REGRESSION ANALYSIS OF NATIONAL ELECTIONS IN JAPAN USING SOCIAL LISTENING

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ABSTRACT

In this study, results predictions on Japan's national elections are made by analyzing data obtained through social listening. The amount of information sent by end users has become enormous as expressed as "information explosion", and social media is a representative source of such information. Social listening on national elections after the internet campaign became available in 2013 was conducted in this study, and a new finding in results predictions that could replace a conventional prediction method, especially in the proportional representation system, was made.

KEYWORDS

Social Listening, Internet Election, Internet Election Campaign, Election Results Predictions, Regression Analysis

1. INTRODUCTION

A conventional method used for election results predictions in Japan is RDD (Random Digit Dialing), in which media randomly call landline telephones to gather statistics. However since people nowadays have mobile phones and those especially under 40 years of age choose not to own landline phones, the RDD method has become less effective for predictions. Although research methods using mobile phones have been sought, mobile phones in Japan do not have area codes which make it impossible to obtain regional information through mobile phones.

As an alternate method of the RDD social listening has drawn attention. Through social listening, which tracks conversations about specific topics, keywords, phrases, products, etc. posted in social media, it is possible to collect massive data that was not available previously, and with that prospect social listening plays an important role in society. For example, under the conventional method, marketing research is conducted by gathering information at the scene or by survey using a certain number of samples for product development, marketing and management. In contrast, social listening makes it possible for companies to listen to numerous opinions from consumers and society through SNS (Social Network Service); as a result consumers and society can be put in the center for product development, marketing and management.

SNS such as Facebook and Twitter is quite actively used in Japan. Especially Twitter is exceedingly popular enough for Twitter Inc. to portray Japan's love of Twitter as "insane". This research is to look into the effectiveness of SNS as a tool for election results predictions by collecting data through social media after the ban on Internet campaigns was lifted in Japan in 2013. It is found that results predictions of Japan's national elections using social media is possible for nationwide proportional representation.

2. BACKGROUND OF STUDY

In this chapter social listening and Internet elections in Japan are discussed as the background of the study.

2.1 Internet Election Campaigns in Japan

Election campaigns using the Internet had not been available in Japan due to the Public Offices Election Laws which regulate various campaign activities such as door-to-door canvassing, pre-election campaigns and distribution of documents to protect the fairness and equality of elections. Among them is the prohibition of distribution of documents and drawings (such as post cards, placards or flyers), and the Supreme Court decided that the contents displayed on computer screens or cell phones are also considered documents or drawings; therefore, election campaigns using the Internet had not been available. However election campaigns which utilize the IT era had been discussed, and “The Act for Amending Part of the Public Offices Election Law related to Permission for Internet Election Campaigns” was passed in 2013, through which election campaigns using social media became available. The Japanese national elections have two types; the Lower House elections and the Upper House elections. The Lower House election consists of 289 single-member districts and 11 proportional representation electoral districts for 176 seats. The Upper House election consists of 47 districts for 73 seats and 48 seats by proportional representation on the national level.

2.2 Social Media in Japan

A social network service that holds the largest number of accounts in Japan (total population 126,937,000 as of November 1, 2016) is LINE with 68 million users, followed by Twitter and Facebook with 40 million and 27 million users respectively. However, LINE could be called a closed social media because LINE is to exchange messages between friends and family members, and the size of the network is quite small compared to Twitter. Thus, Twitter and Facebook are appropriate for this study. Twitter Inc. portrays Japan’s love of Twitter as “insane”. The world record for the number of tweets per minute is 618,725 tweets right after the match between Argentina and Germany during the 2014 Soccer World Cup, and the world record for the number of tweets per second is 143,199 during the Japanese animated adventure film “Laputa: Castle in the Sky” broadcast on August in 2013. In addition, Japan dominates high ranking positions in the number of tweets per second.

3. LITERATURE REVIEW

Analysis of elections using social media have been conducted in many countries such as by Tumasjan, A. et al. (2010) and Jungherr, A. et al. (2012) that focused on the number of tweets. Tumasjan, A. et al. (2010) and Jungherr, A. et al. (2012) both analyzed a German Federal election using 100,000 tweets, and they found contradictory results. This may have been caused by an insufficient number of twitter users in Germany as Doerner S. (2014) indicated. The research by Daniel G. et al. (2011) and Jessica C. et al. (2011) using emotion analysis from 240,000 data found contradictory results as well.

In Japan Nasuno et al. (2013 and 2014) and Yoshimi (2016) published studies focusing on social media to analyze Japanese elections after the ban on Internet campaigning was lifted. Nasuno et al. (2013 and 2014) analyzed the 23rd Upper House regular election using 42,645 tweets by 287 candidates and 368,694 of re-tweets of them. Also Yoshimi (2016) targeted 30,941 tweets posted on their official accounts by 537 candidates running from five major political parties in the 47th Lower House general election. The above three studies only show a tendency due to the scarce amount of data.

On the other hand, this study takes advantage of the Japanese insane love of Twitter, through which anonymous online support groups are created. As Goto (2015) found the predictions in small constituencies at national elections were not possible due to the scarce number of postings. Our research found that for other candidates several hundred to one thousand tweets is the line to win, but that data shows tendencies only. The same thing can be said for candidates who rely on organized votes¹. For example, Yoshifumi

¹ Votes cast for specific candidates or parties by various groups or organizations. Large units of professional office workers (such as self-defense army or police), industry groups, labor unions, interest groups, religious groups are applied to those groups or organizations. A political party Komei was founded based on Sokagakkai, a Buddhist religious corporation, to achieve moderate political influence and wins seats by organized votes.

Takushoku earned the largest number of votes of 429,002 at the 23rd Upper House general election in spite of the fact that the number of postings containing his name was only 8. He is a former head of the national association of postmasters and received organized votes from postal businesses. Thus, with this research method it is difficult to analyze parties or individual candidates in small constituencies or who rely on organized votes. However, analysis by party name in the proportional representation system is effective. For this study 956,268 tweets and Facebook postings that contained political party names for the 23rd Upper House regular election were collected. Furthermore, 1,287,982 tweets for the 47th Lower House general election and 1,777,724 tweets during the 24th Upper House general election were collected. With this overwhelmingly large volume of data compared to other research performed in Japan or other countries this study is distinguished from others.

4. RESEARCH METHOD

A regression analysis using data collected via social listening was performed for this study. In this chapter the methods for social listening and analysis are discussed.

4.1 Methods for Social Listening

Social listening data regarding Japanese national elections are collected through Yahoo! Japan real-time search. The Public Offices Election Law allows an election campaign only between a candidate's registration on the date of a public announcement and a day before a voting date. Campaigning in another period such as pre-election campaign before a candidate registration is prohibited. Therefore, the period for social listening is between the date of public announcement and a day before a voting date.

The media such as press and TV station conduct a sample survey using RDD during election campaigns to predict the election results. Through social listening more precise information can be collected by taking advantage of information generated via Twitter in a spontaneous manner during the same period.

As Goto (2015) previously noted, the number of tweets by candidates name in small constituencies were too scarce to use for the analysis of elections. Also the same can be said of candidates who rely on organized votes. Therefore, social listening was conducted by party names in the proportional representation system using Yahoo! Japan Real-time Search. Some parties cannot be identifiable; for example, although at the 23rd Upper House regular election 12 registered parties' official and official abbreviated names were extracted, the official names of "Your party", "New Party DAICHI", "People's Life Party", "Green Wind", "Green Party" and "Happiness Realization Party" whose official abbreviated names are "You", "DAICHI", "Life", "Midori (note that 'midori' is the Japanese translation of green), "Green" and "Happiness" respectively could not be identified. Since those unidentifiable parties by party name have lesser power, and also the amount of data collected via Yahoo! Japan real-time search is small, only official names of those parties were used for data gathering. Also, since tweets on Liberal Democratic Party, a majority party, included Democratic Party of Japan, another major party, some procedures were used to distinguish tweets between those two parties.

4.2 Analysis Method

Goto (2015) has analyzed a correlation between the total number of postings containing party names on social media during a campaign period and the number of votes each party obtained in the proportional representation system. At the 23rd Upper House regular election held in 2013 R^2 is 0.857, and a strong correlation between the number of postings that contained a party name and the party-list votes in the proportional representation system is found. Also, at the 47th Lower House general election in 2014 R^2 is 0.880, and Pearson correlation coefficient is 0.938 which is 1% level and is significant (both sides); thus a strong correlation between the number of tweets containing party name and the total party-list votes in each constituency in the PR system is found. Further, at the 24th Upper House regular election in 2016 R^2 is 0.891, and Pearson correlation coefficient is 0.944 which is 1% level and is significant (both sides); thus a strong correlation between the number of tweets that contained a party name and the total number of party-list votes in each constituency in the proportional representation system is found as well.

In this study, a regression analysis is performed to the above three elections to find the correlation between social media postings and election results.

5. ANALYSIS

In this chapter the past three national elections after the ban on internet election campaign was lifted are analyzed using the methods described in the previous chapter.

5.1 Analysis of the 23rd Upper House Regular Election

The terms of office for the Upper House members elected in 2007 expired on July 28, 2013, and 121 seats (73 for constituencies and 48 for the proportional representation system by open list) were included in the election on July 21, 2013. This was the first election where the internet campaign was allowed, and public announcement was made on July 4.

Table 1. Each registered party's total number posted during the 23rd Upper House election

	Jul.4	Jul.5	Jul.6	Jul.7	Jul.8	Jul.9	Jul.10	Jul.11	Jul.12	Jul.13	Jul.14	Jul.15	Jul.16	Jul.17	Jul.18	Jul.19	Jul.20	Total	Nr. Of votes
YP	1,586	2,311	2,102	1,803	1,891	1,534	1,791	1,661	1,767	1,586	2,709	2,132	2,628	2,079	2,171	2,031	2,115	33,897	4,221,422
DPJ	7,924	11,024	10,497	12,014	8,863	9,436	9,962	9,652	10,817	8,715	7,595	9,711	12,255	12,352	12,181	11,938	11,357	176,313	4,827,158
NPD	141	2,744	844	413	327	220	369	327	1,065	427	396	376	710	297	433	353	546	9,988	398,848
SDP	1,683	3,002	1,902	2,957	2,325	1,629	1,809	1,995	1,663	1,459	1,492	1,871	1,516	1,631	1,761	2,088	2,051	32,834	983,227
PLP	1,006	2,701	2,190	2,216	2,128	1,721	1,719	1,912	1,927	2,492	2,405	2,781	2,284	2,499	3,110	3,151	2,714	38,956	723,987
GW	970	1,470	1,034	935	899	808	837	849	748	803	1,135	1,426	1,542	1,338	1,276	1,404	1,501	18,975	319,630
LDP	9,577	24,012	33,144	25,220	19,431	17,485	16,506	14,894	15,498	15,643	15,934	18,407	18,437	22,023	30,730	28,149	30,409	355,499	14,080,143
JCP	1,212	3,348	3,112	3,211	2,971	2,734	2,484	2,815	2,998	2,637	2,446	2,890	3,285	3,372	3,838	4,146	4,726	52,225	4,647,765
KOMEI	1,285	3,805	3,054	3,311	3,413	2,855	2,457	2,639	2,587	2,334	2,957	3,247	3,752	3,961	4,237	4,325	4,303	54,522	3,333,142
GP	1,144	1,839	2,720	2,010	1,496	1,695	1,733	2,580	2,405	2,591	2,509	2,931	3,647	4,075	3,578	3,556	3,985	44,494	242,480
JRP	2,845	5,463	5,144	5,463	5,786	6,919	6,263	6,220	5,044	6,791	8,591	7,096	5,538	5,897	6,242	6,177	7,023	102,502	5,191,563
HRP	935	1,730	1,248	1,288	1,482	1,502	1,447	2,031	2,340	2,242	2,383	2,398	2,807	3,405	2,648	2,793	3,384	36,063	153,296

Table 1 shows the number of postings containing party names on Twitter and Facebook, (note that the number of postings in this section is the total from Twitter and Facebook), total number of postings and the votes each party received in the proportional representation system between the day of the official announcement and the day before a voting date. A regression analysis² was performed with the total number of postings containing a party name as an independent variable and with the total number of votes those parties each obtained as a dependent variable. A regression line is given by Y (votes gained) = $37.402 \times x$ (number of postings) + 279687.511 with t -ratio = 7.443 , p -value = 0.000 , $R^2 = 0.874$, and $F = 55.403$. Figure 1 shows a scatter plot. And as Figure 2 of scatter plot standardized residuals shows, standardized residuals is within ± 2 .

Figure 1. Scatter plot

Figure 2. Scatter plot of standardized residuals

² SPSS Ver.24 was used.

A seats prediction can be calculated by multiplying the ratio of the number of postings on each party and 48 seats in the proportional representation, and the comparison with actual election results is made in Figure 3. The prediction errors are 0 for Liberal Democratic Party of Japan, 2 for Democratic Party of Japan, 4 for Komeito, 1 for Japan Restoration Party, and 2 for Japanese Communist Party. Except for Komeito, which relies on organized votes and has a large error, errors are within two seats; therefore, it is suggested that election results predictions in the proportional representation system are correctly made.

Figure 3. Results predictions in PR system by social media and actual results

5.2 47th Lower House General Election

Due to the dissolution of the Lower House on November 21, 2014, a national election was called for 475 seats (295 for small constituencies and 180 for proportional representation system by fixed list). The election was publicly announced on December 2 and voted on December 14.

The number of tweets containing party name (the number of postings on the 47th Lower House general election is from Twitter only), total number of tweets and total number of votes each party gained in 11 electoral districts (Hokkaido, Tohoku, Kitakanto, Minamikanto, Tokyo, Hokurikushinsu, Tokai, Kinki, Chugoku, Shikoku, Kyushu) are shown in Table 2. Also Table 3 shows the same items after the “emotion analysis” through Yahoo! Japan real-time search was made.

Table 2. Each registered party's total number posted during the 47th Lower House election

	Dec. 2	Dec. 3	Dec. 4	Dec. 5	Dec. 6	Dec. 7	Dec. 8	Dec. 9	Dec. 10	Dec. 11	Dec. 12	Dec. 13	Total	Votes
LDP	28,543	24,607	40,095	32,825	34,458	35,868	39,460	37,649	37,557	37,335	41,140	55,762	445,299	17,658,916
NRP	363	237	170	171	116	159	96	95	78	75	101	202	1,863	16,597
DPJ	19,958	15,786	21,535	17,870	18,922	21,622	21,734	21,862	24,073	22,613	21,637	25,699	253,311	9,775,991
KOMEI	8,801	7,367	9,006	9,845	9,577	8,589	11,713	10,662	10,493	8,853	8,417	11,726	115,049	7,314,236
SPD	3,562	3,001	2,891	2,497	2,608	2,771	2,772	3,887	3,872	3,733	3,981	5,609	41,184	1,314,441
JRP	5,760	5,638	6,777	5,301	5,937	6,743	7,159	6,761	7,417	6,647	6,633	10,241	81,014	8,382,699
HRP	1,376	130	867	929	904	956	967	975	1,014	996	1,222	1,417	11,753	259,060
PLP	1,612	1,311	1,604	1,557	1,996	1,711	2,263	2,226	2,297	2,374	2,200	2,928	24,079	1,028,721
JCP	12,408	10,663	13,568	11,589	12,508	14,572	14,388	19,064	17,317	22,283	20,205	23,997	192,562	6,062,962

Table 3. Each registered party's total number posted excluding negative postings during the 47th Lower House election

	Dec. 2	Dec. 3	Dec. 4	Dec. 5	Dec. 6	Dec. 7	Dec. 8	Dec. 9	Dec. 10	Dec. 11	Dec. 12	Dec. 13	Total	Votes
LDP	12,273	11,565	19,246	14,771	15,506	15,782	17,362	16,189	16,901	16,801	18,924	24,535	199,855	17,658,906
NRP	225	142	136	125	86	121	65	76	76	51	68	127	1,298	16,597
DPJ	8,981	8,051	11,629	8,399	9,083	10,811	10,650	10,712	12,518	12,211	11,684	12,850	127,579	9,775,991
KOMEI	4,753	3,978	5,043	5,513	5,842	4,896	7,613	6,717	6,611	5,046	4,882	6,449	67,343	7,314,236
SPD	2,030	1,681	1,677	1,498	1,591	1,552	1,552	2,332	2,478	2,314	2,468	3,702	24,875	1,314,441
JRP	3,110	3,101	3,863	2,863	3,325	3,844	3,937	3,516	4,228	3,589	3,847	5,530	44,753	8,382,699
HRP	867	87	555	632	579	669	600	624	659	657	880	1,006	7,815	259,060
PLP	1,225	1,009	1,283	1,199	1,617	1,317	1,833	1,759	1,907	1,828	1,738	2,313	19,028	1,028,721
JCP	5,584	5,012	6,648	5,679	6,004	7,286	6,906	9,341	8,659	10,919	10,709	11,999	94,746	6,062,962

A regression analysis was performed with the total number of postings containing a party name as an independent variable and with the total number of votes those parties each obtained as a dependent variable. A regression line is given by Y (votes gained) = $89.935 \times x$ (number of postings) + 279959.002 with t -ratio=7.555, p -value= 0.000, $R^2=0.880$, and $F=55.403$. Figure 4 shows a scatter plot. And as Figure 5 of scatter plot standardized residuals shows, standardized residuals is within ± 2 .

Figure 4. Scatter plot

Figure 5. Scatter plot of standardized residuals

Figure 6. Results predictions in PR System by social media and actual results

A seats prediction can be calculated by multiplying the ratio of the number of postings on each party and 180 seats in proportional representation, and the comparison with actual election results are made in Figure 6. The prediction errors were 7 for Liberal Democratic Party of Japan, 4 for Democratic Party of Japan, 5 for Komeito, 7 for Japan Restoration Party, and 9 for Japanese Communist Party. Those errors are considered to be caused by the complicated Lower House electoral system, under which the number of seats in the Lower House is over three times the number of seats in the Upper House, candidates win by sekihairitsu (best loser calculation), some parties do not list candidates in the proportional representation system in some of the 11 constituencies, etc.

5.3 24th Upper House Regular Election

On July 25, 2016, the terms of office for the half of the Upper House members elected in 2013 expired, and a national election was called for 121 seats (73 for constituencies and 48 for proportional representation system by open list). The election was publicly announced on June 22 and voted on July 10.

Table 4. Each registered party's total number posted during the 24th Upper House election

	Jun.22	Jun.23	Jun.24	Jun.25	Jun.26	Jun.27	Jun.28	Jun.29	Jun.30	Jul.1	Jul.2	Jul.3	Jul.4	Jul.5	Jul.6	Jul.7	Jul.8	Jul.9	Total	Votes
LDP	27,538	24,232	24,842	22,508	24,459	27,703	31,894	34,280	28,446	28,787	30,068	29,865	29,581	37,151	40,998	36,696	38,962	63,885	581,895	20,114,788
DPJ	19,682	11,984	13,977	13,286	16,200	14,136	17,575	13,718	14,135	13,214	12,854	18,935	14,963	15,155	17,242	13,320	17,718	19,343	277,437	11,751,015
JCP	13,233	12,070	13,935	14,018	25,614	23,242	26,066	25,379	16,889	14,646	15,689	18,190	17,490	19,392	20,096	20,416	20,711	26,136	343,212	6,016,194
KOMI	5,407	5,025	5,115	5,624	6,204	6,108	6,393	5,919	6,304	5,945	6,642	7,668	7,304	7,312	7,867	7,971	8,299	11,073	122,180	7,572,960
SDP	2,793	2,267	2,284	2,341	2,895	3,171	4,355	4,258	3,067	3,491	4,021	4,119	2,757	2,940	3,320	3,643	3,360	4,626	59,708	1,536,238
ORP	4,807	4,596	4,393	5,139	4,994	4,596	4,308	4,182	4,083	4,191	4,556	5,437	6,046	6,157	6,637	7,679	7,403	9,587	98,793	5,153,584
AVP	348	282	196	190	197	274	236	290	332	671	350	284	316	278	285	583	587	784	6,483	466,706
HRP	853	713	572	500	490	494	691	655	857	877	1,287	844	1,133	834	853	1,677	2,344	4,238	19,912	366,815
NRP	661	727	335	448	398	405	330	444	473	629	345	428	473	450	457	709	1,455	1,064	10,231	580,653
PJK	1088	772	1016	1050	1184	920	904	728	569	709	794	1219	1026	1470	1,630	2,034	2,046	3,587	22,746	734,024
PLP	1126	803	1054	895	898	1006	1118	1253	943	1115	1186	1512	1473	1810	1,581	1,732	2,229	3,217	24,951	1,067,300

The number of tweets on each party posted (the number of postings on the 24th Upper House regular election is from Twitter only), total number of tweets and total number of votes each party gained during the campaign (between the day of public announcement and the day before the voting) are shown in Table 4.

A regression analysis was performed with the total number of postings containing a party name as an independent variable and with the total number of votes those parties each obtained as a dependent variable.

A regression line is given by Y (votes gained) = $89.935 \times x$ (number of postings) + 27.775 with t -ratio = 8.565 , p -value = 0.000 , $R^2 = 0.891$, and $F = 73.362$. Figure 7 shows a scatter plot. And as Figure 8 of scatter plot standardized residuals shows, standardized residuals is within ± 2 .

A seats prediction can be calculated by multiplying the ratio of the number of postings on each party and 48 seats in proportional representation, and the comparison with actual election results are made in Figure 9. The prediction error is 1 for Liberal Democratic Party of Japan, but prediction errors widen because, in this election, the same individuals tweeted the same content many times.

Figure 7. Scatter plot

Figure 8. Scatter plot of standardized residuals

Figure 9. Results predictions in PR system by social media and actual results

6. CONCLUSION

In this research, it is found that results predictions of Japan's national elections using social media is possible in a more frequent manner at lower cost with higher accuracy compared to the conventional research through RDD. As described in Chapter 3, Literature Review, although it is difficult to make predictions on parties or candidates in small-constituency districts or who rely on organized votes, election results predictions using social listening in the proportional representation system are effective. Especially the predictions for the proportional representation system in Upper House elections, which is voted nation-wide, were more precise than those in Lower House elections in which the nation is divided into 11 districts. In addition, adding variables such as the number of party members would make more precise predictions possible than through the conventional methods.

In the era of the "Information Explosion", social listening or big data such as IoT, or a combination of both are essential tools for not only business management but also for problem solving or prediction-making.

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