Ports	0.70	0.10	0.60
CPI	0.10	0.44	-0.51
Aggregate Deposits	0.04	0.78	0.04
Electricity Demand	0.60	0.22	0.18
Exports of Goods	0.64	0.41	-0.10
Food Credit	-0.13	0.44	-0.43
GST	0.90	0.32	0.12
IIP	0.87	0.25	0.40
Non-food Credit	0.06	0.95	-0.03
Non-oil Imports of Goods	0.62	0.29	-0.06
NSE Turnover	0.01	-0.22	0.39
Deviation of Rain from Normal Level	0.03	-0.03	0.01
Revenue Expenditure (Net of Interest Payments)	-0.05	0.05	0.01
Rice Production	0.02	0.07	0.05
Net Tax Revenue	0.83	-0.10	0.89
Production of Two Wheelers	0.96	-0.06	-0.12
Production of Commercial Vehicles	0.93	-0.13	-0.02

Source: Authors' estimates

The factor F2 extracts variations from the growth in monetary indicators namely aggregate deposits, and non-food credit. Finally, the factor F3 extracts

[4] Since tourist arrival in India was suspended during the covid19 period, we exclude this indicator from our analysis.

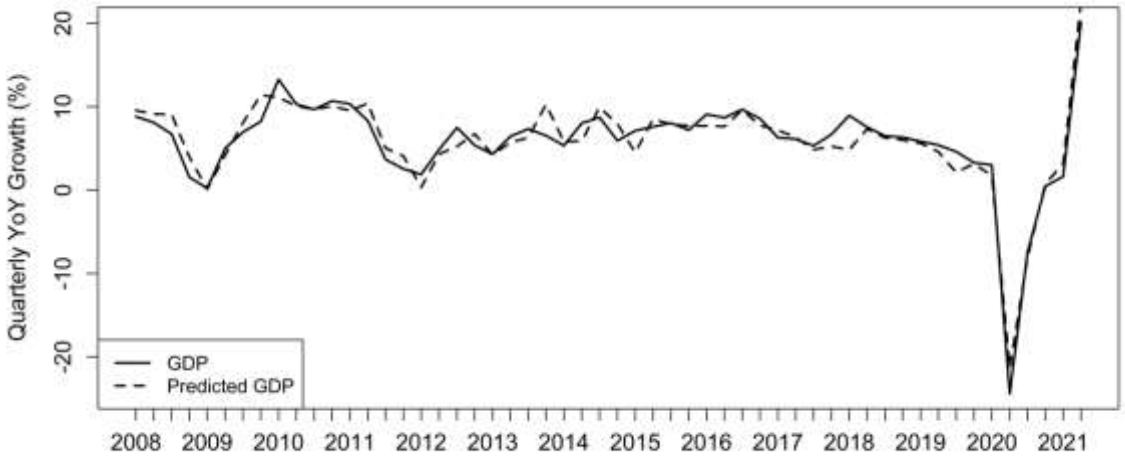
[5] We choose all the three factors following Bhattacharya et.al., (2021).

variations from the growth in services activities, namely cargo handled at major ports.

Next, Equation (2) is estimated where GDP growth is regressed on F1, F2, F3 and one period lagged GDP growth. The coefficients are assumed to vary over time and are estimated in a state-space framework, using Kalman filtration technique. Figure 1 depicts actual GDP growth along with the estimated GDP growth for the sample period Q4:2007:08 to Q1: 2021-22. The graphs show that predicted GDP growth using FA-TVCR model captures most of the turning points in Indian GDP growth series for this period quite well.

Figure 1: Actual and Predicted GDP Growth from Specification I

(Q4: 2007-08 to Q1: 2021-22)



Source: Authors' estimates

III.4 Estimation of Specification II

For Specification II, we incorporate a few additional variables which are available for a shorter sample period. Information from a total of 28 high-frequency indicators is used in this exercise. The number of factors estimated is 4. However, given the limited number of observations in this exercise, only the first two factors explaining 79.2 percent variation in the data is considered for the time-varying coefficient regression model (see Table 2)[6].

[6] Given that the data on consumption of finished steel products are available from December, 2013, the quarterly y-o-y growth of this indicator is available from the quarter Jan-Mar, 2015. Consequently, we have 24 observations for each of 28 indicators. Since the number of observations is less than the number of variables, the factor matrices are rank deficient and hence ML Estimator technique is not applicable (Robertson and Sumons, 2007). Instead, we apply Iterated Principal Factor method in this stage.

Table 2: Loadings of variables in estimated factors: Jan-Mar, 2015 onwards

Variable (YoY growth, %)	*F1*	*F2*
Cargo Movement by Air	0.97	0.18
Passengers Travelled by Air	0.94	0.06
Car Sales	0.96	0.05
Cargo Handled in Ports	0.86	0.24
Production of Coal	0.46	0.08
Production of Cement	0.90	-0.10
CPI	-0.02	-0.46
Aggregate Deposits	-0.04	0.17
Electricity Supply	0.75	0.26
Electricity Demand	0.75	0.14
Exports of Goods and Services	0.72	-0.18
Food Credit	-0.14	-0.84
GST	0.96	0.18
IIP	0.95	0.13
Non-food Credit	-0.06	-0.14
Non-oil Imports of Goods and Services	0.82	0.14
NSE Turnover	-0.08	-0.03
Production of Crude Oil	0.16	0.83
Deviation of Rain from Normal Level	0.06	-0.19
Revenue Expenditure (Net of Interest Payments)	-0.05	-0.12
Rice Production	0.01	-0.21
Goods Movement vial Rail	0.94	0.03
Passengers Travelled by Rail	0.89	-0.12
Consumption of finished steel	0.96	0.02
Net Tax Revenue	0.91	0.01
Telephone/Mobile Subscribers	0.07	0.95
Domestic Sale of Tractors	0.33	0.01
Production of Two Wheelers	0.96	0.05
Production of Commercial Vehicles	0.97	-0.05

Source: Authors' estimates

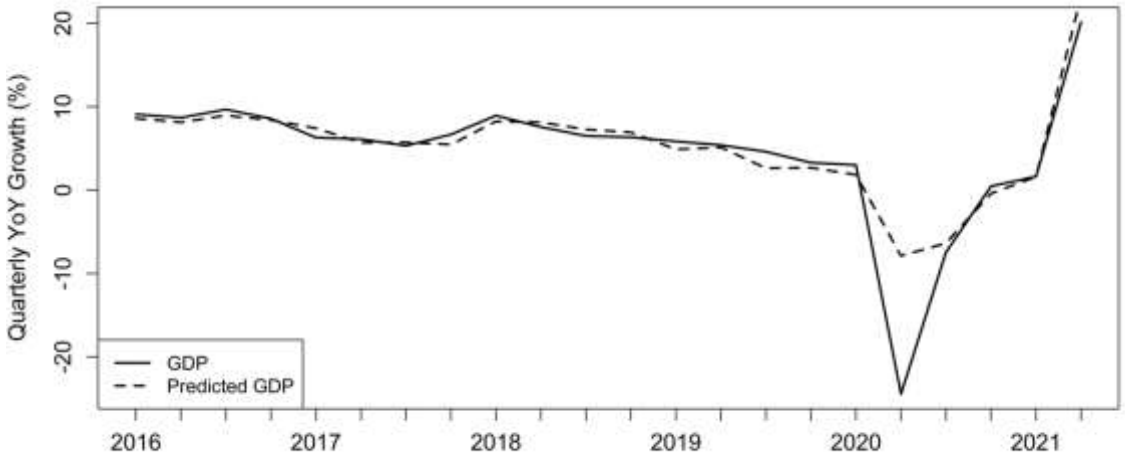
The factor loadings reported in Table 2 suggests that the first factor extracts variations from transport services indicators such as cargo movements via sea, air and rail, and passengers travelling by air and rail; production indicators such as IIP, production of cement, production of two wheelers and commercial vehicles; trade indicators such as exports of goods and services, and imports of non-oil goods and services; electricity demand and supply; other demand indicators such as car sales and consumption of finished steel, fiscal indicators such as net tax revenue and consolidated GST revenue. The second factor extracts variations from growth in food credit, production of crude oil and number of telephone and mobile subscribers.

Figure 2 depicts actual GDP growth along with the estimated GDP growth using Specification II for the sample period Q4:2015-16 to Q1: 2021-22. The graphs show that predicted GDP growth using FA-TVCR model captures most of the turning points in Indian GDP growth series for this period quite well, except for the massive contraction of Q1 2020-21. As was mentioned above, comparing

Figure 1 with Figure 2 we find Specification I captures the massive contraction in India's GDP growth in Q1:2020-21 better, while the Specification II better tracks the subsequent recovery pattern.

Figure 2: Actual and Predicted GDP Growth from Specification II

(Q4: 2015-16 to Q1: 2021-22)



Source: Authors' estimates

IV. Nowcasts for Q2: 2021-22 and FY 2021-22

The nowcast for Q2 2021-22 is obtained by estimating the FA-TVCR model till Q1 2021-22 and using the estimated coefficients along with the factor estimated for Q3 2021-22 from the high frequency indicators.

In order to nowcast GDP growth for the FY 2021-22, we project the factors estimated under both the specifications for Q3 and Q4: 2021-22 using AR (1) models. We then project GDP growth rates for Q3:2021-22 and Q4:2021-22 using the projected factors and coefficients estimated from FA-TVCR model. Finally the nowcast for FY 2021-22 is obtained as a weighted average of the quarterly growth projections where weights are the share of respective quarterly GDP in the annual GDP in the previous year. These nowcasts for the two specifications are presented in Table 3.

Table 3 Projection of GDP growth rates for Q2-Q4: 2021-22 and FY 2021-22

Period	Quarterly y-o-y GDP growth (Actual)	Quarterly y-o-y GDP growth (Projection from Specification I)	Quarterly y-o-y GDP growth (Projection from Specification II)
Q1: 2021-22	20.13		
Q2: 2021-22	8.4	8.74	9.79
Q3: 2021-22		7.03	6.62
Q4: 2021-22		6.46	5.93
FY: 2021-22		9.89	9.88

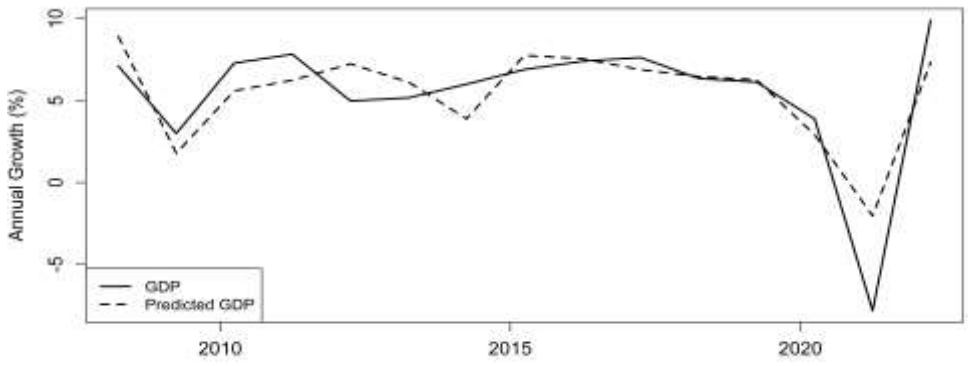
Source: Authors' estimates

The nowcast for 2021-22:Q2 based on the two specifications lies in the range of 8.7 per cent to 9.8 per cent. The nowcast for the year 2021-22 using either specification is 9.9 per cent.

V. GDP growth forecast for 2022-23

Projections based on monthly frequency data cannot be extended till the end of 2022-23 to forecast growth for 2022-23. Accordingly, to obtain the growth projection for 2022-23, we have applied the indicators used for Specification I to re-estimate the model with annual frequency data as in the original Bhattacharya, Chakravarti, Mundle (2019) model. The indicators are available with annual frequency till 2020-21. We have obtained their values for 2021-22 by forecasting monthly indicators till March 2022 and annualizing them for the financial year 2022-22. The GDP growth nowcast for FY 2021-22 is assumed to be the actual growth rate for 2021-22. We extract the factors from the annual indicators data set and use only the first factor given limited number of observations in annual data. The estimated first factor accounts for 40 per cent of variation for forecasting GDP.

Figure 3: Actual and Predicted Annual GDP Growth (2007-08 to 2021-22)



The forecast is obtained by regressing GDP growth till 2021-22 on the first extracted factor and the GDP growth for the last year. The forecast and actual GDP for the within sample period are presented in Figure 3. We forecast GDP growth for FY 2022-23 at 5.2 with a range of (+-) 0.26 at 95 percent probability.

VI. Concluding remarks

The real GDP growth forecast of 5.2 per cent for 2022-23. Factoring in an inflation rate of 5 per cent, this would translate to a nominal GDP growth rate of 10.2 per cent which is lower than the RBI projection of 12.3-13 percent[7] but slightly higher than the 15th Finance Commission projection of 9.5 percent.[8] However this projection cannot take into account the possible impact of the new South African Covid 19 variant of concern which has just emerged during the last few days. Further, the actual GDP growth outcome for 2022-23 will also be contingent on several other elements which cannot be built into the present set of indicators. In particular we should mention external developments such as global growth and inflation, their impact on our trade balance and net capital inflows, the nature of the monsoon next year, and domestic fiscal and monetary policies that will be perused during FY 2022-23. Thus, the forecast of 5.2 per cent is our present best guess. It may need revision as we obtain more up-to- date information during the course of the next few months.

[7] Reserve Bank of India, Monetary Policy Committee Report, October, 2021.

[8] XV Finance Commission, Finance Commission in Covid Times, Report for 2021-26, October, 2020, Volume I Main Report
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Appendix A

Sector	*Series*	*Source*	*Web link*	*Date of release*	*Notes*
Agriculture	Rainfall	CMIE		1st of every month	Deviation from long period average rainfall is more important determinant of agricultural output than absolute rainfall level
	Domestic Sale of Tractors	Tractors Manufacturers Association	https://www.tmaindia.in/consolidated-monthly-reports-2021.php	Mid-month	Used only in Specification II of FA-TVCR Model
	Production of Rice	Department of Agriculture	https://eands.dacnet.nic.in/	No fixed date	
Industry	IIP (2011-12 base)	CSO, MOSPI	http://mospi.nic.in/iip	12th of every month	Data are published with a two months lag
	IIP (2004-05 base)	CSO, MOSPI	http://mospi.nic.in/iip		Used for Specification I of FA-TVCR Model and DFM
	Production of two wheelers	MoSPI Micro data	http://microdata.gov.in/nada43/index.php/catalog/148	12th of every month	Data are published with a two months lag
	Production of commercial vehicles	MoSPI Micro data	http://microdata.gov.in/nada43/index.php/catalog/148	12th of every month	Data are published with a two months lag
	Passenger car sales	CMIE		11th of every month	Used in DFM and FT-TVCR Model
	Production of Coal	Office of Economic Adviser	https://eaindustry.nic.in/	30th of every month	Used only in Specification II of FA-TVCR Model
	Production of Crude Oil	Office of Economic Adviser	https://eaindustry.nic.in/		”
	Production of Cement	Office of Economic Adviser	https://eaindustry.nic.in/		”
	Consumption of Steel	CMIE		Mid-month	”
	Electricity Generation	CMIE		End-of-month	”
	Imports of oil (Rs.)	Press release of Ministry of Commerce and Industry	https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1704910	15th of a month	Used in DFM and FT-TVCR Model
Services	Total Telephone Subscribers	Telephone Regulatory Authority of India	https://trai.gov.in/release-publication/reports/telecom-subscriptions-reports	No fixed date	Published with 2 months lag Used only in Specification II of FA-TVCR Model
	Foreign tourists arrival in India	Ministry of Tourism Press Release	https://tourism.gov.in/market-research-and-statistics	No fixed date	Used for Specification I of FA-TVCR Model and DFM
	Cargo handled at major sea ports	Ministry of Ports, Shipping and Waterways	http://www.ipa.nic.in/	1st week of every month	Used in DFM and FT-TVCR Model
	Cargo handled at airports ('000 tonnes)	CMIE		Third week of every month	Used only in Specification II of FA-TVCR Model
	Number of air travel passengers (lakh)	CMIE		Third week of every month	Used only in Specification II of FA-TVCR Model
	Number of rail travel passengers (millions)	CMIE		First week of every month	Used only in Specification II of FA-TVCR Model
	Cargo handled at railways ('000 tonnes)	CMIE		First week of every month	Used only in Specification II of FA-TVCR Model

	Average Daily Turnover at NSE	National Stock Exchange	https://www1.nseindia.com/products/content/equities/equities/historical_equity_businessgrowth.htm	Weekly	Used in DFM and FT-TVCR Model
Prices	CPI-IW (2001 base)	Labour Bureau/	http://labourbureau.gov.in/LBO_indexes.htm	Last week of every month	Used for Specification I of FA-TVCR Model and DFM
	CPI-IW (2016 base)	Labour Bureau/CMIE	http://labourbureau.gov.in/LBO_indexes.htm		Used for Specification I of FA-TVCR Model and DFM
	CPI (base 2011-12)	CSO, MOSPI	http://164.100.34.62:8080/Default1.aspx	12th of every month	Used in DFM and FT-TVCR Model
External Sector	Exports of goods (Rs crore)	Department of Commerce, Ministry of Commerce & Industry	https://commerce.gov.in/trade-statistics/	15th of every month	Used for Specification I of FA-TVCR Model and DFM
	Imports of non-oil goods (Rs crore)	”	”	”	”
	Exports of Goods and Services (Rs. crore)	”	”	”	Used only in Specification II of FA-TVCR Model
	Imports of non-oil goods and Services (Rs. crore)	”	”	”	”
Fiscal Indicators	Net tax revenue (Rs crore)	Controller General of Accounts	http://www.cga.nic.in/	30th of every month	
	Revenue Expenditure Net of Interest Payments (Rs crore)				
	GST Collection (Rs crore)	PIB, Ministry of Finance	https://pib.gov.in/SearchResults.aspx?q=GST&cx=003919640075425102515%3a4lg1hrnhj_k&cof=FORID%3a9#gsc.tab=0&gsc.q=GST&gsc.page=1	1st of every month	Backcast as proxy for indirect taxes Used in DFM and FT-TVCR Model
Monetary Indicators	Food Credit (Rs crore)	RBI Weekly Statistical Supplement	https://rbi.org.in/scripts/BS_ViewWSS.aspx	2nd Friday of a month	Used in DFM and FT-TVCR Model
	Non-food Credit (Rs crore)	”	”	”	”
	Aggregate Bank Deposits (Rs crore)	”	”	”	”
Energy Demand	Electricity Requirements	CMIE		Daily	Used in DFM and FT-TVCR Model

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