



Variance and Time Series Analysis of Democracy Index

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Authors' contributions

This work was carried out in collaboration between both authors. Author MSR designed the study, performed part of the statistical analysis, and wrote the first draft of the manuscript. Author SN collected the data from internet and managed the analyses of the study. Both authors read and approved the final manuscript.

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ABSTRACT

This article deals with the variance and time series analysis of democracy index data, obtained from the yearly report prepared by Economist Intelligence Unit (EIU). The EIU calculated democracy index since 2006 for 167 countries covering almost the entire population of the world. Democracy index data vary over time and hence variance and time series analysis has been applied to available democracy index data for the period 2006-2016 to investigate the progress of democracy and to find the reason of democratic change. It is observed that some of the highly democratic countries including the USA gradually converted to moderate democratic countries. It is also observed that there exists a strong negative relation between democracy index and nonreligious population fractions for most of these countries. That is an increase of non-religious population fraction of a country may decrease the democracy index of that country.

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1. INTRODUCTION

The Economist Intelligence Unit measured democracy by democracy index [1]. The Democracy Index is based on the ratings of 60 indicator variables grouped in 5 categories: electoral process and pluralism; civil liberties; functioning of government; political participation; and political culture. Each category has a rating on a 0 to 10 scale. The overall index is the simple average of the 5 category indexes. The Democracy Index was first produced for 167 countries in 2006, with updates in 2008, 2010, 2011, 2012, 2013, 2014, 2015 and 2016. These data are presented in Table 1, Table 2, Table 3 and Table 4. Index values are used to place countries in one of 4 types of regimes, highly democratic countries, moderately democratic countries, less democratic countries, and authoritarian regimes according to the allocation given in Table 6 of section 3.

Lutz et al. [2] used age, sex, and educational attainment for 120 countries since 1970 to assess the global relationship between improvements in human capital and democracy. They measured democracy by the freedom house indicator of political rights. They showed that consistently strong effects of improving overall levels of educational attainment, of a narrowing gender gap in education, and of fertility declines and the subsequent changes in age structure on improvements in the democracy indicator. They applied this global relationship to Iran and observed that based on the experience of 120 countries since 1970, Iran has a high chance of significant movement toward more democracy over the next two decades.

Sorensen [3] examines the prospects for democracy in the world today and frames the central dilemma confronting all states touched by the process of democratization. He clarifies the concept of democracy, shows its application in different contexts, and questions whether democratic advancement will continue-and if so, at what price. The consequences of democracy for economic development, human rights, and peaceful relations among countries are illuminated in both their positive and negative aspects.

Kohli [4] stated that a democratic government is an improvement over the authoritarian

governments because people in most countries prefer a predictable to an arbitrary government, value the freedom of expression and association as ends in themselves, and increasingly hold that they have a right to have some say in the selection of their political leaders.

Soriano [5] demonstrated the importance of liberal thought as the foundation of democracy, religious freedom, and Western civilization. They added that individuals should be free to choose how they want to live and what to believe in. Rahman [6] analyzed democracy index data for the period 2006-2012 for all 167 countries together and for four types of regimes separately using ANOVA and Friedman's test. He observed that in some countries there were upgrade in democratic performance and in some countries had regression. However, these changes in democratic performances are not statistically significant. Therefore, democracy becomes stagnant all over the world. This article focused on the analysis of democracy index data for the period 2006-2016 to see any substantial change in the last four years 2012-2016 and presented in Section 3.

It is obvious that democracy index varies over time and hence it is time series data. There are mainly four types of variations observed in time series data namely seasonal variation, cyclical variation, trend, and irregular or random variation (Anderson et al. [7]). Democracy index is calculated yearly so there is no seasonal variation in the data. These data are available for 9 years. With less than ten data points it is not feasible to study cyclical variation. Therefore, we did the trend analysis and analysis of variance and presented in Section 3.

Lutz et al. [8] concluded that better education doesn't only lead to higher individual income but also is a necessary precondition for long-term economic growth. They added that education is one of the best investments societies can make for their futures. Rahman [9] showed that per capita gross domestic product (GDP) and the literacy rate of highly democratic countries are significantly higher than that of autocratic countries. The unemployment rate of highly democratic countries is significantly lower than that of autocratic countries. In this article, an attempt has been made to check the impact of

education and literacy on democracy index and presented in Section 3.

McIntyre [10] said if you believe in God then you no longer have to deal with (i) reality, (ii) your responsibility to yourself, your family, and the world, (iii) Having to accept that you, like everything else in the world, ends, (iv) Having to accept that you are responsible to maintain the world for those that come after, (v) Having to deal with reality, and your responsibility to do what is right for the less wealthy, the less resourced, the less healthy. Believe in God indicates believe in religion.

McGraw [11] stated that the dominant theme of the twenty-first-century political theory is the interaction between religion and politics. He argues that religious citizens can and often do contribute positively to liberal democracy. He added that religious integrationist institutions (e.g., sectarian schools, newspapers, and parties) have proven effective at cultivating precisely the civic virtues that liberal democracy requires of its citizens for political institutions to flourish. He believes “Religions political participation should be welcomed, maybe even encouraged, along with the same lines as other groups.” In this article, an attempt has been made to study the relationship between democracy and the non-religious fraction of the population and presented in Section 3. Section 4 is the conclusion.

2. MATERIALS AND METHODS

The Democracy Index data for 167 countries have been collected from the Economist Intelligence Unit report [1] and presented in Table 1 to Table 4. Democracy index varies from country to country over the time that is why; there are two-way variations in democracy index. Therefore, we consider randomized block design (RBD) for the analysis of variance to test whether there are significant variations found amongst the countries and between years (time variable). The following null and alternative hypotheses are considered for testing the variations of years.

H_0 : No significant differences of Democracy indexes are found between time variables (years).

H_a : There exist significant differences of Democracy indexes between time variables (years).

The test statistic to test the above hypotheses is $F = \frac{MSS(Time)}{MSS(Error)}$ which follows Snedecor's F-

distribution with 8 and error degrees of freedom, where MSS(Time) is the mean sum of squares due to time variation and MSS(Error) is the mean sum of squares due to error. The following null and alternative hypotheses are considered for testing the variations between countries.

Table 1. Data for highly democratic countries based on 2016 index

	Country	2006	2008	2010	2011	2012	2013	2014	2015	2016
1	Norway	9.55	9.68	9.80	9.80	9.93	9.93	9.93	9.93	9.93
2	Iceland	9.71	9.65	9.65	9.65	9.65	9.65	9.58	9.58	9.50
3	Sweden	9.88	9.88	9.50	9.50	9.73	9.73	9.73	9.45	9.39
4	New Zealand	9.01	9.19	9.26	9.26	9.26	9.26	9.26	9.26	9.26
5	Denmark	9.52	9.52	9.52	9.52	9.52	9.38	9.11	9.11	9.20
6	Canada	9.07	9.07	9.08	9.08	9.08	9.08	9.08	9.08	9.15
7	Ireland	9.01	9.01	8.79	8.56	8.56	8.68	8.72	8.85	9.15
8	Switzerland	9.02	9.15	9.09	9.09	9.09	9.09	9.09	9.09	9.09
9	Finland	9.25	9.25	9.19	9.06	9.06	9.03	9.03	9.03	9.03
10	Australia	9.09	9.09	9.22	9.22	9.22	9.13	9.01	9.01	9.01
11	Luxembourg	9.10	9.10	8.88	8.88	8.88	8.88	8.88	8.88	8.81
12	Netherlands	9.66	9.53	8.99	8.99	8.99	8.84	8.92	8.92	8.80
13	Germany	8.82	8.82	8.38	8.34	8.34	8.31	8.64	8.64	8.63
14	Austria	8.69	8.49	8.49	8.49	8.62	8.48	8.54	8.54	8.41
15	Malta	8.39	8.39	8.28	8.28	8.28	8.28	8.39	8.39	8.39
16	UK	8.08	8.15	8.16	8.16	8.21	8.31	8.31	8.31	8.36
17	Spain	8.34	8.45	8.16	8.02	8.02	8.02	8.05	8.30	8.30
18	Mauritius	8.04	8.04	8.04	8.04	8.17	8.17	8.17	8.28	8.28
19	Uruguay	7.96	8.08	8.10	8.17	8.17	8.17	8.17	8.17	8.17

Source: EIU Democracy Index [1]

Table 2. Data for moderately democratic countries based on 2016 index

	Country	2006	2008	2010	2011	2012	2013	2014	2015	2016
20	Japan	8.15	8.25	8.08	8.08	8.08	8.08	8.08	7.96	7.99
21	USA	8.22	8.22	8.18	8.11	8.11	8.11	8.11	8.05	7.98
22	Italy	7.73	7.98	7.83	7.74	7.74	7.85	7.85	7.98	7.98
23	Cape Verde	7.43	7.81	7.94	7.92	7.92	7.92	7.81	7.81	7.94
24	South Korea	7.88	8.01	8.11	8.06	8.13	8.06	8.06	7.97	7.92
25	France	8.07	8.07	7.77	7.77	7.88	7.92	8.04	7.92	7.92
26	Costa Rica	8.04	8.04	8.04	8.10	8.10	8.03	8.03	7.96	7.88
27	Botswana	7.60	7.47	7.63	7.63	7.85	7.98	7.87	7.87	7.87
28	Portugal	8.16	8.05	8.02	7.81	7.92	7.65	7.79	7.79	7.86
29	Estonia	7.74	7.68	7.68	7.61	7.61	7.61	7.74	7.85	7.85
30	Israel	7.28	7.48	7.48	7.53	7.53	7.53	7.63	7.77	7.85
31	Czech Rep	8.17	8.19	8.19	8.19	8.19	8.06	7.94	7.94	7.82
32	India	7.68	7.80	7.28	7.30	7.52	7.69	7.92	7.74	7.81
33	Taiwan	7.82	7.82	7.52	7.46	7.57	7.57	7.65	7.83	7.79
34	Chile	7.89	7.89	7.67	7.54	7.54	7.80	7.80	7.84	7.78
35	Belgium	8.15	8.16	8.05	8.05	8.05	8.05	7.93	7.93	7.77
36	Cyprus	7.60	7.70	7.29	7.29	7.29	7.29	7.40	7.53	7.65
37	Slovenia	7.96	7.96	7.69	7.76	7.88	7.88	7.57	7.57	7.51
38	Lithuania	7.43	7.36	7.24	7.24	7.24	7.54	7.54	7.54	7.47
39	South Africa	7.91	7.91	7.79	7.79	7.79	7.90	7.82	7.56	7.41
40	Jamaica	7.34	7.21	7.21	7.13	7.39	7.39	7.39	7.39	7.39
41	Latvia	7.37	7.23	7.05	7.05	7.05	7.05	7.48	7.37	7.31
42	Slovakia	7.40	7.33	7.35	7.35	7.35	7.35	7.35	7.29	7.29
43	Timor Leste	6.41	7.22	7.22	7.22	7.16	7.24	7.24	7.24	7.24
44	Greece	8.13	8.13	7.92	7.65	7.65	7.65	7.45	7.45	7.23
45	Panama	7.35	7.35	7.15	7.08	7.08	7.08	7.08	7.19	7.13
46	Trinidad and Tobago	7.18	7.21	7.16	7.16	6.99	6.99	6.99	7.10	7.10
47	Bulgaria	7.10	7.02	6.84	6.78	6.72	6.83	6.73	7.14	7.01
48	Indonesia	6.41	6.34	6.53	6.53	6.76	6.82	6.95	7.03	6.97
49	Argentina	6.63	6.63	6.84	6.84	6.84	6.84	6.84	7.02	6.96
50	Philippines	6.48	6.12	6.12	6.12	6.30	6.41	6.77	6.84	6.94
51	Brazil	7.38	7.38	7.12	7.12	7.12	7.12	7.38	6.96	6.90
52	Poland	7.30	7.30	7.05	7.12	7.12	7.12	7.47	7.09	6.83
53	Suriname	6.52	6.58	6.65	6.65	6.65	6.77	6.77	6.77	6.77
54	Croatia	7.04	7.04	6.81	6.73	6.93	6.93	6.93	6.93	6.75
55	Hungary	7.53	7.44	7.21	7.04	6.96	6.96	6.90	6.84	6.72
56	Colombia	6.40	6.54	6.55	6.63	6.63	6.55	6.55	6.62	6.67
57	Dom Rep	6.13	6.20	6.20	6.20	6.49	6.74	6.67	6.67	6.67
58	Peru	6.11	6.31	6.40	6.59	6.47	6.54	6.52	6.58	6.65
59	El Salvador	6.22	6.40	6.47	6.47	6.47	6.53	6.53	6.64	6.64
60	Romania	7.06	7.06	6.60	6.54	6.54	6.54	6.68	6.68	6.62
61	Mongolia	6.60	6.60	6.36	6.23	6.35	6.51	6.62	6.62	6.62
62	Lesotho	6.48	6.29	6.02	6.33	6.66	6.66	6.66	6.59	6.59
63	Serbia	6.62	6.49	6.33	6.33	6.33	6.67	6.71	6.71	6.57
64	Malaysia	5.98	6.36	6.19	6.19	6.41	6.49	6.49	6.43	6.54
65	Sri Lanka	6.58	6.61	6.64	6.58	5.75	5.69	5.69	6.42	6.48
66	Mexico	6.67	6.78	6.93	6.93	6.90	6.91	6.68	6.55	6.47
67	Tunisia	3.06	2.96	2.79	5.53	5.67	5.76	6.31	6.72	6.40
68	Singapore	5.89	5.89	5.89	5.89	5.88	5.92	6.03	6.14	6.38
69	Namibia	6.54	6.48	6.23	6.24	6.24	6.24	6.24	6.31	6.31
70	Paraguay	6.16	6.40	6.40	6.40	6.26	6.26	6.26	6.33	6.27
71	Guyana	6.15	6.12	6.05	6.05	6.05	6.05	5.91	6.05	6.25
72	Senegal	5.37	5.37	5.27	5.51	6.09	6.15	6.15	6.08	6.21
73	Papua N G	6.54	6.54	6.54	6.32	6.32	6.36	6.03	6.03	6.03
74	Moldova	6.50	6.50	6.33	6.32	6.32	6.32	6.32	6.35	6.01

Table 3. Data for less democratic countries based on 2016 index

	Country	2006	2008	2010	2011	2012	2013	2014	2015	2016
75	Zambia	5.25	5.25	5.68	6.19	6.26	6.26	6.39	6.28	5.99
76	Georgia	4.90	4.62	4.59	4.74	5.53	5.95	5.82	5.88	5.93
77	Guatemala	6.07	6.07	6.05	5.88	5.88	5.81	5.81	5.92	5.92
78	Honduras	6.25	6.18	5.76	5.84	5.84	5.84	5.84	5.84	5.92
79	Ghana	5.35	5.35	6.02	6.02	6.02	6.33	6.33	5.92	5.92
80	Albania	5.91	5.91	5.86	5.81	5.67	5.67	5.67	5.91	5.91
81	Ecuador	5.64	5.64	5.77	5.72	5.78	5.87	5.87	5.87	5.81
82	Tanzania	5.18	5.28	5.64	5.64	5.88	5.77	5.77	5.58	5.76
83	Bangladesh	6.11	5.52	5.87	5.86	5.86	5.86	5.78	5.73	5.73
84	Montenegro	6.57	6.43	6.27	6.15	6.05	5.94	5.94	6.01	5.72
85	Ukraine	6.94	6.94	6.30	5.94	5.91	5.84	5.42	5.70	5.70
86	Mali	5.99	5.87	6.01	6.36	5.12	5.90	5.79	5.70	5.70
87	Benin	6.16	6.06	6.17	6.06	6.00	5.87	5.65	5.72	5.67
88	Fiji	5.66	5.11	3.62	3.67	3.67	3.61	5.61	5.69	5.64
89	Bolivia	5.98	6.15	5.92	5.84	5.84	5.79	5.79	5.75	5.63
90	Malawi	4.97	5.13	5.84	5.84	6.08	6.00	5.66	5.55	5.55
91	Kenya	5.08	4.79	4.71	4.71	4.71	5.13	5.13	5.33	5.33
92	Liberia	5.22	5.25	5.07	5.07	4.95	4.95	4.95	4.95	5.31
93	Uganda	5.14	5.03	5.05	5.13	5.16	5.22	5.22	5.22	5.26
94	Macedonia	6.33	6.21	6.16	6.16	6.16	6.16	6.25	6.02	5.23
95	Hong Kong	6.03	5.85	5.92	5.92	6.42	6.42	6.46	6.02	5.23
96	Madagascar	5.82	5.57	3.94	3.93	3.93	4.32	4.42	4.85	5.07
97	Turkey	5.70	5.69	5.73	5.73	5.76	5.63	5.12	5.12	5.04
98	Kyrgyz	4.08	4.05	4.31	4.34	4.69	4.69	5.24	5.33	4.93
99	Bhutan	2.62	4.30	4.68	4.57	4.65	4.82	4.87	4.93	4.93
100	Thailand	5.67	6.81	6.55	6.55	6.55	6.25	5.39	5.09	4.92
101	Bosnia and Hercegovina	5.78	5.70	5.32	5.24	5.11	5.02	4.78	4.83	4.87
102	Lebanon	5.82	5.62	5.82	5.32	5.05	5.05	5.12	4.86	4.86
103	Nepal	3.42	4.05	4.24	4.24	4.16	4.77	4.77	4.77	4.86
104	Nicaragua	5.68	6.07	5.73	5.56	5.56	5.46	5.32	5.26	4.81
105	Morocco	3.90	3.88	3.79	3.83	4.07	4.07	4.00	4.66	4.77
106	Burkina Faso	3.72	3.60	3.59	3.59	3.52	4.15	4.09	4.70	4.70
107	Venezuela	5.42	5.34	5.18	5.08	5.15	5.07	5.07	5.00	4.68
108	Sierra Leone	3.57	4.11	4.51	4.51	4.71	4.64	4.56	4.55	4.55
109	Nigeria	3.52	3.53	3.47	3.83	3.77	3.77	3.76	4.62	4.50
110	Palestine	6.01	5.83	5.44	4.97	4.80	4.80	4.72	4.57	4.49
111	Pakistan	3.92	4.46	4.55	4.55	4.57	4.64	4.64	4.40	4.33
112	Cambodia	4.77	4.87	4.87	4.87	4.96	4.60	4.78	4.27	4.27
113	Myanmar	1.77	1.77	1.77	1.77	2.35	2.76	3.05	4.14	4.20
114	Iraq	4.01	4.00	4.00	4.03	4.10	4.10	4.23	4.08	4.08
115	Mozambique	5.28	5.49	4.90	4.90	4.88	4.77	4.66	4.60	4.02
116	Haiti	4.19	4.19	4.00	4.00	3.96	3.94	3.82	3.94	4.02

H₀: There are no significant differences of Democracy indexes between countries

H_a: There exist significant differences of Democracy indexes between countries

The test statistic to test the above hypotheses is $F = \frac{MSS(Country)}{MSS(Error)}$ which follows Snedecor's F-distribution with 166 and error degrees of freedom, MSS (Country) is the mean sum of

squares due to country variation. We also use Pearson's correlation coefficient to test the strength of the relationship between the non-religious fraction of population and democracy index by using the following formula,

$$r_{xy} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

where x, y are the two variables non-religious fraction and democracy index and \bar{x} , \bar{y} are their respective sample means.

Table 4. Data for autocratic countries based on 2016 index

	Country	2006	2008	2010	2011	2012	2013	2014	2015	2016
117	Mauritania	3.12	3.91	3.86	4.17	4.17	4.17	4.17	3.96	3.96
118	Jordan	3.92	3.93	3.74	3.89	3.76	3.76	3.76	3.86	3.96
119	Niger	3.54	3.41	3.38	4.16	4.16	4.08	4.02	3.85	3.96
120	Armenia	4.15	4.09	4.09	4.09	4.09	4.02	4.13	4.00	3.88
121	Kuwait	3.09	3.39	3.88	3.74	3.78	3.78	3.78	3.85	3.85
122	Ivory Coast	3.38	3.27	3.02	3.08	3.25	3.25	3.53	3.31	3.81
123	Gabon	2.72	3.00	3.29	3.48	3.56	3.76	3.76	3.76	3.74
124	Comoros	3.90	3.58	3.41	3.52	3.52	3.52	3.52	3.71	3.71
125	Ethiopia	4.72	4.52	3.68	3.79	3.72	3.83	3.72	3.83	3.60
126	Algeria	3.17	3.32	3.44	3.44	3.83	3.83	3.83	3.95	3.56
127	Belarus	3.34	3.34	3.34	3.16	3.04	3.04	3.69	3.62	3.54
128	Cuba	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.46
129	Cameroon	3.27	3.46	3.41	3.41	3.44	3.41	3.41	3.66	3.46
130	Angola	2.41	3.35	3.32	3.32	3.35	3.35	3.35	3.35	3.40
131	Vietnam	2.75	2.53	2.94	2.96	2.89	3.29	3.41	3.53	3.38
132	Togo	1.75	2.43	3.45	3.45	3.45	3.45	3.45	3.41	3.32
133	Egypt	3.90	3.89	3.07	3.95	4.56	3.27	3.16	3.18	3.31
134	Russia	5.02	4.48	4.26	3.92	3.74	3.59	3.39	3.31	3.24
135	Qatar	2.78	2.92	3.09	3.18	3.18	3.18	3.18	3.18	3.18
136	China	2.97	3.04	3.14	3.14	3.00	3.00	3.00	3.14	3.14
137	Guinea	2.02	2.09	2.79	2.79	2.79	2.84	3.01	3.14	3.14
138	Rwanda	3.82	3.71	3.25	3.25	3.36	3.38	3.25	3.07	3.07
139	Kazakhstan	3.62	3.45	3.30	3.24	2.95	3.06	3.17	3.06	3.06
140	Zimbabwe	2.62	2.53	2.64	2.68	2.67	2.67	2.78	3.05	3.05
141	Oman	2.77	2.98	2.86	3.26	3.26	3.26	3.15	3.04	3.04
142	Swaziland	2.93	3.04	2.90	3.26	3.20	3.20	3.09	3.09	3.03
143	Gambia	4.39	4.19	3.38	3.38	3.31	3.31	3.05	2.97	2.91
144	Congo (Brazzaville)	3.19	2.94	2.89	2.89	2.89	2.89	2.89	2.91	2.91
145	Djibouti	2.37	2.37	2.20	2.68	2.74	2.96	2.99	2.90	2.83
146	Bahrain	3.53	3.38	3.49	2.92	2.53	2.87	2.87	2.79	2.79
147	UAE	2.42	2.60	2.52	2.58	2.58	2.52	2.64	2.75	2.75
148	Azerbaijan	3.31	3.19	3.15	3.15	3.15	3.06	2.83	2.71	2.65
149	Afghanistan	3.06	3.02	2.48	2.48	2.48	2.48	2.77	2.77	2.55
150	Burundi	4.51	4.51	4.01	4.01	3.60	3.41	3.33	2.49	2.40
151	Sudan	2.90	2.81	2.42	2.38	2.38	2.54	2.54	2.37	2.37
152	Eritrea	2.31	2.31	2.31	2.34	2.40	2.40	2.44	2.37	2.37
153	Laos	2.10	2.10	2.10	2.10	2.32	2.21	2.21	2.21	2.37
154	Iran	2.93	2.83	1.94	1.98	1.98	1.98	1.98	2.16	2.34
155	Libya	1.84	2.00	1.94	3.55	5.15	4.82	3.80	2.25	2.25
156	Yemen	2.98	2.95	2.64	2.57	3.12	2.79	2.79	2.24	2.07
157	Guinea-Bissau	2.00	1.99	1.99	1.99	1.43	1.26	1.93	1.93	1.98
158	Uzbekistan	1.85	1.74	1.74	1.74	1.72	1.72	2.45	1.95	1.95
159	Congo DRC	2.76	2.28	2.15	2.15	1.92	1.83	1.75	2.11	1.93
160	Saudi Arabia	1.92	1.90	1.84	1.77	1.71	1.82	1.82	1.93	1.93
161	Tajikistan	2.45	2.45	2.51	2.51	2.51	2.51	2.37	1.95	1.89
162	Turkmenistan	1.83	1.72	1.72	1.72	1.72	1.72	1.83	1.83	1.83
163	Equatorial Guinea	2.09	2.19	1.84	1.77	1.83	1.77	1.66	1.77	1.70
164	Central Africa	1.61	1.86	1.82	1.82	1.99	1.49	1.49	1.57	1.61
165	Chad	1.65	1.52	1.52	1.62	1.62	1.50	1.50	1.50	1.50
166	Syria	2.36	2.18	2.31	1.99	1.63	1.86	1.74	1.43	1.43
167	North Korea	1.03	0.86	1.08	1.08	1.08	1.08	1.08	1.08	1.08

3. RESULTS AND DISCUSSION

The Democracy index data for the period 2006-2016 is shown in Tables 1 to 4 which

indicates some variations of democracy indexes are found over the years. To test whether these variations are statistically significant, analysis of variance has

been conducted. The test results are given in Table 5.

H_0 : There are no significant variations of democracy indexes between years.

H_1 : There are significant variations of democracy indexes between years.

If we allow 5% error that is consider 0.05 as the level of significance i.e. $\alpha=0.05$, then the null hypothesis will be rejected if P-value is less than 0.05. As the P-value is 0.26 which is very large indicating a very high level of insignificance, that is there are no significant variations of democracy indexes between years are observed.

Then all167 countries are divided into four types of regimes highly democratic, moderately democratic, less democratic and Autocracy is presented in Table 6 and Graph 1.

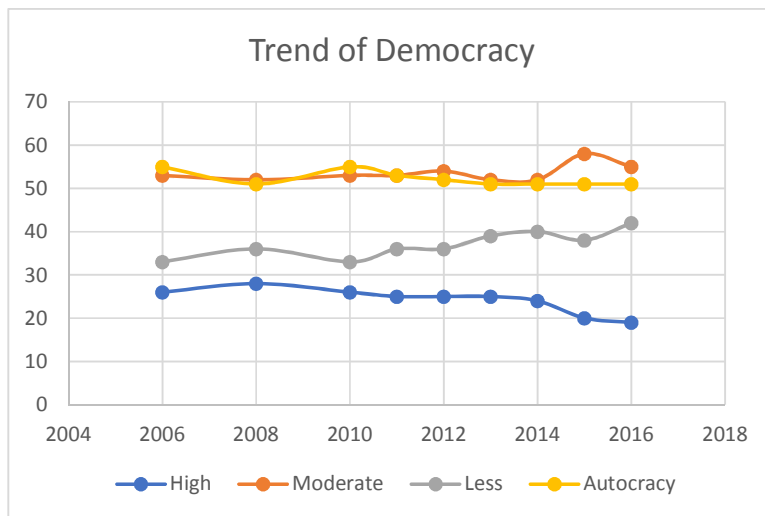
Table 6 and Graph 1 indicate that high democracy has decreasing trend and moderate democracy and less democracy have increasing trend. Autocracy remains unchanged for many years.

Kohli [4] stated that a democratic government is an improvement over the authoritarian governments because people have a right to have some say in the selection of their political leaders. That is the democracy is the most successful political idea throughout the world. Surprisingly here we observed that some highly democratic countries including the USA are

sliding down to moderate democracy. The following is a list of countries those have been demoted from high democracy to moderate democracy and is presented in Table 7 and Graph 2.

It is obvious from Table 7 and Graph 2 that Greece democracy is declining rapidly. USA and Belgium democracies are also gradually declining. However, Japan, Czech Republic, Costa Rica, South Korea, France, and Portugal democracies have some fluctuations. Rahman [9] showed that per capita GDP and the literacy rate of highly democratic countries are significantly higher than that of autocratic countries. The unemployment rate of highly democratic countries is significantly lower than that of autocratic countries. To see whether unemployment rate and literacy rate are related with the declining tendency of democracy in Greece, USA, and Belgium, we collected information on the unemployment rate and literacy rates of these countries that are shown in Graph 3 to Graph 7.

Graphs 3, 4 and 5 indicate that unemployment rate of Belgium and Greece are increasing but that of USA is decreasing so we can't say because of unemployment rate democracy index is decreasing. On the other hand, graph 6 and 7 indicates that literacy rate of Greece is slightly decreasing but the literacy rate of Belgium and USA are 99% that has not changed in the last 10 years. Therefore, we can't say because of literacy rate democracy index is decreasing in these countries.



Graph 1. Democratic trend for four regimes

Table 5. Analysis of variance test results for 167 countries

Source of variation	Sum of squares	df	Mean sum of squares	F	P-value	F critical
Countries	7123.17	166	42.91	385.40	0.00	1.20
Year	1.12	8	0.14	1.25	0.26	1.95
Error	147.86	1328	0.11			
Total	7272.14	1502				

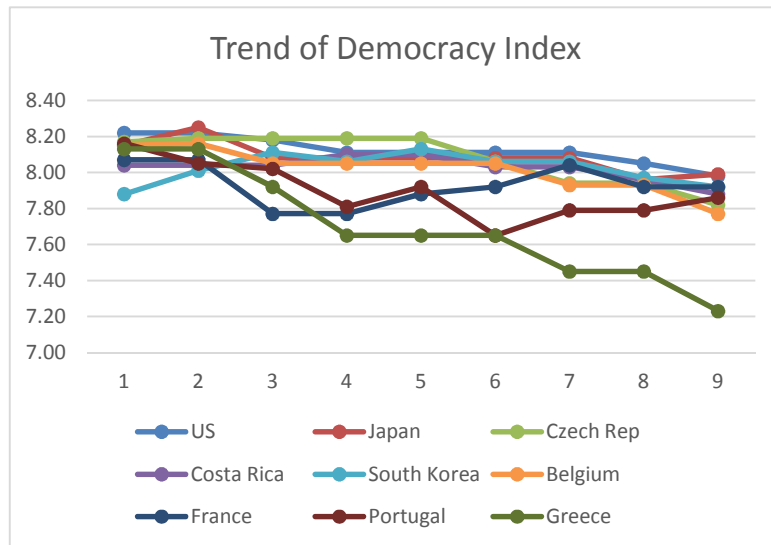
Table 6. Year-wise distribution of countries into four types of regimes

Democracy (Index)	Year								
	2006	2008	2010	2011	2012	2013	2014	2015	2016
High [8-10)	26	28	26	25	25	25	24	20	19
Moderate (6-7.99)	53	52	53	53	54	52	52	58	55
Less (4-5.99)	33	36	33	36	36	39	40	38	42
Autocracy (0-3.99)	55	51	55	53	52	51	51	51	51
Total	167	167	167	167	167	167	167	167	167

Table 7. Countries demoted from high democracy to moderate democracy

	2006	2008	2010	2011	2012	2013	2014	2015	2016
USA	8.22	8.22	8.18	8.11	8.11	8.11	8.11	8.05	7.98
Japan	8.15	8.25	8.08	8.08	8.08	8.08	8.08	7.96	7.99
Czech Rep	8.17	8.19	8.19	8.19	8.19	8.06	7.94	7.94	7.82
Costa Rica	8.04	8.04	8.04	8.10	8.10	8.03	8.03	7.96	7.88
South Korea	7.88	8.01	8.11	8.06	8.13	8.06	8.06	7.97	7.92
Belgium	8.15	8.16	8.05	8.05	8.05	8.05	7.93	7.93	7.77
France	8.07	8.07	7.77	7.77	7.88	7.92	8.04	7.92	7.92
Portugal	8.16	8.05	8.02	7.81	7.92	7.65	7.79	7.79	7.86
Greece	8.13	8.13	7.92	7.65	7.65	7.65	7.45	7.45	7.23

Source: EIU Democracy Index [1]



Graph 2. Democratic trend for countries demoted to moderate democracy

If we look at the nonreligious populations of these countries which are given in Table 8 and Graph 8, we can see that percentage of

nonreligious population fraction is increasing in all countries significantly.

Table 8. Percentage of non-religious population

Country	Year		
	2006	2012	2014
USA	20	35	39
Japan	52	62	62
Czech Rep	64	78	75
Costa Rica	11	12	13
South Korea	37	46	55
Belgium	35	34	48
France	43	63	53
Portugal	11	16	37
Greece	4	8.1	21

Source: List of countries by irreligion [12,13,14]

Table 9. Pearson's correlation coefficient between democracy index and non-religious fraction

Country	Correlation between democracy index and non-religion
US	-0.98
Japan	≈-1
Czech Rep	-0.244
Costa Rica	-0.132
South Korea	-0.698
Belgium	-0.86
France	-0.93
Portugal	-0.872
Greece	-0.866

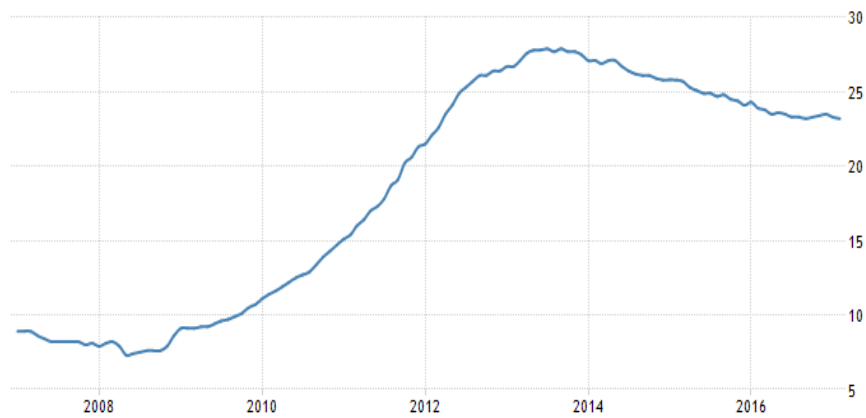
Then we calculate Pearson's correlation coefficient between democracy index and non-religious population fraction and the results are given in Table 9.

As correlation coefficient varies from -1 to +1, there exist a strong negative relation between non-religion fraction and democracy index for most of the countries.



Graph 3. Unemployment rate of Belgium

Source: Belgium unemployment rate [15]

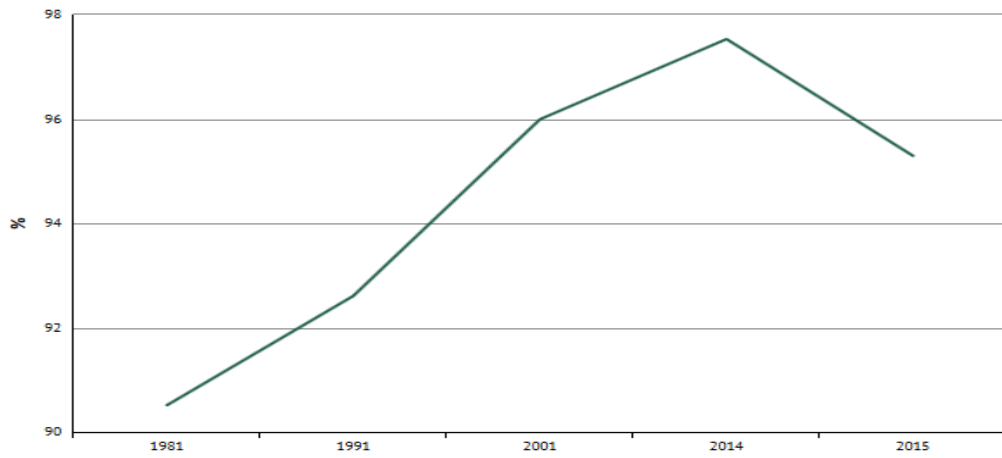


Graph 4. Unemployment rate of Greece

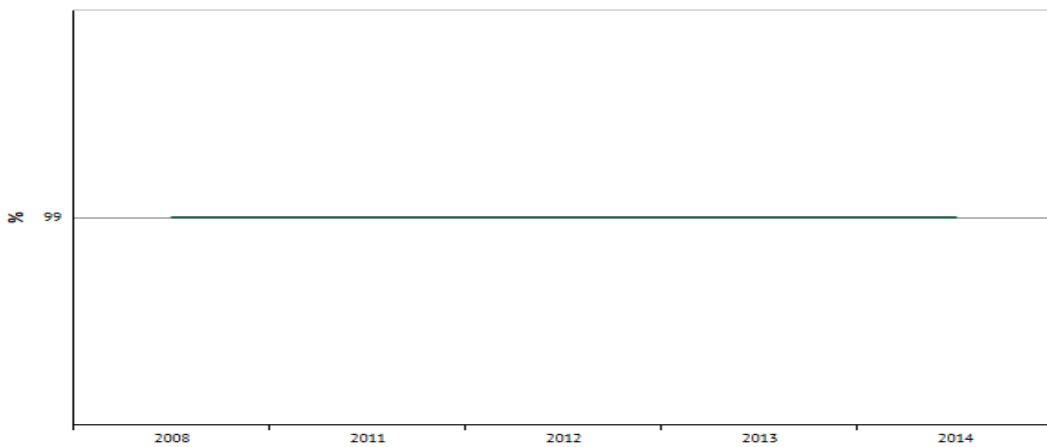
Source: Greece unemployment rate [16]



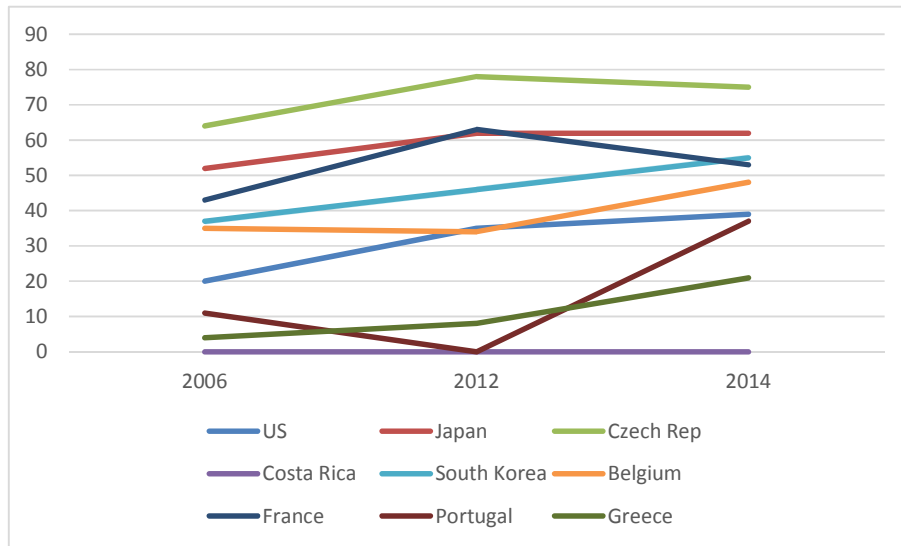
Graph 5. Unemployment rate of USA
Source: United States unemployment rate [17]



Graph 6. Literacy rate of Greece
Source: Greece Elderly literacy rate [18]



Graph 7. Literacy rate of Belgium and USA
Source: Belgium Adult literacy rate [19] and World Data Atlas [20]



Graph 8. Trend of non-religious population

4. CONCLUSION

The global democracy shows stagnancy in the sense that no significant alterations are observed over the years. According to [4] democracy, a popular alternative for less democratic or authoritarian regimes has to be maintained, but the nations' recent democratic transitions brought no such improvements in the society. In many developing countries governments are abusing this democratic identity and under this shade doing all inhuman acts to control the opponents resulting in the cause for sufferings to the ordinary people.

It has been observed that recently nine highly democratic countries including the USA demoted to moderate democracy. In searching the reason, it has been found that there exists some strong negative relation between non-religion fraction and democracy index of these countries. Therefore, the increase of nonreligious group shows significant impact on the decrease of the democratic index.

McGraw [11] stated that there is some relation between religion and politics. He added that religious population correlates positively with liberal democracy. People don't believe in religion indicates that they don't have faith in God and don't believe in his work. Therefore, they can do anything whatever they like. As a result, various unnatural and inhuman things are happening publicly throughout the world even in

major democratic countries. One of the components of democracy index is political participation and political culture. Dominance of nonreligious groups will decrease the public trust and will eventually decrease the political participation and political culture.

Therefore, to increase peoples' trust and reduce all types of corruptions for a better living we need to become better human by acquiring all good qualities of humanity in terms of belief, honesty, character elevation and understanding which has been explained in all religion. A healthy environment will not only enhance the democracy but also abolishes misbeliefs and myths regarding the religion. Sometimes employment-ship can be also improved in several countries with the help of a healthy democracy. The leading countries should also take an oath to encourage people to literate themselves so that the worth of democracy could understand by them and get propelled to every other country in the world.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. EIU Democracy Index 2016 - Infographics - The Economist.
Available:<https://infographics.economist.com/2017/DemocracyIndex/>
2. Lutz W, Cuaresma JC, Abbasi-Shavazi MJ. Demography, education, and democracy: Global trends and the case of Iran. *Population Development Review*. 2010;36(2):253-281.
3. Sorensen G. Democracy and democratization: Processes and prospects in a changing world. Third Edition, Avalon Publishing; 2007.
4. Kohli A. Democracy and development in India. Oxford University Press; 2010.
5. Soriano AG. Liberal democracy and the right to religious freedom. *Religion, Democracy and Civil Society*. 2013;3(8):581-603.
6. Rahman MS. Statistical analysis of democracy index. *Humanomics*. 2014;30(4):373-384.
7. Anderson DR, Sweeney DJ, Williams TA. *Statistics for business and economics*. 11th edition, South-Western. 2011;767-770.
8. Lutz W, Cuaresma JC, Sanderson W. The Demography of educational attainment and economic growth. *Science*. 2008;319(5866):1047-1048.
9. Rahman MS. Comparative study between democracy and autocracy based on social indicators. *British Journal of Economics, Management & Trade*. 2015;8(4):305-312.
10. McIntyre BA. What are benefits of believing in God; 2015.
Available:<https://www.quora.com/What-are-benefits-of-believing-in-God>
11. McGraw BT. Faith in politics: Religion and liberal democracy. Cambridge University Press. 2010;320.
12. List of countries by irreligion.
Available:https://en.wikipedia.org/wiki/List_of_countries_by_irreligion
13. Heneghan T. No religion' is World's third-largest religious group after Christians, muslims according to pew study; 2012.
Available:http://www.huffingtonpost.com/2012/12/18/unaffiliated-third-largest-religious-group-after-christians-muslims_n_2323664.html
14. Rahman MS. Statistical analysis of religious population in Asian countries. *Asian Research Journal of Arts & Social Sciences*. 2016;1(4):1-12.
15. Belgium unemployment rate.
Available:<https://tradingeconomics.com/belgium/unemployment-rate>
16. Greece unemployment rate.
Available:<https://tradingeconomics.com/greece/unemployment-rate>
17. United States unemployment rate.
Available:<https://tradingeconomics.com/united-states/unemployment-rate>
18. Greece-elderly (65+) literacy rate.
Available:<https://knoema.com/atlas/Greece/topics/Education/Literacy/Adult-literacy-rate>
19. Belgium - adult (15+) literacy rate.
Available:<https://knoema.com/atlas/Belgium/topics/Education/Literacy/Adult-literacy-rate>
20. World data atlas, United States of America.
Available:<https://knoema.com/atlas/United-States-of-America/topics/Education/Literacy/Adult-literacy-rate>

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