SAMVAD: SIBM Pune Research Journal, *Vol XVII, 17-22, June 2019*
ISSN (Print) : 2249-1880
ISSN (Online) : 2348-5329

GST Reform and its Economic Impact - A VAR Perspective

Ashwin Randolph John[1*] and Vijaykumar Dhannur[2]

[1]Assistant Professor, Acharya Bangalore B-School, Bengaluru, India; ashwinjohn2000@gmail.com
[2]Assistant Professor, Visvesvaraya Technological University, Belagavi, India; vijaykumar.d@vtu.ac.in

Abstract

The tax reforms in the year 2017 spearheaded by the introduction of the GST (Goods and Services Tax) was witnessed to mixed reactions. Some saw it as a welcome tax reform that would bring all the goods and services under one umbrella, one tax. Others criticized the central government contending that the GST would hamper economic growth and would prove to be detrimental. The paper has the objective of analyzing the impact on the economy pre and post implementation of GST. The proxies used to represent the economy are IIP (Index of Industrial Production) and Nifty_Serv (Nifty Services Sector Index). The EPU Index of India (constructed by Baker, Bloom and Davis since 2012) is used to indicate the uncertainty in the economy pre and post GST implementation. The IRF analysis is carried out after constructing a VAR (Vector Auto Regression) model taking all the variables – EPU index, IIP and Nifty_Serv as endogenous. Certain other macroeconomic variables like interest rate, WPI inflation and GDP are taken as exogenous to the model. The relationship between Economic Policy Uncertainty (EPU) and IIP and the Nifty_Serv are shown by Impulse Response Function (IRF). The IRF Analysis showed a lagged negative response of the Nifty_Serv to shocks from EPU. However, the IIP, a proxy for the manufacturing sector did not show marked response to shocks from EPU. We conclude that policy uncertainty (in this case primarily GST related) had a certain adverse influence on the service sector (Nifty_Serv) but no significant impact on the manufacturing sector.

Keywords: Impulse Response Function, Index of Industrial Production, Inflation, Interest Rate, Macroeconomics, Services Sector, Tax Reforms, Vector Auto Regression, GST

1. Introduction

The GST reform had the intention of bringing India under a single tax net and thereby ending market distortions. As per Jamie Dimon, the CEO of JP Morgan which employs around 34,000 people in India, India's economy grew at the highest rate amongst all the major economies, at 8.2% in the June 2018 quarter. Also, the economy is poised to grow at 7-7.5% as per a CSO (Central Statistical Organisation, India) in FY 2018-19. In terms of size, India has overtaken France this year and is set to overtake Britain in the next to become the fifth largest economy as per a report in The Hindu dated August 30, 2018. The tax reforms and the new bankruptcy code could go a long way to give a much-needed thrust to the economy.

As per a report by Bloomberg Quint, the government collected nearly 80% of the budgeted tax indirect taxes until November 30, 2017 and by April 2018, the GST collections were above average at 94,016 Cr higher than the average of Rs. 89,885 Cr a month in 2017-18. This has been related to the increased compliance post GST launch.

Given these facts, it would be apt to analyse the impact of the uncertainty environment pre and post GST on the economy. The proxies used to represent the economy are IIP (Index of Industrial Production) and Nifty_Serv (Nifty Services Sector Index). The EPU Index of India (constructed by Baker, Bloom and Davis since 2012) is used to indicate the uncertainty in the economy pre and post GST implementation. It is assumed that most of the

**Author for correspondence*

uncertainty in the period considered can be ascribed to the tax reform planned amidst other factors.

The literature on policy uncertainty is brimming with research that shows how policy uncertainty adversely impacts the economy and investment. Bernanke (1983) argues that in cases where investment is irreversible, it pays to defer investment until the uncertainty around policy clears. This has a depressing effect on investment and explains the short-term investment fluctuations associated with the business cycle. Aizenman and Marion (1991) studied the correlation between policy uncertainty and per capita real GDP for 46 developing countries over the 1970-85 period. Their analysis revealed that policy uncertainty and growth are correlated. Hermes and Lensink (2001) studied the relationship between capital flight and policy uncertainty with reference to the issue of voluminous capital flight from the less developed countries since the early 1980s. They conclude that policy uncertainty does affect capital flight and can be attributed to taxation policies. Bachmann, Elstner and Sims (2010) argue that uncertainty accompanies bad economic times and both run simultaneously. Here they ascribe uncertainty to the adverse economic circumstances. Handley and Limao (2012) state that policy uncertainty can significantly affect firm level investment and entry decisions in the context of international trade. Bhagat, Ghosh and Ranjan (2013) conclude, as per their study, that the Indian GDP and fixed investment are negatively related to EPU in India. Anand and Tulin (2014) have studied the causes for the investment slowdown in India until 2013-14. They state that interest rates have had a lesser role to play in investment slowdown. They find that increased policy uncertainty and weak business confidence has had a substantial impact on the new investments. All the above stated literature underlines the importance of a stable policy climate to bolster economic growth and sustenance and the taxation policy/ reforms play a crucial role in business decisions especially the ones involving investment. This paper adds to the existing literature that have analysed policy uncertainty impacts on the economy.

Vij (2018) explains the various shortcomings of GST implementation. However, there is no empirical analysis of GST and the economy. Shukla and Kushare (2017) present a critical analysis of GST and suggest the need for simplifying the processes and tax structures. Singh (2017) states that GST could be a great step towards tax reforms in India and its implementation would provide relief to producers and consumers. However, these claims are not substantiated. Chauhan et al. (2019) have found, using non-parametric tests on sectoral indices, that implementation of GST affected different sectors of the Indian economy. Samantara (2018) deliberates on the positives of GST from the macroeconomic perspective.

However, there is no relevant literature that has empirically studied the impact of GST on the Indian economy using econometric tools. The services sector contributes the most to the Indian GDP followed by the manufacturing sector. Given their respective importance, a study into their interactions with policy uncertainty and the impact of changing tax regimes is called for.

The IRF analysis is carried out after constructing a VAR (Vector Auto Regression) model taking all the variables – EPU index, IIP and Nifty_Serv as endogenous. Certain other macroeconomic variables like Int (interest rate), WPI inflation and GDP (at factor cost) are taken as exogenous to the model. The VAR model is effective in studying inter-relationships among variables as the variables are treated as endogenous to the system.

2. Data and Methodology

The monthly data used for the analysis spans the time range from March 2016 until June 2018. This is keeping in mind that the GST was launched on July 1, 2017 and the Model GST Law was placed in the public domain on June 14, 2016. EPU index data is sourced from www.policyuncertainty.com. IIP, Repo Rate (used as a proxy for Interest rate), GDP (at factor cost), WPI data is sourced from the Database of Indian Economy available in the RBI website. Nifty_Serv is sourced from the NSE website.

The VAR methodology has been used in this paper with the three endogenous variables – EPU, IIP and Nifty_Serv and three exogenous variables – Int, WPI and GDP. IIP and Nifty_Serv are used as proxies for the manufacturing and services sector respectively. The IIP has shown to mirror the state of the manufacturing sector as a whole in terms of the volumes and revenues generated. Nifty_Serv (Nifty Services Sector Index) reflects the sentiments towards the services sector and the underlying pulse. The intent is to study the responses of these two endogenous variables to the shocks from the EPU index. The advantage of using VAR is that the model treats the variables identified as endogenous having inter-relationships between the residuals shown by the variance covariance matrix. This advantage is further extended

when such inter relationships are analysed with IRF Analysis.

The optimal lag for the VAR model has been selected based on the output from R program using the Schwarz's Information criterion (SC), Akaike Information Criterion (AIC) and Hannan-Quin Information criterion (HQ). All the three tests suggested four lags to be used as optimal.

The equations in the VAR model would be as follows with a lag order of four. Each lag represents a month.

EPU = EPU.l1 + IIP.l1 + Nifty_Serv.l1 + EPU.l2 + IIP.l2 + Nifty_Serv.l2 + EPU.l3 + IIP.l3 + Nifty_Serv.l3 + EPU.l4 + IIP.l4 + Nifty_Serv.l4 + const + WPI + GDP + Int

IIP = EPU.l1 + IIP.l1 + Nifty_Serv.l1 + EPU.l2 + IIP.l2 + Nifty_Serv.l2 + EPU.l3 + IIP.l3 + Nifty_Serv.l3 + EPU.l4 + IIP.l4 + Nifty_Serv.l4 + const + WPI + GDP + Int

Nifty_Serv = EPU.l1 + IIP.l1 + Nifty_Serv.l1 + EPU.l2 + IIP.l2 + Nifty_Serv.l2 + EPU.l3 + IIP.l3 + Nifty_Serv.l3 + EPU.l4 + IIP.l4 + Nifty_Serv.l4 + const + WPI + GDP + Int

As seen in the above equations, the endogenous variables are regressed onto each other and their lags, whereas the exogenous variables – WPI, GDP and Int (Repo Rate) appear as independent variables. The variables are tested for stationarity using the Augmented Dickey Fuller test, the results of which are stated in the Analysis and Results section.

If the VAR model so developed has co-efficient entering significantly, then we proceed with the VAR. If not, then a restricted VAR model is estimated excluding the insignificant coefficients. In either case, the model is tested using the diagnostic tests – ARCH test (to check for effects of heteroscedasticity), Serial Test (to check for serial correlation among the error terms) and the Jarque-Bera Normality test to test the stability of the model.

Upon clearing the diagnostic tests, the VAR model is used to generate orthogonal Impulse Response Functions (IRF). The IRF Analysis is an improvement over Forecast Error Impulse Response (FEIR) Analysis which does not assess the contemporaneous reactions of variables unlike the IRF Analysis. IRF Analysis can describe the evolution of VAR model variables in reaction to a shock to one or more variables.

The Impulse Response Function (IRF) analysis traces out the response of the dependent variable (in this case IIP and Nifty_Serv) to shocks in the EPU index values. This helps to better understand the directional relationship between the impulse and the shock variables. Later, Granger causality tests are carried out to supplement the results of the IRF Analysis.

3. Analysis and Results

Before proceeding with VAR model development, the variables were checked for the condition of stationarity. The variables that were not stationary were differenced and made stationary. The Augmented Dickey Fuller test of stationarity was used for this procedure and the results are below in (Table 1):

Table 1. Augmented dickey-fuller test

		Critical Values				
Variable	T-statistic	1%	5%	10%	H0	Conclusion
EPU	-6.6506	-3.58	-2.93	-2.6	The series is non-stationary	reject null at 1% significance level
IIP	-3.649	-3.58	-2.93	-2.6	The series is non-stationary	reject null at 1% significance level
Nifty_Serv	-5.2833	-3.58	-2.93	-2.6	The series is non-stationary	reject null at 1% significance level
Int	-4.2622	-3.58	-2.93	-2.6	The series is non-stationary	reject null at 1% significance level
WPI	-4.0702	-3.58	-2.93	-2.6	The series is non-stationary	reject null at 1% significance level
GDP	-8.1661	-3.58	-2.93	-2.6	The series is non-stationary	reject null at 1% significance level

Later, the VAR model was estimated with the below co-efficients for the dependent variables – IIP and Nfty_Serv as seen in (Table 2):

Table 2. VAR estimation results

Estimation results for equation IIP:

	Estimate	Std. Error	t value	Pr(>|t|)
EPU.l1	0.135064	0.056474	2.392	0.0481*
IIP.l1	-1.01679	0.366262	-2.776	0.0275*
Nifty_Serv.l1	0.004068	0.005205	0.781	0.4602
EPU.l2	-0.02318	0.07944	-0.292	0.7789
IIP.l2	-0.57057	0.51352	-1.111	0.3032
Nifty_Serv.l2	0.001586	0.005125	0.309	0.766
EPU.l3	0.059155	0.059116	1.001	0.3503
IIP.l3	0.144056	0.534281	0.27	0.7952
Nifty_Serv.l3	-0.00518	0.005026	-1.03	0.3372
EPU.l4	0.00639	0.057186	0.112	0.9142
IIP.l4	0.156379	0.323295	0.484	0.6434
Nifty_Serv.l4	0.006631	0.006152	1.078	0.3169
const	1.231706	5.941801	0.207	0.8417
WPI	-0.73332	1.540563	-0.476	0.6486
GDP	-0.003	0.011942	-0.251	0.8089
Int	-9.27737	12.00856	-0.773	0.4651

Estimation results for equation Nifty_Serv:

	Estimate	Std. Error	t value	Pr(>|t|)
EPU.l1	0.72493	3.48659	0.208	0.8412
IIP.l1	-34.9582	22.61206	-1.546	0.166
Nifty_Serv.l1	0.14675	0.32136	0.457	0.6617
EPU.l2	10.77708	4.90444	2.197	0.064
IIP.l2	-51.7541	31.70339	-1.632	0.1466
Nifty_Serv.l2	0.14598	0.31643	0.461	0.6585
EPU.l3	5.7113	3.64968	1.565	0.1616
IIP.l3	-64.8849	32.9851	-1.967	0.0899
Nifty_Serv.l3	0.12095	0.31027	0.39	0.7083
EPU.l4	5.88818	3.5305	1.668	0.1393
IIP.l4	-34.5953	19.95942	-1.733	0.1266
Nifty_Serv.l4	0.08574	0.37984	0.226	0.8279
const	171.9491	366.8313	0.469	0.6535
WPI	-14.6335	95.11037	-0.154	0.8821
GDP	0.43513	0.7373	0.59	0.5736
Int	1126.802	741.3774	1.52	0.1723

As observed from the p-values of the co-efficient above, many of the estimates have not entered significantly. Hence a restricted VAR model was estimated to generate the impulse responses.

Diagnostic tests on the Restricted VAR model were carried out with the following results:

i) ARCH-LM Test:
H0: Homoskedasticity exists

data: Residuals of VAR object restricted_VAR
Chi-squared = 108, df = 180, p-value = 1

As seen above, the p value is 1. Hence the H0 cannot be rejected and the VAR model has no ARCH effects (i.e. the variance of residuals is constant).

ii) Serial Correlation Test:
H0: No Autocorrelation
Portmanteau Test (asymptotic)

data: Residuals of VAR object restricted_VAR
Chi-squared = 99.973, df = 108, p-value = 0.6966

Given the p-value = 0.6966, the H0 cannot be rejected. Hence there is no autocorrelation among the error terms.

iii) Jarque-Bera Normality Test:
H0: Normal Distribution

JB-Test (multivariate)

data: Residuals of VAR object restricted_VAR
Chi-squared = 3.6501, df = 6, p-value = 0.7239

As seen the p value is 0.7239. Hence H0 cannot be rejected. The Restricted VAR model passes the normality test.

Now, the **IRF (Impulse Response Function) Analysis** was done with the below IRF plots:

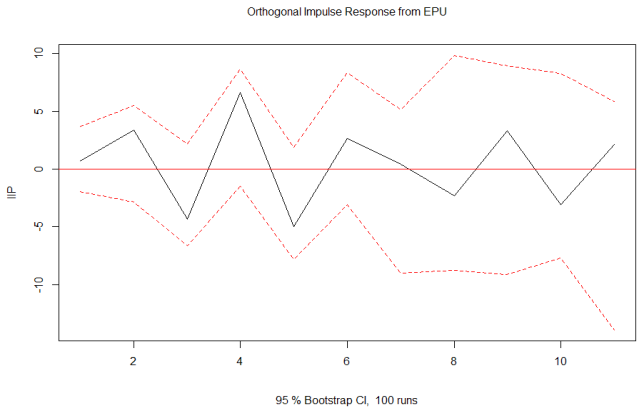

Figure 1. Orthogonal Impulse Response from EPU.

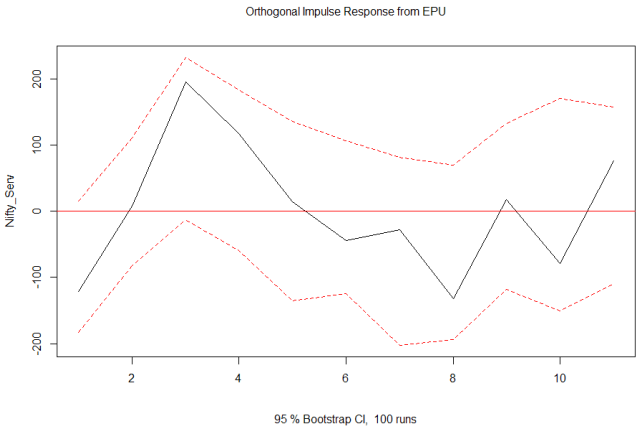

Figure 2. Orthogonal Impulse Response from EPU.

The IRF plots above are orthogonalised as the underlying shocks are less likely to occur in isolation but rather as contemporaneous correlation between the components of the error process of the variables involved.

Figure 1 shows the response of IIP to shocks caused by the innovations (error terms) of EPU. It shows the impact of one unit change in error terms of EPU on IIP. EPU does not impact IIP immediately but with a lag of 2 months and then slides negatively with a lag of 3 months, with an upward response in the 4th month and then again dips. Therefore, there is no clear indication that for the period under consideration, the policy uncertainty is impacting the IIP either positively or negatively.

Figure 2 shows the response of Nifty_Serv to shocks caused by the innovations (error terms) of EPU. It shows the impact of one-unit change in error terms of EPU on Nifty_Serv. There is a negative immediate response of Nifty_Serv which then pushes up after about 3 months and then tapers off and goes negative after 5 months. This plot shows the overall negative response of Nifty_Serv to the shocks in EPU which shows that the service sector had a negative impact due to the uncertainty environment in the period, largely attributed to the tax reform i.e., GST.

The Granger causality test below asserts the causal relationship between EPU and IIP, Nifty_Serv. The test is carried out on the restricted VAR model with the cause variable as EPU.

Granger causality H0: EPU do not Granger-cause IIP Nifty_Serv

data: VAR object restricted_VAR
F-Test = 2.0914, boot.runs = 100, p-value = 0.01

Since p value is 0.01, H0 can be rejected at 5% level of significance. Therefore, EPU granger causes IIP and Nifty_Serv. However, as seen from the IRF analysis, EPU shocks have a lagged influence on Nifty_Serv as compared to the influence on IIP.

Instantaneous causality test result:

H0: No instantaneous causality between: EPU and IIP Nifty_Serv
data: VAR object restricted_VAR
Chi-squared = 2.4793, df = 2, p-value = 0.2895

As per the p-value, we cannot reject H0. There is no instantaneous/contemporaneous causality between EPU and IIP and Nifty_Serv.

Below is the correlation matrix in (Table 3), that gives a crude understanding of the relationship between the stated variables.

Table 3. Correlation matrix

Variable	EPU	IIP	Nifty_Serv
EPU	1	-0.5097	-0.4129
IIP	-0.5097	1	0.0193
Nifty_Serv	-0.4129	0.0193	1

The above correlation matrix shows a negative relation between EPU and IIP and EPU and Nifty_Serv.

4. Conclusion

From the restricted VAR model and the ensuing IRF Analysis, one can conclude that policy uncertainty (in this case primarily GST related) had a certain adverse influence on the service sector (Nifty_Serv) but we cannot say the same about its impact on the manufacturing sector (IIP) which is inconclusive from the analysis. However, policy uncertainty does not have a significant contemporaneous impact on the service sector and manufacturing sector performance. This paper stresses the importance of IRF Analysis in validating the existence of a relationship between variables which may not be confirmed only on the basis of the granger and instantaneous causality tests.

We can also deduce that the uncertainty around the GST launch did not scare the manufacturing sector as it did the services sector especially the market sentiments reflected by Nifty_Serv. Policy uncertainty and its impact also depends on the degree to which the government takes

the sector into confidence before the implementation of a reform. This can also be a reason for the reduced impact on the manufacturing sector and a rather lagged impact on the services sector which gradually adjusted to the GST reform. A possible reason for the shock to the service sector can be the non-readiness to adopt GST and the presumed fear that GST may destabilize the sector owing to uncertainty related to the tax rates. In the future, the government can possibly focus on first taking the sectors into confidence well ahead of policy regime changes in order to avoid the subsequent shocks to these sectors. However, from the overall economic and fiscal management perspective, GST did result in increasing the indirect tax base and brought more businesses under the tax net.

5. References

1. Aizenman, J., & Marion, N. (n.d.). Policy uncertainty, persistence and growth. *Review of International Economics Rev International Economics,* 145-163. DOI: Sep 1991
2. Anand, R., & Tulin, V. (n.d.). Disentangling India's investment slowdown. *IMF Working Papers,* 1-1. DOI: 2014
3. Bachmann, R., Elstner, S., & Sims, E. (n.d.). Uncertainty and economic activity: evidence from business survey data. *American Economic Journal: Macroeconomics,* 217-249. DOI:2010
4. Baker, S., Bloom, N., & Davis, S. (n.d.). Measuring economic policy uncertainty. *SSRN Journal SSRN Electronic Journal*. DOI:2013
5. Bernanke, B. (n.d.). Irreversibility, uncertainty, and cyclical investment. *National Bureau of Economic Research, 502*. DOI:1983
6. Bhagat, S., Ghosh, P., & Rangan, S. (n.d.). Economic policy uncertainty and economic growth in India. *SSRN Journal SSRN Electronic Journal*. DOI: 2013
7. Chauhan, A. S., Gupta, S., & Singh, S. (2019). Impact of GST on stock indices in India. *SSRN Electronic Journal*. DOI:10.2139/ssrn.3308711
8. Enders, W. (2015). *Applied econometric time series*. New York: John Wiley & Sons.
9. Gujarati, D. (2003). Basic econometrics. Boston: McGraw-Hill
10. Handley, K., & Limão, N. (2012). Trade and Investment under Policy Uncertainty: Theory and Firm Evidence. *National Bureau of Economic Research.* doi:10.3386/w17790
11. Hermes, N., & Lensink, R. (n.d.). (2001). Capital flight and the uncertainty of government policies. *Economics Letters,* 71(3), 377-381.
12. John, A. R. (2017). Response of the Indian Pharma Sector to Economic Policy Uncertainty Shocks. *AMBER-ABBS Management Business and Entrepreneurship Review, 8(2)*, 72. DOI:10.23874/amber/2017/v8/i2/166110
13. Samantara, R. (2018). A critical appraisal of goods and services tax in India. *Vision: Journal of Indian Taxation, 5*(2). DOI:10.17492/vision.v5i2.14390
14. Shukla, A., & Kushare, P. (2017). A theoretical study of GST reforms in India. *International Journal of Soci Al & Scientific Research, 3(1)*, 35-41.
15. Singh, S. (2017). GST (Goods and Services Tax) - A game changer for India. *International Journal of Accounting and Financial Reporting, 7(2)*, 140. DOI: 10.5296/ijafr.v7i2.11848
16. Vij, D. (2018). A study on GST (Goods and Service Tax): The Way Forward. *International Journal of Academic Research & Development (IJAR&D), 4(7)*, 1st ser., 13-18.