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CONTENTS

Forecasting of Area, Production, and Productivity of Food Grains in India : Application of ARIMA Model

** Pushpa Savadatti*

Abstract

Food grains occupy a dominant place in Indian agriculture. The demand for food grains is continuously increasing due to steady increase in the population. Food grains are an important source of energy and protein to majority of the Indians, who are vegetarians. Apart from this, the Government of India enacted the National Food Security Act (NFSA) which came into force with effect from July 5, 2013. This further put pressure on the demand for food grains in the country. Realizing the importance of food grains, the Government of India initiated various measures to boost the production and productivity of food grains since independence. As a result of this, the production of food grains has increased since 1950s, but still there is a gap between demand for and supply of food grains in the country which needs to be addressed urgently. In view of this, the projections for the area, production, and productivity of food grains for 5 years starting from 2016-17 onwards, based on the univariate time series analysis known as ARIMA analysis, was conducted in this paper. ARIMA (2,1,2), ARIMA (4,1,0), and ARIMA (3,1,3) models were fitted to the data on area, production, and productivity of food grains, respectively and these models were found to be adequate. The forecast values indicated that production and productivity will increase during the forecast period but that of area exhibited near stagnancy, calling for timely measures to enhance the supply of food grains to meet the increasing demand in the years to come.

Keywords: **forecasts, autocorrelation, partial autocorrelation, residuals**

JEL Classification : C22, C32, C53

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Agriculture accounts for a very important position in the Indian economic development even today. More than 56% of the Indian population depends on agriculture for their livelihood. The agriculture sector provides food for more than 1.2 billion people. Food grains occupy a dominant place in the Indian agriculture as 80% of the cropped area was under food grains production during 2015-16. India is the largest producer of millets and is the second largest producer of rice, wheat, and pulses (Deshpande, 2017). The demand for food grains is continuously increasing due to steady increase in the population. Food grains are an important source of energy and protein to the majority of Indians, who are vegetarians. Apart from this, the Government of India enacted National Food Security Act (NFSA) which came into force with effect from July 5, 2013. The purpose of the act is to provide subsidized food grains to nearly 75% of the rural population and up to 50% of the urban population under Targeted Public Distribution System (TPDS), the act has already covered 80.54 crore persons as against the targeted of 81.35 crore people (Ministry of Finance, Dept of Economic Affairs, 2017). This further put pressure on the demand for food grains in the country. Supply of food grains is influenced by multiplicity of constraints like limited availability of land, water resources, competition from competing crops for the resources, market imperfections, weather risk, price risk, etc. Realizing the importance of food grains, the

* *Dean,* School of Business Studies, **Professor and Head*, Department of Economic Studies and Planning, Central University of Karnataka, Kadaganchi, Aland Road, Gulbarga - 585 367, Karnataka. E-mail : pmsavadatti@gmail.com

Government of India initiated various measures to boost the production and productivity of food grains since independence. As a result of this, food grains production increased from 74231 thousand tonnes in 1965 - 66 to 275680 thousand tonnes in 2015 -16. However, still there is a gap between demand for and supply of food grains in the country which needs to be addressed urgently. In view of this, the projections for the area, production, and productivity of food grains based on the sound technical analysis will help the policymakers and the government to take timely measures to enhance the supply of food grains to meet the increasing demand in the years to come. Hence, the present time series analysis of forecasting the food grains' area, production, and yield with the help of auto regressive integrated moving average (ARIMA) process becomes important, which is the main objective of this research paper.

Literature Review

Many researchers have adopted the ARIMA forecasting model, the popular and very widely used forecasting models for univariate time-series data for the field of agriculture. ARIMA technique was adopted to forecast the productivity of 34 different agricultural products in India (Padhan, 2012) and the study forecasted 5 years ahead from 2011 onwards. The author concluded that though the forecasted values for productivity of few selected agricultural products had been done based upon various criteria like mean absolute percentage error (MAPE), Akaike information criteria (AIC), etc., there were many other factors that could be influencing the productivity of the selected crops. Forecasting rice area, production, and productivity of Odisha was made based upon historical data by using the ARIMA model (Tripathi, Nayak, Raja, Shahid, Kumar, Mohanty, Panda, Lal, & Gautam, 2014). Based on validation results, it was concluded that ARIMA model could be successfully used for forecasting rice area, production, and yield. Similarly, a number of studies had used extensively univariate ARIMA technique to model various aspects of the agriculture sector in India (Biswas, Dhaliwal, Singh, & Sandhu, 2014 ; Darekar & Reddy, 2017 ; Gurung, Panwar, Singh, Banerjee, Gurung, & Rathore, 2017; Mishra, Sahu, Padmanaban, Vishwajith & Dhekale, 2015 ; Prabakaran & Sivapragasam, 2014).

Numerous studies used this technique to forecast area, production, and productivity of agricultural products in other countries also. To quote few such studies, short term forecasting for production of different varieties of rice employing ARIMA model had been done for Bangladesh (Awal & Siddique, 2011) and concluded that the forecasts could be used by policy makers, researchers, as well producers in their decision making. Another study modelled and forecasted area, production, and yield of total seeds of rice and wheat in SAARC countries (Sahu, Mishra, Dhekale, Vishwajith, & Padmanaban, 2015) and based upon the forecasts, the study emphasized the need for quantum jump in the per hectare yield of these two crops for the region. A study had been conducted in Nigeria to forecast the cultivation area and production of maize (Badmus & Ariyo, 2011) using univariate ARIMA process and concluded that total cropped area could be increased in the future, if land reclamation and conservation measures were adopted. An empirical study on agricultural products price forecasting based on ARIMA model in China showed that ARIMA model provided high accuracy of short term prediction for cucumber prices in Shandong Shouguang wholesale market (Xin & Can 2016).

It is evident from the literature review that time series analysis with the help of ARIMA model is widely used in forecasting of different variables pertaining to agricultural crops. In the present study, this univariate technique is adopted to estimate area, production, and yield of food grains grown in India, which are playing a very important role in the Indian economy in terms of food and nutrition to the population, employment creation, etc.

Methodology

(1) Data : The present analysis is based on the secondary data collected from Centre for Monitoring Indian Economy (CMIE). The annual time series data were collected for a period from 1966 - 67 to 2015 - 16 on area,

production, and productivity of food grains, respectively at the all India level. The area, production, and yield of food grains were measured in thousand hectares, thousand tonnes, and kgs/hectare, respectively.

(2) The Box -Jenkins (BJ) Methodology : The present study used the methodology popularly known as BJ methodology for forecasting area, production, and productivity of food grains in India. But technically, this methodology is known as the ARIMA methodology (Guajarati & Sangeeta, 2007). Here, our emphasis is on univariate ARIMA model. The BJ methodology involves the following steps :

(i) Identification : This step is to identify suitable values for *p,d*, and *q* in the ARIMA *(p,d,q)* model. *p* indicates the number of autoregressive (AR) terms, *d* indicates the order of integration, that is, the number of times the time series data has to be differenced so that series are stationary, and *q* denotes the number of moving average terms. The BJ procedure is applicable to stationary time series data. So, it is necessary to ensure that series are stationary ; if not, they have to be made stationary through appropriate transformation. Examining the plots of the auto correlation functions (ACF) and partial auto correlation function (PACF) of the series, appropriate values for the *p,d,q* may be identified.

The general ARIMA *(p,d,q)* model may be written as :

$$\phi(B)\Delta^d Y_t = \theta(B)\varepsilon_t \quad \text{----------} \quad (1)$$

where,

$$\phi(B) = 1 - \phi_1 B - \phi_2 B^2 - \cdots - \phi_p B^p \quad \text{----------} \quad (2)$$, where p = autoregressive parameters.

$$\theta(B) = 1 - \theta_1 B - \theta_2 B^2 - \cdots - \theta_q B^q \quad \text{----------} \quad (3)$$, where q = moving average parameters.

$\phi(B)$ is autoregressive operator and $\theta(B)$ is the moving average operator (Pindyck & Rubinfeld, 1998).

(ii) Estimation and Checking : After selecting the suitable values for *p,d,q* in the first step, the next step is to estimate the parameters of AR and MA terms with the suitable estimation method. Once the model is estimated, then there is need for the model adequacy check by considering the properties of the estimated residuals. The estimated residuals from the selected ARIMA model are normal and randomly distributed and will be tested based on the skewness, kurtosis, Jarque - Bera (JB) test and residual plots of ACF and PACF along with the Ljung-Box Q statistics. The Q statistics can be expressed as :

$$Q_m = n(n+2)\sum_{k=1}^{l}\frac{r_k^2}{n-k} \sim \chi^2_{l-m} \quad \text{----------} \quad (4)$$

where, *n* is the number of observations or residuals, *k* is the order of residual correlation, *l* is the number of autocorrelations included in the test, *m* is the number of parameters estimated, and *l - m* equals degrees of freedom and it follows the chi-square distribution (Nazeem, 1998).

If the estimated residuals are white noise, then the estimated model is adequate ; otherwise, another ARIMA model has to be selected starting from identification stage once again. Since, BJ methodology is an iterative procedure, identification, estimation, and checking stages are repeated until we get a satisfactory model.

(iii) Forecasting : The main purpose of the ARIMA modelling is to forecast and they are known for forecasting accuracy. Hence, once the selected model satisfies the model adequacy tests, then it will be used for forecasting.

The annual time series data collected on the area, production, and productivity of food grains are used for the present analysis with the help of e-views software to identify the appropriate ARIMA models for all the three variables.

Analysis and Results

The BJ methodology involves the process of identification, estimation, and forecasting. The same steps are followed for the analysis. The analysis has been done with the help of E - views 9 software and the results of the data analysis are presented in figures and tables.

(1) Model Identification : Before we begin the modelling of the data, it is necessary to check whether the series under consideration are stationary or not. This can be done by observing the plots of ACF and PACF for the series under consideration and also with the help of Augmented Dicky Fuller (ADF) test. The ACF and PACF plots for the area under food grains (at levels) are presented in the Figure 1. The ACF and PACF of area time series data presented in Figure 1 indicates that series are non-stationary as PACF dies down slowly. The ADF test results for area series are presented in the Table 1.

The ADF test for area (at levels) presented in the Table 1 substantiates the conclusion of non-stationarity as *p* - values is > 0.05. So, the area series are non-stationary at levels. There is need for appropriate data transformation to make the series stationary. The area series were transformed by taking first difference. The ACF and PACF of transformed series are shown in the Figure 2.

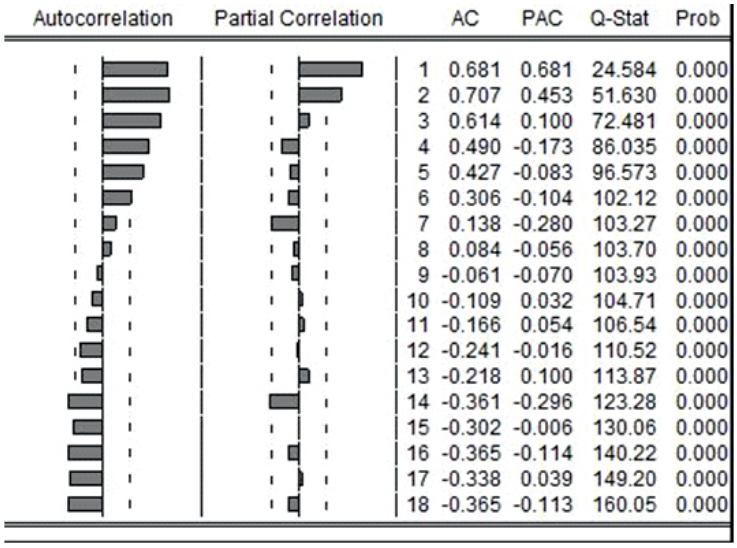
Both ACF and PACF cut off after first lag for the transformed area series indicate that the series are stationary.

Table 1. Stationarity Test for Area Under Total Food Grains in India

Area		At levels		First difference	
		t-statistics	Probability*	*t*-statistics	Probability*
ADF test statistics		-1.773913	0.3887	-12.76053	0.0000
Test Critical Value	1% level	-3.574446		-3.574446	
	5% level	-2.923780		-2.923780	
	10% level	-2.599925		-2.599925	

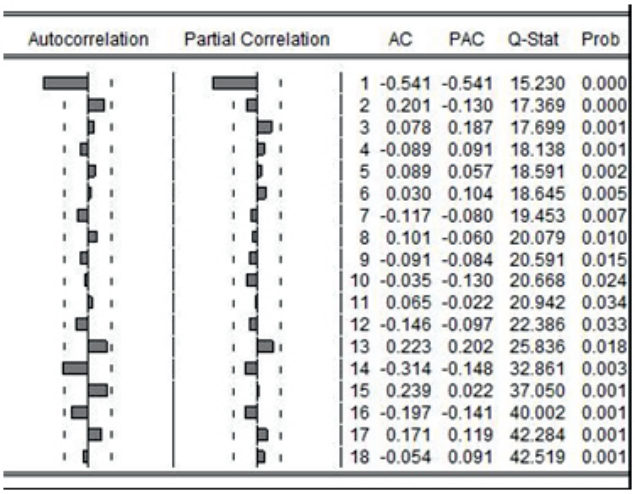
*MacKinnon (1996) one-sided *p* - values ; ADF = Augmented Dicky Fuller

Figure 1. ACF and PACF of the Area (at Levels) under Food Grains in India



	AC	PAC	Q-Stat	Prob
1	0.681	0.681	24.584	0.000
2	0.707	0.453	51.630	0.000
3	0.614	0.100	72.481	0.000
4	0.490	-0.173	86.035	0.000
5	0.427	-0.083	96.573	0.000
6	0.306	-0.104	102.12	0.000
7	0.138	-0.280	103.27	0.000
8	0.084	-0.056	103.70	0.000
9	-0.061	-0.070	103.93	0.000
10	-0.109	0.032	104.71	0.000
11	-0.166	0.054	106.54	0.000
12	-0.241	-0.016	110.52	0.000
13	-0.218	0.100	113.87	0.000
14	-0.361	-0.296	123.28	0.000
15	-0.302	-0.006	130.06	0.000
16	-0.365	-0.114	140.22	0.000
17	-0.338	0.039	149.20	0.000
18	-0.365	-0.113	160.05	0.000

Figure 2. ACF and PACF of the Area (First Difference) Under Food Grains in India



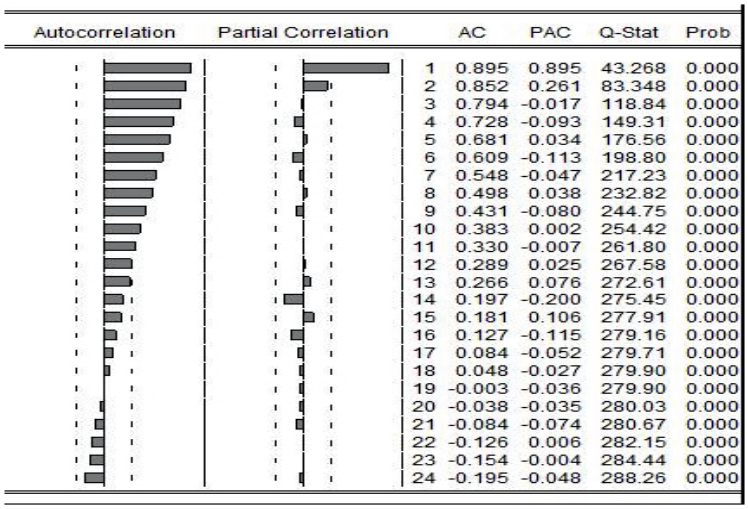
	AC	PAC	Q-Stat	Prob
1	-0.541	-0.541	15.230	0.000
2	0.201	-0.130	17.369	0.000
3	0.078	0.187	17.699	0.001
4	-0.089	0.091	18.138	0.001
5	0.089	0.057	18.591	0.002
6	0.030	0.104	18.645	0.005
7	-0.117	-0.080	19.453	0.007
8	0.101	-0.060	20.079	0.010
9	-0.091	-0.084	20.591	0.015
10	-0.035	-0.130	20.668	0.024
11	0.065	-0.022	20.942	0.034
12	-0.146	-0.097	22.386	0.033
13	0.223	0.202	25.836	0.018
14	-0.314	-0.148	32.861	0.003
15	0.239	0.022	37.050	0.001
16	-0.197	-0.141	40.002	0.001
17	0.171	0.119	42.284	0.001
18	-0.054	0.091	42.519	0.001

Table 2. Stationarity Test for Production of Total Food Grains in India

Production		At levels		First difference	
		t-statistics	Probability*	*t*-statistics	Probability*
ADF test statistics		-0.198722	0.9315	-13.10399	0.0000
Test Critical Value	1% level	-3.571310		-3.574446	
	5% level	-2.922449		-2.923780	
	10% level	-2.599224		-2.599925	

*MacKinnon (1996) one-sided *p*-values ; ADF = Augmented Dicky Fuller

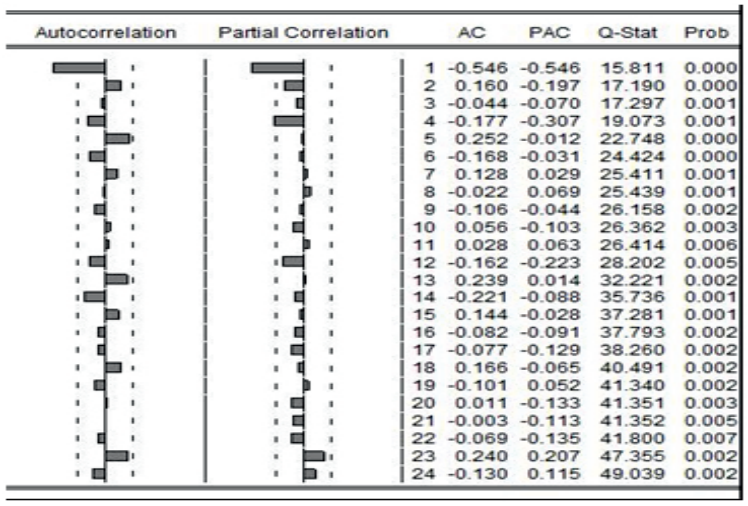
Figure 3. ACF and PACF of the Production (at Levels) of Food Grains in India



	AC	PAC	Q-Stat	Prob
1	0.895	0.895	43.268	0.000
2	0.852	0.261	83.348	0.000
3	0.794	-0.017	118.84	0.000
4	0.728	-0.093	149.31	0.000
5	0.681	0.034	176.56	0.000
6	0.609	-0.113	198.80	0.000
7	0.548	-0.047	217.23	0.000
8	0.498	0.038	232.82	0.000
9	0.431	-0.080	244.75	0.000
10	0.383	0.002	254.42	0.000
11	0.330	-0.007	261.80	0.000
12	0.289	0.025	267.58	0.000
13	0.266	0.076	272.61	0.000
14	0.197	-0.200	275.45	0.000
15	0.181	0.106	277.91	0.000
16	0.127	-0.115	279.16	0.000
17	0.084	-0.052	279.71	0.000
18	0.048	-0.027	279.90	0.000
19	-0.003	-0.036	279.90	0.000
20	-0.038	-0.035	280.03	0.000
21	-0.084	-0.074	280.67	0.000
22	-0.126	0.006	282.15	0.000
23	-0.154	-0.004	284.44	0.000
24	-0.195	-0.048	288.26	0.000

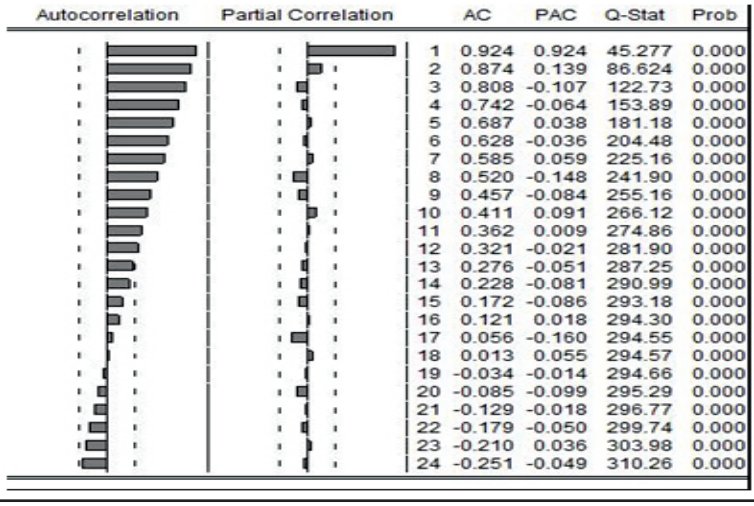
The results of the ADF test for differenced series presented in Table 1 confirm that the data series are stationary after first difference as the *p* - value is < 0.05. The ACF and PACF plots of production series at levels are presented in the Figure 3. It is observed from the Figure 3 that ACF dies down very slowly, signalling that the production series are non - stationary. To validate this decision, the ADF test is also done for production series at level and

Figure 4. ACF and PACF of the Production (First Difference) of Food Grains in India



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.546	-0.546	15.811	0.000
		2	0.160	-0.197	17.190	0.000
		3	-0.044	-0.070	17.297	0.001
		4	-0.177	-0.307	19.073	0.001
		5	0.252	-0.012	22.748	0.000
		6	-0.168	-0.031	24.424	0.000
		7	0.128	0.029	25.411	0.001
		8	-0.022	0.069	25.439	0.001
		9	-0.106	-0.044	26.158	0.002
		10	0.056	-0.103	26.362	0.003
		11	0.028	0.063	26.414	0.006
		12	-0.162	-0.223	28.202	0.005
		13	0.239	0.014	32.221	0.002
		14	-0.221	-0.088	35.736	0.001
		15	0.144	-0.028	37.281	0.001
		16	-0.082	-0.091	37.793	0.002
		17	-0.077	-0.129	38.260	0.002
		18	0.166	-0.065	40.491	0.002
		19	-0.101	0.052	41.340	0.002
		20	0.011	-0.133	41.351	0.003
		21	-0.003	-0.113	41.352	0.005
		22	-0.069	-0.135	41.800	0.007
		23	0.240	0.207	47.355	0.002
		24	-0.130	0.115	49.039	0.002

Figure 5. ACF and PACF of the Yield (at Levels) of Food Grains in India



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.924	0.924	45.277	0.000
		2	0.874	0.139	86.624	0.000
		3	0.808	-0.107	122.73	0.000
		4	0.742	-0.064	153.89	0.000
		5	0.687	0.038	181.18	0.000
		6	0.628	-0.036	204.48	0.000
		7	0.585	0.059	225.16	0.000
		8	0.520	-0.148	241.90	0.000
		9	0.457	-0.084	255.16	0.000
		10	0.411	0.091	266.12	0.000
		11	0.362	0.009	274.86	0.000
		12	0.321	-0.021	281.90	0.000
		13	0.276	-0.051	287.25	0.000
		14	0.228	-0.081	290.99	0.000
		15	0.172	-0.086	293.18	0.000
		16	0.121	0.018	294.30	0.000
		17	0.056	-0.160	294.55	0.000
		18	0.013	0.055	294.57	0.000
		19	-0.034	-0.014	294.66	0.000
		20	-0.085	-0.099	295.29	0.000
		21	-0.129	-0.018	296.77	0.000
		22	-0.179	-0.050	299.74	0.000
		23	-0.210	0.036	303.98	0.000
		24	-0.251	-0.049	310.26	0.000

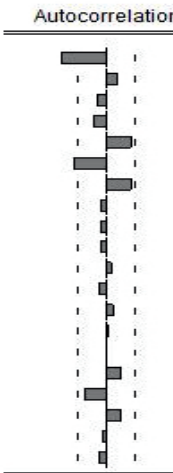
Table 3. Stationarity Test for Productivity of Total Food Grains in India

Productivity		**At levels**		**First difference**	
		***t*-statistics**	**Probability***	***t*-statistics**	**Probability***
ADF test statistics		**-0.156105**	**0.9368**	**-11.34520**	**0.0000**
Test Critical Value	1% level	-3.574446		-3.574446	
	5% level	-2.923780		2.923780	
	10% level	-2.599925		-2.599925	

*MacKinnon (1996) one-sided *p*-values ; ADF = Augmented Dicky Fuller

first difference. The results of the same are presented in the Table 2. The ADF test results (Table 2) for production series at levels display that the series are non-stationary at levels as the probability is 0.9315 > 0.05. The production series are differenced once to make them stationary. The ACF and PACF plots of the differenced series are presented in the Figure 4.

Figure 6. ACF and PACF of the Yield (First Difference) of Food Grains in India



	AC	PAC	Q-Stat	Prob
1	-0.456	-0.456	10.837	0.001
2	0.103	-0.132	11.406	0.003
3	-0.089	-0.124	11.840	0.008
4	-0.130	-0.279	12.774	0.012
5	0.257	0.088	16.529	0.005
6	-0.326	-0.249	22.699	0.001
7	0.249	-0.033	26.403	0.000
8	-0.055	0.054	26.589	0.001
9	-0.057	-0.081	26.793	0.002
10	-0.061	-0.267	27.032	0.003
11	0.051	0.030	27.206	0.004
12	-0.070	-0.254	27.538	0.006
13	0.078	-0.105	27.965	0.009
14	0.017	0.017	27.987	0.014
15	0.003	-0.041	27.987	0.022
16	0.133	0.086	29.325	0.022
17	-0.221	0.015	33.126	0.011
18	0.137	-0.060	34.643	0.010
19	-0.034	0.081	34.741	0.015
20	-0.080	-0.102	35.298	0.019

The Figure 4 clearly shows that ACF and PACF cut off after first lag depicting first differenced series are stationary. This is further authenticated by the ADF test results for the differenced production series presented in the Table 2. The next task is to test whether the yield series are stationary or not. For this, we examine first ACF and PACF of yield series at levels which are presented in the Figure 5.

The ACF plots clearly show that the series are non-stationary. This is confirmed by the ADF test results presented in the Table 3 for yield series at levels and for the first differenced series. The yield series are transformed to first differenced series. The differenced series are tested for stationarity. ACF and PACF plots of the differenced yield series are presented in the Figure 6.

The Figure 6 indicates that the series are stationary at first difference as ACF and PACF cut off after first lag and none of the other lagged autocorrelation and partial correlations appear to be significant except 6^{th} lag of autocorrelation and 4^{th} lag of partial correlations. The ADF test results for differenced series are also in conformity of the conclusion that yield series are stationary at first difference (Table 3). All the three-series - area, production, and yield of food grains are made stationary after first difference. Once the series are stationary, the next task is to it identify the suitable ARIMA model for these series based on the ACF and PACF of the stationary series. We need to try various specifications of the model and that takes us to the next step, that is, estimation and diagnostic checking.

(2) Estimation and Checking : As a part of the identification process, we have examined the ACF and PACF of time series pertaining to area, production, and productivity of food grains and all the three series were made stationary after first difference and the ACF and PACF of differenced series were also closely examined which is necessary for identification of the model. Based on the study of the plots of autocorrelations and their partials, various ARIMA specifications have been tried for all the three variables. The optimal ARIMA models were selected considering the various criteria like Akaike information criterion (AIC), Schwarz information criterion (SIC), significance of the parameters, R^2 , F-statistics, residual series examination, etc. The results of the fitted ARIMA model of the order (2,1,2) for area is presented in the Table 4.

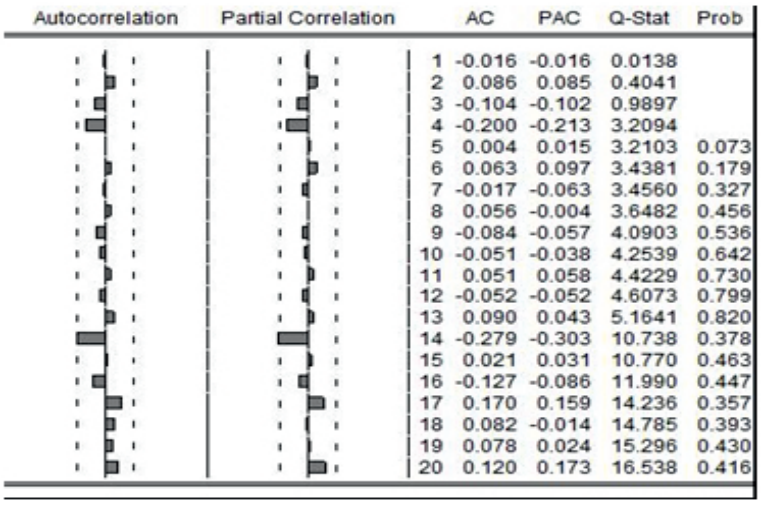
The results indicate that coefficients of AR(1) is significant and R^2 is also significant. Next, it needs to be checked whether the estimated residuals from the fitted model are white noise and for that, we need to study the correlogram of the residuals, which is presented in the Figure 7. It can be seen from the Figure 7 that none of the residual autocorrelations are statistically significant and this can also be confirmed by looking at the Box-Pierce

Table 4.Details of ARIMA (2,1,2) Model Fitted for Area Under Food Grains

Variable	Coefficient	Standard Error	*t* - Statistics	Probability
C	242.7500	616.2080	0.393942	0.6956
AR(1)	0.615258	0.188365	3.266313	0.0021***
AR(2)	-0.209240	0.257031	-0.814065	0.4201
MA(1)	-1.373985	407.2704	-0.003374	0.9973
MA(2)	0.999995	592.8114	0.001687	0.9987
R^2	0.445966***		Akaike info criterion	19.42029
Adjusted R^2	0.381543		Schwarz criterion	19.65194
F- statistics	6.922510		Hannan-Quinn criteria	19.50818
Prob(*F*-statistic)	0.000081		Durbin-Watson stat	1.995968

Note: *** indicates significance at 1%

Figure 7. Correlogram of Residuals - Area Model : ARMA (2,1,2)



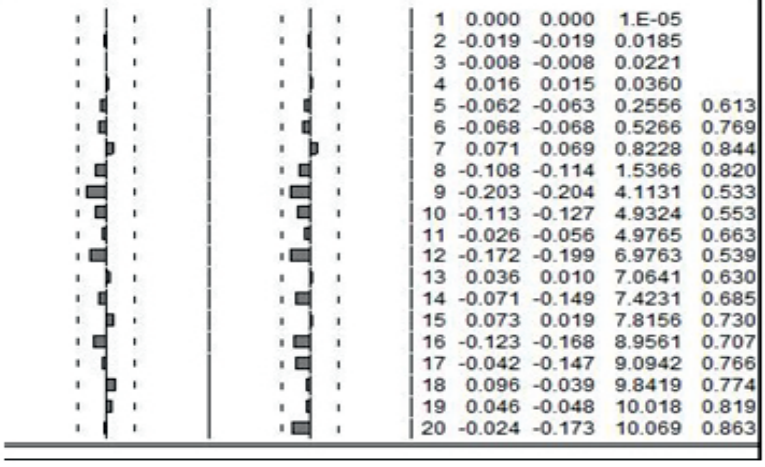
	AC	PAC	Q-Stat	Prob
1	-0.016	-0.016	0.0138	
2	0.086	0.085	0.4041	
3	-0.104	-0.102	0.9897	
4	-0.200	-0.213	3.2094	
5	0.004	0.015	3.2103	0.073
6	0.063	0.097	3.4381	0.179
7	-0.017	-0.063	3.4560	0.327
8	0.056	-0.004	3.6482	0.456
9	-0.084	-0.057	4.0903	0.536
10	-0.051	-0.038	4.2539	0.642
11	0.051	0.058	4.4229	0.730
12	-0.052	-0.052	4.6073	0.799
13	0.090	0.043	5.1641	0.820
14	-0.279	-0.303	10.738	0.378
15	0.021	0.031	10.770	0.463
16	-0.127	-0.086	11.990	0.447
17	0.170	0.159	14.236	0.357
18	0.082	-0.014	14.785	0.393
19	0.078	0.024	15.296	0.430
20	0.120	0.173	16.538	0.416

Table 5. Details of ARIMA (4,1,0) Model Fitted for Production of Food Grains

Variable	Coefficient	Standard Error	*t* - Statistics	Probability
C	3574.196	735.5284	4.859359	0.0000
AR(1)	-0.715859	0.184713	-3.875519	0.0004***
AR(2)	-0.311934	0.216430	-1.441266	0.1568
AR(3)	-0.279771	0.267304	-1.046638	0.3011
AR(4)	-0.319389	0.165101	-1.934509	0.0596*
R^2	0.420848***		Akaike info criterion	21.63764
Adjusted R^2	0.353504		Schwarz criterion	21.86929
F-statistic	6.249284		Hannan-Quinn criteria	21.72553
Prob(*F*-statistic)	0.000194		Durbin-Watson stat	1.937778

Note: ***, * indicate significance at 1% and 10%, respectively

Figure 8 : Correlogram of Residuals - Production Model: ARIMA (4,1,0)



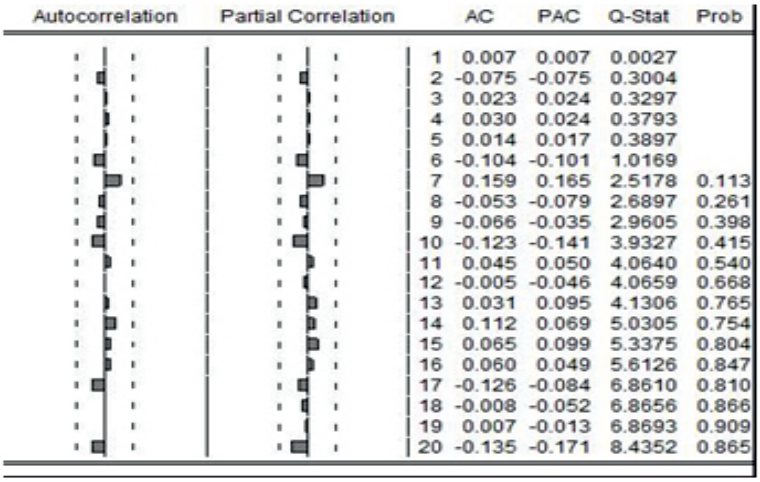
	AC	PAC	Q-Stat	Prob
1	0.000	0.000	1.E-05	
2	-0.019	-0.019	0.0185	
3	-0.008	-0.008	0.0221	
4	0.016	0.015	0.0360	
5	-0.062	-0.063	0.2556	0.613
6	-0.068	-0.068	0.5266	0.769
7	0.071	0.069	0.8228	0.844
8	-0.108	-0.114	1.5366	0.820
9	-0.203	-0.204	4.1131	0.533
10	-0.113	-0.127	4.9324	0.553
11	-0.026	-0.056	4.9765	0.663
12	-0.172	-0.199	6.9763	0.539
13	0.036	0.010	7.0641	0.630
14	-0.071	-0.149	7.4231	0.685
15	0.073	0.019	7.8156	0.730
16	-0.123	-0.168	8.9561	0.707
17	-0.042	-0.147	9.0942	0.766
18	0.096	-0.039	9.8419	0.774
19	0.046	-0.048	10.018	0.819
20	-0.024	-0.173	10.069	0.863

Table 6. Details of ARIMA (3, 1, 3) Model Fitted for Productivity of Food Grains

Variable	Coefficient	Standard Error	*t*-Statistics	Probability
C	28.80512	1.627084	17.70352	0.0000
AR(1)	-0.799759	0.310260	-2.577708	0.0136**
AR(2)	-0.176910	0.380225	-0.465277	0.6442
AR(3)	0.406331	0.235845	1.722871	0.0924*
MA(1)	0.230986	7.145491	0.032326	0.9744
MA(2)	-0.233580	8.374210	-0.027893	0.9779
MA(3)	-0.993993	6.660986	-0.149226	0.8821
R^2	0.491373***		Akaike info criterion	11.53346
Adjusted R^2	0.404535		Schwarz criterion	11.84233
F-statistic	5.658458		Hannan-Quinn criteria	11.65064
Prob (*F*-statistic)	0.000128		Durbin-Watson stat	1.926914

Note: ***, **, * indicate significance at 1%, 5%, and 10%, respectively.

Figure 9. Correlogram of Residuals - Yield Model : ARIMA (3, 1, 3)



	AC	PAC	Q-Stat	Prob
1	0.007	0.007	0.0027	
2	-0.075	-0.075	0.3004	
3	0.023	0.024	0.3297	
4	0.030	0.024	0.3793	
5	0.014	0.017	0.3897	
6	-0.104	-0.101	1.0169	
7	0.159	0.165	2.5178	0.113
8	-0.053	-0.079	2.6897	0.261
9	-0.066	-0.035	2.9605	0.398
10	-0.123	-0.141	3.9327	0.415
11	0.045	0.050	4.0640	0.540
12	-0.005	-0.046	4.0659	0.668
13	0.031	0.095	4.1306	0.765
14	0.112	0.069	5.0305	0.754
15	0.065	0.099	5.3375	0.804
16	0.060	0.049	5.6126	0.847
17	-0.126	-0.084	6.8610	0.810
18	-0.008	-0.052	6.8656	0.866
19	0.007	-0.013	6.8693	0.909
20	-0.135	-0.171	8.4352	0.865

Q - statistics presented in the Figure 7, which are high. Therefore, we can say that the estimated area model may be used to forecast the area series.

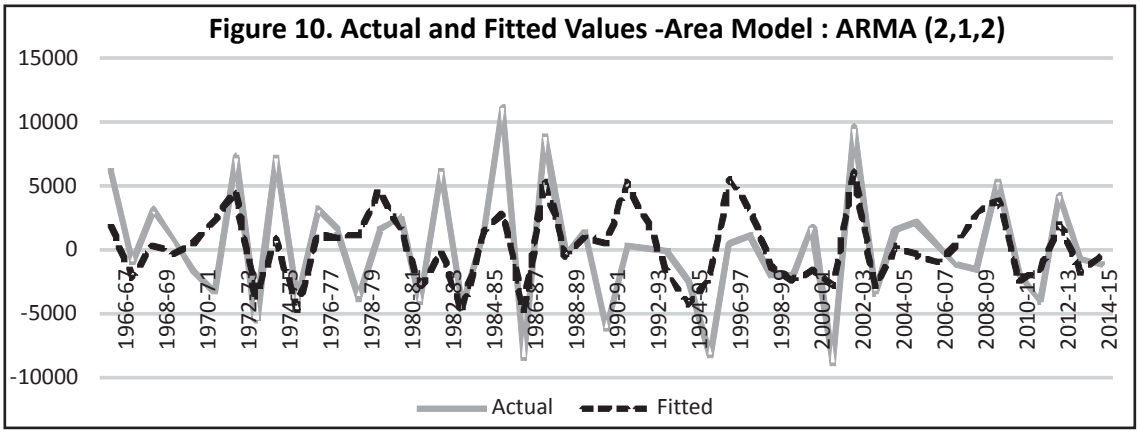
The results of the estimated ARIMA (4,1,0) model for production are presented in the Table 5. It is clear from the Table 5 that AR(1) and AR(4) are statistically significant at 1% and 10% , respectively. The R^2 is also significant at the 1% level. The adequacy of the model is also checked on the basis of estimated residual series whose ACF and PACF plots along with Q statistics are presented in the Figure 8. It is clear from the residual correlogram plot (Figure 8) that all the AC and PAC are statistically insignificant, indicating that there is no pattern left in the residuals for the production model. This is further substantiated by the higher probability values of the Q statistics.

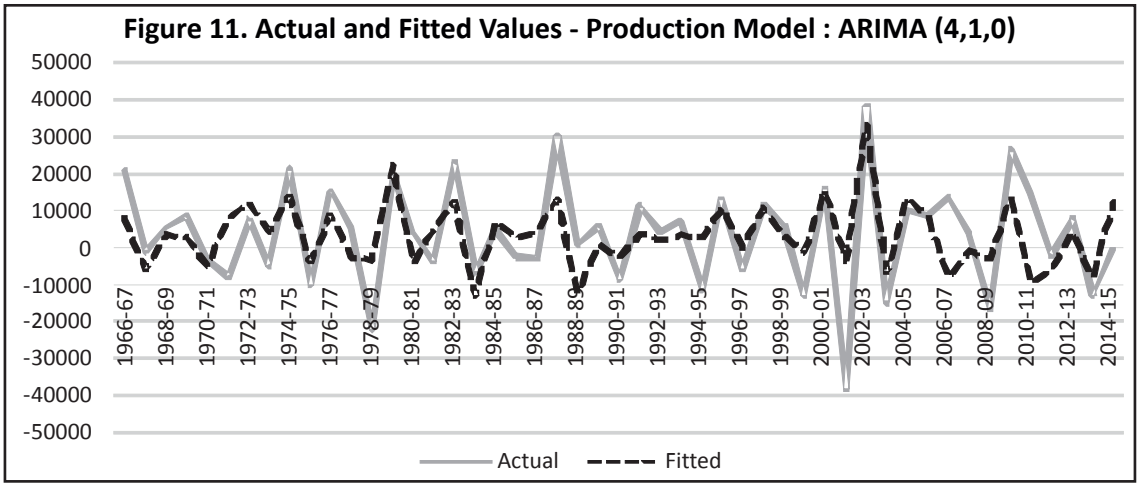
The results of the estimated ARIMA (3,1,3) model for data on yield are presented in the Table 6. The results indicate that AR(1) and AR(3) terms are statistically significant at the 5% and 10% levels, respectively. R^2 is also significant at the 1% level. The ACF and PACF of the estimated residuals of the fitted model are presented in the Figure 9. It is amply clear from the Figure 9 that there is no pattern left in the residuals as all the residuals are statistically insignificant substantiated by the value of the Q statistics and high value of the corresponding probability. Further, the test for presence of heteroskedasticity in residuals is also done for all the three selected ARIMA models based on the correlogram of the squared residuals respectively for area, production, and yield, which indicates the absence of the problem. The normality test of the residuals for all the fitted models were also examined based on the skewness, kurtosis, and Jarque - Bera (JB) tests and the results of the same are presented in the Table 7.

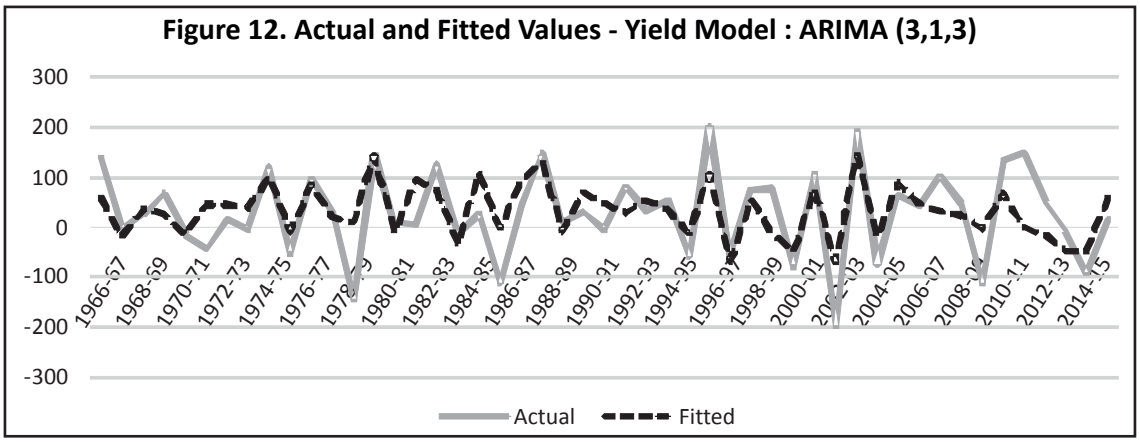
The normality assumption of the residuals is satisfied for all the models and substantiated by the statistics presented in the Table 7. Skewness and kurtosis are near to 0 and 3, respectively and JB probability is > 0.05 in all the cases, indicating that the residuals are normally distributed. The graphs of the actuals and fitted values for area, production, and yield are presented in Figures 10, 11, and 12, respectively. The important pattern present in the area, production, and yield series are captured by the fitted values of area (Figure 10) , production (Figure 11), and yield (Figure 12), respectively. Based on the above diagnostic checking, it is concluded that the all the

Table 7. Normality Test of the Residuals for the Fitted ARIMA Models

Variable/Model	Area/ARIMA (2,1,2)	Production/ARIMA (4,1,0)	Productivity/ARIMA (3,1,3)
Skewness	-0.0270	-0.4752	-0.1855
Kurtosis	2.8370	4.2200	3.0161
Jarque-Bera/	0.0602	4.8834	0.2818
Probability	0.9704	0.0870	0.8686







estimated ARIMA models are considered as reasonably satisfactory and may be used for forecasting. That takes us to the next step of forecasting values for the area, production, and yield of total food grains in the country.

(3) Forecasting : The main purpose of the fitted models is to forecast the values. The fitted models are used to forecast the values for the area, production, and yield for the next 5 years from 2015-16 onwards. The forecast values for area, production, and yield are presented in the Table 8. The forecasting accuracy tests for the models are presented in the Table 9. The accuracy of the forecasts is evaluated with the help of root mean square error (RMSE), mean absolute percentage error (MAPE), and Theil's inequality coefficient. The results of the tests are presented in the Table 9. The Theil's equality coefficient is near to zero in all the three cases, indicating that forecasting accuracy is reasonably good (Pindyck & Rubifeld, 1998). The forecasting precision of the estimated ARIMA models for area, production, and yield have been done. The forecasting precision results for the area model are presented in the Table 10.

The results for area under food grains displays that the forecast model can control 100% of the predicted value relative error in 10 % . The actual, estimated, and relative percentage error for the production model is presented in the Table 11.

In case of production, the predicted value relative error is within 5% in all the cases except for the years 2006-07 and 2009-10 (Table 11). This means 80% of the predicted value relative error is within 5%. Therefore, it may be concluded that the production model is found to be satisfactory as a whole. The Table 12 presents the forecasting precision for yield model.

Table 8. Forecasts for Area, Production, and Yield of Food Grains in India

Year	Area ('000' hectares)	Production ('000' tonnes)	Yield (Kgs/hectare)
2016-17	133442.42	267811.84	2141.55
2017-18	133685.17	271385.93	2170.63
2018-19	133927.92	274960.11	2199.25
2019-20	134170.67	278534.39	2228.07
2020-21	134413.42	282108.48	2257.01

Table 9. Forecast Evaluation of the Fitted ARIMA Models

Variable/Model	Area/ARIMA (2,1,2)	Production/ARIMA (4,1,0)	Productivity/ARIMA (3,1,3)
RMSE	7200.49	12844.57	107.9404
MAPE	4.8709	6.0895	7.3897
Theil's Inequality Coefficient	0.0284	0.0345	0.0365

Table 10. Forecasting Precision for Area Model - ARIMA (2,1,2)

Area under Food grains ('000' hectares)			
Year	Actuals	Estimated	Error %
2006-07	123,708.00	131,014.90	-5.91
2007-08	124,067.50	131,257.70	-5.80
2008-09	122,833.50	131,500.40	-7.06
2009-10	121,333.60	131,743.20	-8.58
2010-11	126,671.30	131,985.90	-4.20
2011-12	124,754.90	132,228.70	-5.99
2012-13	120,770.70	132,471.40	-9.69
2013-14	125,046.80	132,714.20	-6.13
2014-15	124,298.70	132,956.90	-6.97
2015-16	123,217.40	133,199.70	-8.10

Table 11. Forecasting Precision for Production Model - ARIMA (4,1,0)

Production of Food grains ('000 tones)			
Year	Actuals	Estimated	Error %
2006-07	217,282.10	232,070.10	-6.81
2007-08	230,775.00	235,644.30	-2.11
2008-09	234,466.20	239,217.60	-2.03
2009-10	218,107.40	242,793.00	-11.32
2010-11	244,482.00	246,366.10	-0.77
2011-12	259,286.00	249,941.00	3.60
2012-13	257,134.60	253,515.00	1.41
2013-14	265,045.20	257,089.00	3.00
2014-15	252,022.90	260,663.50	-3.43
2015-16	251,566.30	264,237.40	-5.04

In case of yield, all the predicted values are within the relative error of 8% and 90% of the predicted value, and the relative errors are within 5%, confirming the forecasting accuracy of the selected model (Table 12).

The forecasting accuracy tests amply substantiate that the forecasts done for the area, production, and yield of food grains are fairly accurate. The plots of the actual and forecasted values for area, production, and yield are

Table 12. Forecasting Precision for Yield Model - ARIMA (3,1,3)

Yield of Food grains (Kgs/Hectare)			
Year	**Actuals**	**Estimated**	**Error %**
2006-07	1,756.41	1,853.75	-5.54
2007-08	1,860.00	1,882.64	-1.22
2008-09	1,908.81	1,910.92	-0.11
2009-10	1,797.59	1,940.33	-7.94
2010-11	1,930.05	1,968.78	-2.01
2011-12	2,078.36	1,997.55	3.89
2012-13	2,129.11	2,026.69	4.81
2013-14	2,119.57	2,055.09	3.04
2014-15	2,027.56	2,084.15	-2.79
2015-16	2,041.65	2,112.96	-3.49

Figure 13. Actual & Forecasted Values - Area under Food Grains

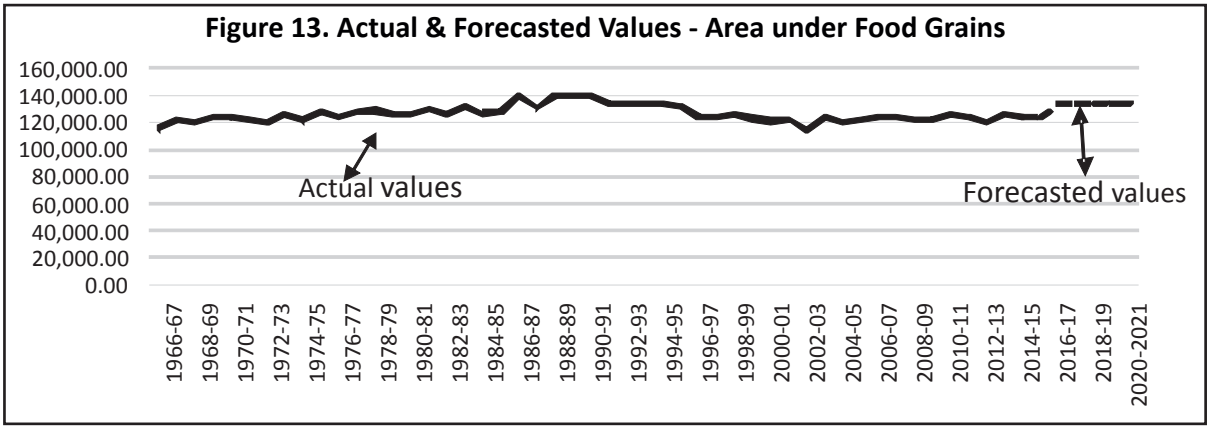
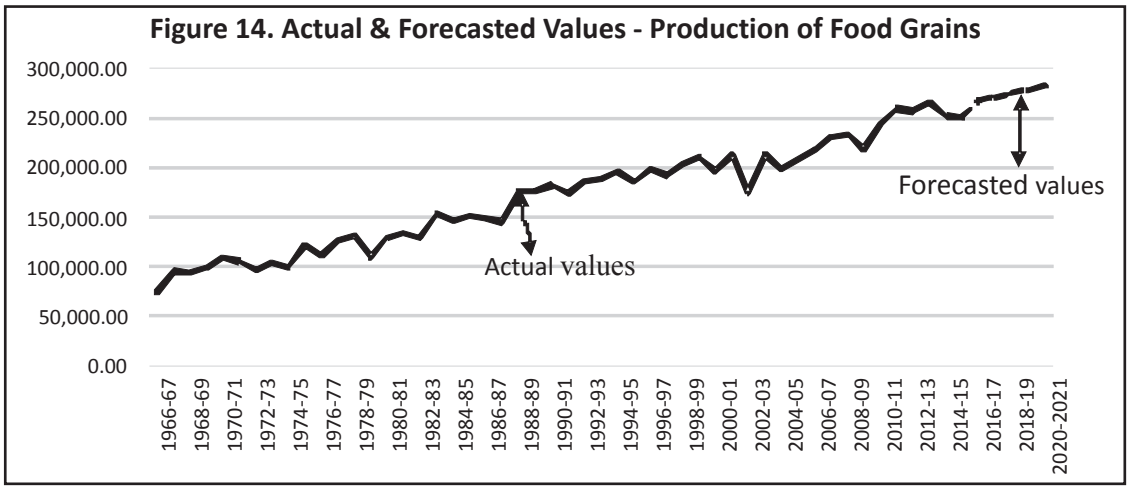
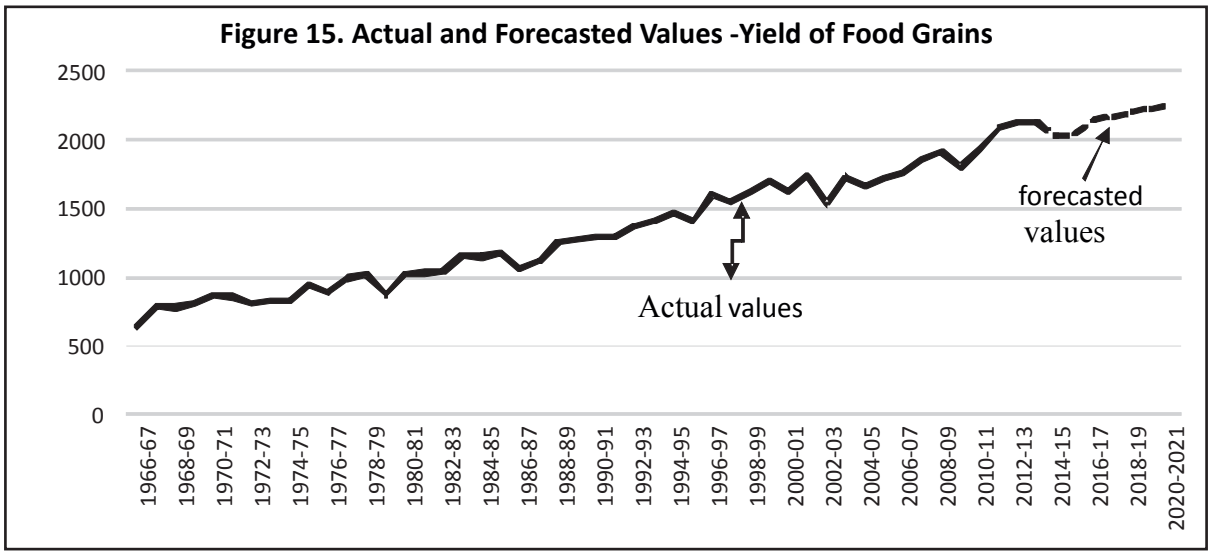


Figure 14. Actual & Forecasted Values - Production of Food Grains





presented in the Figures 13 to 15, respectively. The Figure 13 shows that the area under food grains will be almost stagnant during forecast period, that is, 2016-17 to 2020-21 but that of production and yield of food grains shows increasing trend during the same period (Figure 14 and Figure 15, respectively). It may be inferred that the increase in production will be brought about by increased yield during the forecast period.

Research and Policy Implications

The present study makes an effort to forecast the values for the yield, production, and productivity of food grains in India based on the past historical data using sound econometric technique known as ARIMA technique. The ARIMA technique is popular for its forecasting accuracy. Hence, in the present study, univariate ARIMA analysis is adopted to forecast the values for food grain's production, area, and yield in India for 5 years starting from 2016-17 to 2020-21. The selected ARIMA models fulfil all the technical requirements of a good model ; hence, the forecasts are fairly accurate.

These forecasts would be of great help to policy makers in their planning and future policy decisions as these forecasts indicate the direction of movements of the food grains' area, production, and yield in the country. Food grains are an important source of food to millions of people in India who are poor and living below the poverty line. It is the responsibility of the state to ensure food security to all these poor people. Secondly, the Indian population is growing continuously. This makes it necessary to take measures to ensure the food safety for the future by filling the gap between expected demand and supply of food grains. At this juncture, these forecast values will be of great help to the policy makers to take appropriate investment and policy decisions to ensure food security for all the citizens of the country in the future. It is evident from the forecasts that though production and productivity show an increasing trend, but area under food grains is not showing much increase. So, there is need for more concerted efforts by the government in enhancing the area under food grains production on one hand and on the other, there is need to motivate farmers to grow more food grains as more and more farmers are shifting their cultivable land towards commercial crops. Incentives in terms of better prices for the products, enough warehousing facilities, marketing facilities, supply of inputs at subsidized rates, assured markets, etc., are essential to encourage the farmers to bring more land under cultivation of food grains. Hence, this calls for concerted efforts by the government to increase the area under cultivation of food grains in order to increase the production of food grains on a sustainable basis.

Limitations of the Study and Scope for Further Research

The present analysis is based on the univariate time-series analysis in forecasting the area, production, and yield of food grains, which is the limitation of the study as these variables are influenced by a multiplicity of factors. For example, area under food grains is influenced by cost of cultivation, farm gate prices of the products, timely availability of inputs at ease, rainfall and irrigation facilities, etc. Similarly, production and yield are also influenced by various other factors. So, while forecasting the future values for the area, production, and yield, if we take important exogenous variables in the analysis, that enhances the accuracy of the forecasts. This could be considered for any further research on forecasting.

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About the Author

Dr. Pushpa Savadatti, trained in the London School of Economics, is a Chairperson, Department of Economics and Dean, School of Business Studies at Central University of Karnataka, Kalburgi, Karnataka. She has three decades of research and teaching experience in Economics. Her areas of research interest are Agriculture Economics and Applied Econometrics.

India's Competitive Advantage and Export Performance : A Gravity Model Approach

** Pritish Kumar Sahu*
*** Sam Yong Heng*

Abstract

This paper investigated India's competitive advantage and the influence of trade gravity variables in determining India's exports with its top 50 trading partners. First, we used the Revealed Comparative Advantages Index (RCA) to study the competitiveness at the two and four-digit HS-classification levels during the period from 2000 - 2014. Later, we applied an augmented gravity model to India's exports and estimated the same in a panel data framework during the same period. Considering the random effect model into analysis, the findings revealed that India's exports with its top trading partners were more sensitive to distance, GDP, population, and real exchange rate. However, to our surprise, we could not find a significant evidence of the effect of trade agreements on India's exports.

Keywords: **competitiveness, gravity model, exports, panel data, trade agreement**

JEL Classification : C33, F11, F15, F41

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Attempts to understand the reason for export of a country is not a new phenomenon. In the theory of international trade, many advocated the benefit of international trade for the countries party to it. Starting from mercantilist views of Adam Smith (1776), Ricardo (1817, theory of comparative advantage), Hickscher - Ohlin (1934, Factor endowments), Leontief (1953, paradoxical conclusion on factor abundant), and Vernon (1966, Product life cycle), every trade theory subscribed to the dynamics of international trade with a different degree of sophistication or diversification.

Amongst the new trade proponents, Krugman (1983) incorporated the idea of imperfect competition, economies of scales, product differentiation, and intra - industry trade. Over the years, several literatures (the recent literatures include : Carlin, Glyn, & Van Reenen, 2001 ; León - Ledesma, 2005 ; Weldemicael, 2012 ; Xu & Lu, 2009, etc.) highlighted that factors such as macroeconomic environment, relative unit labour costs, technological advancement, etc. are important in determining export of a country. Similarly, the role of research and development and other institutional factors as a key driver of export was empirically validated by many studies (Athanasoglou & Bardaka, 2010 ; Djankov, La Porta, Lopez - De - Silanes, & Shleifer, 2002 ; Drine, 2012 ; Hummels & Levinsohn, 1993, etc.). These variables have a strong economic significance on the export growth of a country. Empirical studies investigating other demand and supply side determinants (viz. FDI, exchange rate, infrastructure, distance, entry regulations, rule of law, property rights, and other socio-cultural and political factors, etc.) of export performance using various econometric models is well documented in the literature

* *Senior Lecturer - Economics and Quantitative Analysis Unit,* Faculty of Business, Multimedia University, 63100 Cyberjaya, Selangor, Malaysia. E-mail: pritish.sahu@mmu.edu.my
** *Research Scholar,* Faculty of Business, Multimedia University, 63100 Cyberjaya, Selangor, Malaysia.

(Acemoglu, Johnson, & Robinson, 2001 ; Baldauf, Cravens, & Wagner, 2000 ; Goel & Goel, 2014 ; Hall, Urga, & Whitley, 1996 ; Hummels, Ishii, & Yi, 2001 ; Paldam & Gundlach, 2008 ; Sahu, 2015, 2016, etc.).

Given the above, it is evident that the macroeconomic fundamentals of exports dynamics have been rigorously explored in the existing literatures. And one of the highly used tool to model the international trade and analyze the trade dynamics for many years is the use of gravity model (Brun, Carrère, Guillaumont, & de Melo, 2002 ; Liu & Xin, 2011 ; Redding & Venables, 2004 ; Novy, 2013, etc.). This model was successfully applied for the first time by Tinbergen (1962) in the international trade and subsequently extended and employed for empirical purpose in trade analysis. The application of the gravity model in international trade is crucial from the policy perspective, particularly, its application in the light of trade openness (Antonucci & Manzocchi, 2006; Raimondi & Olper, 2011, etc.), trade agreements (Bassem & Samir, 2014 ; Baier & Bergstrand, 2007 ; Frankel, 1997; Jayasinghe & Sarker, 2008; Sahu, 2014), and other trade frictions such as distance, geography, border effects, etc. (Anderson & Wincoop, 2003 ; Liu & Xin; 2011 ; Okubo, 2004, etc.). Mostly, studies that use this model to examine the trade flows across a large number of countries include the dummy variable in the regression, that takes the value one if there exists a trade relation between them or zero otherwise (for a survey see Di Mauro, 2000). Although, previous works have incorporated several variables and modified the basic gravity equation in context of India (Chakravarty & Chakrabarty, 2014 ; Kaur & Nanda, 2010 ; Nag & Nandi, 2006; etc.), but these did not cover extensively (i.e. in terms of number of trade partners) using the gravity equation in the backdrop of growing trade agreements.

In context of the above, the present paper attempts to study two aspects of exports. First, India's competitive advantage in export of goods and second, what factors affect India's export growth with its top trading partner. The competitive advantage of Indian export (products) is studied at two-digit HS classification level (97 chapters) by using the "revealed comparative approach" (RCA). Ideally, the comparative advantage should be used in a pre-trade environment to observe the Autakry. Since every country, including India, is involved in international trade, we use Balassa's "revealed comparative approach" in a way to approximate comparative advantage in autarky. Though this approach is criticized by many, but it remains as the most widely used RCA index (Eaton & Kortum, 2002; Laromain & Orefice, 2013; Sadhna 2017, etc.) and it provides an insight to the competitiveness of a country in its export of products.

The next section tries to access empirically the factors affecting India's export growth with its major trading partner by employing gravity equation. The surge in trade agreement in the world trading system have directed India's trade policy towards increasing economic cooperation, both bilateral (in effect with Afghanistan, Bhutan, Chile, Japan, Malaysia, Singapore, Sri Lanka, Nepal, South Korea, etc.) and regional agreements (in effect with ASEAN, Asia Pacific FTA, South Asia FTA) to reap the prospects of trade and market access. Though India has launched several trade agreements over the years, but many are still into the negotiation process and not into effect. For example, India has launched bilateral trade agreement with Australia, Canada, Egypt, Indonesia, Israel, Mauritius, Thailand and New Zealand, but it is not yet completed and into effect. Similarly, many regional agreements such as Bay of Bengal initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) ; Custom Union of Russia, Belarus, and Kazakhstan ; European Union FTA ; Southern African Custom Union ; and Regional Comprehensive Economic Partnership (RCEP) negotiations are ongoing with India. In this backdrop, we want to access the relevant determinants of India's export to its major trading partners by adopting the gravity approach as detailed in the methodology section.

The study takes the period from 2000-2014 covering the top 50 countries, which represent 95% of the total export during this period. The estimation uses both the fixed effect model and random effect model for the gravity equation, and the interpretation of the results is based on the estimated statistics of both the models.

Review of Literature

The revealed comparative advantage as an index to measure the advantage and the disadvantage of a country in certain products was introduced by Balassa (1965). Several studies supported it as a useful guide to study the comparative advantage, while some others vehemently criticized it. Though this index is debated in the literature, but it remained as one of the most widely used revealed comparative advantage index and was used in several studies in the recent past (Amighini, Leone, & Rabellotti, 2011 ; De Benedictis, Gallegati, & Tamberi, 2008 ; Laursen, 2015 ; Ma & Xiao, 2010, etc.).

The gravity model as a tool of trade analysis was first introduced by Tinbergen (1962) and Poyhonen (1963), though its application was already there in various other sub-fields of social science. Later, many studies (Anderson, 1979; Deardorff, 1998 ; Helpman & Krugman 1985; Sen & Smith, 1995, etc.) strengthened the theoretical base of the model over the years. This model has been used extensively in trade analysis dynamics for many years. For example, be it the estimation of models for geography and trade (Brun et al., 2002 ; Hummels et al., 2001; Novy, 2013 ; Narayan & Nguyen, 2016 ; Redding & Venables, 2004, etc.), or assessing post trade effects of a monetary union (Buongiorno, 2015 ; Egger, Larch, Staub, & Winkelmanni, 2011 ; Gil - Pareja, Llorca - Vivero, & Martinez - Serrano, 2008, etc.), or estimation of the trade creation and diversion effect of free and regional trade agreements (Baier & Bergstrand, 2007; Egger et al., 2011 ; Frankel, 1997; Jayasinghe & Sarker, 2008 ; Lawless, 2010 ; Narayan & Nguyen, 2016 ; Soloaga & Winters, 2001, etc.), or other macroeconomic determinants of trade (Caporale, Sova, & Sova, 2015 ; Kyoung, Cho, & Koo, 2003 ; Nguyen, 2010), this model is used as a major tool for modelling purpose.

There are several applications of the gravity model in the international trade. One thing that is mostly common in the application of the gravity model is that its use is primarily focused on examining trade relations within a regional block or trading partners (Anderson & Wincoop, 2003 ; Antonucci & Manzocchi, 2006 ; Bussiere & Schnatz, 2009 ; Frankel, 1997 ; Lawless, 2010 ; Limão & Venables, 2001; Narayan & Nguyen, 2016 ; Nguyen, 2010 ; Sohn, 2005, and many others). Most of these studies tried to examine how the distance between these partner countries affected the trade growth. Frankel (1997), in emphasizing the geographical factors (distance, border sharing, and population), revealed that a percentage increase in GDP would led to one tenth (0.1%) increase in bilateral trade flows. Limão and Venables (2001) investigated the trade volume in a general setting using world endowment data. The findings broadly focused on the dependence of transport costs on geography and infrastructure using the gravity equation. It revealed that deterioration of infrastructure raised the transport costs and reduced trade volumes. Antonucci and Manzocchi (2006) examined the likely impact on Turkey's trade over a time span of 35 years (1967 - 2001) on the backdrop of EU's preferential treatment to Turkey but ahead of EU membership. The empirical findings using the gravity model covered over 45 countries and found no strong evidence of any additional merchandised trade between the two, irrespective of the specification. Sohn (2005) used the gravity model to analyze Korea's bilateral trade flows with 30 major trading patterns in 23 disaggregated sectors during 1995. It found that Korea's trade was more of interindustry in nature and the distance variable was the most important in explaining Korea's bilateral trade flows. Limão and Venables (2001), using the shipping cost as the transportation cost to various destinations in the world, concluded that poor infrastructure and other unfavorable geographic topographies such as landlocked increased the transportation cost significantly for the countries.

Nguyen (2010), using both the static and the dynamic gravity model in a panel data framework, found a positive growth of Vietnam's export with the income growth of its trading partners. In addition, the study also revealed that the transport cost (distance), exchange rate, and the membership into ASEAN also significantly affected Vietnam's export performance. Similarly, several studies (Mukhtar & Malik, 2010; Mukherjee & Pozo, 2011, etc.) found the effect of exchange rate on the trade in a gravity equation framework. Mukhtar and Malik (2010), using the vector error correction model, found that the volatility in real exchange rate had a significant negative

effect on the exports. Mukherjee and Pozo's (2011) study, using the gravity model with a semi parametric regression method, found that exchange rate volatility reduced the trade and increased the uncertainty which, in fact, increased the trade cost and hedging.

In a slightly different context, studies such as the ones conducted by Taglioni (2004) ; Baldwin, Skudelny, and Taglioni, 2005; Font (2010) ; Frankel (2010) ; Egger et al. (2011) ; Buongiorno (2015), etc. examined the effect of a monetary union on trade using the gravity model. Gil - Pareja et al.'s (2008) study found the effects of European Monetary Union on trade flows using a sample of 25 organizations for OECD countries. The results showed the evidence that monetary agreement played a positive and significant role in influencing trade in the region. Similarly, Buongiorno (2015) examined the bilateral trade between 12 euro countries from 1988 to 2013 using a differential gravity model. Estimating it in a fixed effect model, the results showed either positive or neutral effect of Euro on different commodity groups. Citing the lack of theoretical foundation and the limitation of the basic gravity model, there are many studies which modified it over the years. Anderson and Wincoop (2003), citing the lack of theoretical foundation of the gravity equation, developed a modified gravity equation that correctly estimated the trade movement of countries involved. Applying their modified equation to 1993 data, they found that national border declined the trade volume by 44% between the U.S. and Canada and by 30% among other industrialized countries.

Data Sources

The present study uses the secondary data collected from various sources. The variables 'export' used for revealed comparative advantage and gravity model are taken from International Trade Centre. Other variables, such as, GDP, population, and real exchange rate are taken from the 'World Bank' data sources. The variable 'distance' is taken from CEPII. The 'trade agreement' variable, that is, whether India has an existing agreement with the partner country or not is taken from the World Trade Organization. In addition, the country specific sources such as Ministry of Commerce, Govt. of India is used to cross check the accuracy of India's existing trade agreements.

Methodology

(1) Revealed Comparative Advantages (RCA) Index : Revealed comparative advantage index measures the competitiveness of a product in countries' export to the world market. In other words, the competitiveness of trade specialization from India to the rest of the world is examined over the 10-year period from 2000 to 2014. The analysis of comparative advantages is based on sector wise two digit and four-digit level of HS classification. Using Balassa's (1965) version of RCA index, we rewrite the index as follows to examine the competitiveness of country *'i'* to the importing country (India/ Malaysia) :

$$RCA^{*}X_{ij} = (X_{ij}/X_{i})/(C_{ij}/C_{w})$$

where,
X_{ij} is India's total imports/export of commodity *'j'* from country *'i'* ;
X_{i} is India's total imports/exports from country *'i'* ;
C_{ij} is India's total imports/exports of commodity *'j'* ;
C_{w} is India's total imports/exports.

If the estimated RCA* is more than 1, it implies that country *'i'* has a comparative advantage in exporting to India commodity *'j'* rather than any other commodity. On the other hand, it indicates the opposite if the ratio is found to be less than 1. Moreover, the comparative advantages will be accessed in two different perspectives

namely, pattern of comparative advantages and changes in comparative advantages over the years. The patterns of comparative advantage of Malaysia attempts to identify the commodity which has comparative advantages during that particular year ; whereas, the changes in comparative advantages identify which commodities gain or loss in comparative advantages over the years.

(2) The Gravity Model : The specification of the Gravity model as proposed by Tinbergen (1962) and Poyhonen (1963) is in line with Newton's law of universal gravitation and is specified as :

$$X_{ij} = \alpha \frac{(Y_i Y_j)}{D_{ij}} \quad \text{--- (1)}$$

where,
X_{ij} = export from *i* to *j* (or total trade),
Y = economic size (GDP, population),
D_{ij} = bilateral distance,
and α is constant of proportionality.

Expressing the model in logarithmic estimable form :

$$\text{Ln}\, X_{ij} = \alpha + \beta_1 \text{Ln}\, Y_i + \beta_2 \text{Ln}\, Y_j + \beta_3 \text{Ln} D_{ij} + u_{ij} \text{ --- (2)}$$

where, the β's are coefficients and attach a random error term (u_{ij}). The gravity model gives a hypothesized relationship where, the coefficients of β_1 and β_2 are expected to be positive, indicating that the export from country *'i'* to country *'j'* is positively associated with the economic size and negatively associated with the distance between them ; hence, expecting a negative coefficient for β_3 (Anderson, 1979 ; Deardorff, 1998 ; Frankel, 1997 ; Helpman & Krugman, 1985 ; Sohn, 2005; 2010 ; Tinbergen, 1962 ; Nguyen, 2010 ; Narayan & Nguyen, 2016, etc.). The incorporation of trading agreement dummy in the equation has been used by ample number of studies ever since exhaustive experiment of Frankel (1997). Similarly, the inclusion of multilateral resistance factors (viz. trade agreements, common language, and colonial base, etc.) have been used in a number of studies (Anderson & Wincoop, 2003 ; Baier & Bergstrand, 2009, etc.). For the present purpose, the basic gravity model is extended as follows by adding the dummy that may influence the trade levels of India with its top 50 trading partners in the world. In the line of the recent developments, the present study includes only the time variant variables to the basic gravity model and the augmented gravity model is expressed as :

$$\text{Ln}\, X_{ijt} = \alpha_0 + \beta_1 \text{Ln}\,(GDP_{it} GDP_{jt}) + \beta_2 \text{Ln}\,(POPN_{it} POPN_{jt}) + \beta_3 \text{Ln}\,(REXR_{jt}) + \beta_4 \text{Ln}\,(DIST_{ijt}) + \beta_5 (TA_t) + \varepsilon \quad \text{--- (3)}$$

where,
X_{ijt} = Exports of country *'i'* to country *'j'* at time *'t'*, measured as the total value of exports between trading partners. This is taken from the International Trade Centre.
GDP_{it}/GDP_j = Gross Domestic Product of country *'i'* and country *'j'* at time *'t'*.The proxy of economic size, where larger the economic size of country in terms of GDP, the larger is the number of varieties of goods offered to trade and is taken from the World Bank Database.
$POPN_{it}/ POPN_{jt}$ = Population of country *'i'* and country *'j'* at time *'t'*. This is derived from the World Bank Database.
$DIST_{ijt}$ = Distance between country *'i'* and *'j'* at time *'t'*. It is the proxy of transportation or trade cost and is taken from the CEPII database.
$REXR_{jt}$ = Real exchange rate of the currencies of importing countries at time *'t'*. Large exchange rate volatility is

likely to effect the export adversely. This is taken from World Bank which averages the real exchange rate of the currencies of importing countries.
TA_t = A dummy variable 1 indicates if country *'i'* and country *'j'* belong to any trade agreement ; otherwise, it is 0 at time *'t'*. This is based on the information available with the World Trade Organization.
ε = error term and Ln= natural log.

The above specification is estimated during the period from 2000 - 2014 with 50 major export destinations of India. Three main models, that is, pooled model, fixed effect model (FEM), and random effect model (REM) can be used in gravity model. In the present study, we use both the FEM and REM for our estimations as multilateral resistance factors could bias the estimation of the gravity model (Anderson & Wincoop, 2003 ; Baier & Bergstrand, 2009, etc.) . However, the choice of methods for the interpretation of the estimated results would depend upon the estimated test statistics, that is, Hausman test and Langrangian multiplier statistics.

Analysis and Results

(1) Competitive Advantage - Evidence from RCA : The revealed comparative advantage (RCA) for all 97 chapters of the HS classification is estimated during the period from 2000 and 2014 at both the sector and product levels. In order to calculate the RCA for 2014, we consider 2000 as the reference year for comparative purposes. However, it may be possible that the pattern of comparative advantage may differ across different levels of disaggregation and sectors. Therefore, the study also analyzes RCA at more disaggregated level of 4-digit HS classification.

Results based on the RCA index show that at two-digit HS classification level, India enjoyed a comparative advantage for 40 sectors in the world market during the year 2000. India's comparative advantage was mostly concentrated in sectors like silk, lac, gums, cotton, carpets and other textile floor coverings, and cereals, etc. Over the years, the change in many countries' (including India) specializations and productivity shift altered India's comparative advantage from one product to other. For example, silk, which remained the most competitive in 2000, found no place in the top 10 competitive products in 2014, based on the RCA value. This could be because

Table 1. India's Top 10 Most Competitive Sectors Based on RCAI over 2000 - 2014

2000			2014		
HS Code	Product Description	RCA Score	HS Code	Product Description	RCA Score
50	Silk	12.9	13	Lac, gums, resins, vegetable saps and extracts nes	17.84
13	Lac, gums, resins, vegetable saps and extracts nes	11.8	52	Cotton	8.86
57	Carpets and other textile floor coverings	9.4	57	Carpets and other textile floor coverings	5.89
71	Pearls, precious stones, metals, coins, etc	8.2	10	Cereals	5.09
63	Other made textile articles, sets, worn clothing etc	7.3	14	Vegetable plaiting materials, vegetable products nes	4.49
26	Ores, slag and ash	7.0	53	Vegetable textile fibres nes, paper yarn, woven fabric	4.26
52	Cotton	5.7	63	Other made textile articles, sets, worn clothing etc	4.06
14	Vegetable plaiting materials, vegetable products nes	5.1	71	Pearls, precious stones, metals, coins, etc	3.84
53	Vegetable textile fibres nes, paper yarn, woven fabric	4.9	9	Coffee, tea, mate and spices	3.49
09	Coffee, tea, mate and spices	4.9	54	Manmade filaments	3.01

Note : * Sectors ranked in descending order

Table 2. Inter- Temporal Movement of India's RCA

Total number of products for which India holds advantage			
In 2000: 39	In 2014: 40		
Number of products retained advantage: 32			
Number of products gained advantage: 8		Number of products lost advantage: 7	
HS Code	**Products gained advantage**	**HS Code**	**Products Lost advantage**
02	Meat and edible meat offal	26	Ores, slag and ash
17	Sugars and sugar confectionery	97	Works of art, collectors pieces & antiques
27	Mineral fuels, oils, distillation products	08	Edible fruit, nuts, peel of citrus fruit…
30	Pharmaceutical products	82	Tools, implements, cutlery of base metal
75	Nickel and articles thereof	38	Miscellaneous chemical products
78	Lead and articles thereof	28	Inorganic chemicals, precious metal compound, isotopes
79	Zinc and articles thereof	40	Rubber and articles thereof
89	Ships, boats and other floating structures		
	Number of products Gained more than 10 ranks in 2014		**Number of products lost more than 10 ranks in 2014**
58	Special woven or tufted fabric, lace, tapestry etc	50	Silk
02	Meat and edible meat offal	26	Ores, slag and ash
79	Zinc and articles thereof	97	Works of art, collectors pieces and antiques
78	Lead and articles thereof	08	Edible fruit, nuts, peel of citrus fruit, melons
89	Ships, boats and other floating structures	74	Copper and articles thereof
17	Sugars and sugar confectionery	82	Tools, implements, cutlery, etc. of base metal
27	Mineral fuels, oils, distillation products, etc	28	Inorganic chemicals, precious metal compound, isotopes

of the cost competitive production of silk materials in countries like Taiwan and Vietnam. Based on the RCA value, the Table 1 shows India's comparative advantages of top 10 products at two - digit level in the world market during 2000 and 2014.

At the disaggregated level, 4 digits RCA index is calculated for all 1258 commodities exported by India to the world in 2014. For 343 commodities, the RCA values greater than 1 indicate that India enjoys comparative advantages in these products in the world market. Of which, organic chemicals ranked the highest with index value of 39.8 followed by items like human hair, worked ; wool/animal hair, and other textile material, prepared for wigs (RCAI = 33.50) human hair, unworked (RCAI = 31.60), and so on. Out of these, for a maximum number of commodities, India holds comparative advantage in the world market in organic chemicals (27 commodities) followed by inorganic chemicals, precious metal compounds, isotopes (16 commodities) and salt, sulphur, earth, stone, plaster, lime, and cement (14 commodities). It is observed that most of the sectors have shown a significant decrease at disaggregates 4-digit level. Similarly, only one sector (inorganic chemicals, precious metal compounds, and isotopes) do not enjoy comparative advantage in the world market at the HS 2-digits level, but enjoy comparative advantages in disaggregated HS 4-digit levels in term of number of commodities (RCA > 1).
Similarly, the intertemporal movement of RCA at two-digit level shows that India's advantage remained roughly the same over the years. In other words, India enjoyed a comparative advantage in 40 products in 2014 as compared to 39 in 2000 (Table 2).

A disaggregated finding shows that India retained comparative advantage in 32 products of the 39 products of 2000 and gained comparative advantage in eight new products, making the total comparative advantages to 40 in 2014. During the same period, it is observed that seven products gained a comparative advantage and an equal number of products lost the comparative advantage by more than 10 points during the same period.

Table 3. Appropriation of Method : Hausman Test and LM Test

Test Statistics	Chi-Square	*p* - value
Hausman Test	6.74	0.3453
LM Test	2043.9	0

(2) Estimation Results of the Gravity Model : The estimated results of India with its top 50 partners is reported in the Table 4. The augmented gravity equation (equation 3) is estimated with the use of both fixed effect and random effect model. The appropriation of the method, that is, fixed effect or random effect model for our analysis is based on the Hausman test and LM statistics. The results of both statistics favors the use of random effect over the fixed effect in the gravity model as evident in the Table 3. Thus, the estimated results summarized in random effect model is considered for analysis.

The Table 4 reports the estimated results of both the fixed effect and the random effect. In line with many existing studies, the present gravity model considers the variables namely - economic size, market size, real exchange rate, distance, and trade agreement as determinants of India's export to its top trading partners. The findings of this study are consistent with other studies in explaining bilateral trade by using the gravity model.

The estimated results reveal that the economic size (GDP) of the exporter country (India) has a positive and significant effect on its exports. In other words, an increase by 1% of India's GDP will increase its exports by an average index of 0.71%. Though the economic size of the importing country shows a negative sign, but insignificant results do not explain the fact that the growth in importer countries' GDP reduces India's exports to that country. The proxy of the market size (i.e. population) of the importing country is positive and significant, indicating that India's export increases with increase in the population of the importing country, but the population growth of India has no significant impact on its exports to its trading partners. On the other hand, it appears that the impact of trade cost (i.e. distance) and the real effective exchange rate inversely affect India's exports. The negative and significant coefficient of trade cost reveals that a percentage increase in trade cost is likely to reduce India's exports by 0.96% on an average.

Similarly, the negative elasticity of export demand with respect to REER implies that the real appreciation of

Table 4. Results of the Gravity Model

VARIABLES	Fixed Effect Export	Random Effect Export
Gross Domestic Product of Exporter Country *(lngdp)*	0.76825*** (0.09716)	0.70844*** (0.07647)
Gross Domestic Product of Importer Country *(lngdpi)*	-0.15432 (0.68300)	-0.08334 (0.68128)
Population of Exporter Country *(lnpop)*	0.57340* (0.21436)	0.17076 (0.11757)
Population of Importer Country *(lnpopi)*	8.52872** (3.72010)	8.92181** (3.72428)
Distant *(lndist)*	-	-0.96380*** (0.27161)
Real Exchange Rate *(lnREER)*	-0.53006*** (0.16879)	-0.42451*** (0.15060)
Trade Agreement Dummy (TA)	0.13255 (0.16494)	0.09454 (0.15106)
Constant	-180.58506*** (58.92478)	-174.48327*** (59.12120)
Observations	500	500
R-squared	0.84378	0.8421
Number of country	50	50

Source: estimated using equation (3).

Notes: Standard errors in parentheses, Significant level is indicated as, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

rupee or depreciation of the importing country's currency against that of the Indian rupee affects India's exports adversely. Statistically, the finding shows that 10% appreciation in Indian currency would reduce the export demand by 4.2%. This result is in line with the earlier findings of Carre`re, (2006), Oskooee and Hegerty (2007), and Vieira and MacDonald (2016), Narayan and Nguyen (2016), and many others. The results, surprisingly, suggest that India's trade agreements with its trading partners do not affect exports significantly, though its influence is positive.

Most of our variables using the gravity equation are similar with the findings of majority of the existing studies (Anderson & Wincoop, 2003 ; Baier & Bergstrand, 2007 ; Carre`re, 2006 ; Jayasinghe & Sarker, 2008 ; Okubo, 2004 ; Narayan & Nguyen, 2016, etc.). However, our results for the variable 'importing country's GDP' contradicts some of the earlier works which argued that importing country's GDP positively affects the export growth from the partner country (India in this case). The insignificant effect of partner importing country's GDP on India's exports could be because of growing agreements (viz. FTA, PTA, and others) of these trading partners with the rest of the world, hence making the trade diversion effect stronger. In other words, as a country grows (higher GDP), it strengthens its relation with other countries by strengthening its economic partnership (via trade agreements and various other economic treaties). Growing economic partnership of these trading partners with the rest of the world could increase the trade diversion and reduce exports from India, hence showing an insignificant effect on India's export growth to these countries.

Similarly, the results show no significant impact of trade agreements in influencing exports from India to its top partners. This result is in contrast to some of the previous estimations (e.g. Carre`re, 2006), which have shown a significant increase in trade during the ex-post trade agreements. The insignificant result of trade agreements dummy may be because of the following facts - first, despite India's trade agreement into effect with some countries, its export growth seems to be more with the USA, European Union, China etc., with whom India do not have a FTA in effect. Second, the involvement of some of India's trading partners in regional agreement to which India is not a party may have increased the trade diversion of these partner countries and reduced exports from India, indicating an insignificant effect of variable *TA* on India's exports. For example, Banga and Sahu (2015) showed that the recently concluded TPP would reduce India's exports to the TPP countries by an estimated US$190 million despite India having FTA in effect with many TPP signatories. Third, it is seen that after India's trade agreement came into effect with some countries, the total trade volume has declined over the years instead of increasing. For example, though Malaysia-India Comprehensive Economic Cooperation Agreement (MICECA) came into effect in July 2011, but there was a decline in India's exports to Malaysia in recent years (2014 and 2015) by 27% and 5%, respectively. Hence, these possible reasons may have shown insignificant sign of *TA* variable in the estimated results.

Policy Implications

For every study, the policy implementations have to be well realized. The competitiveness of products raises some important policy issues. First, it is observed that over the years, many Indian manufacturing products lost their competitive advantage ; whereas, some other products gained it, though there is an overall gain in the competitive advantage. In this context, it is important that better government support and policies would help the competitiveness of other products too. The State should have a mechanism to support the manufacturer through proper coordination and meetings between the policy makers and the manufacturers. This would keep them aware about the products, international market conditions, production techniques, competition, and help them increase their competitiveness too.

Similarly, FTAs raise some important policy issues. FTAs serve as a long - term national interest and trade policy objectives. It is important for the government to look into the interests associated with FTAs. For example, some of the FTAs may hurt the interest of the domestic manufacturers and their ability to survive and sustain

because of the free inflow of products across the border. Hence, the State should be proactive in deciding which type of FTA agreements would serve the national interests and what should be the criteria in choosing FTA partners. Are FTAs a substitute for or a complement to India's commitments and interests in promoting a multilateral trading system via the World Trade Organization (WTO)? It is well known that each trade liberalizing measure can have positive effects on some sectors and adverse effects on others. Hence, the states should make a proper assessment in determining which countries would be an appropriate FTA partners for India with minimum adverse effect on its people.

Concluding Remarks

This paper highlighted two aspects of Indian exports, namely the competitive advantages and the influence of trade gravity variables to Indian exports to its top 50 exporting partners with recent database. It is interesting to underline that the comparative advantage (at HS two-digit level) has changed for a number of products over a period of 15 years. Some of the most competitive products like silk, ores, and slag which remained as the top 10 competitive products lost their comparative advantage in a span of one and a half decade. The same is also observed in the estimation at the four digit HS classification level. However, inter-temporal movement of RCA at two-digit level shows a marginal increase in India's comparative advantage from 39 products in 2000 to 40 products in 2014.

Our empirical analysis using an augmented gravity model shows the results for majority of the variables at par with many existing studies. Taking random effect result into account, the variables such as GDP of India, population of importing country, and distance have shown the results as expected. But some variables such as trade agreements with exporting countries did not show the expected results. Taking into account the estimated results, our findings make a point that India's exports are crucial to its GDP, importer country's population, distance, and exchange rate, but not for the established trade agreements.

Limitations of the Study and Scope for Further Research

Improving export performance is one of the key objectives of many countries, including India. Although India's export performance has lagged behind the expectations, but it has increased much faster following the liberalization. In this context, the study considered the top 50 trading partners of India during the period from 2000 - 2014. Though the empirical findings are as per our expectations, but given the coverage and the methodology, the findings may have certain limitations. First, the inclusion of the number of countries may be cited as a limitation in the study as the countries having minimum trade relation with India or zero trade flow are not included. Second, choice of the gravity model, while estimating the exports, is undertaken differently in different studies, each one with its strengths and limitations.

The present paper used an augmented gravity model, which can be presented differently by different researchers. For example, some studies have included dummies such as common language, common border in their augmented gravity model, which are not included here. Similarly, choice of explanatory variables is also different in different studies. Given the above, there lies ample scope of estimating export performance of Indian firms by incorporating other variables and may use the dummies in the model as the conventional gravity model is not quite sensible under some circumstances. There is a need for more in-depth analysis with wider coverage of study period, number of countries, and the methodology, particularly the inclusion of explanatory variables in the augmented gravity model.

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About the Authors

Dr. Pritish Kumar Sahu is working as a Senior Lecturer at the Faculty of Business, Multimedia University, Malaysia. He received his PhD and M. Phil in Economics from Jawaharlal Nehru University, New Delhi, India. He has published several papers in indexed journals, popular newspapers, working papers, and has contributed to Nobel Laureate Paul Krugman's three global edition textbooks. He has worked as a lead researcher on several projects, has undertaken international consultancy, and is associated with few journals in various capacities.

Sam Yong Heng is a Research Scholar at the Multimedia University, Malaysia. He has worked as a Research Fellow in several projects and has submitted his M.Phil in Economics at MMU, Malaysia. Presently, he is working as a Research Team Member with a multinational firm in Singapore.

Fiscal Decentralization and Urban Local Finance in India : A Case Study of Haryana

** Jagdeep Kumar*
*** Rajpal Singh*

Abstract

The present paper analyzed the changing contour of Indian federalism after the historical constitutional amendments in 1992 related to Panchayati Raj and urban local bodies. The urban local finance in Haryana, particularly after the historical 74th Constitutional Amendment Act, 1992 has added a new dimension to the fiscal decentralization and fiscal federalism in this country. This analysis was based upon secondary data collected for the period of 10 years (2004-2014) from various sources on income and expenditure of urban local government in Haryana.

Keywords: **Centre Finance Commission, expenditure, fiscal federalism, grant-in-aid, State Finance Commission, tax and non tax revenue, urban local bodies**

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The term 'fiscal federalism' was first introduced by the German born American economist Richard Musgrave in 1959. Garran (1995) defined federation as a form of government in which sovereignty or political power is divided between the central and local governments, so that each of them within its own sphere is independent of the other. Fiscal federalism deals with the fiscal financial relations among different layers of a government. Federalism provides a thread by which various regions having diverse characteristics can be knitted together into a beautiful and well-designed fabric of federal nation. Thus, federation is a bouquet of entities, all diverse, but brought together and tied by a string of constitution. Federal form of government stands for decentralization of authority for the reasons of economy, administrative convenience, and efficiency.

The history of fiscal federalism in Modern India goes back to the Government of India Act, 1919. This was the first attempt of the government where separation of revenue head of federal and the provinces were made. Thereafter, second attempt was made in the year 1935 when Govt. of India act, 1935 was enacted. This act was the one of the largest acts enacted in the history of British government. This act had 321 sections and 10 schedules. Financial powers were given in the VII scheduled of the Act which contained three separate lists (a) Federal legislative list, (b) Provincial legislative list, and (c) concurrent list. The powers and functions of the federal and provincial governments were demarked in this act.

The Government of India (GOI) Act, 1935 was repealed by the constituent assembly and the new constitution of India was adopted on January 26, 1950 in which the federal form of government was adopted. Indian Federalism was formerly evolved as a two-tier structure where center was at the top and states were lying in the periphery with a clear-cut demarcation of revenue and expenditure in the seventh schedule of the constitution. Functions of national importance are placed in the Central list and those of regional importance are kept in State list. Functions

* *Research Scholar,* Department of Commerce, M.D. University, Rohtak - 124 001, Haryana.
E-mail : jagdeepdhy@gmail.com
** *Professor,* Department of Commerce, M.D. University, Rohtak - 124 001, Haryana.

that require cooperative solution are kept in Concurrent list. However, residual powers have been to the central government. To strengthen fiscal federalism, under article 280 President of India is required to constitute a Finance Commission after every 5 years to review and improve the fiscal health of the consolidated fund of the states.

Fiscal federalism is an important component of decentralization. Decentralization may be defined as the empowerment of local people through local government (Oonmen, 2006). Decentralization increases efficiency of the lower levels of Government in providing various local services. An increase in decentralization is expected to delegate more powers to local government authorities and augment their capacity to mobilize resources. Fiscal decentralization is a basic requirement for effective and functional decentralization. Fiscal decentralization, therefore, is the fiscal empowerment of local government by devolving taxation and spending powers to rectify mismatches in resources and responsibilities. Decentralization increases economic and administrative efficiency in delivering local services. Powers and functions should be distributed among different level of government on the principle of comparative advantages. Kerala is the only state in India where functions and taxation powers are demarcated between state and the local bodies (Ghosh, 2010). According to James (1999) four crucial conditions are required for the success of democratic decentralization (a) devolution of sufficient powers within political system, (b) adequate financial resources to accomplish functions, (c) administrative capacity to accomplish assigned functions, (d) ensure accountability of elected politicians to citizens and bureaucracy to the elected politicians.

The local bodies in India existed both in rural and urban areas even before 1992 but they were not functioning as an independent unit of self-government. Before 1992 it was the responsibility of states governments to strengthen local bodies by enabling them with certain power and functions so that they can function independently. However, till 1992 nothing concrete was done by any of the state governments for the development of local bodies. Without constitutional status local bodies in all states became paralyzed. Local bodies were functioning under the clutches of the caste ridden feudal system with concentration of power in the hands of few landlords (Singh & Kumar, 2012).

After independence central government had appointed various committees e.g. Balwant Roy Mehta committee, K. Santham Committee, and L.M. Singhvi Committee to review functioning of local bodies. The then Prime Minister Shri Rajiv Gandhi introduced the 64th Constitutional Amendment Bill in 1989 which was passed by Lok Sabha, but failed to get the assent of Rajya Sabha. Later, with comprehensive amendments, the Panchayati Raj Bill of 1989 was again introduced in the form of 73rd constitution Amendment Bill, 1992 during the Prime Ministership of P. V. Narasimha Rao and this time it was passed by both the Houses of Parliament. Thus, a third tier was added to our federal structure.

The 73rd constitutional amendment Act, 1992, came into force w.e.f. April 24, 1993, and immediately after this the 74th amendment Act relating to municipalities was passed by the Parliament and the act came into force from June 1, 1993. These two amendments in the constitution were of historic importance and marked a watershed in the history of modern India. After seventy-third and seventh-fourth amendment, Indian federal structure was constitutionally transformed into a three-tier structure. Two types of local bodies were created in the third tier, viz. Rural Local Bodies (RLB) or Panchayati Raj Institution (PRI) and Urban Local bodies (ULB) or Municipalities. These local bodies were further divided into three layers of administration.

Review of Literature

Oommen (2006) stated that the fiscal decentralization in India was routed through local government but local bodies had been struggling for functional autonomy. His analysis found that in many states fiscal transfers were made to the local government through various schemes of the state government. A study on urban decentralization was conducted by Bagchi and Chattopadhyay (2004). They found that decentralization in urban

areas was a result of rapid urbanization of big cities. These cities became the hub of industrial and economic activities which attracted foreign direct investment (FDI) as well as other small portfolio investors. Devolution of fiscal power to lower governments aggravated regional disparity and delegation of unlimited borrowing powers to the local governments could lead to excessive debt burden on the national government. The study conducted by Behar (1999) on centre and state financial relations found that decentralization meant devolving powers and authority to the local government institutions but in the case of local government these were limited to development and financial functions, whereas, most of the regulatory functions like revenue and resource generation were vested in the state government.

Another study conducted by Pal (2012) found that because of large number of local services including public safety and convenience, education and medical, streets, public health services, water supply, veterinary services, and municipal work, expenditure increased continuously and showed rising trends. The study conducted by Pethe and Lalvani (2006) found that apart from inherent structural bottlenecks like limited autonomy regarding taxation, small buoyancy of non - tax tax revenue, and the unpredictable nature of funds transfer from the state, the problem of ULBs was further aggravated by the stipulation in the municipal act that ULB must balance their budgets. Ghosh (2010) examined two judgments of the apex court regarding encroachments in the functional domain of the local bodies and found that the judiciary also had found nothing unconstitutional in case of MPLAD scheme and Arkavathy layout cases. In these cases, the states governments had taken a firm stand that constitution had not given exclusive financial powers to local bodies and also reiterated that the role of local government was not greater than the agents of the state government in delivery of local public goods**.** Singh (1974) found that Municipal finance was based on tax revenues which contributed 82% of total municipal income.

Mohanty and Mishra (2017) concluded that revenue expenditure was pro-cyclical in the long run whereas capital expenditure was pro-cyclical in the short run. At the state, level primary revenue expenditure was more pro-cyclical. Therefore, states should identify wasteful expenditure to control cyclical effect in the economy. Bagchi (2001) found that ULB depended on state government and state government depended on central government for finance. Therefore, to relieve the higher government from excessive financial burden, an alternative method or unconventional method like capital market funds had to be introduced for financing ULB. Bandyopadhyay (2008) recommended that for effective decentralization, the Ministry of Panchayati Raj Institutions (MOPRI) needs to put constant pressure on the state government to prepare and implement activity mapping in the three tiers of the local bodies.

Dash and Rath ((2016) evaluated the fiscal performance of North-Eastern (NE) States of India and found that fiscal performance of NE states was better than other general category states because of high share of Grants in total state income. At the same time debt as a percent of GSDP (gross state domestic product) of NE States was increasing whereas debt of general category states was decreasing. Therefore, NE states should take initiatives to increase their own revenue receipt.

Urban Local Bodies in Haryana

Municipal bodies are classified on the basis of size of population living in a particular municipal area defined by the state government. A municipal area which is also known as transitional area between rural to urban having population up to 50,000 is denoted Municipal Committee whereas smaller urban areas having population more than 50,000 but less than 5,00,000 are designated as Municipal Councils. The larger urban municipal area where total population is more than 5,00,000 is constituted as a Municipal Corporation. At present 10 Municipal Corporations, 18 Municipal Councils and 52 Municipal Committees are functioning in Haryana.

Functions of Municipalities

Under section 243 W of the 74th Constitutional Amendment Act (CAA) powers and functions of municipalities are defined in the constitution of India. In compliance with 74th CAA, the government of Haryana enacted the Haryana Municipal Corporation Act, 1994 and the Haryana Municipal (amendment) Act (HMA), 1994. Under section 66-A of HMA 1994 Act, 18 obligatory functions are entrusted to the municipal councils and committees. However, state government has overriding power to transfer or withdraw any of the functions given in this section on the basis of its discretion.

Similarly, under section 42 of the Haryana Municipal Corporation Act, 1994, a list of 18 broad functions are mentioned whereas and under section 43 of this act there is an additional list of 22 obligatory functions which can be levied by the municipal corporation as per requirement. Moreover, there is another list of 24 discretionary functions under section 44 of the act.

In all the functions related to the any of the municipalities, the state government has overriding power under section 67 of the HMA, 1973 to take away any of the functions from the municipalities if it is satisfied that municipalities are incompetent/unwilling to perform functions related to maintenance or construction, water supply, and road etc. The water supply and sewerage disposal are the core functions of the ULB but the function of water supply was taken from the all Municipalities in 1993 except Municipal Corporation, Faridabad and handed over to the Public Health engineering department Haryana. This is direct encroachment of the functions allotted to the ULB in the 74th constitutional amendment (4th State Finance commission Haryana Report, pp 159).

The 4th State Finance Commission (SFC) of Haryana observed that out of 18 mandatory functions given under section 243W of 74th CAA, only 12 functions were transferred to the municipalities by the state government; remaining six functions i.e. preparation of plans for economic development and social functioning, urban planning including town planning, urban forestry, protection of environment and ecology, water supply for domestic, industrial and commercial purpose. Safeguarding the interest of weaker section of society including handicapped and mentally retarded, promotion of cultural education and aesthetic aspects are yet to be transferred to ULBs.

Objectives of the Study

- To examine the trends of revenue and expenditures of municipalities and assess their fiscal position.
- Examine and identify major constraints that can influence the overall performance of ULB.

Methodology and Data Collection

This study is based on secondary data. The required data is collected from various reports of State Finance Commission and Directorate of Urban Local Bodies, Haryana. The present study utilizes the time series data from 2004-2005 to 2013-2014 on Tax Revenue, Non Tax Revenue, and Expenditure of Urban Local Bodies in Haryana. In the present study Compound Annual Growth Rate (CAGR) tool is used to calculate growth rate.

- **Tools and Techniques Used :** Simple percentage, multiplication.

(1) Annual Compound Growth Rate : The annual compound growth rates for different variables were computed by fitting the power function to the figures of revenue and expenditure of local bodies in Haryana for the period of 2003-2004 to 2013-2014. The ordinary least square method was used to fit the power function of the following form. It was done using Microsoft Excel.

$Y = Y_0 (1+r)^t$
Y_0=A, $(1+r) = B$
$Y = Ab^t$

It was converted into log linear function with the help of logarithmic trends :

Log Y = Log A + t log B
Y = revenue/expenditure
t = time variable

$y = a + bt$
Log $Y = y$
Log $A = a$
Log $B = b$
a is intercept/constant
b is regression coefficient

Annual compound growth rules (ACGRs) were calculated by using the formula :
b =Log $(1+r)$
Take antilog
antilog b =$(1+r)$
r = antilog b -1
r is annual compound growth rate.

Analysis and Results

(1) Taxation Powers of the ULB : Municipal Councils and Municipal committee are empowered to impose two categories of taxes namely obligatory taxes and discretionary taxes under Haryana Municipal Act, 1973. Section 69 of the act provides details of the various obligatory taxes which shall be levied by the ULB whereas section 70 of the act provides details of the discretionary taxes that may be imposed by the municipalities as per their requirement/discretion. In a similar manner, Municipal Corporations also have powers to raise revenue from tax and non tax sources. The Section 87 and 88 of the Haryana Municipal Corporation Act, 1994, provides details of obligatory & discretionary taxes/charges which may be levied by the Municipal Corporations. It is pertinent to mention here that all the taxes levied by the municipalities are subject to prior approval of the government. Presently, municipalities in Haryana are levying House tax, Driving License tax, Motor tax, Fire tax, Entertainment tax, Additional Stamp duty, and Electricity tax. In addition to tax sources, Municipalities also raise revenue from non-tax sources, that is, development charges, The Bazari, license fee, fee and fine, rent, interest receipt, and miscellaneous (sale of assets) etc.

The Property tax was the main source income for ULB but it was abolished by the state government w.e.f. April 1, 2008 on residential buildings and later it was reintroduced vides its notification SO.47S.O.47/H.A.24/1973/S.84/2012 dated June 21, 2012. Taxes like Property tax and Fire tax are the only taxes collected by the Municipality itself, whereas driving license tax, Motor tax, Electricity duty, and Entertainment taxes are collected by the concerned administrative departments at the rates notified by the state government from time to time. The amount is remitted to the concerned ULB.

Apart from these taxes, there are some other taxes like Local Area Development Tax (LADT), Stamp duty, Excise duty, and HVAT are levied and collected by the state government and the proceedings are shared with the ULBs as per the recommendations of the SFC. However, these taxes are not enumerated as sources of revenue of the ULB.

The Octroi was one of the important sources of income for ULB but it was abolished by the state government w.e.f. Nov 1, 1999. It was a major jolt to municipal finance. However, to compensate the revenue loss from Octroi, the state government introduced the LADT in 2000 but the Hon'ble Punjab and Haryana High courts had declared LADT as unconstitutional in 2008.

(2) Trends of Tax Revenue and Non Tax Revenue of ULB in Haryana : The ULBs in Haryana received revenue collected from various tax and non tax sources. The Tax Revenue Sources (TRS) are divided into parts i.e. own taxes revenue and shared tax revenue. The shared taxes are the taxes which are levied and collected by the state government but the proceeds are shared with the local bodies on the recommendations of the SFC. Moreover, ULBsalso generate revenue from various non tax sources which such as development charges, TehBazari, license fee, fee and fine, rent, interest receipt and other miscellaneous sale of assets. The data on tax and non tax sources of revenue has been compiled in Tables 1 and 2.

Table 1. Tax Revenue of ULB (in Crore)

Year	Own taxes							Shared taxes					
	House Tax	Fire Tax	Driving License tax	Motor Tax	Electricity tax	Entertainment Tax	Total	LADT	Addl. Stamp duty	Excise Rev.	Sur. On VAT	Total	Grand Total
2004-2005	44.94	5.68	3.96	3.96	4.25	7.98	**70.77**	39.50	42.16	6.7		88.36	**159.13**
2005-2006	41.77	4.00	5.51	4.54	6.59	8.78	**71.19**	115.8	56.75	6.25		178.8	**249.99**
2006-2007	42.56	3.62	1.53	5.53	8.28	0.15	**61.67**	129.64	37.72	8.2		175.56	**237.23**
2007-2008	43.43	3.99	1.35	5.55	7.83	0.05	**62.2**	157.27	69.35	9		235.62	**297.82**
2008-2009	33.98	3.10	1.82	6.10	7.19	0.08	**52.27**		297.91	9.9		307.81	**360.08**
2009-2010	23.95	3.29	2.33	5.10	8.97	0.06	**43.7**		228.64	10.90		239.54	**283.24**
2010-2011	66.00	4.71	5.38	7.78	20.38	0.06	**104.31**		364.85	43.15	248	656	**760.31**
2011-2012	117.32	17.68	5.37	23.03	16.75	0.07	**180.22**		533.3	40.65	550.39	1124.34	**1304.5**
2012-2013	207.20	7.26	2.30	13.23	19.61	7.72	**257.32**	1.79	451.55	46.38	198.75	698.47	**955.79**
2013-2014	335.27	16.52	4.84	13.63	19.23	.17	**389.66**	.38	426.89	36.09	238.19	701.55	**1091.2**
CAGR	**24%**	**14%**	**4%**	**17%**	**18%**	**-21%**	**26%**		**38%**	**29%**			**26%**

Source: Various Reports of State Finance Commission (SFC), Haryana

Table 2. Non-Tax Revenue of ULB (in Crore)

Year	Devp. Charge	TehBazari	License Fee	Fee and Fine	Rent	Interest Receipt	Misc.(sale of assets etc.)	Total
2004-2005	14.12	2.15	1.13	1.74	15.43	2.05	18.30	54.92
2005-2006	24.58	2.64	1.18	1.42	15.71	1.41	21.73	68.67
2006-2007	38.21	2.88	1.13	2.09	17.86	3.04	31.83	97.04
2007-2008	30.87	2.91	1.09	1.57	15.30	6.56	25.48	83.78
2008-2009	32.15	3.00	1.46	2.14	21.76	7.23	35.86	103.6
2009-2010	53.39	6.29	2.84	2.72	21.21	10.15	208.88	305.48
2010-2011	25.58	43.33	11.42	3.58	25.70	20.18	104.43	234.22
2011-2012	69.18	64.24	14.14	8.01	39.17	47.82	167.02	409.58
2012-2013	74.15	5.18	16.60	29.28	30.11	66.57	51.33	273.22
2013-2014	58.31	4.26	18.39	9.97	37.82	78.97	138.36	346.08
CAGR	**15%**	**24%**	**47%**	**32%**	**12%**	**60%**	**26%**	**26%**

Source: State Finance Commission (SFC) Reports

Table 1 shows the data on tax revenue accrued to the municipalities in Haryana from the period 2004-2005 to 2013-2014. Total revenue from tax sources are divided into two parts i.e. own tax revenue and shared tax revenue. House tax/property tax is the main own tax source of income for the municipalities which contribute maximum revenue to the municipal exchequer. In 2004-2005, collection from house tax was 44.94 crore which constitutes 63.5% of the total own tax sources. In 2007- 08, this percentage goes up to 69.82% and in the year 2012-2013 and 2013-2014 it become 80.52% and 86.04%, respectively. The data indicates that the income from House tax is consistently rising and consistently making highest contribution among all own tax sources of municipalities. Recovery from house tax reduced in 2009-2010 due to abolition of House tax on residential buildings w.e.f. April 1, 2008. It again shows improvement in 2011-2012 because it was re-imposed w.e.f. June 21, 2012 with enhanced rate. The tax on consumption of electricity was imposed by the government on July 1, 1992 and ULB got share at the rate of 1 paisa per unit and this rate was further increased to 5 paisa per unit w.e.f. May 16, 2000 to strengthen municipal revenue. The CAGR of House tax and Electricity tax are calculated as 24% and 18% respectively. Entertainment tax is the only tax which is showing negative CAGR i.e. -21% which is because of the substantial decrease in tax rate by the government and abolition of show tax w.e.f. July 1, 2001.

The contribution of share taxes plays a very significant role in municipal finance. In 2004-2005, the total contribution from the additional stamp duty was ₹ 42.16 crore which was ₹ 47.71% of the total received under the shareable tax sources. In 2008-2009 and 2009-2010 it contributed 96.78% and 95.44% of the total contribution made from the state taxes. The data indicates that share from ASD (Additional Stamp Duty) is very significant and consistent. The CAGR of ASD and Excise duty is 38% and 29% respectively.

Table 2 shows the trends of Non-Tax Revenue Sources (NTRS) of the ULB in Haryana. Development charges and sale of assets are the major source of non-tax revenue for municipalities. Both of these non-tax revenue sources contribute an average of 42 crore and 80 crore respectively. In 2004-2005 revenue from development charges was collected 14.12 crore which was 25% of the total NTRS of the ULB. In 2006-2007 it became 38.21 crore which was equivalent to 36% of the total NTRS. Rent and interest receipt contributed an average of 24 crore per annum. Contribution of license fee and fine is only 6 to 7 crore annually. Moreover, the CAGR of License fee and interest receipts are calculated as 47% and 60%, respectively. Whereas development charges show very sluggish annual growth rate i.e. 15% and 12%. Overall CAGR of all non-tax revenue is only 26%. Similarly, revenue from sale of assets was ₹ 18.30 crore in 2004-2005 which is 33 % of the total NTRS. The revenue from this source was increased to 68% in 2009-2010 but the percentage goes went down in 2013-2014 to 39%. The revenue from sale of asset is not a sustainable source of the income for ULB. Significantly high share of this source in the total NTRS represent weak financial health of the ULB.

Figure 1. Tax and Non-Tax Revenue Trends

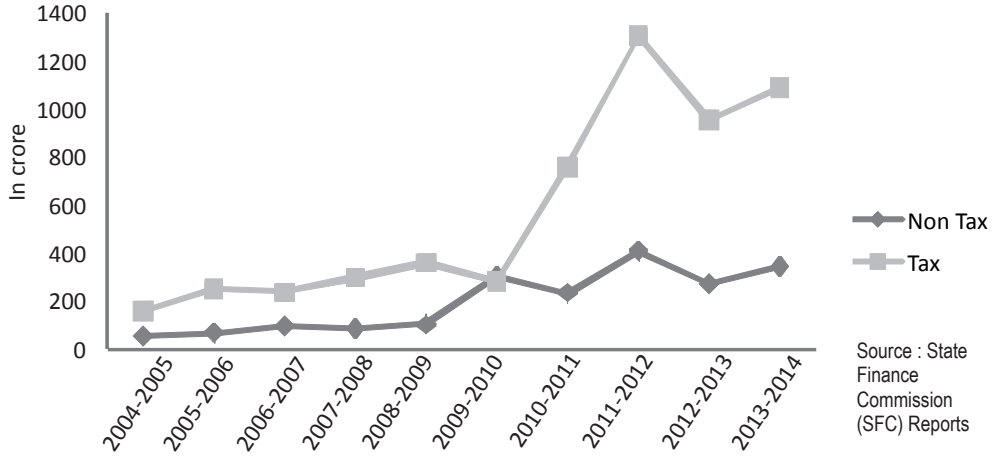


Table 3. Percentage of Tax and Non-Tax Revenue to Total Revenue

Year	Tax Revenue percentage	Non Tax Revenue percentage
2004-2005	74.34	25.66
2005-2006	78.45	21.55
2006-2007	70.97	29.03
2007-2008	78.05	21.95
2008-2009	77.66	22.34
2009-2010	48.11	51.89
2010-2011	76.45	23.55
2011-2012	76.1	23.9
2012-2013	77.77	22.23
2013-2014	75.92	24.08

Source: State Finance Commission (SFC) reports

In Figure 1, the Trends of tax and non tax revenue are shown. The Tax Revenue trends are rising whereas Non Tax trends are moving on at a constant rate. In the year 2009-10 the collection of revenue from tax and Non-Tax are almost same it is because of abolition of LADT in 2008. After 2009-10 revenue from tax sources shows a steep rise in trends whereas because of negative growth of income from TehBazari, Rent, and sale of assets in 2012-2013 overall revenue from non-tax resources comes down. Overall CAGR of non tax revenue is 26%. The CAGR of other NTRS like interest receipt, sale of assets, license fee & TehBazari are 60%, 26%, and 47%, respectively. The CAGR of both revenue sources, that is, TRS & NTRS are calculated almost same 26% growth but after 2009-2010, TRS indicates a steep rise in collection, whereas NTRC are moving constantly.

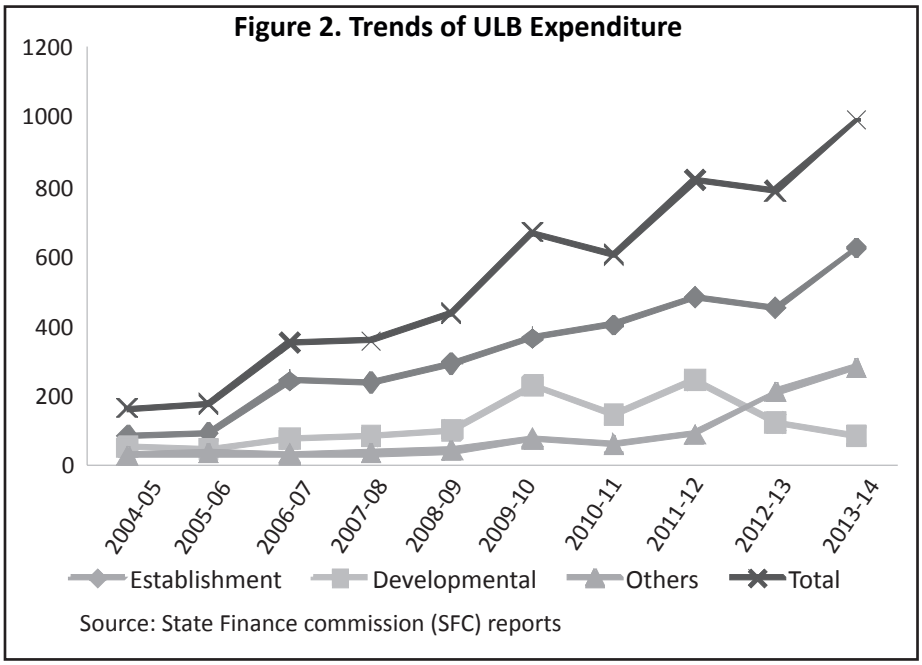
It is clear from Table 3 that the municipal finance in Haryana has a narrow base. It is heavily biased towards revenue sources from tax. Non- tax resources are not properly exploited. In 2004-2005 revenue collected from TRS constitute 74.34% whereas NTRS contributed only 25.66% of the total revenue collection. In 2005-2006, it further rose to 78.45% on the other collection from NTRS reduced to 21.55%. If we look at the entire period from 2004-2005 to 2013-2014, we would find that in all the years except 2009-2010 proportions of TRS is significantly higher than that of NTRS. The percentage of TRS and NTRS collection in 2009-2010 are 48.11% and 51.89%, respectively. This happened because of steep rise in the collection of revenue from sale of assets of municipality. On the other hand collection of House Tax decreased because of the abolition of House tax on residential buildings in 2008. Moreover, LADT was also rolled back by the government on March 14, 2008 on the direction of the Hon'ble Punjab and Haryana High court. It was levied from May 05, 2000 as a compensatory after abolition of Octroi w.e.f. November 01, 1999. The tax buoyancy of NTRS is always wider than that of TRS because of its wider coverage area but in case of ULB Haryana its contribution is very less. Lower revenue collection indicates that the non-tax revenue potentials of the municipalities are not fully exploited.

(3) Expenditure of Urban Local Bodies : Table 4 shows the major components of expenditure of the municipalities in Haryana. Data shows that expenditure on establishment constitutes major chunk of total municipal expenditure. While studying the trends of expenditure, it came to our notice that expenditure on establishment is increasing at a very fast rate. In 2004-2005, expenditure on establishment was 84.1 crore which constitutes 51% of total expenditure. In 2008-2009, it became 292.58 crore and the proportion reached 67%. Thereafter, in the year 2013-2014 it again doubled and become 622.83 crore which constitutes 63% of total municipal expenditure. The CAGR of the expenditure on establishment, development, and others expenditures are calculated as 23%, 12% and 28%, respectively. Overall growth of total expenditure is 22%. The data shows

Table 4. Expenditure of Urban Local Bodies (ULB) (in crore)

Year	Establishment	Developmental	Others	Total	% of Estb.Exp.
2004-2005	84.1	51.3	28.04	163.44	51
2005-2006	93.71	47.57	34.53	175.81	53
2006-2007	242.17	75.44	32.44	350.05	69
2007-2008	237.43	83.93	34.24	355.6	67
2008-2009	292.58	101.33	42.26	436.17	67
2009-2010	364.47	226.76	75.9	667.13	54
2010-2011	401.61	143.77	59.16	604.54	66
2011-2012	483.29	243.68	89.25	816.22	59
2012-2013	451.35	122.88	210.2	784.43	57
2013-2014	622.83	84.38	280.15	987.36	63
CAGR	**23%**	**12%**	**28%**	**22%**	

Source: State Finance commission (SFC) reports



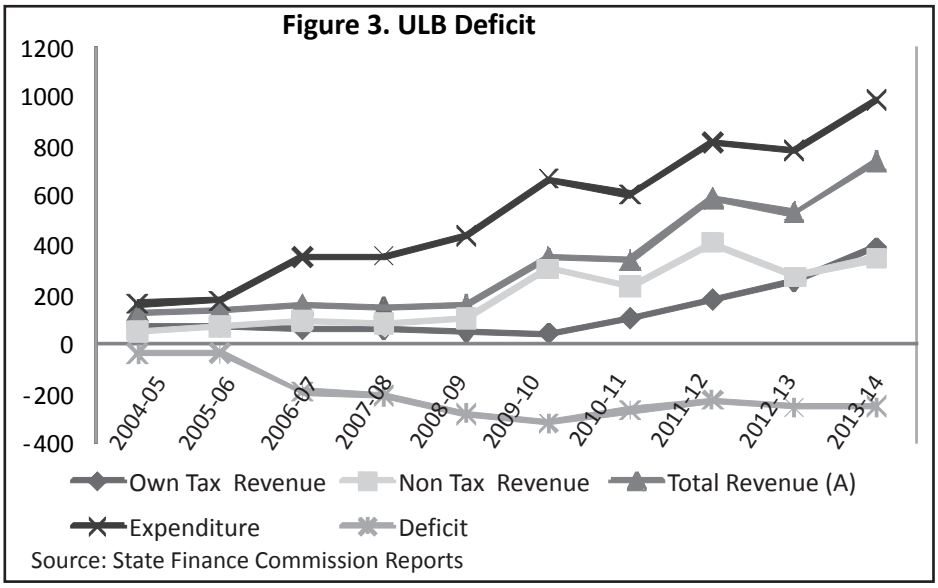
that major part of municipal revenue is being spent on paying wages and salaries to employees. Figure 2 reflects upward rising trends of expenditure on establishment. Since 2004-2005 expenditure on establishment is constantly rising. However, other components of expenditure like developmental expenditure are showing constant trends. Trends are also exploring that after 2011-2012 expenditure on development starts declining and 'others' start rising. Moreover, expenditure other than establishment and development are not showing any significant rising trends.

(4) Income and Expenditure : A comparison of income and expenditure of ULB has been done on the basis of the data compiled in Table 5. The data on Tax and Non Tax has been complied for analysis of fiscal deficit of ULB, whereas total expenditure is taken from Table 4.

Table 5. Deficit of ULB (in crore)

Year	Own Tax Revenue	Non Tax Revenue	Total Revenue (A)	Expenditure (B)	Deficit=A-B
2004-2005	70.77	54.92	125.69	163.45	-37.76
2005-2006	71.19	68.67	139.86	175.81	-35.95
2006-2007	61.67	97.04	158.71	350.05	-191.34
2007-2008	62.2	83.78	145.98	355.6	-209.62
2008-2009	52.27	103.6	155.87	436.17	-280.3
2009-2010	43.7	305.48	349.18	667.13	-317.95
2010-2011	104.31	234.22	338.53	604.54	-266.01
2011-2012	180.22	409.58	589.8	816.22	-226.42
2012-2013	257.32	273.22	530.54	784.43	-253.89
2013-2014	389.66	346.08	735.74	987.36	-251.62
CAGR	21%	26%	24%	22%	

Source: State Finance commission (SFC) Reports



In Table 5, we can see data on TRS and NTRS. In 2004-2005 revenue from own tax sources collected was ₹ 125.69 crore, whereas expenditure was ₹ 163.45 crore which represent a deficit of ₹ 37.76 crore. In 2007 - 2008, the deficit goes up and reaches ₹ 209.62 crore and in 2009-2010. Thereafter, it touches the highest point, that is, ₹ 317.95 crore in the 2009-2010. In 2013-2014, total deficit calculated is ₹ 251.62 crore. From the data, it is apparently clear that TRS and NTRS are not adequately exploited by the ULB. With regard to financial matters state government is enjoying full autonomy and discretion whereas local bodies are surviving on the pity of the state government in Haryana. However, additional revenue requirements are met by providing share in the tax levying by the State government.

Figure 3 depicts the trends of own tax, non tax revenues and expenditure trends. Overall expenditure is showing rising trend whereas total revenue trend line is lower which indicates deficit from 2004 -2005 to 2013 - 2014. Deficit in 2009-2010 is maximum, which reflects that local bodies have not sufficient resources to meet their expenditure requirements.

Discussion and Conclusion

The 73rd and 74th constitutional amendment in 1992 was a landmark decision in the direction of democratic decentralization of the Indian federal structure. In conformity with the 74th CAA, the Haryana government notified the Haryana Municipal Corporation Act, 1994 and amended the Haryana Municipal Act, 1973. Under section 66-A of the Haryana Municipal Act, 1994, a comprehensive list of 18 functions are given and under section 69 and 70 details of obligatory and discretionary taxes are given. However, the state government has full-fledged control over all financial matters. Apart from financial power, state government is also empowered under section 67 to take over the management of such functions which are purely in local domain. All such provisions given in the act should immediately be abolished for effective decentralization of power up to local bodies. Similar results were also found in the study of Abhey and Mala (2016).

The data given in Table 5 shows that the ULB do not have sufficient financial resources to meet its requirements. Property tax and Fire tax are the only taxes which are collected by the ULB itself. Property tax has high potential to generate revenue for the ULB but because of excessive state control ULBs have not been able to utilize its full capacity. Moreover, the share of non-tax revenue is also very low in comparison to that of tax revenue. The data also reveals that non tax sources are not fully exploited by the ULB because of the interference and control of the state government even in deciding the rates of fee, fines, charges etc. Therefore, it is suggested that there should be a complete demarcation of tax and non tax sources of the state government and ULB (Fourth SFC Report, 2014, p. 335).

Table 4 indicates that major chunk of municipal funds are spent on employee salary (Establishment). In terms of Haryana municipal Services (Recruitment & Service conditions) Rules, 1882, the state government appoints administrators, executive officers, municipal engineers, Assistant Town planners, Junior Engineers, Superintendents, Accountants, Chief Sanitary Inspectors, and Fire station officers. These appointing authorities also exercise full administrative control over these officials without owning financial responsibility like salary, wage, funds etc. The salary and other expenses of these officials are paid out of the municipal exchequer. The state government should provide 100% Grant in Aid (GIA) to the ULB against salary of employees appointed by the state government and Director of local bodies of Haryana.

An MOU was signed by the state government with Ministry of Panchayati Raj, Government of India on Aug 22, 2005 vide which state government has to prepare activity mapping to delegated functions to the PRI. In February 2006, an activity mapping chart was released by the Chief Minister of Haryana in the presence of the Union Minister for Panchayati Raj in which ten different departments covering 10 functions listed in the Eleventh Schedule namely, Food and supply, social justice and empowerment, public health, education, animal husbandry, agriculture, health, women and child development, irrigation, and forest were assigned to the local bodies. In this regard an NGO (PRIA) conducted a study to track the progress of 'Activity Mapping' in Haryana and found that activity mapping is not being implemented at ground level. Large numbers of respondents were not aware about the delegation of power to them under activity mapping. The study concludes that the letter issued by the government is a dead letter and is limited to a paper (Rao, 2011). The 4th SFC also observed that "delegation orders remained on paper due to lack of political will, apathy of bureaucracy, incapacity of elected representative of local bodies". The task of empowerment of ULB cannot be completed without implementing activity mapping in its true letter and spirit.

The dependency of lower government on the upper tiers of Government arises primarily because of vertical mismatches between functions and finance but greater dependency on the upper tier adversely affects the functioning of local governments. As compared to the functions, financial position of the ULB is too weak. The state government is supreme in all financial matters as per the enabling provisions of the municipal acts. Municipalities receive GIA from the State and Central government in the form of various plan and non plan schemes. The ULBs don't play any role in planning or proposition of the scheme going to be implemented in their

jurisdiction by the State or Central government. This is direct encroachment of the State and Central government in local functions which shatter the objective of decentralization and principle of fiscal federalism as envisioned at the time of 73rd and 74th CAA. The study conducted by Oommen (2006) and Ghosh (2010) also arrived at similar conclusions.

Research and Policy Implications

The historic 74th constitutional amendment was passed by the Parliament in 1992 to strengthen the democratic decentralization of power upto the grass root level. Now more than two decades have gone by but the local bodies are still in the clutches of the states government in terms of finance. The existing municipal laws provide states an upper hand in deciding all financial matters related with municipal finance. Hence, without making amendments in the existing municipal laws, the objective of making local bodies as self-government cannot be achieved. A clear cut demarcation of functions and taxation powers should be made to define jurisdiction of state and ULB. The functions assigned to the Municipal Corporation, Municipal Council & Municipal Committee are overlapping. The overlap should be removed by a way of preparing activity mapping of each department allocated to ULBs.

Limitations of the Study and Scope for Further Research

Major limitations of this study is that it is limited to the time period 2004-2005 to 2013-2014. It is because of non-availability of authentic data on ULB. The data is compiled by the department concerned only on the direction of SFC. Hence, SFC is the only authentic source of data on local bodies. There is an ample scope for the researcher in present study if latest data is added to it. The government is Haryana did not accept the fourth SFC report. Hence, the devolution of the grant-in-aid and share of the ULB is based on the previous pattern. A comparative analysis of municipal finance of Haryana can be done with other states.

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About the Authors

Jagdeep Kumar is a Research Scholar in the Department of Commerce in M D University, Rohtak, Haryana and is working as an Assistant Professor in the Department of Economics, M D University Rohtak, Haryana with specialization in the field of Public Finance. He has an experience of 8 years of teaching P.G. classes.

Dr. Rajpal Singh is a Professor of Commerce in M D University, Rohtak, Haryana. He has been serving this organisation since the last 20 years. Many research scholars have completed their Doctor of Philosophy under his valuable guidance and supervision. He has published a large number of research papers in various national and international journals.

An Empirical Study on Future of Mobile - Wallets in India : A Gateway for Cashless Payments

** Upendra Nath Shukla*

Abstract

After the demonetization in India by the Union Government on Nov 9, 2016, mobile-wallets (m-wallets), as pre-paid purchase instruments (PPI) would play a vital role to boost efforts towards cashless payments and financial inclusion in the Indian economy. All the bank account holders with debit cards and smart phones will be the most probable users of m-wallets post demonetization. Therefore, this research paper attempted to explore the future of m- wallets in India by accessing the intent of existing debit card users to use m - wallets for cashless payments. Extensive literature review and personal interviews of senior professionals from banking and telecom industries were conducted to find the parameters to explore usage intentions of m - wallets based on adaption readiness and perceived risk for m - wallets. A survey of 445 such customers, who used debit cards for cashless payments, was conducted in the city of Lucknow during December 2016, post demonetization. Questions were asked to test the awareness level for m-wallets and about their experience while using debit cards to understand their probable behavior for using m-wallets in India. By using discriminant analysis, a model was derived, which suggested that debit card users who were upto 45 years of age had fewer handling problems related to debit cards and were more inclined towards adopting m-wallets post demonetization in India. This information has vital implications for policy makers and service providers while strategizing for cashless payments. The post demonetization environment for cashless payment is conducive for m-wallets in India, opening ample business opportunities for service providers by providing secured and quality day to day cashless payment facility for customers in the future.

Keywords: **cashless payments, debit cards, digitalization, , financial-inclusion, insurance premium, m-wallet**

JEL Classification : E42,J33,P34

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The M-wallet's market is a nascent market till now, which includes money transfers, services related to banking transactions, insurance premiums, value-added services such as shopping, ticketing, recharging, and bill payments, but now it is fast picking up and is estimated to grow considerably in the next 5 years. According to a study by research and consultancy firm RNCOS, the current Indian market size for m-wallet stands at about ₹ 350 crore and is estimated to rise to ₹ 1,210 crore by 2019. The segment is projected to grow at a compounded annual growth rate (CAGR) of around 30% in the next 5 years from 2015-2019. As per the report, growth will be driven by increase in demand for smartphones, which is estimated to grow at a higher pace with rising mobile internet users in rural areas, which has grown to 92% in 2013. Smartphone users can install m-wallet applications in handsets and can create their own login account. They get a permanent pin number for utilizing m-wallet services.

As per India's top mobile wallet app (2016), some of the major m-wallet players are Airtel Money, M-rupee, Vodafone M-paisa, Oxigen wallet, Paytm, Mobikwik, and Idea Money. There will be more players in this segment, giving tough competition and thereby a fall in the prices and better services are likely. Subsequently, in the second phase, micro-finance companies may use it as a payment tool to penetrate their business in remote

* *Assistant Professor,* Amity Business School, Amity University (Lucknow Campus), Lucknow - 226 028, Uttar Pradesh.
E-mail : unshukla2lko.amity.edu

areas as well, in order to provide rural customers an opportunity to have secured money transfer and premium payment mechanism for financial inclusion.

Literature Review

Thakur and Srivastava (2014) tested the functional relationship between adoption readiness (AR), perceived risk (PR), and usage intention for mobile payments in India and investigated the stability of proposed structural relationships across different customer groups.

Chauhan (2015) explored the acceptance of mobile money by poor citizens of India. For a large section of the population in India, m-wallet can act as a way to achieve financial inclusion. However, for m-money to succeed, users should accept the initiative wholeheartedly and prefer it to debit cards, as debit cards have problems related to theft, misuse, validation, etc.

Vyas, Gaur, and Singh (2016) found that mobile banking has evolved in the last couple of years with the help of mobile penetration, which has shown phenomenal growth in rural areas of India. Bankers are adding value in services by developing smartphone apps, mobile wallets, and educating consumers about the benefits of using mobile banking, which is resulting in adoption of mobile banking faster among consumers as compared to debit card payments via net banking.

According to Zhong (2009), this technology has wide applications even in rural areas and there is a road ahead in China as well as it is more secure and faster than current debit card payments.

Chandra, Srivastava, and Theng (2010) said that market awareness and customer trust on the security of m-wallets along with quality of service would be the major requirements to succeed in India. According to Dai, Singh, and Iyer (2007), intentions of Chinese customers to adopt a variety of m-commerce services were based on a variety of individual characteristics and service quality. The results of this study may inform practitioners in developing focused segmentation strategies for Chinese consumers based on their intentions and preferences toward various m-commerce activities.

According to Lai and Chuah (2010), mobile payments had wide applications in retail payments primarily for supply where payments had to be quick and reliable and had quick and faster validation procedures to make small but urgent cashless payments ; whereas, debit card payments had many validations, mishandling, and theft-related issues. Therefore, debit card users were likely to switch to m - wallets payments for small day to day payments.

Kreyer, Pousttchi, and Turowski (2003) explored the scope of mobile payments based upon payment characteristics in different markets to specified customers for safe and secure day to day payments. Kim, Mirusmonov, and Lee (2010) in an empirical examination of factors influencing the intention to use mobile payments found that value-added features would be the key to attract customers to mobile based payments as compared to net banking or debit card payments. Russell (2015) described that India's top mobile wallet app adds support for payments to bank accounts leading to cashless payments.

Research Gap

On the basis of the findings from the literature review, it is derived that no study is available in the Indian context to explore the future prospects of m - wallets in India for cashless payments. There are many challenges for m - wallets and their acceptability due to certain perceived risk as an alternate method of cashless payments. Personal interviews of persons responsible from banking and telecom industries were also done to understand the ongoing practices and challenges for m-wallets in India.

Objectives of the Study

(i) To study the current scenario, business trends in India and guidelines of Reserve Bank of India for m-wallets.

(ii) To develop a model to predict customers' liking towards use of m-wallets on the basis of their perception while using debit cards for cashless payments.

(iii) To understand m-wallets and their utility for domestic service providers for promotion of cashless payments to broaden their business and customer base.

Mobile - Wallet : Technology, Current Scenario, and Reserve Bank of India's (RBI) Guidelines

(1) Concept of Mobile Wallets & Technology : Mobile wallets are a pre-paid purchase instrument (PPI) also referred to as mobile money, mobile money transfer for payment services operated under financial regulation and performed from or via a mobile device. As per Business detail for m - wallets (2016), the distinguishing features of m-wallets are money transfer businesses, recharge and bill payments and utilities, and online purchase to the maximum limit of ₹ 50,000. Mobile wallets use near-field communication (NFC) chips inside mobile smart phones and tablets to transmit payment information. When a customer is ready to pay using a mobile wallet, he/she opens an app on a smartphone or other device. The customer then enters a PIN and selects the payment account he/she wishes to use, along with any special offers or customer reward programs he/she wants to apply to. At the time of payment, they simply tap their device to an enabled payment terminal, and the payment information is transmitted.

Table 1. Business Details of M-Wallets and Debit Cards

Month/	Debit Cards		M-Wallet	
	Volume (Million)	Value (Rupees Billion)	Volume (Million)	Value (Rupees Billion)
2015-2016				
Apr	696.11	2,115.58	67.05	11.96
2014-2015				
Mar	700.31	2,095.76	46.11	10.82
Feb	638.29	1,749.70	24.08	8.76
Jan	677.04	2,037.63	27.62	8.92
Dec	664.68	2,110.79	23.19	8.28
Nov	635.72	1,934.97	21.38	6.97
Oct	676.4	2,042.57	21.39	7.01
Sep	656.56	1,951.98	18.77	6.74
Aug	654.95	1,929.87	16.58	5.76
Jul	647.6	1,953.90	15.52	5.52
Jun	615.37	1,885.59	13.71	4.66
May	627.35	1,969.57	13.57	4.37
Apr	610.3	1,830.31	13.07	4.03

Source: RBI database of Indian economy: Payment System Indicator, 2014-2015 and 2015-2016

(2) Current Business Status of M - Wallets and Debit - Cards in India : The Table 1 clearly shows that the business of m-wallets is increasing ; whereas, the same of debit cards is growing relatively at a slower pace. This is primarily due to the fact that the market of m-wallets in India is at an introductory stage and is moving towards the growth stage gradually.

(3) RBI Guidelines : As per Reserve Bank of India's (2009) guidelines for issuance and operation of m -wallets (2015), the pre-paid payment instruments that can be issued in the country are classified under three categories, that is, (i) closed system payment instruments, (ii) semi-closed system payment instruments, and (iii) open system payment instruments.

(i) Closed System Payment Instruments : These are payment instruments issued by a person for facilitating the purchase of goods and services. These instruments do not permit cash withdrawal or redemption. As these instruments do not facilitate payments and settlement for third party services, issue and operation of such instruments are not classified as payment systems.

(ii) Semi - Closed System Payment Instruments : These are payment instruments which can be used for purchase of goods and services, including financial services, at a group of clearly identified merchant locations/ establishments which have a specific contract with the issuer to accept the payment instruments. These instruments do not permit cash withdrawal or redemption by the holder.

(iii) Open System Payment Instruments : These are payment instruments which can be used for purchase of goods and services, including financial services like funds transfer at any card accepting merchant locations (point of sale terminals), and also permit cash withdrawal at ATMs. Banks which comply with the eligibility criteria would be permitted to issue all categories of pre-paid payment instruments. Non-banking financial companies (NBFCs) and other institutions or persons would be permitted to issue only closed and semi-closed system payment instruments, including mobile phone based pre-paid payment instruments.

(4) Capital Requirements : Banks and non-banking financial companies which comply with the capital adequacy requirements prescribed by Reserve Bank of India from time-to-time, shall be permitted to issue pre-paid payment instruments. All other persons, seeking authorization henceforth, shall have a minimum paid-up capital of ₹ 500 lakhs and minimum positive net worth of ₹ 100 lakhs at all the times.

Research Methodology

(1) Research Design : Descriptive research design was used to describe the current situation on m - wallets on the basis of historical data available from RBI reports and available literature. Primary data was collected from customer survey and was further analyzed using analytical research design.

(2) Data Sources : Secondary data were collected from RBI reports upto 2015-2016. Primary data was collected through a well-structured questionnaire and customer survey.

(3) Area of Study and Time Period of the Study : The study was conducted in the city of Lucknow during December 2016, post demonetization.

(4) Sample Unit : Debit card (ATM) holders in the city of Lucknow because they might be the most convenient and probable users of m-wallets initially for the purpose of the study.

(5) Sample Size Determination : To select the representative sample, precision level and confidence intervals were determined to estimate the sample size. In this study, buying motives were measured on Likert scale of 1 to 5. For scores between 1 and 5, at 95% confidence level, the acceptable limit of error (precision level) was determined to be 0.20.

Therefore, standard deviation (σ) should be less than or equal to range divided by 2.

$\sigma \leq 5\text{-}1/2 = 2$

The sample size was determined by – $N = (Z2 * \sigma 2) / e2$
$Z = 1.96$ at 95% confidence level. $e = 0.20$, hence $N = (1.962 * 22) / (0.20) 2 = 384.16$

However, to ensure a higher degree of precision and accuracy, 445 responses through well-structured questionnaires were collected out of which 400 were complete and were found to be suitable for the study.

(6) Instrument Development and Data Collection: On the basis of the literature review and opinion of industry experts, variables considered for the study were customer's age, handling problems, fear of theft, fear of misuse, validation issues, and non-functionality of debit cards. A 5 - point Likert scale was used to collect the responses for buying motives. The questionnaire was validated by industry experts for content validity. Cronbach's Alpha value was found to be 0.84. This established the reliability of the instrument. A pilot study with 100 customers was done initially to validate the results and variables under the study. The results of the pilot were found appropriate for the variables under study. Thus, further study was conducted using the validated questionnaire, and 400 final responses were collected exhibiting consistent results.

Analysis and Results

A survey was conducted in the city of Lucknow to collect the preferences of customers and their readiness to use m-wallets who were using debit cards for payment of utilities and fund transfers. Out of a total of 445 questionnaires received after the survey, 400 were found to be correct and suitable for the analysis. The survey was based upon a mix of stratified random sampling and convenience sampling in order to ensure an equal representation of different individuals from different demographic profiles and socioeconomic backgrounds. Customers were picked from different ATMs in the city of Lucknow randomly, and ATMs were selected from different locations of Lucknow as it was convenient. The Table 2 exhibits the detailed sample profile.

↳ **Discriminant Analysis :** It was conducted as following to understand two different customer groups of m - wallets. One group used m - wallets for cashless payments and other group did not use it due to lack of trust and security concerns of m - wallets. The group statistics is as depicted in the Table 3.

The Table 3 shows that there is a significant difference in means between the two groups with respect to all the six parameters (age, handling problems, fear of theft, fear of misuse, validating issues, and non-functionality). It indicates that it is worthwhile to proceed further with the discriminant analysis.

Tests of Equality of Group Means, as highlighted in the Table 4, provides strong statistical evidence of significant differences between means of m-wallet users and non-user groups for all six factors with fear of misuse of debit cards having a very high *F* - value. The Table 5 shows the test of equality of covariance matrices for further conduct of discriminant analysis.

In discriminant analysis, a basic assumption is that the variance - covariance matrices are equivalent. Box's M tests (Table 6) the null hypothesis that the covariance matrices do not differ between groups formed by the dependent. This test should not to be significant so that the null hypothesis that the groups do not differ can be retained. For this assumption to hold good, Log determinants (Table 5) should be equal & M values should be

Table 2. Sampling Profile of the Respondents

Income	**Frequency**
Income<= 2 Lakhs	80
2.1 - 10 Lakhs	240
10.1 Lakhs and above	80
Total	**400**
Age	**Frequency**
Age<= 30 Years	146
31 - 50 Years	190
51+ Years	64
Total	**400**
Gender	**Frequency**
Male	269
Female	131
Total	**400**
Education	**Frequency**
High School (10th)	19
Intermediate(12th)	31
Graduation	141
Post-Graduation	128
Above Post Graduation	80
Total	**502**
Occupation	**Frequency**
Government Service	66
Private Service	155
Professional	68
Business	76
Homemaker	14
Agriculturist	22
Total	400

non-significant. Here, log determinants are almost equal, but M value of -50.135 is non-significant, which supports a favorable discriminant analysis.

Wilk's Lambda (Table 7) indicates the significance of the discriminant function. This table indicates a highly significant function ($p < 0.000$), which is favorable.

These coefficients assign weights to the different factors in discriminant function. These Pearson coefficients are structure coefficients or discriminant loadings. They serve like factor loadings in factor analysis. Thus, the respective weights of all five attributes and age are as per the Table 8.

As per the Table 9, the unstandardized coefficients are used to create the discriminant function (equation). These operate just like a regression equation. In this case, the discriminant equation is :

$D = (-0.463 \times \text{age}) + (-0.286 \times \text{Handling Problems}) + (0.120 \times \text{Fear of Theft}) + (0.278 \times \text{Fear of Misuse}) + (0.339 \times \text{Validation issues}) + (0.249 \times \text{Non-functionality}) - 0.740$

The Table 10 clearly shows that two distinct customer groups are formed on the basis of five attributes of using

Table 3. Group Statistics

Customers would use m-wallet: yes/no		*Mean*	Std. Deviation	Valid *N* (list wise)	
				Unweighted	Weighted
Yes	Age	2.10	1.045	276	276
	Handling Problem	2.91	1.512	276	276
	Fear of theft	3.09	1.391	276	276
	Fear of misuse	3.03	1.361	276	276
	Validation issues	3.06	1.360	276	276
	Non-functionality	2.99	1.398	276	276
No	Age	2.74	1.125	124	124
	Handling problem	2.00	1.653	124	124
	Fear of theft	1.71	2.085	124	124
	Fear of misuse	1.58	1.523	124	124
	Validation issues	1.65	1.496	124	124
	Non-functionality	1.52	1.458	124	124
Total	Age	2.30	1.106	400	400
	Handling problem	2.63	1.606	400	400
	Fear of theft	2.66	1.748	400	400
	Fear of misuse	2.58	1.558	400	400
	Validation issues	2.62	1.543	400	400
	Non-functionality	2.53	1.566	400	400

Table 4. Tests of Equality of Group Means

	Wilks' Lambda	*F*	*df1*	*df2*	Sig.
Age	.927	7.662	1	398	.007
Handling problem	.930	7.359	1	398	.008
Fear of theft	.866	15.185	1	398	.000
Fear of misuse	.813	22.493	1	398	.000
Validation issues	.819	21.695	1	398	.000
Non-functionality	.810	23.006	1	398	.000

Table 5. Box's Test of Equality of Covariance Matrices

Log Determinants		
Would-use-m-wallet	**Rank**	**Log Determinant**
Yes	6	1.881
No	6	1.981
Pooled within-groups	6	1.730

Table 6. Box's M Test Results

Box's *M*		50.135
F	Approx.	2.192
	df1	21
	df2	13317.408
	Sig.	0.006

debit cards along with customer's age. Customers having positive intention to use m-wallets would have discriminant value approaching 0.449. The Figures 1 and 2 exhibit the canonical discriminant function of the two distinct set of customers with one group having positive intention to use m - wallets and the other group which is not positively inclined to use m - wallets.

Table 7. Wilk's Lambda

Test of Function(s)	Wilk's Lambda	Chi-square	*df*	Sig.
1	0.686	35.840	6	0.000

Table 8. Structure Matrix

	Function
	1
Non-functionality	0.716
Fear of misuse	0.708
Validation issues	0.695
Fear of theft	0.581
Age	-0.413
Handling-problem	0.405

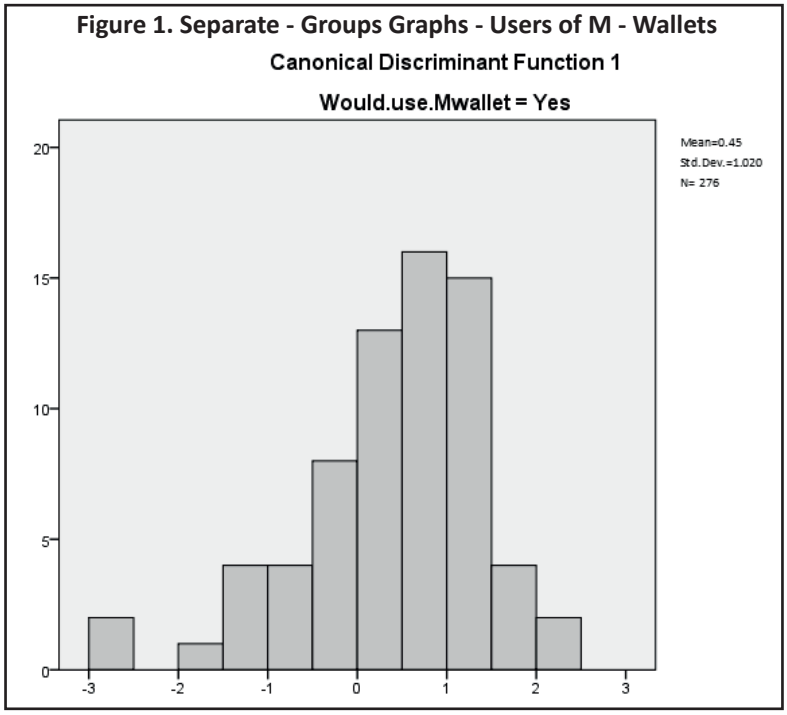
Table 9. Canonical Discriminant Function Coefficients

	Function
	1
Age	-0.463
Handling-problem	-0.286
Fear of theft	0.120
Fear of misuse	0.278
Validation issues	0.339
Non-functionality	0.249
(Constant)	-0.740

Table 10. Functions at Group Centroids

Customer would use M-wallet	Function
	1
Yes	0.449
No	-1.000

Figure 1. Separate - Groups Graphs - Users of M - Wallets



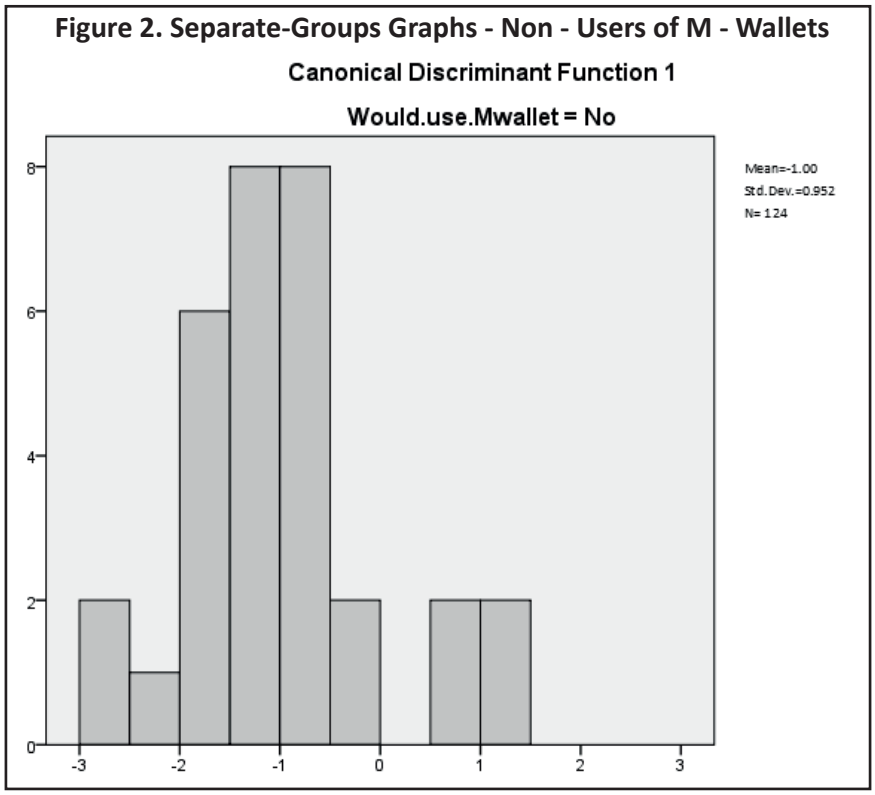


Table 11. Classification Results

Particulars		Would use m-wallet	Predicted Group Membership		Total
			Yes	No	
Original	Count	Yes	248	28	276
		No	48	76	124
	%	Yes	89.9	10.1	400.0
		No	38.7	61.3	400.0
Cross-validated	Count	Yes	244	32	276
		No	48	76	124
	%	Yes	88.4	11.6	400.0
		No	38.7	61.3	400.0

It is clear from the Figure 1, Figure 2, and Table 11 that 89.9% of the original grouped cases are correctly classified and after cross validation, 88.4% cases are correctly classified.

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Findings and Suggested Model for M - Wallets

Six major attributes associated with usage of debit cards such as age of customer, handling problems of debit cards, fear of theft of debit card, fear of misuse of debit cards, validating issues, and non-functionality of debit cards are found to be the most significant attributes towards switching clients to m-wallets as an alternative as it

provides safer and easier payment method for different small but frequent transactions. Major benefits from m-wallets are increased security, faster payments, and cashless transactions.

↳ **Model to Test the Level of Inclination to Use M-Wallets :** $D = (-0.463 \times \text{Age of Client}) + (-0.286 \times \text{Handling Problems}) + (0.120 \times \text{Fear of theft}) + (0.278 \times \text{Fear of Misuse}) + (0.339 \times \text{Validation issues}) + (0.249 \times \text{Non-functionality}) - 0.740$

If *D* approaches positive values near 0.5 or more, it would indicate yes, which means individual would be more inclined towards using m-wallets. If *D* approaches negative values near -1 or less, it would indicate No, which means that individual would not be inclined towards using m-wallets.

↳ **Values of Variables :** All variables except age for handling problems, fear of theft, fear of misuse, validation issues, and non-functionality would accept the value of ratings of customer preferences ranging from 1 to 5 (1 being the *least significant* rating and 5 being the *most significant* rating of these attributes while using debit cards). If age is below 20 years, value of age variable would be 1, if age is between 20 and 30 years, value of age variable would be 2, if age is between 30-45 years, value of age variable would be 3, and if age is 45 years and above, value of age variable would be 4.

Recommendations

↳ The Model suggests that customers who are upto 45 years of age with lower ratings for handling problems (i.e. having no or lesser handling problems of debit cards) would be more inclined towards using m-wallets. Similarly, customers having higher ratings for rest of the four variables/attributes like fear of theft, fear of misuse, validation issues and non-functionality of debit, would also be more inclined towards using m-wallets. Therefore, service providers must consider these factors while formulating their marketing policies accordingly for their business growth and promotion of m-wallets.

↳ Expansion of service portfolios to enhance value addition in the utility of m-wallets by domestic service provider companies will be key growth engines in this segment. Money transfer businesses, followed by recharge, utilities, bill, and fund transfers (premium payments, etc.) will enjoy the maximum growth in this segment, thus it should be the major focus area. Working population engaged in banking and online purchasing of products should be offered some initial discounts and rebates to use m-wallets to induce seasonal purchases.

↳ Awareness creation drives should be launched advocating secure and cashless payments by m-wallets. However, in India, telecom service providers like Vodafone India and Bharti Airtel have their individual mobile wallet platforms, and they should come-up with versatile mobile account linked features to make them more popular in India. More tie-ups like Vodafone with ICICI Bank should come forward to strengthen this nascent market in India, which is at the introductory stage of the product life cycle but has a huge potential to grow.

↳ Internet connectivity is one of the major limitations, particularly in remote areas. However, after the Digital India drive of the government, Internet penetration has increased in remote areas as well. This has opened new and huge market avenues for domestic service providers. Taking this as an opportunity, domestic firms could use it as a major tool for financial inclusion as well at a later stage to promote cashless payments in remote areas to have deeper penetration of financial/insurance services in the long run.

↳ Smartphone prices have come down significantly. In the current scenario, after the integration of smart phones and Internet connectivity across the country, large numbers of customers are looking for more mobile based

interactions with banks, finance companies, telecom companies, retailers, etc. Simple, customer friendly, value added products with assurance of security of payments would be the key to get a competitive advantage in the business of m-wallets for domestic service providers.

Policy Implications

Policymakers, while making the policy for cashless payments and financial inclusion, must keep in mind that m-wallet is perceived to be more secure for cashless payments as compared to debit cards in terms of quick validation and easier handling issues. Thus, lesser service tax should be imposed on the payments of m-wallets. Service providers must focus on the population below the age group of 45 years to pitch m -wallets for larger business volume for rapid capital formation in the economy.

Conclusion

After demonetization in India by the Union government, m-wallets turned out to be a prerequisite to boost the economy and trade. Despite this, the m-wallet market is facing challenges in India. Lack of awareness, stringent policies on restriction of cash-out facility, less focus by major public and private banks for promotion and poor Internet connectivity in many areas are holding back growth of m-wallets. The m-wallet industry is still in a nascent stage, it offers exciting opportunity for innovations and experiments. Therefore, offerings should be based upon extensive research and customer insights from pilots. Mobile banking and subsequently m-wallets have the potential to emerge as game changers in terms of costs, convenience, penetration, and the speed to reach the masses. Payment industry is slowly approaching a tipping point. Thus, mobile wallet would inevitably become a viable everyday payment tool in the coming years all across the country and has the potential to become an integral part of the financial inclusion drive in the long run as well to boost up the Indian economy which has recently been hit by short term challenges of demonetization.

Limitations of the Study and Scope for Further Research

A country like India has immense potential for expansion of financial services based on cashless and secured payments in urban as well as rural areas. It is really significant to explore m-wallet as an alternate, secure, and cashless payment tool based on different financial needs of customers. After the influx of smartphones with internet connectivity even in remote areas, the use of m-wallet platforms will be of vital utility that will stimulate financial inclusion in India later as well. Limited sample size has been one of the major limitations of the study. Research can further be extended to product innovations, technology, feasibility, viability, and different marketing dimensions of m-wallets.

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About the Author

Mr. Upendra Nath Shukla is currently working as an Assistant Professor in Banking & Finance area with Amity Business School, Lucknow, Uttar Pradesh. Mr. Shukla has completed his M.B.A, P.G.D.B.A, and has qualified UGC-NET. His current areas of interest are Banking - Insurance, Financial Inclusion, Financial Management, and Personal Tax. He has publications in different national and international journals of repute like - International Journal of Teaching and Case Studies of Inderscience Publisher, and IIM's Journal of Management Science. Before joining the B - School, he worked in the Life-insurance and Banking Industry at different managerial positions at a senior level for over 14 years.