

Prediction of The Referendum Results According To People's Attitude Towards The Local Government

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Abstract

In recent years, the referendums play an important role in modern democracies. With the rapid changes in globalization, information and communication technologies and the increasing complexity of economic and social problems caused by intense competition, especially the referendums that are held to maximize the legitimacy of the decisions taken by the public will be seen as direct participation of citizens in the political process when traditional forms of political participation are declining. This study present a method to predict how citizen will vote in the referendum only by starting from their attitude towards local governments. For this purpose, a qualitative research was designed and 2446 voters were interviewed in Kilis Province Center of Turkey. In the study, Support Vector Machines, which is a nonparametric classification method based on statistical learning theory, was used to estimate the referendum results that would be voted as yes or no. At the end of the study, by using twenty-six variables, the rate of people voting in the referendum was predicted by 81%. This results guide the survey companies' efforts to predict the results of the referendum.

Keywords: Support Vector Machines, Referendum, Forecasting, Voting

Referandum Sonucunun Seçmenlerin Yerel Yönetime Tutumu İle Tahmin Edilmesi

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Öz

Son yıllarda referandumlar modern demokrasilerde önemli bir rol oynamaktadır. Küreselleşme, bilgi ve iletişim teknolojilerindeki hızlı değişimler ve yoğun rekabetin meydana getirdiği ekonomik ve sosyal problemlerin giderek daha karmaşık hale gelmesi ile birlikte kamu iradesinin aldığı kararların meşruluğunu en üst düzeye çıkarmak için kullanılan referandumlar, özellikle geleneksel siyasal katılım azaldığı dönemde vatandaşların siyasi sürece doğrudan katılımı olarak görülmektedir. Bu çalışmanın amacı vatandaşların sadece yerel yönetinlere karşı tutumlarından yola çıkarak referandumda ne yönde oy kullanacakları tahmin edilmesi için bir yöntem ortaya koymaktır. Bu amaç doğrultusunda nitel bir araştırma tasarlanmış ve Kilis İl Merkez’de 2446 adet seçmene anket uygulanmıştır. Çalışmada evet veya hayır yönünde oy kullanılacak referandum sonuçları tahmin edilmesinde istatistiksel öğrenme teorisine dayalı parametrik olmayan bir sınıflandırma yöntemi olan Destek Vektör Makineleri (Support Vector Machines) kullanılmıştır. Araştırma sonunda yirmi altı değişken kullanmak suretiyle, kişilerin referandumda hangi yönde oy kullanacakları %81 oranında önceden kestirilebilmiştir. Bu sonuçlar anket şirketlerinin referandum sonuçlarını önceden tahmin etme çabalarına yol gösterici niteliktedir.

Anahtar Kelimeler: Destek Vektör Makineleri, Referandum, Tahmin, Oy verme.

Introduction

The referendum is considered the cornerstone of direct democracy, which allows citizens to have a direct voice of important political issues and engage in public policy issues (Quinlan, Shephard and Paterson, 2015, p.192). This gives people the power to control the public will as a distinctive feature of modern democracy. At a time when traditional forms of political participation such as voting for elections and political party membership diminish and politicians' confidence is diminishing, the direct participation of citizens in the political process can be seen through referendum. Therefore, a referendums are one of the most important issues for legal administration.

While political science researches on voting behavior in referendums are relatively new and increasingly popular, different approaches have been used and discussed in many different areas for the predictions of the referendum. Understanding the voting behavior in referendums is crucial. The most common methods used to estimate results in the academic literature are expert judgment, surveys, prediction markets and quantitative models (Graefe, 2014, p.205).

The researchers identified some basic variables that could affect voting behavior in referendums. This study aims to develop a simple estimation model to predict future referendum results by selecting voters' attitudes towards local governments. The estimation model used in the study was adapted to estimate the referendum results to be voted on to yes or no after considering the attitudes of voters towards the local government. This method provides alternative ways to evaluate voter tendencies.

Referendum Concept

Referendums are becoming more and more commonplace in almost every part of the world (Neijens and van Praag, 2006, p.445). Referendums are routinely used in many countries both to amend constitutions and as an alternative to the legislative process (Darcy and Laver, 1990, p.1). The notion of referendums has become associated with the concept and processes of democracy (Marques and Smith, 1984, p.85). In this respect, the referendum is an important institution of democracy. It is considered to be the

main feature of direct democracy, which gives people the power to control public opinion. The referendum is one of the ways for every citizen to participate in the decision-making process on certain political issues (Higley and Mcallister, 2002, p.845; Laycock, 2013, p.237). In other words, the referendum is a decision-making process. When very important issues are involved, it is seen as a process in which people state their opinions apart from political restraints.

Referendums offer citizens different options than political elections. No political party or candidate names appear in referendums. In a referendum, unlike political elections, citizens need to decide between alternatives that have sometimes unknown and perhaps not reliable cues. Therefore, more uncertainty might be expected in voting behavior in a referendum than in political elections. Campaigns are of great importance, especially when the subjects of the referendum are completely new to citizens (LeDuc, 2000, p.1).

The referendum is a mechanism what provides the opportunity of submitting to popular vote a decision on a certain issue considered or made by a governmental body. In the broadest sense, referendum can be defined as official popular votes or plebiscites on a particular in a nation state (LeDuc, 2002, p.711). Indeed, referendums transfer decision-making power to the people (Baum and Freire, 2001, p.2). The referendum is different ways of submitting laws, proposals for laws, or other current issues to the electorate so that the people can directly express their opinion by accepting or rejecting the issue. The referendum is a good example of a direct democracy that reflects the decision of public to the government (Uste and Guzel, 2011, p.148) and is often justified in terms of results representing the will of the majority.

The accepted definition of democracy in the academic literature refers to the direct participation of citizens in the political processes. The referendums serve as one of the forms of direct democracy (Jerzak, 2014, p.369). Direct democracy or referendums provide an environment for observing political elections (Bornsteina and Lanz, 2008, p.431). In particular, referendums are one of the most important features of direct democracy, which allows citizens to have a direct voice and become more knowledgeable about current issues and not to agree with public policy issues. It also provides a "veto of the people", that could be considered as an additional

control to the governments (Quinlan et al., 2015, p.192). In other words, referendums enable citizens to shape the formation of laws more quickly than legislative procedures that mediate their legal preferences and policy outcomes (Jerzak, 2014, p.369).

The Political Context of the Referendum

The referendum, as a mechanism of direct democracy, provides voters a say on specific political questions. Indeed, the referendum phenomenon is an important part of the political process throughout the World (Atikcan and Oge, 2012, p.449). The referendums that are held to maximize the legitimacy of the decisions taken by the public will be seen as direct participation of citizens in the political process in particular when traditional forms of political participation, such as voting for political elections and membership of political parties, are declining (O'Mahony, 2009, p.431; Roberts, 2001, p.108).

A referendum as a political document can be defined as the right of every citizen to vote on a particular issue. After the decisions of the representative political bodies, the people's referendum is held and the referendum is voluntary (Neijens and Van Praag, 2006, p.446). The vast majority of referendums are initiated either directly or indirectly by governments, and in particular the reasons why the ruling parties call for a referendum shape the context in which voting takes place (LeDuc, 2015, p.140). It can also be confused with some other short-term political factors that go beyond the issue presented in referendum voting. In this regard, the referendums carry a number of characteristics of second degree elections (LeDuc, 2002, p.712).

The referendums are seen as a way of legitimizing a political decision that could be a source of ongoing conflict (LeDuc, 2005, p.170). Referendums are a means to overcome the issues of traditional conflicts between political parties (Closa, 2007, p.1313). In other words, referendums are considered as a tool that can help solve the problems in the relationship between voters and representatives. In particular, some referendum issues are major political events of interest. For example, referendums on issues such as large regional trade agreements, constitutional restructuring and national sovereignty have economic, social and political dimensions that

can affect the lives of millions of people in many countries (Borges and Clarke, 2008, p.436-437).

Forecasting of the Referendum

There is a considerable public interest in the likely outcome of the referendum even well in advance (Fisher, 2015, p.137). Election markets have recently emerged as an intriguing new tool for predicting directly into the Election Day vote (Erikson and Wlezien, 2008, p.191). Election behavior theories have revealed complicated models that analyze through collective election data or poll collections on individual voters (Norpoth, 2004, p.297).

Research tells us that the likely outcome of referendum is predictable (Campbell, 2001, p.33; Lock and Gelman, 2010, p.337; Graefe, Scott, Randall and Alfred, 2014a, p.43). Scientists try to forecast the expected results of the vote by using various economic and political indicators, such as economic growth rates, the results of previous elections, dismissal and various other possible considerations (Hummel and Rothschild, 2014, p.124). Many different indicators are put to use to predict the results (Fisher and Shorrocks, 2018, p.59-60). Voting behavior research integrates with public opinion, electoral systems and political economy and increasingly uses many advanced methodologies of technology in the social sciences (Linzer and Lewis-Beck, 2015, p.895). The most common methods used to estimate the results of voting behavior in the literature are expert judgment, surveys, prediction markets and quantitative models (Graefe, 2014, p.205).

Expert Judgment: The referendum forecasting is a natural consequence of social sciences' efforts to understand society. One of the oldest approaches to predicting results is to rely on experts' expectations (Graefe, Scott, Randall and Alfred, 2014b, p.1; Linzer and Lewis-Beck, 2015, p.895). Expert judgments are predictions made by individuals with expertise in the field. For this reason, experts are expected to correctly predict the results of the voting based on past and present information (Fisher and Shorrocks, 2018, p.63). The common assumption is that experts have experience in reading and interpreting surveys, evaluating campaigns, and estimating

the effects of the final or expected events on total voting (Graefe, 2014, p.205).

Polls: Traditional polls are a common way to predict voting results. In other words, it acted as a mechanism to estimate the voting results from the question of voting intent. Academicians, the media and the public are generally interpreted as estimates of the surveys and reflect the election day of the voting results (Graefe et al., 2014a, p.47; Linzer and Lewis-Beck, 2015, p.896). In general, there are basic factors affecting voting results (Fisher, 2015, p.137). When voting is done, market players become more productive because they can combine new types of information from surveys (Erikson and Wlezien, 2012, p.534). This situation describes the historical relationship between the results of the surveys and the referendum, the direction and scope of the possible changes in the idea and the level of uncertainty expected from the outcome of my vote (Fisher and Shorrocks, 2018, p.66). That is to say, surveys are conducted on people who intend to vote in the elections held today. That is, the surveys do not provide foresight, but they provide snapshots of the public at some point in time (Graefe, 2014, p.205).

Prediction Markets: Forecast markets allow people to predict the outcome of the election. The revealed results are then interpreted as estimates (Graefe, 2014, p.207). It is generally accepted that the prediction markets are better than surveys, quantitative models and expert judgments, since prediction markets generally obtain general information about an event in real time. The referendum prediction markets predict not only the share of the votes, but also which side will win (Fisher and Shorrocks, 2018, p.64).

Quantitative Models: The common point of the electoral behavior is the referendum on the performance of the party in power during the end of the term of office. Academicians have developed and tested this theory, mostly by developing econometric models to predict results. Most of the models have two and five variables and often combine indicators of economic conditions and public opinion to measure the in-office performance (Graefe et al., 2014a, p.48).

Methodology

Support Vector Machine: Support vector machine is a non-parametric classification method based on statistical learning theory (Kavzoglu and Colkesen, 2009, p.352; Huang, Davis, and Townshed, 2002, p.726). A support vector machine has been developed for binary classifications and with this method; it is possible to obtain accurate classification results by a small number of sampling data (Foody and Mathur, 2004, p.113). It is a method in which the optimal algorithm is used to determine the boundary between classes in the property space. Originally designed for the classification of two-class linear data, the method was then enhanced for the classification of multi-class and non-linear data. It is mainly based on the principle of determining the hyperplane that can distinguish between two classes (Lau and Wu, 2008, p.1541; Hong, Min, Cho, and Cho, 2008, p.663). A number of studies have been carried out on the use of Support vector machines used in different areas in the field of remote sensing (Zhu and Blumberg 2002, p.234; Hsu and Lin, 2002, p.416; Huang et al. 2002, p.726; Kavzoglu and Colkesen, 2009, p.354; Wang, Neskovic and Cooper, 2005, p.556). This method has the property of working in multidimensional space using kernel functions and it is stated that the results obtained from the method depend on the properties of the selected kernel and parameters (Foody and Mathur, 2006, p.181; Song, Zheng and Jiang, 2012, p.3302).

Survey form: The study tries to predict the votes of the participants in the referendum based on their opinions of the local government. For this purpose, a questionnaire was prepared which questions the opinions of the voters about the local government. This survey includes demographic questions and questions that will help to reveal the views of the participants on local government. In addition, the participants were asked about their vote in the referendum. In the questionnaire, the participants' personal information was not demanded.

Data Collecting: According to the data issued by the Supreme Board of Elections, there were 81,118 registered voters in the total number of 334 chests in 88 districts of Kilis (a province of Turkey) during the survey period (ysk.gov.tr). However, the majority of the participants are located in

Kilis - Centrum. As the surveys in villages and districts would increase the cost of the study and there were not too many voters in these places, the study was limited with Kilis Center so the Elbeyli, Musabeyli and Polateli districts and villages were excluded from the study. The universe of our survey is composed of 58,143 voters who will vote in 173 polling stations in 75 neighborhoods in Kilis Center.

Findings

Data Cleaning and Analysis Preparation: 2446 completed questionnaires were coded in SPSS software. However, the data set must be cleared before performing the forecast study. In some surveys, 10 questions were answered at the most. The use of these surveys will not have an impact on the outcome of the study, so they must be removed from the data set.

In addition to this, 4 options about their votes at the future referendum were offered to participants in the questionnaire. These are "yes, no, undecided and I will not vote". Those who are undecided and who say that they will not vote will not contribute to the main purpose of the study. Therefore, they should be removed from the questionnaire.

It has been determined that some of the variables (57 of them) to be used as input in the questionnaire form have a high correlation coefficient. Using such variables as inputs in the data set will adversely affect the results of the analysis (due to multicollinearity problem). Therefore, variables with a correlation coefficient above 90% were detected and only the first variable was kept in the data set.

After the data cleaning process, 1694 questionnaires and 52 variables remained suitable for the analysis in the data set.

The data set is divided into two groups: the training model in which the estimation model will be optimized and the test set to test the performance of the model. However, the data set is ordered by neighborhoods. For this reason, the data set was randomly ranked first, and the first one hundred questionnaires were used for the purpose of questionnaire testing, and the remaining 1594 questionnaires were used for training and optimization purposes. Descriptive statistics for demographic characteristics for training and test sets are presented in the table below. Since there

are 100 observations in the test set, n represents the percentage values at the same time.

Table 1. Descriptive Statistics

Gender	Training Set		Test Set	Education	Training Set		Test Set
	n	%	n		n	%	n
Female	647	40.6	33	Primary school	356	22.3	18
Male	923	57.9	66	Middle School	366	23.0	26
No answer	24	1.5	1	High school	381	23.9	23
				Associate Degree	102	6.4	5
				Faculty	148	9.3	11
				Graduate	11	0.7	1
				No answer	230	14.4	16
Occupation	Training Set		Test Set	Age	Training Set		Test Set
	n	%	n		n	%	n
Worker	206	12.9	13	18 - 25	260	16.3	18
Trades	397	24.9	25	26 - 33	348	21.8	20
Officer	104	6.5	8	34 - 41	408	25.6	29
Business man	17	1.1	0	42 - 49	235	14.7	14
Educator	40	2.5	1	50 - 57	160	10	9
Healthcare staff	35	2.2	0	58 +	154	9.7	9
Doctor	5	0.3	2	No answer	29	1.8	1
Housewife	382	24.0	15				
Retired	110	6.9	8				
Engineer-Architect	6	0.4	0				
Military-Police	9	0.6	1				
University Student	86	5.4	9				
Other	121	7.6	13				
No answer	76	4.8	5				

Table 2. Questions in the questionnaire form

No	Question
1	Gender
2	Age
3	Education
4	Occupation
5	Does the Mayor carry out all the plans and projects that he announced before the elections?
6	If it is the Mayor's election today, would you vote again for the current Mayor?
7	In general, do you think that your opinion about the Mayor is positive?
8	In general, do you find the Municipality of Kilis successful?
9	Can you easily reach the mayor of Kilis?
10	Do you have easy access to Kilis deputy mayors and managers?
11	Do you get answers to your application to the Municipality of Kilis?
12	Do you think that the principles of equality and impartiality are complied with while being served by Kilis Municipality?

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13	Are you satisfied with the attitudes and behaviors of the relevant staff towards you when you receive service from Kilis Municipality?
14	Do you know about the services and projects offered by the Municipality of Kilis?
15	E Municipality services
16	Zoning, license and building inspection
17	Road, pavement and asphalt
18	Workplace permit licenses
19	Cleaning and collection of solid waste
20	Public bus services
21	Municipal police services
22	Car park
23	Park, garden and green areas
24	Public Relations
25	Health Service
26	Culture and art
27	Street animals
28	Pest control
29	Urban transformation
30	Services for the disabled
31	Youth and sports services
32	Services for women, children and the elderly
33	Services for the poor
34	Disaster management
35	Employment services
36	Fighting with snow and frosting
37	Hardworking and determined
38	Gentle and warm
39	Good management ability
40	Honest
41	Education Center
42	Logistics Center
43	Amusement center
44	Faith Tourism Center
45	Fitness center
46	Trade Center
47	Recreation Center
48	Health Care Center
49	Center for Cultural and Artistic Activities
50	Small and Medium Level Manufacturing Center
51	Quiet City
52	In which direction will you vote in the Constitution Referendum (16 April 2017)?

Performance Indicator: In the study, the results of the referendum to be voted yes or no are estimated. Therefore, it is possible to say that the study is a classification study. In the study, the performance of the model created

by the parameters and variables optimized in the training set will be examined by the confusion matrix on the test set.

Four initial kernel functions are determined. Although it is possible for users to create the kernel function, only the existing kernel functions are used to keep the volume of the work at a reasonable level. Mathematical expressions of kernel functions and functions are shown in the table below.

Table 3. Kernel functions (Kecman, 2001, p. 171)

Type of Classifier	Kernel Functions
Linear	$K(x, x_i) = x^T x_i$
Polynomial	$K(x, x_i) = [(x^T x_i) + 1]^d$
RBF	$K(x, x_i) = e^{-1/2[(x-x_i)^T \Sigma^{-1}(x-x_i)]}$
Sigmoid	$K(x, x_i) = \tanh(\beta_0 x_i^T x_i + \beta_1)$

Analysis Results: Features that will produce the best performance are selected among 51 variables in the initial data set by trial and error. As a result of this process, it was decided to use twenty-six variables in the analysis. The selected variables are listed in the following table. The kernel function type was also determined by trial and error. The kernel type is determined as linear for this study.

Table 4. Optimal Feature Subset

Kernel Type	Explanation
Selected Variables	Linear Kernel Function Age; Occupation; Does the Mayor realize all plans and projects that he announced before the elections?; If it is the Mayor's election today, would you vote again for the current Mayor?; In general, do you think that your opinion about the Mayor is positive?; In general, do you find the Municipality of Kilis successful?; Are you satisfied with the attitudes and behaviors of the relevant staff towards you when you receive service from Kilis Municipality?; Opinions about Road, pavement and asphalt; Cleaning and collection of solid waste; Public bus services; Health Service; Struggle with pest; Youth and sports services; Services for women, children and the elderly; Services for the poor; Disaster management; Fighting with snow and icing; Good management ability; Honest; Education Center; Faith Tourism Center; Fitness center; Recreation Center; Medical Center; Culture and Art Center; Manufacturing Center

The performance of the SVM model used in the study during the training process is as follows. According to the results in the table, the rate of success for the model will be 44.92%. The success rate of the model is

25.78%. In other words, the model achieved a successful estimate of 70.70% $((716 + 411) / 1594)$ in the training set. However, this value has no practical merit since this success rate was obtained by using the training set.

Table 5. Training Performance

		Predicted Vote		Total
		Yes	No	
Actual Vote	Yes	716 (44,92%)	170 (10,66%)	886
	No	297 (18,63%)	411 (25,78%)	708
	Total	1013	581	1594

The out-of-sample performance of the SVM prediction model is presented in Table 6. Out-of-sample performance of the model was calculated as 81% $(= (37 + 44) / 100)$.

Table 6. Out-of-sample Performance

	Guess for Yes votes	Guess for No votes	Total
Yes Rating	37	16	53
No Rating	3	44	47
	40	60	100

Discussion and Conclusion

A study has been carried out to estimate the referendum results based on the attitudes of individuals towards the local government. Thus, it was tried to determine how people would vote in the referendum only by using from their attitudes towards local government.

At the end of the study, by using twenty-six variables as input to support vector machine prediction model, it was possible to predict the direction of votes up to 81%. This result is guiding the efforts of the survey companies to predict the results of an election. In other words, the survey companies can estimate the results of an election with lower costs.

There are some limitations of the study. In the study, variable selection was carried out by trial and error. In future studies, the effect of different variable selection techniques and different forecasting models on predictive performance can be investigated.

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