



EXPLORING THE CAUSAL-EFFECT RELATIONSHIP OF HARTAL: A BINARY LOGISTIC REGRESSION MODEL APPROACH

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ABSTRACT

Hartals become an acceptable means of protest when constitutional politics goes missing. Hartal politics has become pervasive in Bangladesh. It has become part of our life. The frequent Hartals and work stoppages have been viewed from different angles. Politics of Hartal have been consistently looked down upon by successive ruling parties, and a large section of the public is also of the view that Hartal as a political weapon, however effective it might have been during colonial times, is no longer appropriate in a modern national state. Economically, Hartals are very damaging. But most politicians in the opposition camp still prefer to use Hartal in order to maximize pressure on the government. The objective of the following study is to explore the cause-effect relationship of Hartal by fitting Binary Logistic Regression Model.

Key words: Dummy variables, hartal, odds ratio, stepwise regression.

INTRODUCTION

Although Hartal by virtue is the political and constitutional right of the people protesting government failures at keeping with its promises and decisions or actions contrary to people's interest, much has been criticized due to the sufferings Hartal causes to the economy and daily activities of people. Hartals become an acceptable means of protest when constitutional politics goes missing, when illegitimacy is the crude principle on which a class or classes of individuals attempt to undermine the democratic aspirations of citizens. Barring such stipulations, a Hartal turns into an irritant, an instrument that rains blows on a nation's self-esteem and leaves it wounded badly in the knees.

Hartal politics has become pervasive in Bangladesh. It has become part of our life. The frequent Hartals and work stoppages have been viewed from different angles. Through Hartals, the opposition political parties insist on a powerful tool of pressure to make their demands. In its most basic form, a Hartal especially in Bangladesh where an ever-present requirement remains for democratic pluralism to dig deeper roots is a potent sign of the clear absence of intellect that has come to shadow the world of our politics. Nothing can be more telling than a Hartal

putting a nation through asphyxiation at a point in history when the rest of the world is moving ahead to make itself a better place for those who inhabit it. A Hartal in these times comes wrapped in things spurious, for it reflects only the narrow political outlook of those who, unable to rise to the level of the visionary, look upon it as a sure-fire way of clawing to power.

Originally, a Gujarati expression, "HARTAL" signifies closing down of shops and warehouses with the object of realizing a demand. Though essentially a mercantile practice, Hartal acquired political significance in the 1920s and 1930s when MK Gandhi, the Indian national leader from Gujarat, institutionalized it by organizing a series of anti-British general strikes in the name of "Hartal". Hartal played a decisive role in mobilizing people on the eve of the Bangladesh War of Liberation. Since 1980s, it has become a very frequently used political tool for agitation. However, the culture of frequent Hartal has been depleted now-a-days. Politics of Hartal have been consistently looked down upon by successive ruling parties, and a large section of the public is also of the view that Hartal as a political weapon, however effective it might have been during colonial times, is no longer appropriate in a modern

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national state. Economically, Hartals are very damaging. But most politicians in the opposition camp still prefer to use Hartal in order to maximize pressure on the government. According to them, in the existing socio-political environment of Bangladesh, Hartal is still a powerful weapon to generate public opinion on various national issues. The present study aims to explore the cause-effect relationship of Hartal by applying Binary Logistic Regression Analysis.

MATERIALS AND METHODS

The primary data for this study were collected by the authors from the citizens of Dhaka City. Two hundred thirty respondents were interviewed during January – February of 2012. Stratified Random Sampling technique was used to cover citizens of all types of professions. The 10 Strata were (a) Media (b) Police (c) Student (d) Day Labor (e) Transport (f) Production (g) Export-Import (h) Bank (i) Food-stops (j) Politics. Equal allocation was applied to allocate sample to strata. The collected data were analyzed using statistical software SPSS. Logistic Regression Model was fitted to the data to investigate the causal-effect relationship of Hartal.

We want to assess whether the respondent’s political view (X) has an effect on informing/ choosing the reason behind Hartal (Y). The categories of X and Y are as follows:

Respondent’s political view (X)	Reasons behind Hartal (Y)
1. Govt. supporter	1. Wrong decision & carelessness of govt.
2. Non-govt. supporter	2. Opposition parties own interest
3. Neither	3. Wrong activity of any person/organization
	4. The welfare of general people

Since the dependent variable is a multiple response variable, we created dummies for Y in beside of X. The dummies of X and Y are as follows:

Dummies of X	Dummies of Y
$X_1 = \begin{cases} 1, & \text{Govt. supporter} \\ 0, & \text{Others} \end{cases}$	$Y_1 = \begin{cases} 1, & \text{Wrong decision and carelessness of govt.} \\ 0, & \text{Others} \end{cases}$
	$Y_2 = \begin{cases} 1, & \text{Opposition parties own interest} \\ 0, & \text{Others} \end{cases}$
$X_2 = \begin{cases} 1, & \text{Non govt. supporter} \\ 0, & \text{Others} \end{cases}$	$Y_3 = \begin{cases} 1, & \text{Wrong activity of any person/organization} \\ 0, & \text{Others} \end{cases}$
	$Y_4 = \begin{cases} 1, & \text{The welfare of general people} \\ 0, & \text{Others} \end{cases}$

We will fit four Binary Logistic Regression models for four dummies of Y. The dependent variable in logistic regression is usually dichotomous, that is, the dependent variable can take the value 1 with a probability of success p, or the value 0 with probability of failure (1-p). This type of variable is called a Bernoulli variable. The particular model used by logistic regression, which distinguishes it from standard linear regression and from other types of regression analysis used for binary-valued outcomes, is the way the probability of a particular outcome is linked to the linear predictor function:

$$\text{logit}(E\{Y_i|X_{i1}, X_{i2}, \dots, X_{im}\}) = \text{logit}(p_i) = \ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 X_{i1} + \dots + \beta_m X_{im}$$

The goal of logistic regression is to correctly predict the category of outcome for individual cases using the most parsimonious model. To accomplish this goal, variables in the model are selected using stepwise regression or backward stepwise regression. Since logistic regression calculates the probability or success over the probability of failure, the results of the analysis are in the form of an odds ratio. The process by which coefficients are tested for significance for inclusion or elimination from the model involves Wald Test or Likelihood Ratio Test.

A Wald test is used to test the statistical significance of each coefficient in the model. A Wald test calculates a Z statistic, which is:

$$Z = \frac{\hat{\beta}}{\text{Standard Error of } \hat{\beta}}$$

This z value is then squared, yielding a Wald statistic with a chi-square distribution. However, several authors have identified problems with the use of the Wald statistic. Menard (1995) warns that for large coefficients, standard error is inflated, lowering the Wald statistic (chi-square) value. Agresti (1996) states that the likelihood-ratio test is more reliable for small sample sizes than the Wald test. The likelihood-ratio test uses the ratio of the maximized value of the likelihood function for the full model (L_1) over the maximized value of the likelihood function for the simpler model (L_0). The likelihood-ratio test statistic equals:

$$D = -2 \ln\left(\frac{\text{Likelihood of the fitted model}}{\text{Likelihood of the saturated model}}\right)$$

This log transformation of the likelihood functions yields a chi-squared statistic. In Logistic regression, the Pseudo R^2 is used to assess goodness of fit. Which is

$$R^2_L = \left(1 - \frac{D_{model}}{D_{null}}\right)$$

The Cox and Snell R^2 is widely used Pseudo R^2 index of goodness of fit. The Cox and Snell index is problematic as its maximum value is 0.75. The

Nagelkerke R^2 provides a correction to the Cox and Snell R^2 so that the maximum value is equal to one.

RESULTS AND DISCUSSION

1st Model (for Y_1):

Table 1. Parameter Estimates for 1st model (for Y_1)

Covariates	B	Std. Error	Wald	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
						Lower Bound	Upper Bound
Intercept	0.05	.312	.024	.876	-	-	-
X_1							
Govt. supporter	-.811	.387	4.384	.036	.444	.208	.949
Others (RC)	-	-	-	-	-	-	-
X_2							
Non-Govt. supporter	1.05	.383	7.497	.006	2.857	1.348	6.057
Others (RC)	-	-	-	-	-	-	-

RC: Reference Category

For Y_1 , the fitted model is-

$$\ln\left(\frac{P_1}{1 - P_1}\right) = 0.05 - 0.811X_1 + 1.050X_2.$$

The model fitting information is given in Table 2; it (Table 2) shows that the final model is significant at 5% level significance with the intercept only model. By finding the value of Pseudo R-square it was found that the model can explain 14.8% (As Cox and Snell) variation in Y_1 . As Nagelkerke this is 19.8% and as McFadden this is 11.6%.

Table 2. Model Fitting Information for 1st model (for Y_1)

Model	Model Fitting	Likelihood Ratio			Pseudo R-square	Nagelkerke's R-square	McFadden's R-square
	Criteria	Test					
	-2 Log Likelihood	Chi-Square	df	Sig.			
Intercept Only	51.775	-	-	-	-	-	-
Final	13.823	37.952	2	.00	14.8%	19.8%	11.6%

Also from the classification table (Table 3) it was found that the estimated model could correctly predict 68.4% of cases, which is pretty high. So, from the above criteria, we can conclude that, there remains a causal-effect relationship between Y_1 (choice of-wrong decision & carelessness of govt.) with X (Political view of the respondent), which is fairly described by the fitted model.

Table 3. Classification table for 1st model(for Y_1)

Observed	Predicted		
	no	yes	Correct
no	60	47	56.1%
yes	28	102	78.5%
Overall	37.1%	62.9%	68.4%

2nd Model (for Y₂):

Table 4. Parameter Estimates for 2nd model (for Y₂)

Covariates	B	Std. Error	Wald	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
						Lower Bound	Upper Bound
Intercept	0.45	0.32	1.943	.163	-	-	-
<i>X</i> ₁							
Govt. supporter	1.058	.423	6.255	.012	2.880	1.257	6.598
Others (RC)	-	-	-	-	-	-	-
<i>X</i> ₂							
Non-Govt. supporter	-0.707	.374	3.566	.059	.493	0.237	1.027
Others (RC)	-	-	-	-	-	-	-

RC: Reference Category

The fitted model for Y₂ is-

$$\ln\left(\frac{P_2}{1 - P_2}\right) = 0.45 + 1.058X_1 - 0.707X_2$$

Where, P₂ gives the probability of occurring Y₂ = 1. The parameter estimates for this model is given in Table 4. Here, from the Table 4 it is seen that the coefficient of X₁ is significant and coefficient of X₂ is insignificant at 5% level of significance. Again, exp (B) = 2.880 means when X₁ equals 1 the odds of occurring Y₂ is 2.880 times of not occurrence of Y₂, i.e. when X₁ = 1, it is very likely to occur Y₂. X₁ (political view- Govt. supporter) has a greater effect on the choice of Y₂ (choice of-opposition parties own interest) than X₂ (political view- Non-Govt. supporter).

Table 5. Model Fitting Information for 2nd model (for Y₂)

Model	Model Fitting Criteria	Likelihood Ratio Tests			Pseudo R-square	Nagelkerke's R-square	McFadden's R-square
	-2 Log Likelihood	Chi-Square	df	Sig.			
Intercept Only	44.967	-	-	-	-	-	-
Final	13.671	31.296	2	.00	12.4%	16.8%	9.9%

The model fitting information for this 2nd model is given in Table 5, which shows that the final model is significant at 5% level significance with the intercept only model. By finding pseudo R-square it was observed that the model can explain 12.4% (As Cox and Snell) variation in Y₂. As Nagelkerke this is 16.8% and as McFadden this is 9.9%.

Table 6: Classification Table for 2nd model (for Y₂)

Observed	Predicted		Correct
	no	yes	
no	61	32	65.6%
yes	47	97	67.4%
Overall Percentage	45.6%	54.4%	66.7%

The classification table (Table 6) showed that, the estimated model could correctly predict 66.7% of cases, which is pretty high. So, from the above criteria, we can conclude that, there remains a causal-effect relationship between Y₂ (choice of-opposition parties own interest) with X (Political view of the respondent), which is fairly described by the fitted model.

3rd Model (for Y₃):

Table 7: Parameter Estimates for 3rd model (for Y₃)

Covariates	B	Std. Error	Wald	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
						Lower Bound	Upper Bound
Intercept	- 1.98	.477	17.109	.000	-	-	-
<i>X</i> ₁							
Govt. supporter	-.835	.663	1.586	.208	.434	.118	1.591
Others (RC)	-	-	-	-	-	-	-
<i>X</i> ₂							
Non-Govt. supporter	- 1.05	.661	2.526	.112	.350	.096	1.278
Others (RC)	-	-	-	-	-	-	-

RC: Reference Category

The fitted model for Y₃ is-

$$\ln\left(\frac{P_3}{1 - P_3}\right) = -1.98 - 0.835X_1 - 1.051X_2$$

Where, P₃ gives the probability of occurring Y₃ = 1. The parameter estimates for 3rd model is given in Table 7, which shows that the coefficients of X₁ & X₂ are insignificant at 5% level of significance. So, we can conclude that, there has no causal-effect relationship between Y₃ (choice of- Wrong activity of any person/ organization) with X (Political view of the respondent).

4th Model (for Y₄):

Table 8: Parameter Estimates for 4th model (for Y₄)

Covariates	B	Std. Error	Wald	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
						Lower Bound	Upper Bound
Intercept	- 2.96	.725	16.786	.000	-	-	-
<i>X</i> ₁							
Govt. supporter	-.074	.887	.007	.933	.929	.163	5.287
Others (RC)	-	-	-	-	-	-	-
<i>X</i> ₂							
Non-Govt. supporter	-.585	.932	.394	.530	.557	.090	3.461
Others (RC)	-	-	-	-	-	-	-

RC: Reference Category

The fitted model for Y₄ is-

$$\ln\left(\frac{P_4}{1 - P_4}\right) = -2.96 - 0.074X_1 - 0.585X_2$$

Where, P₄ gives the probability of occurring Y₄=1. The parameter estimates for 4th model are given in Table 8, which shows that the coefficients of X₁ & X₂ are highly insignificant at 5% level of significance. So, we can conclude that, there has no causal-effect relationship between Y₄ (choice of-welfare of general people) with X (Political view of the respondent).

The findings can be summarized as follows:

1. There remains a causal-effect relationship between Y₁ (choice of-wrong decision & carelessness of govt.) with X (Political view of the respondent), which is fairly described by the fitted model.
2. There remains a causal-effect relationship between Y₂ (choice of-opposition parties own interest) with X (Political view of the respondent), which is fairly described by the fitted model.

3. There has no causal-effect relationship between Y_3 (choice of- Wrong activity of any person/ organization) with X (Political view of the respondent).
4. There has no causal-effect relationship between Y_4 (choice of- welfare of general people) with X (Political view of the respondent).

CONCLUSION

In order to investigate the main reason behind Hartal, we studied and found that the “own interest of opposition parties” bears the highest frequency. We also looked upon the reason behind Hartal for the respondents involved in different political parties. Here we performed regression analysis and are able to know that the supporters of opposition parties have more effects on the choice of “wrong decision and carelessness of govt.” than supporters of ruling parties as a reason for Hartal. On the other hand, the supporters of ruling party has a greater effect on the choice of “opposition parties own interest” than supporter of opposition parties as a reason behind Hartal. To understand why Hartal is a part of our politics and the risks of banning it, we have to recognize both its costs and its benefits. It not only has negative impacts but also has positive contributions that shaped the history of our nation. Starting from our struggle against colonial rule, the movement for independence and during our struggle for democracy, Hartals has played a vital role. Since Hartal has proved to be such an effective tool for materializing public demands in our country, we need to keep legal provisions for it.

REFERENCES

- Agresti A. 1996. An Introduction to Categorical Data Analysis. John Wiley and Sons, Inc. pp. 165-266.
- Chawdhury OH. 2000. A Survey on the impact of Hartal on the poor of Dhaka city. ActionAid Bangladesh and Democracy watch.
- Dewan AA. 24th March, 2005. The political economy of Hartals. The Daily Star.
- Everitt BS. 1977. The Analysis of contingency Tables. Chapman and Hall, New York,USA. pp. 38-41.
- Hossain A. 2000. Anatomy of Hartal politics in Bangladesh. Asian Survey. 40: 508-529.
- Hosmer DW and Lemeshow S. 1989. Applied Logistic Regression. John Wiley and Sons, Inc. pp. 31-44.
- Haq MAA. 2011. The cost benefit analysis of pursuing Hartal to the nation. BLiTZ, Comprehensive tabloid weekly.
- Mudditt J Blog. 15th July, 2011. A summary of UNPD’s “Beyond Hartals: towards democracy in Bangladesh”. The Independent.
- Menard S. 1995. Applied Logistic Regression Analysis. Sage Publications.Series: Quantitative Applications in the Social Sciences.
- Raina J. 2010. Effectiveness of Hartals & Feasible Alternatives. REASON, Kashmir, India.