



Determining rank size distribution of urban centers in Maharashtra state

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Abstract

This paper investigates the Rank size rule of Maharashtra state in 1991 to 2011. The Rank-Size rule is one of the methods of analyzing total settlement network in a region and also a tool for analyzing the settlement system that helps in the description and interpretation of the relationship between rank and population size of urban centers. A city-size distribution, in which the largest city is several times larger than the second largest is known as the primate city-size distribution. The present study aims to examine the validity of Rank-Size Rule in Maharashtra State. A Stochastic model of the actual and expected population of the primate city and its variation from the estimated one provides interesting results that the urban centers in Maharashtra do not completely conform to the rank size rule.

The rank-size relationship of the Class I and II urban centers of Maharashtra state from 1991 to 2011 is analyzed for the investigating of hierarchy and rank order of them. The state does not show the clear picture of the rank order during 1991 to 2011. The average difference between actual and expected population for the whole state in 1991 was 2.6 times. There is more scope for the future urbanization. In 2001, 24 cities are shown in less than two times of actual population size than their expected population and 21 urban centers show more than three times variation their expected population. In 2011, 27 cities show smaller actual population size than their expected population and remaining urban centers are more than two times of their actual population. All Class I and II urban centers have shown more actual population than their expected population in the state.

Key words – Primate City, Urbanization, Rank-Size Rule, Zipf's Law.

Introduction:

The rank and size of population of town or city are important characteristics for the investigation of rank order of settlement. Rank size rule is identifying the statistical relationship between the population sizes and population ranks order of the cities in the one spatial unit or country. Most of urban geographers used different concepts of rank order of the cities. F. Auer Bach develops the concept of rank size rule in 1913 but G. K. Zipf (1941) introduces the revised concept of rank size rule in the book of 'National Unity and Disunity'. Zipf examined the rank size relationships of 100 largest metropolitan districts in the U.S.A. in 1940. According to Zipf's rank size rule, all towns or cities of the region are arranged by descending order. The first ranking cities



are called primate or largest city of region. The populations of the second largest city will be the half population of the largest city; the third largest city will one-third, fourth largest city will one-fourth of the population of the largest city and similar to the next tenth largest city will one-tenth of largest city and similar to other cities of region. Zipf developed curve on semi log paper for graphical presentation of ranking of the cities.

Different urban geographers in use the concept of rank size rule worldwide for investigation of the ranking of cities. **Stewart** (1958) has applied this concept for analyzing for the nature of 72 counties of the different continents. **Mark Jefferson** (1939) was the first geographer introduced the 'Law of Primate city'. The central place theory of W. Christaller is also associated with this concept. Vining (1955), W. Isard (1956), G. R. Allen ((1954), C. H. Madden (1954), Garrison (1958), Beckmann (1958), Hagget (1965), Smailes (1967) also checked the relevance of the rank size rule in their work. Rank size rule concept is suitable for the investigation of the urban process of U. S. A., and Russia.

In India, different urban geographers and administrators for examining the relationships of population and ranking of cities apply this concept. **Reddy** (1969), examined the rank-size relationship and effect of the primate city on the urban centers in Krishna-Godavari delta of Andhra Pradesh. **BaraiDaksha** (1974) investigates the spatial distribution and rank-size relationship of the urban centers of settlements in Tamil Nadu state. Another Indian geographer has also used same method for analysing the rank-size relationship of urban centers in India. Singh, D. N. (1983), Ahmad Qazi (1965), Ramesh A. (1965), Khan Mumtaz (1980), Patil S. R. (1969), Singh B. L. (1985), Saha S. K. (1987), GovindRai (1989), Ramachandran R. (1999), Mandal R. B. (2000), Dhanenwar V. S. (2004), Singh A. K. (2007), and Verma L.N (2008) are some notable researchers of the country.

Objectives:

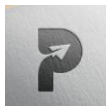
The present study aims to examine the validity of Rank-Size Rule in Maharashtra State.

Study area:

The State of Maharashtra extends from 15° 45' to 20° 6' North Latitude and 70° 36' to 80° 54' East Longitude with Geographical area 3, 07,713 Sq. Km. It is bounded by Arabian Sea in the west, the State of Gujarat in the Northwest. MadhyaPradesh in the North, Chhattisgarh in the East, Andhra Pradesh in the Southwest, Karnataka in the South and Goa in the Southwest. Maharashtra occupies the western and central part of the country and has a long coastline stretching nearly 720 Km along the Arabian Sea. The total population of Maharashtra was 11,23,74,333 persons. The male and female population of the state is 58,243,056 and 54,131,277 respectively. The 54.8 percent of the population live in the rural area and 45.2 percent population live in urban area. The state has 35 districts, Tahsils 355, census town are 279.

Data base and methodology:

The present study is based on secondary data collected from census reports of Government of India., census handbook (1991, 2001 and 2011), Socio-economic review of Maharashtra statistical abstract. The period from 1991 to 2011 is selected for the observation. The collected data has been processed and analysed by using different quantitative and statistical technique. The tabulated data has been presented by graphs and Maps.



The rank size and expected population of the town or city is calculated by using the simple formula of Zipf's-

$$P_n = \frac{P_1}{n}$$

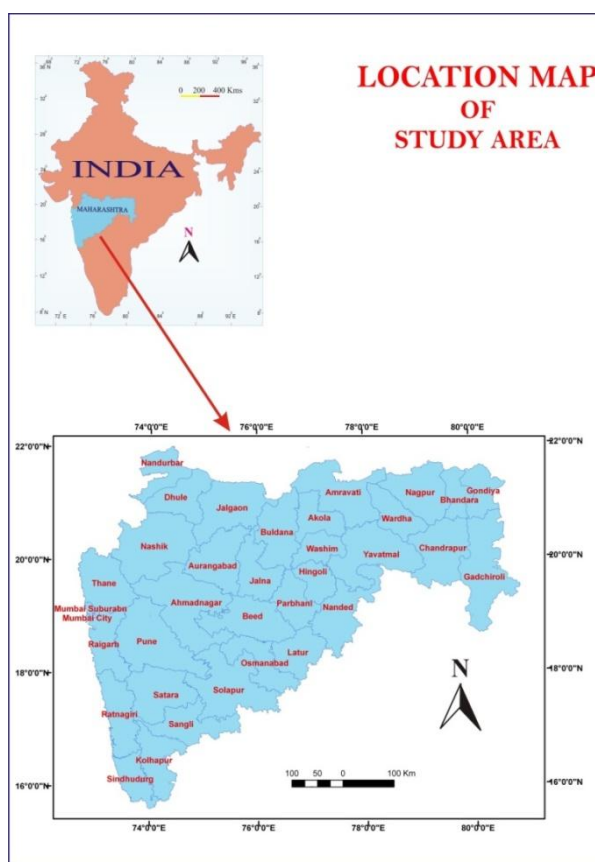
Where,

P_n = estimated population of x^{th} urban centre

P_1 = the population of the largest city or urban center

n = rank of urban centre

The rank of cities against the city population size is plotted on the log papers. Chorley and Haggett (1968) suggested the rank- size rule appears on a double logarithmic graph as a straight line.



The rank-size relationship of the Class I and II urban centers of Maharashtra state from 1991 to 2011 is analysed for the investigating of hierarchy and rank order of them. The state is not shows the clear picture of the rank order during 1991 to 2011. The actual population, expected population percentage and ratio of actual and expected population and double logarithmic graphs of three decade has drawn below. Greater Mumbai is always largest in the state.

**Rank-size rule in 1991:**

The rank-size rule for the period of 1991 is presented in Table 1. The actual population of Mumbai is 992589. The ranking and expected population of cities of the study area is presented in Fig. 1. The actual population of second order city Nagpur is three times less than to the expected population. Similar about the third order Pune is two times less than expected population. Actual populations of all 60 cities are two to three times less than expected population. The actual population of Navi Mumbai, Dhule, Nanded Waghala, Akola and Malegaon are close to the expected population. Nashik, Thane, Pune, Nagpur, Pandharpur, Ballarpur, Kalyan-Dombivli, Hingoli and Buldana cities, shows the highest difference between actual and expected population. The Class II cities are showing highest deviation of the actual and expected population. The average difference between actual and expected population for the whole state in 1991 was 2.6 times. There is more scope for the future urbanization.

Table 1
Rank size rule -1991

Town Name	Population		Rank		Population	Rank
	A	E	A	E	A-E	A-E
Mumbai	9925891	9925891	1.000	1.000	0	0.000
Nagpur	1624752	4962946	0.164	0.500	-3338194	-0.336
Pune	1566651	3308630	0.158	0.333	-1741979	-0.175
Kalyan-Dombivli	1014557	2481473	0.102	0.250	-1466916	-0.148
Thane	803389	1985178	0.081	0.200	-1181789	-0.119
Nashik	656925	1654315	0.066	0.167	-997390	-0.100
Solapur	620846	1417984	0.063	0.143	-797138	-0.080
Aurangabad	573272	1240736	0.058	0.125	-667464	-0.067
PimpriChinchwad	534536	1102877	0.054	0.111	-568341	-0.057
Amravati	421576	992589	0.042	0.100	-571013	-0.058
Kolhapur	406370	902354	0.041	0.091	-495984	-0.050
BhiwandiNizampur	379070	827158	0.038	0.083	-448088	-0.045
Ulhasnagar	369077	763530	0.037	0.077	-394453	-0.040
Sangli MirajKupwad	351917	708992	0.035	0.071	-357075	-0.036
Malegaon	342595	661726	0.035	0.067	-319131	-0.032
Akola	328034	620368	0.033	0.063	-292334	-0.029
Nanded Waghala	309316	583876	0.031	0.059	-274560	-0.028
Navi Mumbai	307724	551438	0.031	0.056	-243714	-0.025
Dhule	278317	522415	0.028	0.053	-244098	-0.025
Jalgaon	242198	496295	0.024	0.050	-254097	-0.026
Chandrapur	226105	472661	0.023	0.048	-246556	-0.025
Vasai-Virar	215762	451177	0.022	0.045	-235415	-0.024
Ichalkaranji	214950	431560	0.022	0.043	-216610	-0.022
Latur	197408	413579	0.020	0.042	-216171	-0.022
Parbhani	190255	397036	0.019	0.040	-206781	-0.021
Ahmadnagar	181339	381765	0.018	0.038	-200426	-0.020
Mira-Bhayandar	175605	367626	0.018	0.037	-192021	-0.019



Jalna	174985	354496	0.018	0.036	-179511	-0.018
Bhusawal	145143	342272	0.015	0.034	-197129	-0.020
Beed	112434	330863	0.011	0.033	-218429	-0.022
Gondiya	109470	320190	0.011	0.032	-210720	-0.021
Yavatmal	108578	310184	0.011	0.031	-201606	-0.020
Wardha	102985	300785	0.010	0.030	-197800	-0.020
Achalpur	96229	291938	0.010	0.029	-195709	-0.020
Satara	95180	283597	0.010	0.029	-188417	-0.019
Barshi	88810	275719	0.009	0.028	-186909	-0.019
Ballarpur	83511	268267	0.008	0.027	-184756	-0.019
Pune (CB)	82139	261208	0.008	0.026	-179069	-0.018
Pandharpur	79902	254510	0.008	0.026	-174608	-0.018
Hinganghat	78715	248147	0.008	0.025	-169432	-0.017
Kamptee	78612	242095	0.008	0.024	-163483	-0.016
Nandurbar	78378	236331	0.008	0.024	-157953	-0.016
Kirkee	78323	230835	0.008	0.023	-152512	-0.015
Chalisgaon	77420	225588	0.008	0.023	-148168	-0.015
Amalner	76442	220575	0.008	0.022	-144133	-0.015
Khamgaon	73692	215780	0.007	0.022	-142088	-0.014
Parli	72670	211189	0.007	0.021	-138519	-0.014
Bhandara	71813	206789	0.007	0.021	-134976	-0.014
Shrirampur	71368	202569	0.007	0.020	-131201	-0.013
Udgir	70453	198518	0.007	0.020	-128065	-0.013
Karanja	68866	194625	0.007	0.020	-125759	-0.013
Osmanabad	68019	190883	0.007	0.019	-122864	-0.012
Manmad	61312	187281	0.006	0.019	-125969	-0.013
Panvel	58986	183813	0.006	0.019	-124827	-0.013
Ambejogai	57459	180471	0.006	0.018	-123012	-0.012
Karad	56819	177248	0.006	0.018	-120429	-0.012
Ratnagiri	56529	174138	0.006	0.018	-117609	-0.012
Pusad	55931	171136	0.006	0.017	-115205	-0.012
Hingoli	54457	168235	0.005	0.017	-113778	-0.011
Buldana	52767	165432	0.005	0.017	-112665	-0.011
Malkapur	51311	162720	0.005	0.016	-111409	-0.011

Source - Compiled by researcher based on Census of 1991. (A-Actual, E- Expected)

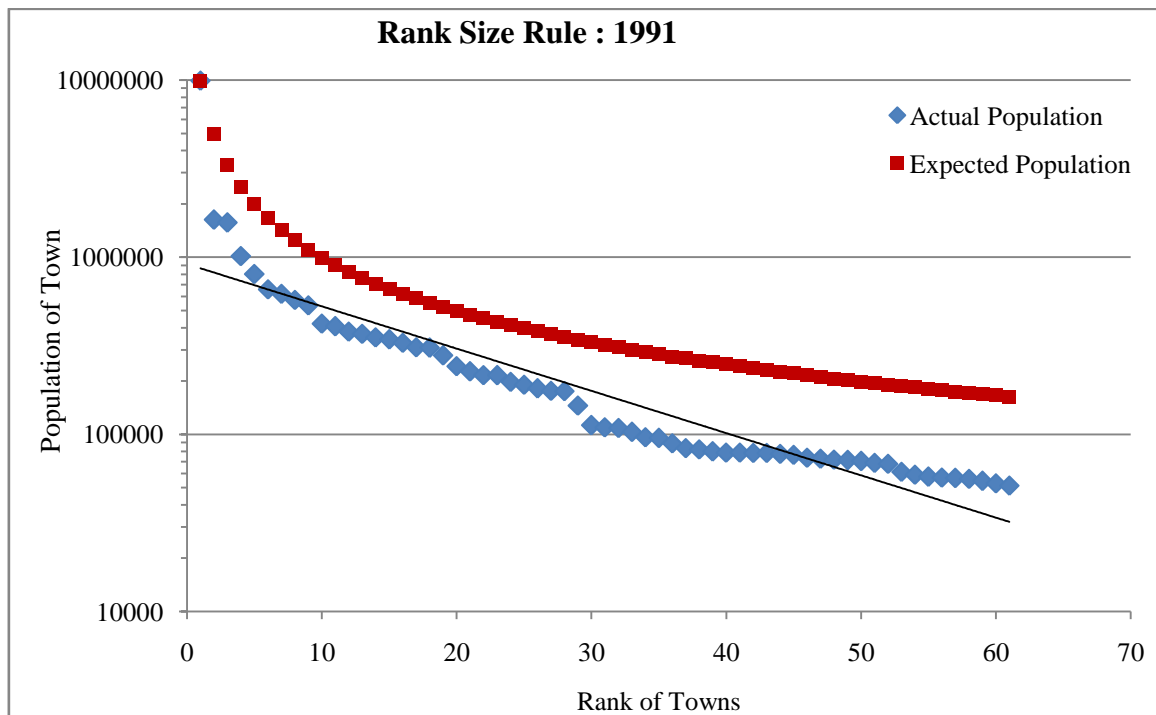


Fig. 1

Rank-size rule in 2001:

The numbers of Class I and II cities are increased upto 83 in this decade (Table- 2). This decade is showing different picture of rank size relationships of cities as compared to the 1991. In 2001, 24 cities are shown in less than two times of actual population size than their expected population and 21 urban centers were shows more than three times variation their expected population. Nagpur was second place in 1991 but now Pune replaces it. Highest difference between actual and expected population of urban centers is shons by Badlapur, Anjangaon, Shegaon, Palghar, Baramati and Wani. Whereas lowest is shown by Malegaon, Nanded Waghala, Dhule, Jalgaon, Solapur and Akola. The average difference between actual and expected population for the state during this decade is two and half times. In this decade Kalyan-Dombivli, Thane, PimpriChinchwad, BhiwandiNizampur, Amravati, Mira-Bhayandar, Vasai-Virar and Solapur replace Solapur, Amravati, Kolhapur, BhiwandiNizampur, Ulhasnagar, Sangli MirajKupwad and PimpriChinchwad respectively.

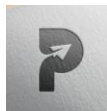


Table 2 Rank size rule 2001

Town Name	Population		Rank		Population	Rank
	A	E	A	E	A-E	A-E
Mumbai	11978450	11978450	1.000	1.000	0	0.000
Pune	2538473	5989225	0.212	0.500	-3450752	-0.288
Nagpur	2052066	3992817	0.171	0.333	-1940751	-0.162
Thane	1262551	2994613	0.105	0.250	-1732062	-0.145
Kalyan-Dombivli	1193512	2395690	0.100	0.200	-1202178	-0.100
Nashik	1077236	1996408	0.090	0.167	-919172	-0.077
PimpriChinchwad	1020448	1711207	0.085	0.143	-690759	-0.058
Aurangabad	873311	1497306	0.073	0.125	-623995	-0.052
Solapur	872478	1330939	0.073	0.111	-458461	-0.038
Navi Mumbai	704002	1197845	0.059	0.100	-493843	-0.041
BhiwandiNizampur	598741	1088950	0.050	0.091	-490209	-0.041
Amravati	549510	998204	0.046	0.083	-448694	-0.037
Mira-Bhayandar	520388	921419	0.043	0.077	-401031	-0.033
Vasai-Virar City	518601	855604	0.043	0.071	-337003	-0.028
Kolhapur	493167	798563	0.041	0.067	-305396	-0.025
Ulhasnagar	473731	748653	0.040	0.063	-274922	-0.023
Sangli MirajKupwad	436781	704615	0.036	0.059	-267834	-0.022
Nanded Waghala	430733	665469	0.036	0.056	-234736	-0.020
Malegaon	409403	630445	0.034	0.053	-221042	-0.018
Akola	400520	598923	0.033	0.050	-198403	-0.017
Jalgaon	368618	570402	0.031	0.048	-201784	-0.017
Dhule	341755	544475	0.029	0.045	-202720	-0.017
Ahmadnagar	307615	520802	0.026	0.043	-213187	-0.018
Latur	299985	499102	0.025	0.042	-199117	-0.017
Chandrapur	289450	479138	0.024	0.040	-189688	-0.016
Parbhani	259329	460710	0.022	0.038	-201381	-0.017
Ichalkaranji	257610	443646	0.022	0.037	-186036	-0.016
Jalna	235795	427802	0.020	0.036	-192007	-0.016
Ambarnath	203804	413050	0.017	0.034	-209246	-0.017
Bhusawal	172372	399282	0.014	0.033	-226910	-0.019
Beed	138196	386402	0.012	0.032	-248206	-0.021
Gondiya	120902	374327	0.010	0.031	-253425	-0.021
Yavatmal	120676	362983	0.010	0.030	-242307	-0.020
Wardha	111118	352307	0.009	0.029	-241189	-0.020
Satara	108048	342241	0.009	0.029	-234193	-0.020
Achalpur	107316	332735	0.009	0.028	-225419	-0.019
Barshi	104785	323742	0.009	0.027	-218957	-0.018
Panvel	104058	315222	0.009	0.026	-211164	-0.018
Badlapur	97948	307140	0.008	0.026	-209192	-0.017
Nandurbar	94368	299461	0.008	0.025	-205093	-0.017



Hinganghat	92342	292157	0.008	0.024	-199815	-0.017
Udgir	91933	285201	0.008	0.024	-193268	-0.016
Amalner	91490	278569	0.008	0.023	-187079	-0.016
Pandharpur	91379	272238	0.008	0.023	-180859	-0.015
Chalisgaon	91110	266188	0.008	0.022	-175078	-0.015
Ballarpur	89995	260401	0.008	0.022	-170406	-0.014
Khamgaon	88687	254861	0.007	0.021	-166174	-0.014
Parli	88537	249551	0.007	0.021	-161014	-0.013
Bhandara	85213	244458	0.007	0.020	-159245	-0.013
Kamptee	84344	239569	0.007	0.020	-155225	-0.013
Navi Mumbai	81855	234872	0.007	0.020	-153017	-0.013
Shrirampur	81255	230355	0.007	0.019	-149100	-0.012
Akot	80726	226008	0.007	0.019	-145282	-0.012
Osmanabad	80625	221823	0.007	0.019	-141198	-0.012
Pune (CB)	79965	217790	0.007	0.018	-137825	-0.012
Kirkee (CB)	77473	213901	0.006	0.018	-136428	-0.011
Manmad	72401	210148	0.006	0.018	-137747	-0.011
Ratnagiri	70383	206525	0.006	0.017	-136142	-0.011
Ambejogai	69478	203025	0.006	0.017	-133547	-0.011
Hingoli	69432	199641	0.006	0.017	-130209	-0.011
Pusad	67166	196368	0.006	0.016	-129202	-0.011
Buldana	62972	193201	0.005	0.016	-130229	-0.011
Washim	62956	190134	0.005	0.016	-127178	-0.011
Sangamner	61958	187163	0.005	0.016	-125205	-0.010
Shirpur-Warwade	61694	184284	0.005	0.015	-122590	-0.010
Malkapur	61012	181492	0.005	0.015	-120480	-0.010
Chopda	60865	178783	0.005	0.015	-117918	-0.010
Karanja	60158	176154	0.005	0.015	-115996	-0.010
Kopargaon	59970	173601	0.005	0.014	-113631	-0.009
Khopoli	58664	171121	0.005	0.014	-112457	-0.009
UranIslampur	58330	168711	0.005	0.014	-110381	-0.009
Basmath	57365	166367	0.005	0.014	-109002	-0.009
Bhadravati	56903	164088	0.005	0.014	-107185	-0.009
Karad	56161	161871	0.005	0.014	-105710	-0.009
Lonavala	55652	159713	0.005	0.013	-104061	-0.009
Wani	52834	157611	0.004	0.013	-104777	-0.009
Palghar	52677	155564	0.004	0.013	-102887	-0.009
Shegaon	52423	153570	0.004	0.013	-101147	-0.008
Baramati	51334	151626	0.004	0.013	-100292	-0.008
Anjangaon	51170	149731	0.004	0.013	-98561	-0.008
Phaltan	50800	147882	0.004	0.012	-97082	-0.008
Deolali (CB)	50620	146079	0.004	0.012	-95459	-0.008

Source - Compiled by researcher based on Census of 2001. (A-Actual, E- Expected)

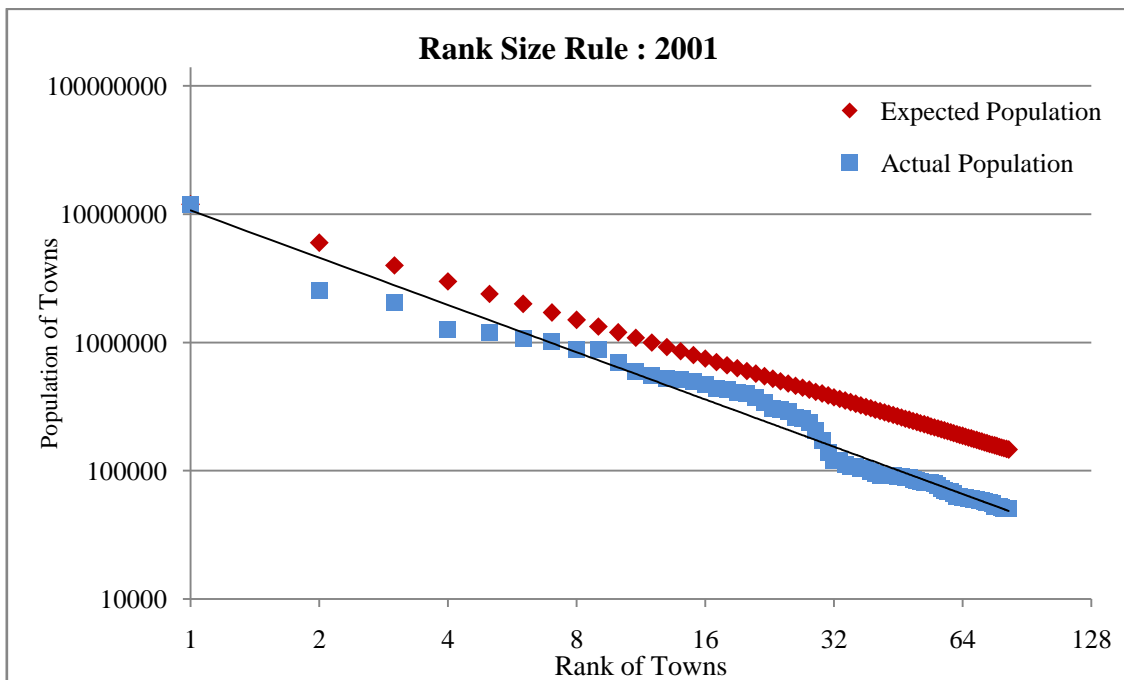


Fig. 2

Rank-size rule in 2011:

The rate of urbanization is high during this decade. The number of urban Class I and II cities are increased upto 98 in this decade (Table 3). This decade is showing different picture of rank size relationships of cities as compared to the 1991 and 2001. In 2011, 27 cities are shows smaller actual population size than their expected population and remaining urban centers are more than two times of their actual population. All Class I and II urban centers have shown more actual population than their expected population in the state. Navi Mumbai, Aurangabad, Solapur, Vasai-Virar, Mira-Bhayandar, BhiwandiNizampur, Jalgaon, Malegaon, Amravati, Sangli MirajKupwad, Akola, Nashik, Kolhapur, Kalyan-Dombivli, PimpriChinchwad, Dhule and Ulhasnagar cities show the less than one and half times difference between actual and expected population. The expected population of second largest city Pune is double than actual population. Satara, Achalpur, Barshi, Yavatmal, Pandharpur, Udgir, Wardha, Osmanabad, Hinganghat, Chalisgaon, Amalner, Kharghar and Khamgaon showed highest difference between actual and expected population.

The average difference between actual and expected population for the state during this decade is 2.3 times. In this decade Kalyan-Dombivli, PimpriChinchwad, Aurangabad, Solapur, BhiwandiNizampur, Amravati, Mira-Bhayandar, Vasai-Virar, Kolhapur, Ulhasnagar, Sangli MirajKupwad and Nanded Waghala are replaced by PimpriChinchwad, Kalyan-Dombivli, Vasai-Virar, Aurangabad, Solapur, Mira-Bhayandar, BhiwandiNizampur, Amravati, Nanded Waghala, Kolhapur, Ulhasnagar and Sangli MirajKupwad respectively.



Table 3
Rank size rule 2011

Town Name 2011	Population		Rank		Population	Rank
	A	E	A	E	A-E	A-E
Mumbai	12442373	12442373	1.000	1.000	0	0.000
Pune	3124458	6221187	0.251	0.500	-3096729	-0.249
Nagpur	2405665	4147458	0.193	0.333	-1741793	-0.140
Thane	1841488	3110593	0.148	0.250	-1269105	-0.102
PimpriChinchwad	1727692	2488475	0.139	0.200	-760783	-0.061
Nashik	1486053	2073729	0.119	0.167	-587676	-0.047
Kalyan-Dombivli	1247327	1777482	0.100	0.143	-530155	-0.043
Vasai-Virar	1222390	1555297	0.098	0.125	-332907	-0.027
Aurangabad	1175116	1382486	0.094	0.111	-207370	-0.017
Navi Mumbai	1120547	1244237	0.090	0.100	-123690	-0.010
Solapur	951558	1131125	0.076	0.091	-179567	-0.014
Mira-Bhayandar	809378	1036864	0.065	0.083	-227486	-0.018
BhiwandiNizampur	709665	957106	0.057	0.077	-247441	-0.020
Amravati	647057	888741	0.052	0.071	-241684	-0.019
Nanded Waghala	550439	829492	0.044	0.067	-279053	-0.022
Kolhapur	549236	777648	0.044	0.063	-228412	-0.018
Ulhasnagar	506098	731904	0.041	0.059	-225806	-0.018
Sangli MirajKupwad	502793	691243	0.040	0.056	-188450	-0.015
Malegaon	481228	654862	0.039	0.053	-173634	-0.014
Jalgaon	460228	622119	0.037	0.050	-161891	-0.013
Akola	425817	592494	0.034	0.048	-166677	-0.013
Latur	382940	565562	0.031	0.045	-182622	-0.015
Dhule	375559	540973	0.030	0.043	-165414	-0.013
Ahmadnagar	350859	518432	0.028	0.042	-167573	-0.013
Chandrapur	320379	497695	0.026	0.040	-177316	-0.014
Parbhani	307170	478553	0.025	0.038	-171383	-0.014
Ichalkaranji	287353	460829	0.023	0.037	-173476	-0.014
Jalna	285577	444370	0.023	0.036	-158793	-0.013
Ambarnath	253475	429047	0.020	0.034	-175572	-0.014
Panvel (R)	195373	414746	0.016	0.033	-219373	-0.018
Bhusawal	187421	401367	0.015	0.032	-213946	-0.017
Panvel	180020	388824	0.014	0.031	-208804	-0.017
Badlapur	174226	377042	0.014	0.030	-202816	-0.016
Beed	146709	365952	0.012	0.029	-219243	-0.018
Gondiya	132813	355496	0.011	0.029	-222683	-0.018
Satara	120195	345621	0.010	0.028	-225426	-0.018
Barshi	118722	336280	0.010	0.027	-217558	-0.017
Yavatmal	116551	327431	0.009	0.026	-210880	-0.017
Achalpur	112311	319035	0.009	0.026	-206724	-0.017



Osmanabad	111825	311059	0.009	0.025	-199234	-0.016
Nandurbar	111037	303473	0.009	0.024	-192436	-0.015
Wardha	106444	296247	0.009	0.024	-189803	-0.015
Udgir	103550	289358	0.008	0.023	-185808	-0.015
Hinganghat	101805	282781	0.008	0.023	-180976	-0.015
Pandharpur	98923	276497	0.008	0.022	-177574	-0.014
Chalisgaon	97551	270486	0.008	0.022	-172935	-0.014
Amalner	95994	264731	0.008	0.021	-168737	-0.014
Khamgaon	94191	259216	0.008	0.021	-165025	-0.013
Akot	92637	253926	0.007	0.020	-161289	-0.013
Bhandara	91845	248847	0.007	0.020	-157002	-0.013
Parli	90975	243968	0.007	0.020	-152993	-0.012
Ballarpur	89452	239276	0.007	0.019	-149824	-0.012
Shrirampur	89282	234762	0.007	0.019	-145480	-0.012
Kamptee	86793	230414	0.007	0.019	-143621	-0.012
Hingoli	85103	226225	0.007	0.018	-141122	-0.011
Kharghar	80612	222185	0.006	0.018	-141573	-0.011
Manmad	80058	218287	0.006	0.018	-138229	-0.011
Kirkee (CB)	78684	214524	0.006	0.017	-135840	-0.011
Washim	78387	210888	0.006	0.017	-132501	-0.011
Shirpur-Warwade	76905	207373	0.006	0.017	-130468	-0.010
Ratnagiri	76229	203973	0.006	0.016	-127744	-0.010
Ambejogai	73975	200683	0.006	0.016	-126708	-0.010
Pusad	73046	197498	0.006	0.016	-124452	-0.010
Chopda	72783	194412	0.006	0.016	-121629	-0.010
Pune (CB)	71781	191421	0.006	0.015	-119640	-0.010
Khopoli	71141	188521	0.006	0.015	-117380	-0.009
Palghar	68930	185707	0.006	0.015	-116777	-0.009
Basmath	68846	182976	0.006	0.015	-114130	-0.009
Karanja	67907	180324	0.005	0.014	-112417	-0.009
Malkapur	67740	177748	0.005	0.014	-110008	-0.009
Buldana	67431	175245	0.005	0.014	-107814	-0.009
UranIslampur	67391	172811	0.005	0.014	-105420	-0.008
Sangamner	65804	170443	0.005	0.014	-104639	-0.008
WadgaonKolhati	65620	168140	0.005	0.014	-102520	-0.008
Sinnar	65299	165898	0.005	0.013	-100599	-0.008
Kopargaon	65273	163715	0.005	0.013	-98442	-0.008
Shahade	61376	161589	0.005	0.013	-100213	-0.008
Bhadravati	60565	159518	0.005	0.013	-98953	-0.008
Shegaon	59672	157498	0.005	0.013	-97826	-0.008
Pachora	59609	155530	0.005	0.013	-95921	-0.008
Wani	58840	153610	0.005	0.012	-94770	-0.008
Sillod	58230	151736	0.005	0.012	-93506	-0.008



Chikhli	57889	149908	0.005	0.012	-92019	-0.007
Lonavala	57698	148123	0.005	0.012	-90425	-0.007
Beed (Rural)	56531	146381	0.005	0.012	-89850	-0.007
TalegaonDabhade	56435	144679	0.005	0.012	-88244	-0.007
Anjangaon	56380	143016	0.005	0.011	-86636	-0.007
Chiplun	55139	141391	0.004	0.011	-86252	-0.007
Deglur	54493	139802	0.004	0.011	-85309	-0.007
Baramati	54415	138249	0.004	0.011	-83834	-0.007
Gadchiroli	54152	136729	0.004	0.011	-82577	-0.007
Wadi (CT)	54048	135243	0.004	0.011	-81195	-0.007
Deolali (CB)	54027	133789	0.004	0.011	-79762	-0.006
Umred	53971	132366	0.004	0.011	-78395	-0.006
Karad	53879	130972	0.004	0.011	-77093	-0.006
Phaltan	52118	129608	0.004	0.010	-77490	-0.006
Ozar	51297	128272	0.004	0.010	-76975	-0.006
Dahanu	50287	126963	0.004	0.010	-76676	-0.006

Source - Compiled by researcher based on Census of 2011. (A-Actual, E- Expected)



Fig. 3

The expected and actual population of urban centers is showing highest variation during the three decade. There is excess population in Class I cities and deficit population in the Class II cities. For the equal distribution of urban center, the reshuffling of urban population is necessary in the state.



Conclusions:

The rank-size relationship of the Class I and II urban centers of Maharashtra state from 1991 to 2011 is analyzed for the investigating of hierarchy and rank order of them. The state is not shows the clear picture of the rank order during 1991 to 2011

The average difference between actual and expected population for the whole state in 1991 was 2.6 times. There is more scope for the future urbanization. In 2001, 24 cities are shown in less than two times of actual population size than their expected population and 21 urban centers were shows more than three times variation their expected population. The expected and actual population of urban centers is showing highest variation during the three decade. There is excess population in Class I cities and deficit population in the Class II cities. For the equal distribution of urban center, the reshuffling of urban population is necessary in the state.

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