Inflation in India

Infosphere

A Centre for New Economics Studies Initiative

Hemang Sharma, Aniruddh Bhaskaran, Soumya Marri, Anushka Chib and Malhaar Kasodekar

Retail inflation eases to 6.71% in July, stays a[...]
tolerance band

The downward trend in retail inflation can be attributed to pri[...]
ranging from 0.4 percent to 6.4 percent. Apart from oil, the de[...]
prices is also responsible for bringing down the inflation rate.
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Joe Biden hails data showing US inflation 'b[...]
moderate'

US President Joe Biden was speaking at the White House shor[...]
data showed the consumer price index was unchanged compa[...]
annual inflation rate slowed to 8.5 percent from a four-decade [...]
seeing a stronger labor market where jobs are booming and Am[...]
and we are seeing signs that inflation may be beginning to mo[...]
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US inflation slips from 40-year peak but rem[...]

Still, prices are spiking across a wide range of goods and servic[...]
Americans worse off. Average paychecks are rising faster than t[...]
but not fast enough to keep up with accelerating costs for such[...]
autos and medical services.
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WORLD
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COLOMBO, JULY
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Sri Lankan rupees are seen in a bowl at a vegetable[...]
Photo Credit: Reuters

India's food inflation likely to top 9% in second half of 2022, according to Nomura

By Ankit Saproo, ET Online • Last Updated: Jun 21, 2022, 11:47 AM IST

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Synopsis
The report sees food inflation surging in the second half of the year in Asia with major food importers like Singapore bearing the brunt of higher prices of staples.

Agencies

India's **food inflation** is likely to top 9 per cent in the second half of 2022 on the back of higher feedstock costs and uptick in minimum support prices according to a **Nomura** report.

The food inflation will average over 8 per cent year-on-year in 2022 from 3.7% in 2021, the report stated.

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Food prices soaring in developing world amid Ukraine crisis, World Bank finds

Lebanon is worst-hit by food inflation after food grain store explosion in Beirut in 2020

UK inflation could hit 18 percent next year[...] Citi forecasts

US bank Citi raises its UK consumer price forecast in the light of the latest jump in energy prices.

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European inflation hits 25-year high, driven by energy spike

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📷 The cargo ship Razoni leaves the Ukrainian port of Odesa carrying 26,000 tons of corn destined for Lebanon. Photograph: Turkish Defence Ministry Handout/EPA

Fed's Bullard: Rates will need to be 'higher for longer' if inflation does not recede

Reuters • Last Updated: Aug 03, 2022, 09:11 AM IST

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Synopsis
Bullard, in response to questions at an event in New York, also said he expects growth in the second half of this year to pick up from the first half, which featured contractions in overall output in both the first and second quarters.

If **inflation** does not respond to the Federal

Reuters

US inflation reached a new 40-year 9.1%

By By CHRISTOPHER RUGABER, AP • Last Updated: Jul 13, 2022, 06:17 PM IST

Synopsis
Inflation to a new four-decade peak in June, further pressuring households and likely sealing the case for another large interest rate hike by the Federal Reserve, with higher borrowing costs to follow. Consumer prices soared 9.1% compared with a year earlier, the government said Wednesday, the biggest 12-month increase since 1981, and up from an 8.6% jump in May.

AP

Surging prices for gas, food and rent catapulted U.S. inflation to a new four-decade peak in June, further pressuring households and likely sealing the case for another large interest rate hike by the **Federal Reserve**, with higher borrowing costs to follow.

Federal Reserve Chairman Jerome Powell attends

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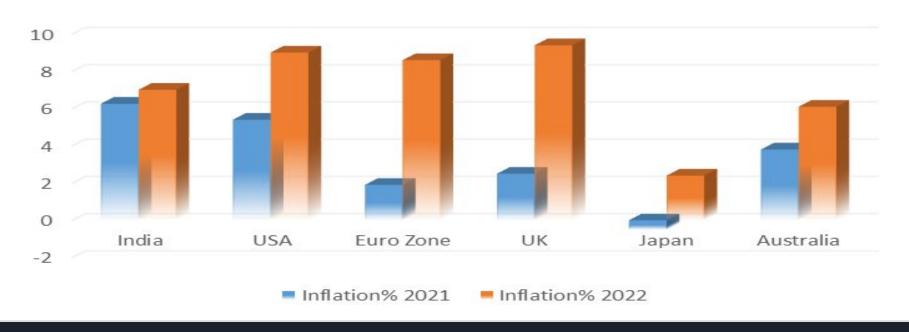   is cheating: Wipro's Rishad

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Shaktikanta Das: Inflation risks from rise in global commodity prices

The renewed surge in international crude oil prices will require close monitoring as they pose a risk to domestic inflation, said the Reserve Bank of India Governor Shaktikanta Das as per the minutes of the meeting of the Monetary Policy Committee (MPC) released on Thursday. "We need to remain watchful of the risks to domestic [...]

Introduction to Inflation

- Inflation is skyrocketing in all economies around the world, with food and energy prices on an unprecedented increase.
- Even developed countries with decades of stable inflation rates are having trouble keeping it under control.
- India reported 7.01 percent CPI inflation in June 2022, 9.1 percent in USA, 78.6 percent in Turkey, 11.9 percent in Brazil, 8.6 percent in Euro Zone and 9.4 percent in UK.
- COVID-19 and Russia Ukraine war are the biggest factor driving up the inflation rate; Russia- Ukraine together contribute 25% of wheat exports
- Food price inflation in India has increased from 0.68% to 8.38% between September 2021 and April 2022
- Issue briefs:
    - 1) Food Inflation and supply side factors
    - 2) Demand pull factors in current inflation trends.
    - 3) India's performance against other developed nations.

INFLATION TRENDS

Source: Infosphere

❏   India reported 0.75% Increase in inflation, 3.6% increase in USA, 6.7% increase in Euro Zone, 6.9% increase in UK, 2.9% increase in Japan, 2.3% increase in Australia

Supply Side Factors

Supply Side factors

- Supply side factors are usually exogenous in nature. To assess the impact of such factors on inflation, we have used climatic variables.
- Rainfall: Rainfall plays a very important role in determining the rate at which the crop is growing, the crop output and the soil health.
- Temperature: There are variety of crops which depend on specific temperature and failing to have that temperature would not give a good crop output.
- To assess the relationship between these factors and food inflation, we used regression analysis.

	Year	Food_Inflation	Rainfall	Temperature
0	2012	11.07	837.1	27.71
1	2013	12.09	943.4	27.46
2	2014	6.36	781.0	27.88
3	2015	4.88	758.2	27.73
4	2016	4.23	865.5	28.44
5	2017	1.80	845.7	28.50
6	2018	0.14	804.0	28.28
7	2019	6.71	970.8	28.60
8	2020	7.69	959.3	28.00
9	2021	3.76	872.3	28.00

Source: Infosphere
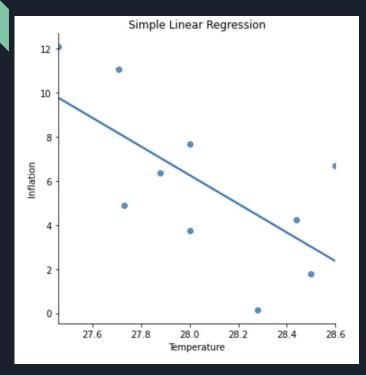
Regression Analysis


```
                        OLS Regression Results
================================================================
Dep. Variable:         Food_Inflation    R-squared:              0.733
Model:                            OLS    Adj. R-squared:         0.657
Method:                 Least Squares    F-statistic:            9.627
Date:              Wed, 24 Aug 2022    Prob (F-statistic):    0.00979
Time:                      15:10:27    Log-Likelihood:        -20.308
No. Observations:                10    AIC:                    46.62
Df Residuals:                     7    BIC:                    47.52
Df Model:                         2
Covariance Type:          nonrobust
================================================================
                 coef    std err        t    P>|t|    [0.025    0.975]
----------------------------------------------------------------
Intercept     189.7184    54.056    3.510    0.010    61.897   317.540
Rainfall        0.0281     0.010    2.801    0.027     0.004     0.052
Temperature    -7.4169     1.953   -3.797    0.007   -12.036    -2.798
================================================================
Omnibus:                      0.207    Durbin-Watson:          1.810
Prob(Omnibus):                0.902    Jarque-Bera (JB):       0.380
Skew:                         0.155    Prob(JB):               0.827
Kurtosis:                     2.097    Cond. No.             6.73e+04
================================================================
```
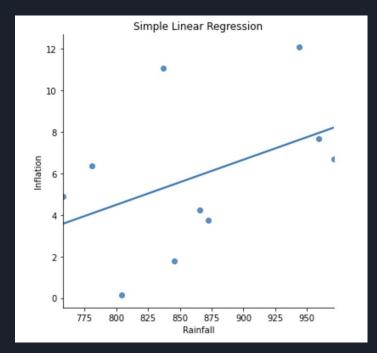
Source: Infosphere

❏ Food Inflation - dependent variable; Rainfall and temperature - independent variables.

❏ Negative relationship between food inflation and temperature.

❏ Result is significant at 1% significance level (since the p-value is less than 0.01)

❏ The coefficient of temperature means that with an increase in temperature of 1 degree would reduce the inflation by 7.4169%.

❏ Limitation: There could be an omitted variable bias which could slightly affect the model.

❏ The purpose of this regression analysis was to look at the relationship from a more macro level.

Regression Visualisation

Y: Food Inflation, X: Temperature

Y: Food Inflation, X: Rainfall

More Indicators

Wholesale Price Index : It is the price of the representative basket of wholesale goods.

Consumer Food Price Index: It is the measure of change in retail prices of food items consumed in the country.

	YEAR	Temperature	Rainfall	WBInflation	CFPI	InfCFPI	WPI	InfWPI	FoodgrainsIndex	CFPI_CerealsProducts_Index	Inf_CFPI_CerealsProducts	InfFGI	CMRainfall
0	2010	27.50	911.6	11.989390	96.516667	6.344688	108.211111	5.252351	114.30	NaN	NaN	3.903939	91.16
1	2011	27.54	911.1	8.911793	102.275000	5.966154	113.611111	4.990245	119.50	NaN	NaN	0.045494	91.11
2	2012	27.71	837.1	9.478997	103.400000	1.099976	115.100000	1.310513	119.40	103.8	NaN	-0.000837	83.71
3	2013	27.46	943.4	10.017878	115.900000	12.100000	124.500000	8.200000	123.30	116.6	(12.3)	0.032663	94.34
4	2014	27.88	781.0	6.665657	123.200000	6.400000	128.400000	3.100000	115.90	122.6	(5.2)	-0.060016	78.10
5	2015	27.73	758.2	4.906973	129.200000	4.900000	137.300000	6.900000	115.70	124.9	(1.8)	-0.001726	75.82
6	2016	28.44	865.5	4.948216	129.200000	0.000000	152.000000	10.700000	131.10	130.2	(4.2)	0.133103	86.55
7	2017	28.50	845.7	3.328173	137.100000	6.100000	142.600000	-6.200000	136.80	134.7	(3.5)	0.043478	84.57
8	2018	28.28	804.0	3.938826	137.300000	0.100000	146.700000	2.900000	134.40	137.5	(2.1)	-0.017544	80.40
9	2019	28.60	970.8	3.729506	146.500000	6.700000	159.600000	8.800000	139.80	141.4	(2.8)	0.040179	97.08
10	2020	28.00	959.3	6.623437	157.800000	7.700000	159.300000	-0.200000	141.00	146.8	(3.8)	0.008584	95.93
11	2021	28.00	872.3	5.131407	159.858333	1.304394	167.611111	5.217270	142.94	NaN	NaN	0.013759	87.23

Source: Infosphere

Regression analysis of the indicators
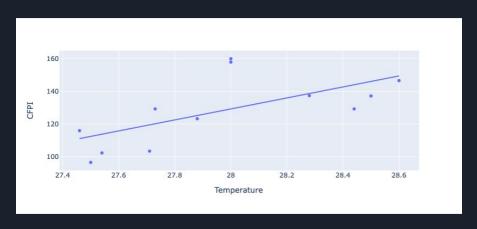
OLS Regression Results

Dep. Variable:	CFPI	R-squared:	0.429
Model:	OLS	Adj. R-squared:	0.302
Method:	Least Squares	F-statistic:	3.377
Date:	Fri, 19 Aug 2022	Prob (F-statistic):	0.0805
Time:	13:53:00	Log-Likelihood:	-49.673
No. Observations:	12	AIC:	105.3
Df Residuals:	9	BIC:	106.8
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-838.3333	372.086	-2.253	0.051	-1680.050	3.384
Temperature	33.6111	13.086	2.568	0.030	4.008	63.214
CMRainfall	0.3031	0.759	0.399	0.699	-1.414	2.020

Omnibus:	2.196	Durbin-Watson:	0.872
Prob(Omnibus):	0.334	Jarque-Bera (JB):	1.452
Skew:	0.809	Prob(JB):	0.484
Kurtosis:	2.463	Cond. No.	6.75e+03

OLS Regression Results

Dep. Variable:	WPI	R-squared:	0.557
Model:	OLS	Adj. R-squared:	0.458
Method:	Least Squares	F-statistic:	5.651
Date:	Fri, 19 Aug 2022	Prob (F-statistic):	0.0257
Time:	13:46:40	Log-Likelihood:	-47.534
No. Observations:	12	AIC:	101.1
Df Residuals:	9	BIC:	102.5
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-908.5390	311.345	-2.918	0.017	-1612.850	-204.228
Temperature	36.3212	10.950	3.317	0.009	11.551	61.092
CMRainfall	0.3504	0.635	0.552	0.595	-1.086	1.787

Omnibus:	2.962	Durbin-Watson:	0.852
Prob(Omnibus):	0.227	Jarque-Bera (JB):	1.610
Skew:	0.893	Prob(JB):	0.447
Kurtosis:	2.823	Cond. No.	6.75e+03

Source: Infosphere

- The <u>p-value of temperature</u> in both analysis is less than 0.05, which suggests that they are significant at 5% level.
- Safe to conclude that exogenous climatic variables significantly affect food inflation.
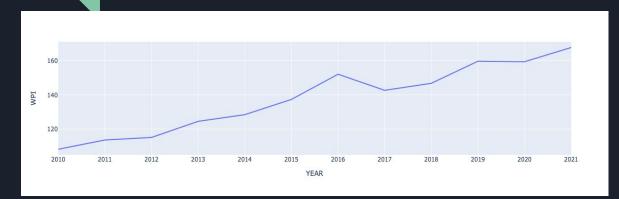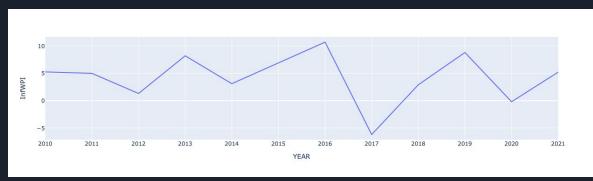
Regression Visualization

The line of best fit on both graphs show that temperature has a positive relationship with both-CFPI and WPI.
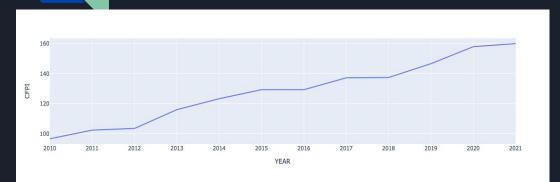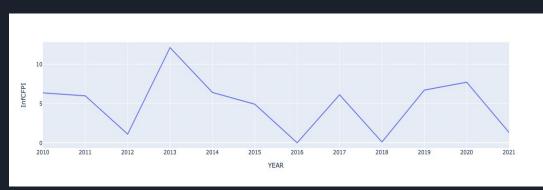
Checking for Stationarity (1)

- ❏ Used Augmented Dickey-Fuller (ADF) test to check for Stationarity.
- ❏ Stationarity means the statistical properties of a time series data does not change over time.
- ❏ The WPI data exhibits a relatively predictable upward trend over time, while the WPI inflation data does not exhibit such a trend.
- ❏ Over time the WPI inflation seems to be relatively stationary. We can confirm this using the ADF test.

Source: Infosphere

Checking for Stationarity (2)

Source: Infosphere
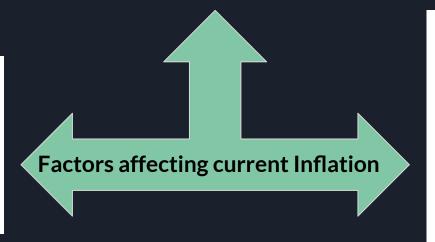
- In the ADF test , null hypothesis is that the series is non-stationary, and the alternative hypothesis is that the series is stationary.
- The p-value of the ADF test on the WPI time-series is roughly 0.38. **As 0.38>0.05,** we cannot reject the null hypothesis – the series is therefore **non-stationary.**
- The p-value of the ADF test on the WPI inflation time-series is roughly 0.0014. As **0.0014<0.05** – the series is **stationary**.
- Both statistical tests agree with our intuitions based on the plots in the previous slide. We should therefore use WPI as the dependent variable.
- We see the same trends in the CFPI data as well. By an analogous argument, we also use CFPI as a dependent variable.

Russia's Invasion of Ukraine. In the months of February and March, the UN's Food and Agriculture Organization (FAO) reported a price increase of 12.6% in globally traded food commodities.

Trade sanctions on Russia spirals up the crude oil prices. They spill over commodity prices as oil in itself is an integral part of the supply chains.
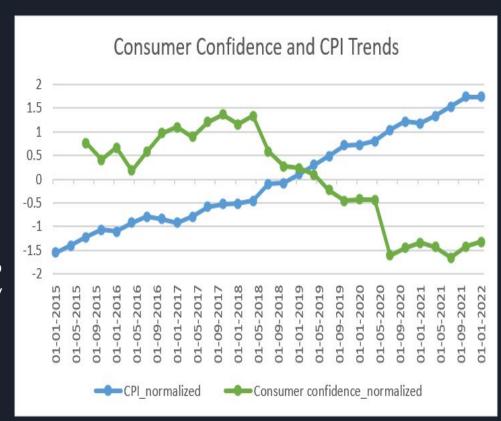
Factors affecting current Inflation

Inefficient international trade. The pandemic introduced the Container Crisis to the world. Owing to a combination of port congestion, slow circulatory movement, and high shipping rates, the supply chains are expected to stay disrupted well into 2022.

❏ Disruption to global supply is such manner is driving up the costs of production, resulting in Cost-Push Inflation

Demand Side factors

- Consumer Confidence is household demand for non-essential goods.
- It is used as a proxy for consumer demand.
- Both CPI and Consumer Confidence data has been normalised
- From 2018, consumer confidence has been gradually declining.
- In 2020, consumer confidence took a sudden dip to onset of the pandemic while CPI consistently increased.
- We ran regression analysis with CPI as dependent variable while consumer confidence as independent variable.
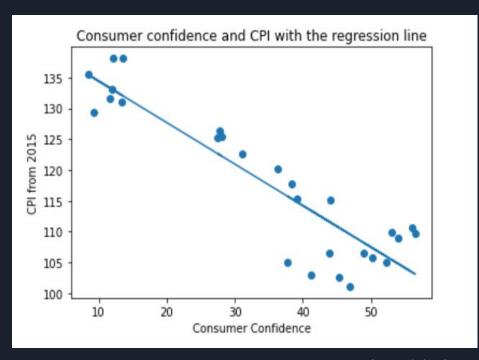

Consumer Confidence and CPI Trends

CPI_normalized   Consumer confidence_normalized

Source: Infosphere

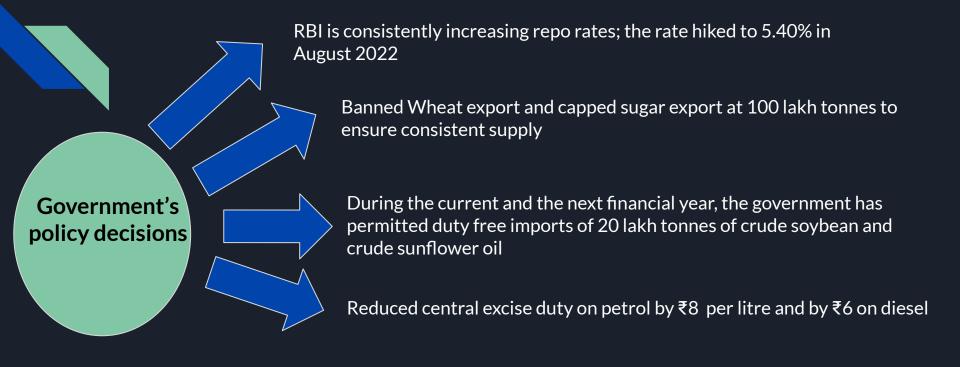|	coef	std err	t	P>|t|	[0.025	0.975]
const	97.4634	6.659	14.637	0.000	83.721	111.206
Private Consumption (Total)	1.213e-12	1.8e-13	6.727	0.000	8.41e-13	1.58e-12
Consumer confidence	-0.3842	0.058	-6.672	0.000	-0.503	-0.265

- ❏ The results of the regression showed that consumer confidence and CPI were negatively related
- ❏ The results were statistically significant at the 1% level as the p value was less than critical p for 1% level of significance (0.01)
- ❏ While this shows a strong relationship between consumer confidence and CPI, it does not approximate the direction of the relationship (CPI could be affecting confidence and not vice versa).

Note: The initial regression was done with private consumption, as this captures the monetary aspect of demand while consumer confidence captures behaviour. But private consumption has not been included in the final analysis as the relationship with CPI is quite weak, although significant. The complete table can be found in the appendix.
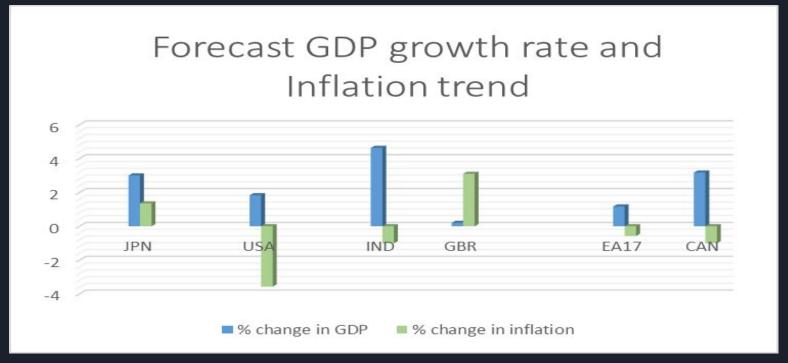
- ❏ Negative relation between consumer confidence and CPI
- ❏ However, Consumer confidence has been declining from 2018, where as inflation promptly rose in the last year only
- ❏ We can assume that demand didn't play significant role in current inflation trends

Consumer confidence and CPI with the regression line

Government's policy decisions

RBI is consistently increasing repo rates; the rate hiked to 5.40% in August 2022

Banned Wheat export and capped sugar export at 100 lakh tonnes to ensure consistent supply

During the current and the next financial year, the government has permitted duty free imports of 20 lakh tonnes of crude soybean and crude sunflower oil

Reduced central excise duty on petrol by ₹8 per litre and by ₹6 on diesel

❏ Nirmala Sitharaman told the parliament that the centre is not in denial about inflation in India and Indian economy is in better situation than developed economies

India against rest of the world

Forecast GDP growth rate and Inflation trend

Source: Infosphere

❏ Comparing forecast increase in gdp growth rate and inflation in 2022 Q1 with 2023 Q1.
❏ India and USA has the biggest positive difference, suggesting that they will perform better than other countries

Conclusion

- ❏ The inflation hike is supply driven, not demand pulled.
- ❏ Variables driving up inflation are exogenous, they cannot be significantly influenced by the governments.
- ❏ Contractionary monetary and fiscal policies could provide some cushion against the inflation.
- ❏ By 2023 Q1, inflation rate in most developed countries is expected to fall, hinting at a tentative timeline for inflationary pressures to relax around the world.
- ❏ India is and will be performing better than other developed nations

For any inputs, suggestions or clarifications, please contact us at cnesinfosphere@gmail.com

Thank you!

Appendix

Regression Analysis table for consumer confidence and CPI

```
                        OLS Regression Results
==============================================================================
Dep. Variable:     CPI (with base year as 2015)  R-squared:              0.937
Model:                                     OLS   Adj. R-squared:         0.931
Method:                          Least Squares   F-statistic:            177.2
Date:                         Thu, 18 Aug 2022   Prob (F-statistic):  4.24e-15
Time:                                 10:42:53   Log-Likelihood:       -67.917
No. Observations:                           27   AIC:                    141.8
Df Residuals:                               24   BIC:                    145.7
Df Model:                                    2
Covariance Type:                     nonrobust
==============================================================================
                              coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const                      97.4634      6.659     14.637      0.000      83.721     111.206
Private Consumption (Total) 1.213e-12   1.8e-13      6.727      0.000     8.41e-13    1.58e-12
Consumer confidence        -0.3842      0.058     -6.672      0.000      -0.503      -0.265
==============================================================================
Omnibus:                    23.016   Durbin-Watson:                   1.519
Prob(Omnibus):               0.000   Jarque-Bera (JB):               38.153
Skew:                        1.805   Prob(JB):                     5.19e-09
Kurtosis:                    7.570   Cond. No.                     3.07e+14
==============================================================================
```

ADF test results


```
ADF Test – WPI

Test Statistic              -1.798912
p-value                      0.381002
#Lags Used                   4.000000
Number of Observations Used  7.000000
Critical Value (1%)         -4.938690
Critical Value (5%)         -3.477583
Critical Value (10%)        -2.843868
dtype: float64
```

Results of ADF Test for WPI time-series


```
ADF Test – WPI Inflation

Test Statistic              -3.997589
p-value                      0.001423
#Lags Used                   1.000000
Number of Observations Used 10.000000
Critical Value (1%)         -4.331573
Critical Value (5%)         -3.232950
Critical Value (10%)        -2.748700
dtype: float64
```

Results of ADF Test for WPI inflation time-series