

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor & UGC Approved Journal)

Website: www.ijirset.com

Vol. 6, Issue 9, September 2017

Statistical Modeling for Population

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ABSTRACT: A best linear statistical model for total population is selected using stepwise regression with the available independent variables namely number of births, number of deaths, per capita income and total population with one time lag period related to the data of India, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka during 2000-2015. Chow test and dummy variable technique is applied for testing the structural change (shift) within India, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka in two selected period 2000-2007 and 2008-2015, also between the four states Andhra Pradesh, Tamil Nadu, Kerala and Karnataka during 2000-2015. Through numerical analysis it is observed that there is no any shift in total population within India, Andhra Pradesh, Tamil Nadu and Kerala in the two periods 2000-2007 and 2008-2015 but there is shift in Karnataka. Also there is no structural change between the four southern states of India during 2000-2015.

KEY WORDS: Linear statistical model, Inference in linear model, Stepwise regression, Chow test, Dummy variable technique.

I. INTRODUCTION

The purpose of the present study is to construct chow test for structural change in 'total population' and also to develop dummy variable technique for the same assuming a linear relationship between the dependent variable 'total population' (Y_t) and four independent variables namely number of births (NB), number of deaths (ND), per capita income (PCI) and total population with one time lag period (Y_{t-1}) using stepwise regression for testing the structural change. Empirical study is conducted for the data of India, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka individually for structural change between the two periods 2000-2007 and 2008-2015, also among the four states Andhra Pradesh, Tamil Nadu, Kerala and Karnataka during 2000-2015. Relevant data is collected from Directorate of Economics and Statistics, Central Statistics Office, Annual Reports on the Registration of Births and Vital Statistics of India Based on the Civil Registration System.

II. METHODOLOGY

To study the structural change in total population between the two periods 2000-2007 and 2008-2015 for India, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka independently, we have to select a best linear relationship between the dependent variable total population and the four independent variables number of births, number of deaths, per capita income and total population with one time lag period through stepwise regression for the study period 2000-2015. After selecting the best regression model, we construct chow test and dummy variable approach for testing the structural change between the two time periods 2000-2007 and 2008-2015.

And for testing the structural change among the four southern states of India namely Andhra Pradesh, Tamil Nadu, Kerala and Karnataka during the time period 2000-2015, we proceed as follows

- (i) Arrange the data of four states on dependent and four independent variables one below the other.
- (ii) From the above 64 data points on the study variables select a best linear regression model using stepwise regression.

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- (iii) Use the above selected model for testing the structural change in total population through chow test and dummy variable approach.

STEPWISE REGRESSION:

1. Fit the regression model with all available independent variables.
 2. Compute t-calculated values corresponding to regression coefficients of each independent variable of the model.
 3. Omit the independent variables from the regression model whose calculated t-values are less than one.
 4. Refit the regression model with independent variables whose t-calculated values are greater than one.
 5. Again calculate the t-values for the regression coefficients of independent variables which are in the model.
 6. Finally we select the model with independent variables whose t-calculated values are greater than one.
- This procedure is called stepwise regression.

CHOW TEST:

To study the structural change between two sets of observations in the linear relationship between a dependent variable Y and a set of two independent variables X_1 and X_2 we make use of chow test which is developed by G.C.Chow(1960). Let n_1 be the number of observations on the variables. Suppose, further we obtain additional n_2 observations on the same variables. Denote n_1, n_2 as the number of observations in first and second sets of data respectively.

Let the relation between Y and X_1, X_2 be

$$Y = \alpha + \beta X_1 + \gamma X_2 + \varepsilon \quad (1)$$

In particular this relation for the two sets namely first and second of data may be written respectively as

$$Y_{1j_1} = \alpha_1 + \beta_1 X_{1j_1} + \gamma_1 X_{2j_1} + \varepsilon_{1j_1}, \quad j_1 = 1, 2, \dots, n_1 \quad (2)$$

$$Y_{2j_2} = \alpha_2 + \beta_2 X_{1j_2} + \gamma_2 X_{2j_2} + \varepsilon_{2j_2}, \quad j_2 = 1, 2, \dots, n_2 \quad (3)$$

In equations (2) and (3) ε 's are stochastic error terms. It is assumed that ε_2 has the same normal distribution as ε_1 with variance covariance matrix $\sigma^2 I$. Y_1, Y_2 are first and second sets of observations respectively on dependent variable Y .

Given (2) and (3) we can think of the following possibilities regarding the coefficients.

i. $\alpha_1 = \alpha_2 ; \beta_1 = \beta_2 ; \gamma_1 = \gamma_2$ (4a)

i.e., all the coefficients are same in the two regressions.

ii. $\alpha_1 \neq \alpha_2 ; \beta_1 = \beta_2 ; \gamma_1 = \gamma_2$ (4b)

i.e., the two regressions are different in intercepts only.

iii. $\alpha_1 = \alpha_2 ; \beta_1 \neq \beta_2 ; \gamma_1 = \gamma_2$ (4c)

i.e., the two regressions are different in X_1 coefficients only.

iv. $\alpha_1 \neq \alpha_2 ; \beta_1 \neq \beta_2 ; \gamma_1 \neq \gamma_2$ (4d)

i.e., the two regressions are different in all regression coefficients.

In the similar fashion we may have different possibilities. To test whether the two regressions are different or not we can construct the Chow test procedure as follows

- i. Combine all the (n_1+n_2) observations and compute the OLS estimates of α, β and γ , from the combined regression equation (1). From this obtain the residual sum of squares S_1 with degrees of freedom (n_1+n_2-k) , k is the number of parameters involved in the model. Here $k=3$.

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- ii. Run the regressions (2) and (3) separately and obtain the respective residual sum of squares say S_2 and S_3 with degrees of freedom n_1-k and n_2-k respectively. Add these two residual sum of squares and denote it as S_4 . i.e., $S_4 = S_2 + S_3$ with degrees of freedom $(n_1+n_2 -2k)$
- iii. Obtain $S_5 = S_1 - S_4$ with degrees of freedom k .
- iv. Apply the F-test

$$F = \frac{S_5/k}{S_4/(n_1+n_2-2k)} \sim F_{(k, n_1+n_2-2k)} \quad (5)$$

If F-calculated value is greater than F-critical value, reject the hypothesis that the parameters α 's, β 's and γ 's are the same for two sets of observations, otherwise accept the hypothesis at required level of significance. This procedure may be extended to any number of independent variables and any number of sets of observations.

Chow test is general in nature, it merely tells whether the regressions are different or not without specifying whether the differences if any is due to difference in intercept terms or due to difference in the coefficients of particular explanatory variables.

DUMMY VARIABLE APPROACH:

Dummy variable approach for structural change is developed by Damodar Gujarati (1970). To test the structural change between the two sets of data namely (2) and (3), we consider the following equation

$$Y_i = a_0 + a_1D + a_2X_{1i} + a_3DX_{1i} + a_4X_{2i} + a_5DX_{2i} + \varepsilon_i, \quad i = 1, 2, 3, \dots, (n_1+n_2) \quad (6)$$

Here

$D = 1$, if the observation belongs to set-2
 $= 0$, other wise

a_0 : Intercept for set-1

a_1 : Differential intercept for set-2.

a_2, a_4 : Slope co-efficient of Y with respect to X_1 and X_2 respectively for set-1.

a_3, a_5 : Differential slope co-efficient of Y with respect to X_1 and X_2 respectively for set-2.

From the above differential intercepts and differential slope coefficients we can easily obtain the actual values of intercept and slope coefficients for two sets as follows.

$$\text{For set-1: } Y_1 = a_0 + a_2 x_1 + a_4 x_2 \quad (7)$$

$$\text{For set-2: } Y_2 = (a_0+a_1) + (a_2+a_3) x_1 + (a_4+a_5) x_2 \quad (8)$$

To determine the equations (7) and (8), we need equation (6) which can be estimated by the method of ordinary least squares.

Depending up on the statistical significance of estimated differential intercepts and differential slope coefficients one can find out whether the sets of linear regression coefficients are different or not. This procedure may be extended to any number of independent variables and any number of sets of observations.

III. EMPIRICAL STUDY FOR STRUCTURAL CHANGE

In this section we can test the structural change using chow test and dummy variable technique in total population (i) in two selected periods namely 2000 – 2007 and 2008 – 2015 for India, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka, (ii) in four selected states namely Andhra Pradesh, Tamil Nadu, Kerala and Karnataka.

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CHOW TEST FOR TWO PERIODS 2000-2007 AND 2000-2015:

For India, the best regression model using stepwise regression is

$$Y_t = 5341.6677 + 0.0001 NB + 0.0056 PCI + 0.3289 Y_{t-1} \quad (9)$$

$$S_1 = 150142.1856, \quad S_2 = 75467.9878, \quad S_3 = 9.0209$$

$$S_4 = 75477.0087, \quad S_5 = 74665.1768, \quad F = 1.9785$$

Since $F(4,8)$ at 5% = 3.838, we accept H_0 and conclude that there is no structural change in the two periods.

For Andhra Pradesh, the best regression model using stepwise regression is

$$Y_t = 70.1738 + 0.0002 NB + 0.5729 Y_{t-1} \quad (10)$$

$$S_1 = 106837.5884, \quad S_2 = 25.7325, \quad S_3 = 91469.2162$$

$$S_4 = 91494.9486, \quad S_5 = 15342.6398, \quad F = 0.5590$$

Since $F(3,10)$ at 5% = 3.7083, we accept H_0 and conclude that there is no structural change in the two periods.

For Tamil Nadu, the best regression model using stepwise regression is

$$Y_t = 80.3169 + 0.0003 NB + 0.0007 ND \quad (11)$$

$$S_1 = 1334.684378, \quad S_2 = 607.2732, \quad S_3 = 287.4006$$

$$S_4 = 894.6738, \quad S_5 = 440.0105, \quad F = 1.6394$$

$F(3,10)$ at 5% = 3.7083, we accept H_0 and conclude that there is no structural change in the two periods.

For Kerala, the best regression model using stepwise regression is

$$Y_t = 105.5237 + 0.0001 ND + 0.6289 Y_{t-1} \quad (12)$$

$$S_1 = 133.2525, \quad S_2 = 0.6726, \quad S_3 = 96.1057$$

$$S_4 = 96.7783, \quad S_5 = 36.4743, \quad F = 1.2563$$

Since $F(3,10)$ at 5% = 3.7083, we accept H_0 and conclude that there is no structural change in the two periods.

For Karnataka, the best regression model using stepwise regression is

$$Y_t = 107.4183 + 0.0003 PCI + 0.8031 Y_{t-1} \quad (13)$$

$$S_1 = 247.5822, \quad S_2 = 36.6048, \quad S_3 = 95.1998$$

$$S_4 = 131.8047, \quad S_5 = 115.7775, \quad F = 2.9280$$

Since $F(3,10)$ at 10% = 2.728, we reject H_0 and conclude that there is structural change in the two periods.

CHOW TEST FOR FOUR STATES ANDHRA PRADESH, TAMIL NADU, KERALA AND KARNATAKA:

The best regression model using the data of four states (64 observations) through stepwise regression is

$$Y_t = -10.4862 + 0.0003 ND + 0.8450 Y_{t-1} \quad (14)$$

$$S_1 = 122631.4065, \quad S_2 = 106837.5884, \quad S_3 = 1334.684378, \quad S_4 = 133.2525$$

$$S_5 = 247.5822, \quad S_6 = 108553.1075, \quad S_7 = 1564.25544, \quad F = 0.7493$$

Since $F(9,52)$ at 5% = 2.07, we accept H_0 and conclude that there is no structural change in the two periods.

DUMMY VARIABLE APPROACH FOR TWO PERIODS 2000-2007 AND 2008-2015:

For India, the model can be written as

$$Y_t = a_0 + a_1 D + a_2 B + a_3 DNB + a_4 PCI + a_5 DPCI + a_6 Y_{t-1} + a_7 DY_{t-1} + \varepsilon_t \quad (15)$$

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Table (1): India-Estimation of parameters

Variables	Parameters	Coefficients	Standard Error	t Stat	P-value
Intercept	a ₀	1077.7566	2273.1642	0.4741	0.6481
D	a ₁	-754.8892	11245.9341	-0.0671	0.9481
NB	a ₂	0.0003	0.0001	4.3965	0.0023
DNB	a ₃	-0.0003	0.0002	-1.3081	0.2272
PCI	a ₄	-0.0877	0.0431	-2.0338	0.0764
DPCI	a ₅	0.0877	0.0471	1.8625	0.0995
Y _{t-1}	a ₆	0.7004	0.2343	2.9886	0.0174
D Y _{t-1}	a ₇	0.2883	1.2816	0.2250	0.8277

For Andhra Pradesh, the model can be written as

$$Y_t = a_0 + a_1D + a_2NB + a_3DNB + a_4Y_{t-1} + a_5DY_{t-1} + \varepsilon_t \quad (16)$$

Table (2): Andhra Pradesh - Estimation of parameters

Variables	Parameters	Coefficients	Standard Error	t Stat	P-value
Intercept	a ₀	-7.8728	1737.2255	-0.0045	0.9965
D	a ₁	-45.6681	1758.0333	-0.0260	0.9798
NB	a ₂	0.0000	0.0005	0.0042	0.9968
DNB	a ₃	0.0003	0.0006	0.6018	0.5607
Y _{t-1}	a ₄	1.0179	2.6931	0.3780	0.7134
D Y _{t-1}	a ₅	-0.4391	2.7103	-0.1620	0.8745

For Tamil Nadu, the model can be written as

$$Y_t = a_0 + a_1D + a_2NB + a_3DNB + a_4ND + a_5DND + \varepsilon_t \quad (17)$$

Table (3) : Tamil Nadu -Estimation of parameters

Variables	Parameters	Coefficients	Standard Error	t Stat	P-value
Intercept	a ₀	161.8998	533.9083	0.3032	0.7679
D	a ₁	-56.0622	537.5380	-0.1043	0.9190
NB	a ₂	0.0002	0.0004	0.5310	0.6070
DNB	a ₃	0.0001	0.0004	0.2947	0.7743
ND	a ₄	0.0006	0.0003	2.1339	0.0586
DND	a ₅	-0.0001	0.0003	-0.4200	0.6833

For Kerala, the model can be written as

$$Y_t = a_0 + a_1D + a_2ND + a_3DND + a_4Y_{t-1} + a_5DY_{t-1} + \varepsilon_t \quad (18)$$

Table (4) : Kerala -Estimation of parameters

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Variables	Parameters	Coefficients	Standard Error	t Stat	P-value
Intercept	a ₀	-21.7689	157.6890	-0.1380	0.8929
D	a ₁	298.9755	191.4328	1.5618	0.1494
NB	a ₂	0.0000	0.0002	-0.1312	0.8982
DNB	a ₃	0.0000	0.0002	-0.0198	0.9846
Y _{t-1}	a ₄	1.0916	0.6029	1.8105	0.1003
D Y _{t-1}	a ₅	-0.8833	0.6719	-1.3146	0.2180

For Karnataka, the model can be written as

$$Y_t = a_0 + a_1D + a_2PCI + a_3DPCI + a_4Y_{t-1} + a_5DY_{t-1} + \varepsilon_t \tag{19}$$

Table (5): Karnataka -Estimation of parameters

Variables	Parameters	Coefficients	Standard Error	t Stat	P-value
Intercept	a ₀	-5.5355	81.0854	-0.0683	0.9469
D	a ₁	570.1767	207.0931	2.7532	0.0204
PCI	a ₂	-0.0002	0.0005	-0.4401	0.6692
D PCI	a ₃	0.0013	0.0006	2.2973	0.0445
Y _{t-1}	a ₄	1.0333	0.1673	6.1777	0.0001
D Y _{t-1}	a ₅	-1.0811	0.3894	-2.7763	0.0196

Regarding India, Andhra Pradesh, Tamil Nadu, Kerala from tables (1), (2), (3) and (4) respectively, we observed that none of the differential intercepts and differential slope coefficients are significant at 5% level of significance. Hence we infer that there is no structural change in total population between the two time periods 2000-2007 and 2008-2015.

Regarding Karnataka from table (5), it is observed that the differential intercept a₁ and differential slope coefficients a₃, a₅ are significant at 10 % level, hence we infer that there is structural change in total population during 2008-2015 with respect to the per capita income (PCI) and total population with one time lag period (Y_{t-1}).

DUMMY VARIABLE APPROACH FOR FOUR STATES ANDHRA PRADESH, TAMIL NADU, KERALA AND KARNATAKA:

To test the structural change in total population in four selected states Andhra Pradesh, Tamil Nadu, Kerala and Karnataka during the period 2000-2015, the model can be written as

$$Y_t = a_0 + a_1D_1 + a_2D_2 + a_3D_3 + a_4ND + a_5D_1ND + a_6D_2ND + a_7D_3ND + a_8Y_{t-1} + a_9D_1Y_{t-1} + a_{10}D_2Y_{t-1} + a_{11}D_3Y_{t-1} + \varepsilon_t, i=1, 2, 3, \dots (n_1+n_2+n_3+n_4) \tag{20}$$

Where

Y_t = Total population

ND = Number of deaths

Y_{t-1} = Total population with one time lag period

D_i = 1, if the data belongs to Tamil Nadu State

= 0, otherwise

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$D_2 = 1$, if the data belongs to Kerala State
 $= 0$, otherwise

$D_3 = 1$, if the data belongs to Karnataka State
 $= 0$, otherwise

Also a_i 's entering into (20) are interpreted as follows:

a_0 : Intercept for the model of Andhra Pradesh.

a_1, a_2, a_3 : Differential intercept for the models of Tamil Nadu, Kerala and Karnataka respectively.

a_4, a_8 : Slope co-efficient of Y_t with respect to ND, Y_{t-1} respectively for the state Andhra Pradesh.

a_5, a_9 : Differential slope co-efficient of Y_t with respect to ND, Y_{t-1} respectively for the state Tamil Nadu.

a_6, a_{10} : Differential slope co-efficient of Y_t with respect to ND, Y_{t-1} respectively for the state Kerala.

a_7, a_{11} : Differential slope co-efficient of Y_t with respect to ND, Y_{t-1} respectively for the state Karnataka.

From the above differential intercepts and differential slope coefficients we can easily obtain the actual values of intercept and slope coefficients for four states as follows.

For Andhra Pradesh state

$$Y_1 = a_0 + a_4ND + a_8 Y_{t-1} \tag{10}$$

For Tamil Nadu state

$$Y_2 = (a_0+a_1) + (a_4+a_5) ND + (a_8+a_9) Y_{t-1} \tag{11}$$

For Kerala state

$$Y_3 = (a_0+a_2) + (a_4+a_6) ND + (a_8+a_{10}) Y_{t-1} \tag{12}$$

For Karnataka state

$$Y_4 = (a_0+a_3) + (a_4+a_7) ND + (a_8+a_{11}) Y_{t-1} \tag{13}$$

Table (6) : Estimation of parameters

Variables	Parameters	Coefficients	Standard Error	t Stat	P-value
Intercept	a_0	9.1881	121.6032	0.0756	0.9401
D_1	a_1	128.8328	285.0153	0.4520	0.6531
D_2	a_2	96.3356	680.7444	0.1415	0.8880
D_3	a_3	-26.3134	242.6242	-0.1085	0.9141
D	a_4	0.0008	0.0002	3.4366	0.0012
D_1D	a_5	-0.0003	0.0006	-0.5369	0.5937
D_2D	a_6	-0.0007	0.0009	-0.7655	0.4474
D_3D	a_7	-0.0007	0.0010	-0.7336	0.4665
Y_{t-1}	a_8	0.5877	0.1395	4.2143	0.0001
$D_1 Y_{t-1}$	a_9	-0.1046	0.7318	-0.1430	0.8869
$D_2 Y_{t-1}$	a_{10}	0.0421	2.5345	0.0166	0.9868
$D_3 Y_{t-1}$	a_{11}	0.4032	0.6006	0.6714	0.5050

From table (6), since the differential intercepts and the differential slope coefficients are not significant at 5% level, we conclude that there is no structural change in total population among the four states Andhra Pradesh, Tamil Nadu, Kerala and Karnataka with respect to variables under study.

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IV. CONCLUSIONS

In the present study a best linear relationship is established using stepwise regression between the dependent variable total population and four independent variables namely number of births, number of deaths, per capita income and total population with one time lag period relating to the data of India, Andhra Pradesh, Kerala and Karnataka independently during the period 2000-2015. Also combining the data of four states a best linear relationship is found out using stepwise regression. Later we applied chow test for testing the shift in total population between the two periods 2000-2007 and 2008-2015 using the corresponding best linear regression within India, Andhra Pradesh, Kerala and Karnataka. Also the same test is applied for testing the shift in total population between the four southern states of India during the period 2000-2015.

Dummy variable approach for testing the shift in total population within India, Andhra Pradesh, Kerala and Karnataka is conducted independently also tested the shift in total population between the four southern states of India.

Using chow test and dummy variable approach it is concluded that there is no shift in the total population within India, Andhra Pradesh, Tamil Nadu and Kerala between the two periods 2000-2007 and 2008-2015, there is no shift in the population between the southern states India during 2000-2015. But using chow test it is observed that there is shift in the total population in Karnataka state between the two periods 2000-2007 and 2008-2015. In particular using dummy variable approach it is observed that there is shift in the period 2008-2015 with respect to intercept per capita income and total population with one time lag period.

APPENDIX

INDIA					
year	Population (Lakhs)	No of Births	No of Deaths	PCI	Y_{t-1}
2000	10534.81	12946823	3789466	15881	10349.77
2001	10287.37	12993577	3961767	16688	10534.81
2002	10901.89	15645632	4436100	17782	10287.37
2003	11083.70	15290261	4569026	18885	10901.89
2004	11264.19	15777612	4487886	20871	11083.70
2005	11443.26	16394625	4602727	23198	11264.19
2006	11620.88	18121296	5298279	26003	11443.26
2007	11796.86	19469756	5804922	29524	11620.88
2008	11970.70	19993799	5638131	33283	11796.86
2009	12141.82	21292574	5677705	37490	11970.70
2010	12309.84	21430434	5690549	46117	12141.82
2011	12474.46	21836920	5735082	53331	12309.84
2012	12635.90	21951519	5850176	67839	12474.46
2013	12794.99	22482951	6086616	68757	12635.90
2014	12952.92	23001523	6138182	74920	12794.99
2015	13110.51	23136145	6267685	86879	12952.92

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ANDHRA PRADESH						TAMIL NADU				
year	Population (Lakhs)	No of Births	No of Deaths	PCI	Y_t-I	Population (Lakhs)	No of Births	No of Deaths	PCI	Y_t-I
2000	760.45	933717	350909	15427	754.27	616.00	1114828	356257	18367	626.29
2001	765.42	881256	359615	17195	760.45	621.83	1101376	387451	20367	616.00
2002	777.10	986599	369331	18573	765.42	627.42	1107351	403422	21239	621.83
2003	786.16	913607	374679	19434	777.10	663.32	1088659	420107	21738	627.42
2004	795.02	952629	375521	21931	786.16	638.83	1091016	408799	24087	663.32
2005	803.69	933498	354261	23925	795.02	644.16	1071863	419119	27512	638.83
2006	812.19	1124280	403800	26662	803.69	644.16	1054929	443503	31663	644.16
2007	820.49	1184555	427698	30439	812.19	654.35	1073635	433970	37190	644.16
2008	828.58	1179114	412561	35600	820.49	659.19	1053826	429981	40757	654.35
2009	836.49	1164942	434064	40902	828.58	663.86	1058142	447900	45058	659.19
2010	841.29	1192721	415050	52814	836.49	676.32	1065271	472450	63547	663.86
2011	846.66	1186895	420646	62912	841.29	721.39	1157979	476709	72993	676.32
2012	857.44	1122879	405909	71540	846.66	732.21	1205092	496876	84058	721.39
2013	864.76	722843	248110	72301	857.44	743.19	1185397	507578	98628	732.21
2014	493.87	848883	306618	81397	864.76	754.79	1206850	547579	112664	743.19
2015	513.40	851499	310340	90517	493.87	766.56	1167506	568271	128366	754.79

KERALA						KARNATAKA				
year	Population (Lakhs)	No of Births	No of Deaths	PCI	Y_t-I	Population (Lakhs)	No of Births	No of Deaths	PCI	Y_t-I
2000	317.57	593724	178795	18117	315.3	525.22	1009716	351736	17502	518.18
2001	319.72	579063	182059	20107	317.57	533.21	1017224	365181	18344	525.22
2002	323.03	572847	184597	20287	319.72	539.69	973653	355662	18547	533.21
2003	325.91	549719	194264	22776	323.03	553.27	1001749	359661	19621	539.69
2004	328.75	558933	199017	24492	325.91	559.92	988520	343644	20901	553.27
2005	331.54	555122	204157	27048	328.75	566.47	1007868	364415	26882	559.92
2006	334.26	556326	219094	36276	331.54	572.92	1046531	387604	31239	566.47
2007	336.94	545154	238691	40419	334.26	579.27	1046424	381890	35981	572.92
2008	339.58	535738	221769	45700	336.94	585.52	1082450	372062	42419	579.27
2009	342.16	544348	232020	53046	339.58	591.70	1076383	373290	48084	585.52
2010	344.67	546964	238864	60264	342.16	597.80	1071518	381743	51364	591.70
2011	347.08	559828	244295	71434	344.67	603.82	1108562	384745	62251	597.80

International Journal of Innovative Research in Science, Engineering and Technology

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Website: www.ijirset.com

Vol. 6, Issue 9, September 2017

2012	335.52	544388	237615	83725	347.08	609.75	1124490	407015	68053	603.82
2013	337.15	536352	260195	91567	335.52	615.60	1068671	413635	77168	609.75
2014	338.79	534458	248242	103820	337.15	640.55	1087530	411533	89545	615.60
2015	340.40	516013	252576	138390	338.79	650.61	1053248	393731	102324	640.55

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