Determinants of Growth in Service Sector of India

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ABSTRACT: As economies grow they experience structural changes. The economies tend to shift from lower stages to the higher stages of development. They move from simple to modern techniques of production. Though, the agricultural sector is known as the primary sector of the economy, it loses its importance when the per capita income of the country increases. As the demand for agricultural products does not rise with the increase in the per capita income of the economy, so it gives ways to the other sectors of the economy to rise. The service sector is the main sector of economic transformation as all countries cannot have a competitive edge in industrial and manufacturing sector. In India, the structural transformation has taken place by shifting from agricultural sector to service sector, leaving behind industrial sector**. Looking at such trend, the present research tries to highlight the different determinants of services sector using a Vector Error Correction Model. The period under consideration is from 1991 to 2017. Long run and short run causalities of the variables on service sector is seen.**

KEYWORDS:*Service sector, India, causality***.**

INTRODUCTION: India has been known as a Services Hub. In modern times India has proved to be the land of Knowledge with new innovations in everyday life and due to the outgrowing services in India. Indian Service Sector started to grow in mid-1980 and then its growth accelerated in 1990, due to the reforms of Liberalization, Privatization and Globalization which were introduced at that time. In spite of their rising share in growth and trade their share in total employment did not rise. For this reason, India had to experience an economy with jobless growth. An analysis into the service sector, specially what were the factors that initiated their growth is a need of time.

OBJECTIVE: To examine the determinants of service sector of India. The study tries to capture long run and short causality between the service sector and its determinants.

METHODOLOGY:

A time series is a vector or set of different time periods y (t) = 0, 1, 2…n. The methodology consists of a time series econometric model: **VECM model** (Vector Error Correction model). Data from 1991 to 2917 is used for analysis. For applying this test the data should not be stationary at first difference. The data becomes stationary when its second difference is taken. For checking this condition **Augmented Dickey Fuller Test** is applied to the data. The co-integration was checked using **Johannsen's Co-integration test** at lag value three. If there would have been no co-integration then VAR model would have been applied. Since the variables were co-integrating at Maximum rank 1 then VECM model (restricted VAR) is applied which helps to see long run and short run causalities among the variables. Service Sector (Services C),Industry (Industry C), Foreign Direct Investment (FDI), Gross Domestic Product At factor cost (gdp FC) and growth Rate are the variables under consideration.

VECM MODEL WITH 5 VARIABLES

$$\Delta \text{ServicesC}_t = \alpha_1 + \sum_{i=1}^{K-1} \beta_i \ \Delta \text{services C}_{t-i} + \sum_{j=1}^{K-1} \theta_j \ \Delta \text{ Industry C}_{t-j} +$$

$$+ \sum_{l=1}^{K-1} \gamma_i \ \Delta \text{ FDI}_{t-l} + \sum_{m=1}^{k-1} \varphi_m \ \Delta \text{gdp FC}_{t-m} + \sum_{n=1}^{K-1} \delta_n \Delta \text{Growth rate}_{t-n} + \lambda_1 \ \text{ECT}_{t-1} + \mu_{1t}$$

$$\Delta \text{IndustryC}_t = \alpha_2 + \sum_{i=1}^{K-1} \beta_i \ \Delta \text{services C}_{t-i} + \sum_{j=1}^{K-1} \theta_j \ \Delta \text{ Industry C}_{t-j} +$$

$$+\sum_{l=1}^{K-1} \gamma_i \Delta FDI_{t-l} + \sum_{m=1}^{k-1} \varphi_m \Delta gdp\ FC_{t-m} + \sum_{n=1}^{K-1} \delta_n \Delta Growth\ rate_{t-n} + \lambda_2\ ECT_{t-1} + \mu_{2t}$$

$$\square FD1_t = \alpha_3 + \sum_{i=1}^{K-1} \beta_i\ \Delta services\ C_{t-i} + \sum_{j=1}^{K-1} \theta_j \Delta\ Industry\ C_{t-j} +$$

$$+\sum_{l=1}^{K-1} \gamma_i \Delta FDI_{t-l} + \sum_{m=1}^{k-1} \varphi_m \Delta gdp\ FC_{t-m} + \sum_{n=1}^{K-1} \delta_n \Delta Growth\ rate_{t-n} + \lambda_3\ ECT_{t-1} + \mu_{3t}$$

$$\square grossFC_t = \alpha_4 + \sum_{i=1}^{K-1} \beta_i\ \Delta services\ C_{t-i} + \sum_{j=1}^{K-1} \theta_j \Delta\ Industry\ C_{t-j} +$$

$$+\sum_{l=1}^{K-1} \gamma_i \Delta FDI_{t-l} + \sum_{m=1}^{k-1} \varphi_m \Delta gdp\ FC_{t-m} + \sum_{n=1}^{K-1} \delta_n \Delta Growth\ rate_{t-n} + \lambda_4\ ECT_{t-1} + \mu_{4t}$$

$$\square Growth\ rate_{\ t} = \alpha_5 + \sum_{i=1}^{K-1} \beta_i\ \Delta services\ C_{t-i} + \sum_{j=1}^{K-1} \theta_j \Delta\ Industry\ C_{t-j} +$$

$$+\sum_{l=1}^{K-1} \gamma_i \Delta FDI_{t-l} + \sum_{m=1}^{k-1} \varphi_m \Delta gdp\ FC_{t-m} + \sum_{n=1}^{K-1} \delta_n \Delta Growth\ rate_{t-n} + \lambda_5\ ECT_{t-1} + \mu_{5t}$$

Here, K-1= lag length, which is reduced by one.

β_i, θ_j, Υ_l, φ_m, δ_n are short run dynamic coefficients.

λ_i= Speed of adjustment parameter. It should be with negative sign, if the variables were adjusted in long run. In short, it is the coefficient of error correction term (ECT). It measures the speed at which the dependent variable returns to equilibrium after changes in various independent endogenous variables which are under consideration. ($-1<\lambda_i< 0$)

ECT_{t-1} = It is the error correction term. The ECT explains the deviations that occurred in previous period's long run equilibrium. The deviations are the errors in this case. Such errors influence short run movement in the dependent variable.

μ_{it} = residuals (stochastic error terms). These are the impulses or shocks or innovations in the VEC model.The error correction coefficient (λ_i) is very important in the VEC model. The greater the value of coefficient, the more is the speed of adjustment in the model from the short run to long run.The error correction term (ECT_{t-1}) represents long run relationshipbetween the variables. If (λ_i) is negative and significant then a long run relationship exists between the variables.

Johansen Tests for Co-Integration

TABLE 1: Trend: Constant Number of observation = 24

Sample: 1994 - 2017 Lags = 3

maximum rank	parms	LL	eigenvalue	trace statistics	5% critical value
0	55	-160.91464		77.3198	68.52
1	64	-143.6135	0.76349	42.7175*	47.21
2	71	-131.25033	0.64309	17.9912	29.68
3	76	-124.89744	0.41105	5.2854	15.41
4	79	-122.73128	0.16516	0.9531	3.76
5	80	-122.25474	0.03893		

maximum rank	parms	LL	eigenvalue	max statistics	5% critical value
0	55	-160.91464		34.6023	33.46
1	64	-143.6135	0.76349	24.7264	27.07
2	71	-131.25033	0.64309	12.7058	20.97
3	76	-124.89744	0.41105	4.3323	14.07
4	79	-122.73128	0.16516	0.9531	3.76
5	80	-122.25474	0.03893		

The Johansen's test produces the results for K-1 vectors, where k is the number of variables used in the model. As the number of variables used in the model is 5, therefore, the test produces results up to maximum rank 4 (5-1=4).

At maximum rank = 0

Null Hypothesis (H_o) = There is no co-integration among variables.

Alternate Hypothesis (H_a) = There is co-integration among variables.

As the trace statistic is (77.3198) is more than 5% critical value (68.52), the null hypothesis (H_0) is rejected. This means there is co-integration among the variables (Trace > critical = reject H_0)

As the maximum statistic (34.6023) is more than 5% critical value (33.46), the null hypothesis is rejected. This means there is co-integration among the variables. (Max > critical = rejected H_0)

This shows that there is co-integration among the variables services, value added, industry value added, foreign direct investment (net inflows) Gross fixed capital formation and GDP growth annual).

At maximum rank 1

Null Hypothesis (H_o) = There is co-integration of equation one.

Alternate Hypothesis (H_a) = There is no co-integration of equation one.

The trace value (42.7175) is less than the 5% critical value (47.21), the null hypothesis (H_0) gets accepted. There is co-integration of equation one.

The maximum statistic (24.7264) is less than 5% critical value (27.07), the null hypothesis (H_0) gets accepted. This means there is co-integration of equation one.

VECTOR ERROR CORRECTION MODEL

All the variables in the model are endogenous variables and there are no exogenous variables because all the variables are the function of their own lags and the lagged values of other variables, under consideration.

Vector error-correction model

TABLE 2: Sample: 1994 - 2017 No. of Observations= 24

		AIC	=	17.30113
Log likelihood =	-143.6135	HQIC	=	18.13456
Det (Sigma_ml) =	0.1084362	SBIC	=	20.4426

Equation	Parms	RMSE	R-Sq	chi2	P>chi2
D_servicesC	12	0.595345	0.8649	76.81928	0.0000
D_industryC	12	2.83927	0.5266	13.34888	0.0344
D_FDI	12	0.44162	0.6903	26.75035	0.0084
D_grossFC	12	3.59765	0.9058	115.324	0.0000
D_growthrate	12	1.53416	0.8135	52.34048	0.0000

	Coef.	**Std.Err.**	**Z**	**P>|z|**	**[95% Conf.**	**Interval**
D_servicesC						
_cel L1.	-0.0010	0.0042	-0.26	0.769	-0.0093	0.0071
servicesC						
LD.	-0.5449	0.2510	-2.17	0.030	-1.0370	-0.5284
L2D.	0.3345	0.3013	1.11	0.267	-.2560	0.9251
industryC						
LD.	0.0888	0.0678	1.31	0.190	-0.0441	0.2217
L2D.	-0.0624	0.0703	-0.89	0.375	-0.2003	0.0755
FDI						
LD.	0.3342	0.2932	1.14	0.245	-0.2404	0.9089
L2D.	0.6113	0.3050	2.00	0.045	0.1341	1.2093

grossFC						
LD.	-0.0504	0.0267	-1.88	0.059	-0.1028	0.0020
L2D.	-0.0024	0.0242	-0.10	0.918	-0.0500	0.0450
growthrate						
LD.	-0.0558	0.1409	-0.40	0.692	-0.3321	0.2203
L2D.	-0.1703	0.1852	-0.92	0.358	-0.5333	0.1927
_cons	0.9856	0.3095	3.18	0.001	0.3788	1.5924
D_industryC						
_cel	-0.0447	0.0204	-2.23	0.026	-0.0840	-0.0054
L1.						
servicesC	-1.5354	1.1974	-1.28	0.200	-3.8822	0.8114
LD.						
L2D	-1.2607	1.4370	-0.88	0.380	-4.0773	1.5557
industryC						
LD.	0.2602	0.3234	0.80	0.421	-0.3736	0.8941
L2D.	0.3230	0.3356	0.96	0.336	-0.3348	0.9808
FDI						
LD.	-1.9852	1.3984	-1.42	0.156	-4.7260	0.7555
L2D.	1.0211	1.4550	0.70	0.483	-1.8306	3.8729
grossFC						
LD.	-0.2413	0.1275	-1.89	0.258	-0.4913	0.0085
L2D.	-0.1572	0.1157	-1.36	0.175	-0.3841	0.0697
growthrate						
LD.	1.3973	0.6721	2.08	0.038	0.0800	2.7146

L2D.	0.4266	0.8834	0.48	0.629	-1.3048	2.1581
_cons	1.3654	1.4764	0.92	0.355	-1.5282	4.2592
D_FDI						
_cel	0.0634	0.0031	2.04	0.042	0.00023	0.01245
L1.						
servicesC						
LD.	-0.2754	0. 0186	-1.48	0.139	-0.6404	0.0896
L2D	-0.0457	0.2235	-0.20	0.838	-0.4838	0.3923
industryC						
LD.	0.5603	0.0503	1.11	0.265	-0.0425	0.1546
L2D.	-0.0158	0.0522	-0.30	0.761	-0.1182	0.0864
FDI						
LD.	-0.1133	0.2175	-0.52	0.602	-0.5396	0.3130
L2D.	0.5036	0.2263	2.23	0.026	0.0600	0.94719
grossFC						
LD.	0.0200	0.0198	1.01	0.313	-0.0188	0.0588
L2D.	0.0068	0.0180	0.38	0.704	-0.0284	0.0421
growthrate						
LD.	-0.3009	0.1045	-2.88	0.004	-0.5058	-0.0961
L2D.	-0.2050	0.1374	-1.49	0.136	-0.4743	0.0643
_cons	0.5187	0.2296	2.26	0.024	0.0686	0.9687
D_grossFC						
_cel	-0.1244	0.0253	-4.90	0.000	-0.1742	-0.0746
L1.						
servicesC						

LD.	4.6379	1.5172	3.06	0.002	1.6641	7.6116
L2D	-7.7310	1.8208	-4.25	0.000	-11.299	-4.1622
industryC						
LD.	1.5333	0.4098	3.74	0.000	0.7301	2.3365
L2D.	1.6626	0.4252	3.91	0.000	0.8291	2.4961
FDI						
LD.	-0.3115	1.7719	-0.18	0.860	-3.7844	3.1614
L2D.	-0.8134	1.8436	-0.44	0.659	-4.4270	2.8001
grossFC						
LD.	-0.7263	0.1615	-4.49	0.000	-1.0430	-0.4095
L2D.	-0.7353	0.1467	-5.01	0.000	-1.0228	-0.4478
growthrate						
LD.	1.7681	0.8516	2.08	0.038	0.0989	3.4373
L2D.	4.3634	1.1194	3.90	0.000	2.1694	6.5574
_cons	-0.9110	1.8708	-0.49	0.626	-4.5777	2.7556
D_growth rate						
_cel						
L1.	-0.0364	0.0108	-3.37	0.001	-0.0576	-0.0152
servicesC						
LD.	-0.2972	0.6469	-0.46	0.646	-1.5653	0.9708
L2D	-2.4663	0.7764	-3.18	0.001	-3.9881	-.9444
industryC						
LD.	0.6934	0.1747	3.97	0.000	0.3509	1.0359
L2D.	0.1573	0.1813	0.87	0.386	-0.1980	0.51279
FDI						

LD.	-0.4429	0.7556	-0.59	0.558	-1.9239	1.0380
L2D.	0.9398	0.7862	1.20	0.232	-0.6011	2.4807
grossFC						
LD.	-0.0440	0.0689	-0.64	0.523	-0.1790	-0.0910
L2D.	-0.0365	0.0625	-0.58	0.559	-0.1591	-0.0860
growth rate						
LD.	0.1766	0.3631	0.49	0.627	-0.5351	-0.8884
L2D.	-0.4773	0.4773	1.00	0.317	-0.4582	1.4129
_cons	1.4962	0.7977	1.88	0.061	-0.0673	3.0598

Cointegrating equations

Equation	Parms	chi2	P>chi2
_cel	4	39.1299	0.0000

Identification: Beta is exactly identified

This shows that there is co-integration among the variables services value added (servicesC), industry value added (industryC), Foreign Direct Investment (net inflows), (FDI), Gross Fixed Capital Formation (grossFC) and GDP growth annual (growth rate).

$$\Delta \text{services } C_t = 0.9856 - 0.5449\ \Delta \text{services } C_{t-1} + 0.3345$$

$$\Delta \text{services } C_{t-2} + 0.0888\ \Delta \text{ industry } C_{t-1}$$

$$-0.0624\ \Delta \text{industry } C_{t-2} + 0.3342 \Delta FDI_{t-1}$$

$$+0.6113 \Delta FDI_{t-2} - 0.0504\ \Delta \text{gross } FC_{t-1}$$

$$-0.0024\ \Delta \text{gross } FC_{t-2} - 0.05588\ \text{growth rate}_{t-1}$$

$$-0.01703\ \Delta \text{growth rate}_{t-2} - 0.0010\ ECT_{t-1}$$

Long run causality – The coefficient of error correction term is –0.0010. The negative sign shows that there is long run causality among the variables but as p value is 0.796, so the result is insignificant.

Short run causality – As per the result, the 1st lag of services C (services value added) and 2nd lag of FDI (net inflows) have significant impact on the service C. Apart from these two no other lag have significant level. One unit change in services C at lag one leads to 0.5449 times change in services C. Similarly, one unit change in FDI at Second lag leads to 0.611 times change in services, value added.

Test: linear hypothesis for short run causality.

Null Hypothesis D [Services] LD industry C=0

L2D industry C=0

Chi 2(2) = 6.32

Prob Chi2 = 0.0424

According to linear hypothesis test the lagged values of industry, value added taken together do affect services, value added as the p value is 0.0424, which is less than 0.05. So the null hypothesis gets rejected. There is short run causality running from industry C to services C.

• Test (D_services C]: LD. FDI

L2D. FDI

Null Hypothesis D[ServicesC] : LD.FDI = 0

D[ServicesC] : L2D.FDI = 0

Chi2 (2) = 6.32

prob > Chi 2 = 0.0468

According to linear hypothesis test the lagged values of FDI (net inflows) taken together do affect services, value added as the p value is 0.468 which is less than 0.05. So the null hypothesis gets rejected. There is short run causality running from FDI to servicesC.

• Test [D_servicesC] : LD .gross FC

: L2D.gross FC

Null Hypothesis D [Services C] : LD. gross FC= 0

D [Services C] : L2D.gross FC=0

Chi2 (2) = 5.18

prob > Chi2 = 0.0751

According to linear hypothesis test the lagged values of gross FC taken together does not affect services, value added as the p value is 0.0757, which is more than 0.05. So, the null hypothesis gets accepted. There is no short run causality running from gross FC to services C.

Test [D_Services C]: LD.growth rate

L2D.growth rate

Null Hypothesis [D_Services C]: LD.grossFC= 0

[D_Services C]: L2D.grossFC=0

Chi2 (2) = 1.10

prob > Chi^2 = 0.5757

According to linear hypothesis test the lagged values of growth rate taken together does not affect services, value added as the p value is 0.5757, which is more than 0.05. So the null hypothesis gets accepted. There is no short run causality running from GDP growth (annual) to services C industry C as the Dependent variable.

Table No. 3: Johansen normalization restriction imposed

Beta	Coef.	Std. Err.	z	P> I z I	[95% Conf.	Interval]
_cel						
servicesC	1	.	.	.	.	.
industry	12.86145	8.626082	1.49	0.136	-4.045361	29.76826

FDI	-57.7293	11.6898	-4.94	0.000	-80.64089	-34.8177
grossFC	-7.859234	3.055118	-2.57	0.010	-13.84715	-1.871313
growthrate	41.31007	10.83479	3.81	0.000	20.07428	62.54586
_cons	-295.1984	.	.	.	.	.

Johansen normalization restriction imposed result shows long run equation from where error correction term is generated.

ECT_{t-1} = 1.000 $servicesC_{t-1}$ + 12.86145 $industryC_{t-1}$

–57.7293 FDI_{t-1} – 7.859234 gross FC_{t-1}

+ 41.31007 growth $rate_{t-1}$ –295.198

The service value added (% of GDP) – (ServicesC) is the main target variable as shown in the table 8. In long run industry value added (industryC) and GDP annual growth (growth rate) has a negative impact on the service value added (ServicesC). On the other hand, Foreign Direct Investment (net inflows) [FDI], gross fixed capital formation (gross FC) has a positive impact on the Service Value Added (ServicesC), in long run.

The coefficients of FDI, grossFC and Growth rate are statistically significant at 1% level. The coefficient of industry C is statistically insignificant even at 5% level.

The independent variables have asymmetric effect on services value added in long run. The asymmetric effect means that while industryC and growth rate has negative effect, the other two variables FDI and grossFC has positive impact on the dependent variables shows that the independence variables have asymmetric impact on it.

Conclusion:

The results when checked using langrange test did not show any autocorrelation. The results were normally distributed (checked with jarque bera test). Even the eigenvalue stability test was used to that the results satisfied the stability condition or not.

REFERENCES:

Adhikari, R., & Agrawal, R. K. (2013). An introductory study on time series modeling and forecasting. *arXiv preprint arXiv:1302.6613*.

Ajmair, M., Gilal, M. A., & Hussain(2018,June), K. Determinants of Sectoral Growth in Pakistan: A Structural Vector Auto Regression (SVAR) Analysis.

Ajmair, M., and K. Hussain. (2017, September). what determines the growth of services sector in Pakistan? A comparison of ARDL bound testing and time varying parametric estimation with general to specific approach. Turkish Economic Review, (September 2017). www.kpsyjournals.org.

Asari, F. F. A. H., Baharuddin, N. S., Jusoh, N., Mohamad, Z., Shamsudin, N., & Jusoff, K. (2011). A vector error correction model (VECM) approach in explaining the relationship between interest rate and inflation towards exchange rate volatility in Malaysia. *World Applied Sciences Journal*, *12*(3), 49-56.

Binh, P. T. (2013). Unit root tests, cointegration, ECM, VECM, and causality models. *Topics in Time Series Econometrics*.

Desai, Nirav A., and M. Bhatia. (2016). A multiple variable regression model for Gross Domestic Product Growth rate prediction in India using Key macroeconomic Indicators. IOSR Journal of Economics and Finance, 7(2), (March-April 2016), PP. 47-51).

Gujarati, D. N. (2011). *Econometrics by example/Damodar Gujarati* (No. 330.015195 G84.).

Jain, D., K. Sanal Nair. and V. Jain. (2015, April). Factors Affecting GDP (Manufacturing, services, Industry): An Indian Perspective. Annual Research Journal of Symbiosis centre for management studies, Pune. Vol. 3, PP. 38-56.

Nikolić, I., & Zoroja, M. (2016). The estimation of long-run relationship between Serbian and German economic growth. *Industrija*, *44*(2), 55-66.

Onwukwe, C., and G.N wafor. (2014, November). A Multivariate Time Series Modelling of Major Economic Indicators in Nigeria. American Journal of Applied Mathematics and Statistics, 2(6), PP. 376-385. http://pubs.sciepub.com.

Österholm, P., & Hjalmarsson, E. (2007). *Testing for cointegration using the Johansen methodology when variables are near-integrated* (No. 7-141). International Monetary Fund.

Raboloko, MPHD.(2018, March). Determinants of Service Sector Growth in Botswana. BIDPA working paper 56. http://www.bidpa.bw.

Singh, M., & Kaur, K. (2014). India's services sector and its determinants: An empirical investigation. *Journal of Economics and development Studies*, *2*(2), 385-406.

Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: journal of the Econometric Society*, 1-48.

Suharsono, A., Aziza, A., & Pramesti, W. (2017, December). Comparison of vector autoregressive (VAR) and vector error correction models (VECM) for index of ASEAN stock price. In *AIP Conference Proceedings* (Vol. 1913, No. 1, p. 020032). AIP Publishing LLC.

Yaffee, R. A. (2007). A review of Stata versions 9 and 10 time series and forecasting capability. *Journal of Statistical Software*, *23*(1), 1-18.