STA 371H PROJECT
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Overview

The United Nations (UN) is a worldwide organization with a mission to promote international cooperation and order. In keeping with its mission, the UN has the power to intervene in conflicts around the world to end them; for the purposes of our report and dataset, a conflict (or crisis) is defined as a "bargaining process in which actors are in dispute over some good or issue" (Beardsley, 2012). The UN spends a large amount of time, money, and other resources to intervene in conflicts. For example, from July 1, 2017, to June 30, 2018, the UN peacekeeping budget is $6.80 billion (United Nations, 2018). However, is there actually a relationship between the UN's presence and a reduction in conflict duration? Is the relationship strong enough to justify its resource consumption? The purpose of our report is to see if the UN's presence, as well as its four different intervention strategies--assurance, diplomatic engagement, military involvement, and intimidation--are associated with the length of crises and whether there is any relationship between the strategy or multiple strategies utilized and the duration of the conflict.

UN Strategies:

- Assurance: the authorization and deployment of observer missions, humanitarian missions, peacekeeping missions, and/or peacebuilding activities
- Diplomatic engagement: the dispatch of a special representative, the dispatch of a fact-finding mission, the offer of mediation, and the provision of mediation
- Military involvement: the authorization and deployment of multinational forces, the use of force by UN-authorized missions, and the deployment, expansion, and strengthening of UN peacekeeping missions
- Intimidation: issues a clear call for crisis actors to adopt course of action, condemns crisis actors for behavior, threatens sanctions or military involvement, or implements sanctions

To analyze the various effects of UN involvement, we modified a dataset taken from Dr. Kyle Beardsley of the Department of Political Science at Duke University. This dataset was first published in the Journal of Peace Research Journal in 2012 and accounts for 424 conflicts, both with and without UN engagement, from 1946-2002.

The variables in this data set are as follows:

Date0: date conflict began
Date_end: date conflict ended
Crisno: the crisis identifier from the International Crisis Behavior Project database
Year: year of initial observation of crisis
Statea: first state/participant in the crisis
Stateb: second state/participant in the crisis
Cractr: number of crisis actors (entities involved in the conflict)
Time: duration of a crisis in days
Assurance: dummy variable stating if assurance is present
Cnt_assurance: number of times assurance was used in crisis

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Diplo: dummy variable stating if diplomatic engagement is present
Cnt_diplo: number of times diplomatic engagement was used in crisis
Military: dummy variable stating if military involvement is present
Cnt_military: number of times military involvement was used in crisis
Intimidation: dummy variable stating if intimidation is present
Cnt_intimidation: number of times intimidation was used in crisis
Uninv_any: dummy variable stating if any UN involvement is present at all
Ethniccomp: dummy variable if a conflict was an ethnic conflict
Pc: dummy variable if a conflict was a protracted conflict (long-lasting conflict)
P5: dummy variable if one side is a permanent member of UN security council
Contig: dummy variable of contiguity (in direct contact such as a border) presence
Violtrig: dummy variable of the presence of a violent trigger to the conflict
Maxrestime: maximum response time to respond to a crisis trigger
Dur_assurance: the length of assurance, if used
Dur_military: the length of military involvement, if used
Dur_diplo: the length of diplomatic engagement, if used
Dur_intimidation: the length of intimidation, if used
Uninv_crisis: dummy variable if the crisis experienced any other UN involvement (not the 4)
cnt_other_UN_inv: count of any other UN involvement *not the four defined
dur_other_UN_inv: length of any other UN involvement *not the four defined
Roinv: Regional Organization (e.g. government,non-profit) involvement
Endtype: Type of crisis end: 1 = Victory, 2 = Stalemate, and 3 = Compromise

Question 1: Is UN involvement of any type associated with a shorter duration of conflict?
Prediction: The presence of any UN involvement is associated with shorter crisis durations.

Data and Model

To answer this question and test this prediction, we needed to determine the relationship between the presence of UN involvement and crisis durations. Just plotting time ~ uninv_any, however, hinted that the prediction might be incorrect (**Figure 1**).

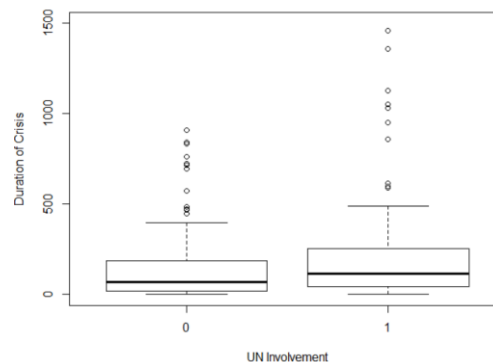*Figure 1. Basic relationship between any UN involvement and crisis duration*

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Figure 1 ignores the effects of other variables. In order to isolate the partial relationship between UN involvement and the duration of the crisis, we need to hold other potential confounding variables equal. By first plotting each variable against time (y) and against UN involvement (x) to check for visual relationships (**Figure 2**), a confounding variable could be defined. A variable was identified as confounding if it had a relationship with the predictor and the response, i.e. obvious difference in medians or proportions.

Figure 2. Plots to check for ethnic conflict as a confounding variable
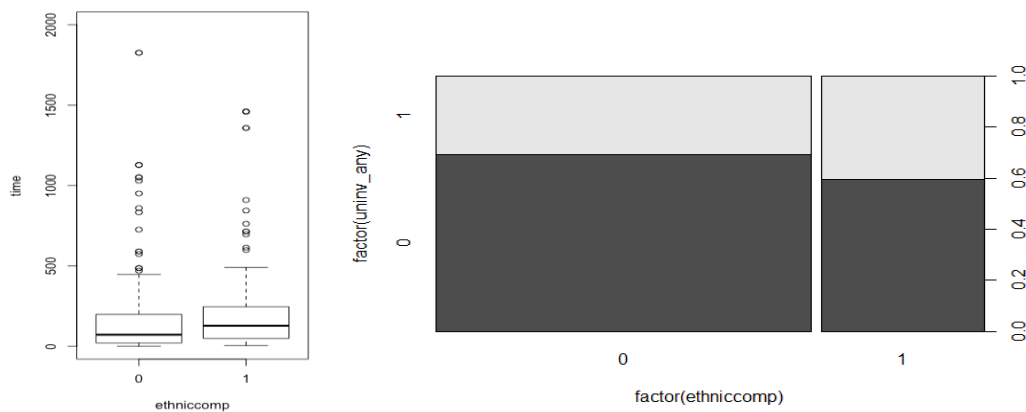
We then built a multiple regression model by adding these confounders to our baseline model to isolate the partial relationship between UN involvement and the duration of crisis while holding other variables such as ethnic conflict constant.

It is important to note that in this initial model, we did not include any variables pertaining to the specific tactics (e.g. diplomatic engagement, count of diplomatic engagement, duration of diplomatic engagement, etc.) as confounders. Because we knew they would increase R^2 significantly, we felt including those variables would skew the results of the relationship we were trying to model (i.e. pure relationship between duration of conflict vs. any type of tactic). In part 2, we look at the relationship between each individual tactic and length of conflict.

Results

To check that these variables explained variation, ANOVA tables were created for each model to give credit to each variable in the model. If a variable noticeably increased R^2 and "improved" the standard deviation, it was included in the model. In **Figure 3**, for example, the UN involvement variable improves R^2 by .048, the highest increase, suggesting a relationship between UN involvement and time. After, the coefficient of UN involvement was examined to determine the partial relationship (**see Figure 3**).

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Figure 3. ANOVA Table for Time ~ UN Involvement Relationship

```
                  Df       R2 R2_improve     sd sd_improve       pval
    Intercept      1 0.000000             372.97
    uninv_any      1 0.048485  0.048485 364.24       8.7221 0.000002
    ethniccomp     1 0.051895  0.003410 364.02       0.2208 0.202395
    roinv          1 0.055233  0.003338 363.82       0.2079 0.207263
    maxrestime     1 0.103098  0.047865 354.90       8.9120 0.000002
    endtype        2 0.123179  0.020081 351.75       3.1531 0.008697
    year           1 0.131799  0.008620 350.44       1.3118 0.043010
    Residuals    415
```

While the dataset contains observations of many crises, small to large, we assume the records are likely incomplete by assuming the dataset represents a sample of the population of world crises. Thus, the bootstrapping method was applied to better understand how the sample reflects the population by pretending the sample is the whole population and taking samples with replacement. We sought the bootstrapped OLS estimator (the coefficient of the specified predictor variable, or its slope.) Through bootstrapping 1,000 times, samples were taken from the dataset itself to approximate the estimator's true sampling distribution. Then, a 95% confidence interval around the point estimate for the coefficient of UN involvement (**Figure 4**) was built.

Figure 4. Bootstrapped confidence interval for coefficient of UN Involvement

```
        2.5%       97.5%
    64.08327  262.94809
```

There is compelling evidence of a nonzero effect of any UN involvement on the time of the crisis. We are 95% confident that the presence of UN involvement increases crisis duration by 64 to 263 days. Thus, we consider our first prediction false.

Question Two: How does each specific type of UN involvement affect duration of crisis?

Data and Model

For each of the four UN strategies, a multiple regression model was fit to predict the duration of the crisis that included the type of UN involvement and its confounders, subsetting by crises the UN was involved in. This allowed isolation of the partial relationship between the duration of the crisis and type of UN involvement. Again, ANOVA tables were used to check the relevance of the confounders, paying special attention to whether R^2 increased noticeably.

In order to find confounders, we plotted each variable against time (y) and against each tactic (x) to determine if a variable had a relationship between the predictor and the response. After first plotting all variables against time, we found that the contig variable did not have a relationship to the response; therefore, we didn't include it in any of our models. For an example, contig did not have a correlation with the y variable of time, so it was initially eliminated.
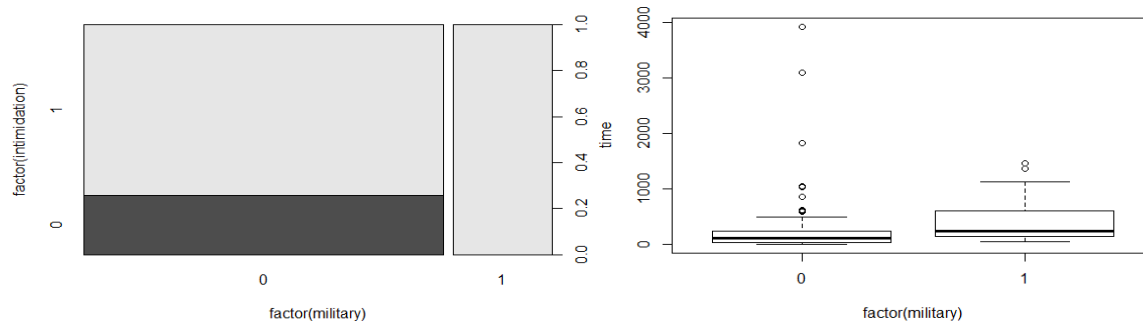
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2A) Prediction: *The presence of intimidation will be associated with shorter crisis durations it seems to be a relatively aggressive tactic.*

Figure 5. *Plotting to check for military intervention as a confounder for time ~ intimidation*

As seen in **Figure 5**, military intervention was added as a categorical predictor to the model because it had obvious relationships with both the predictor and response variables. Ultimately, the discarded variables were year, ethniccomp, pc, p5, violtrig, dur_other_UN_inv, and roinv to fit a model with intimidation, assurance, diplo, military, maxrestime, dur_assurance, dur_diplo, dur_military, dur_intimidation, and intimidation:dur_diplo. We checked for a intimidation:dur_diplo interaction because dur_diplo contributed most significantly to R^2, and we found the interaction substantially improved R^2 too, so it was included in the model.

2B) Prediction: *The presence of diplomatic engagement will be associated with longer crisis durations because the tactic seems relatively moderate.*

Figure 6. *Plotting to check for p5 as a confounder for time ~ diplomatic engagement*

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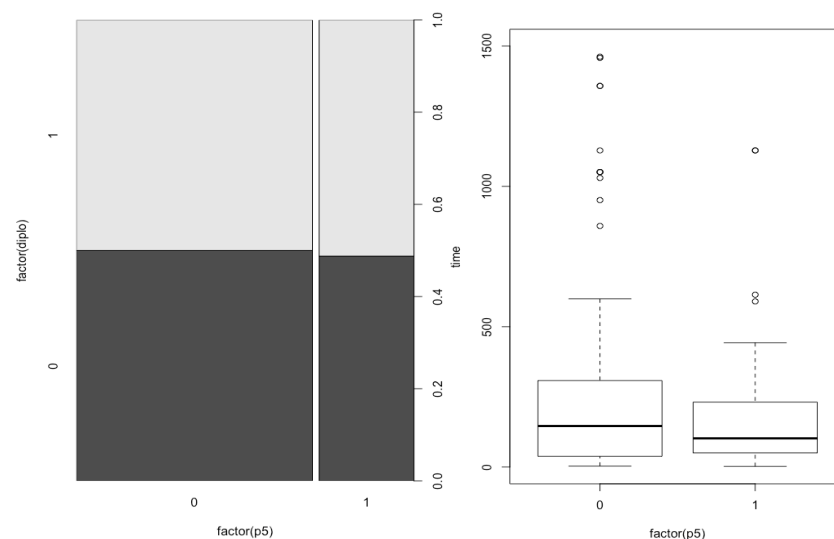
As seen in **Figure 6**, p5, a dummy variable if one side is a permanent member of UN security council, was discarded as a categorical predictor to the model because it did not display an obvious relationship with either the predictor or response variables. Ultimately, the discarded variables were year, pc, p5, contig, violtrig, maxresttime, dur_other_UN_inv, roinv, and endtype. Therefore, the diplomatic engagement model included diplo, dur_assurance, ethniccomp, assurance, dur_diplo, intimidation, military, dur_military, dur_intimidation. We checked for diplo:dur_intimidation and diplo:ethniccomp interactions because dur_intimidation and ethniccomp contributed significantly to R^2 and we found that including these interactions substantially improved R^2 as well so they were included in the model.

2C) Prediction: *The presence of military involvement will be associated with shorter crisis durations because the tactic seems relatively aggressive.*

As seen in **Figure 7,** variables like diplomatic engagement were included as confounders in a model of conflict duration vs. military involvement if they were seen to have a clear relationship with both the response variable and predictor variable. In addition, if a variable was added as a confounder but was not significantly important in improving the R^2 or standard deviation, it was also removed from the final model. Hence, the variables included in the model of time ~ military were year, diplo, maxrestime, dur_assurance, dur_diplo, dur_military, dur_intimidation and military:dur_diplo. Similar to the previous two models, the interaction was included because of the large contribution of dur_diplo to improvement in R^2. Consequently, variables not included in the model were assurance, intimidation, contig, p5, pc, ethniccomp, violtrig, cnt_other_UN_inv, dur_other_UN_inv, roinv, and endtype,

Figure 7: *Plotting to check for diplo as a confounding variable*
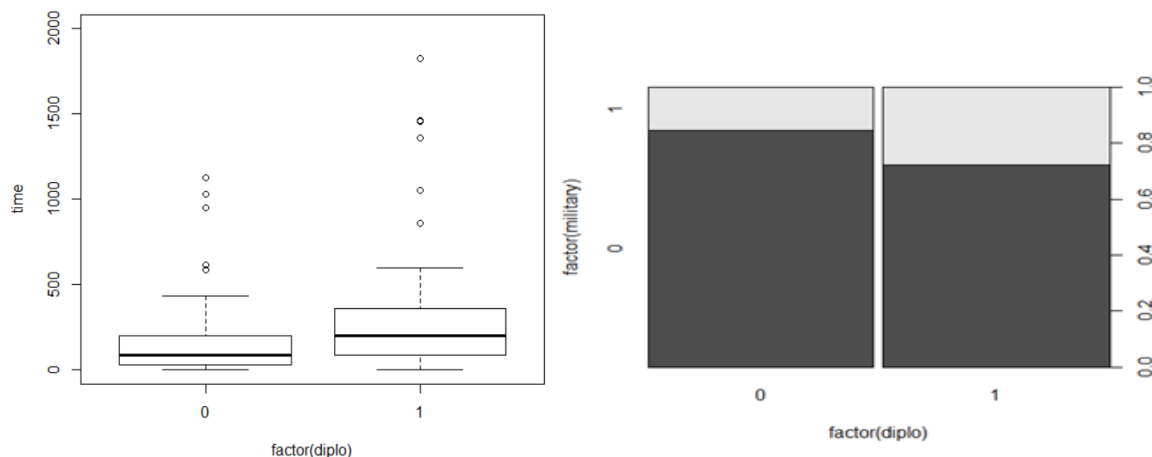
2D) Prediction: *The presence of assurance will be associated with longer crisis durations because the deployment of observer, humanitarian, and peacekeeping missions seems less aggressive.*

As seen in **Figure 8,** some variables had a stronger effect on the x and y than others. The variable p5 was not added as a categorical predictor to the model because there was barely a difference in medians when plotted against time and only a slight decrease when plotted against assurance. Therefore, the discarded variables were diplo, ethniccomp, pc, p5, violtrig, dur_other_UN_inv, and roinv, assurance:dur_military, assurance:dur_intimidation, assurance. The model included variables of year, endtype, intimidation, military, maxrestime, dur_assurance, dur_diplo, dur_military, dur-intimidation, and assurance:dur_diplo as variables to isolate the partial relationship between assurance and time.

Figure 8. Plotting to check for p5 as a confounding variable
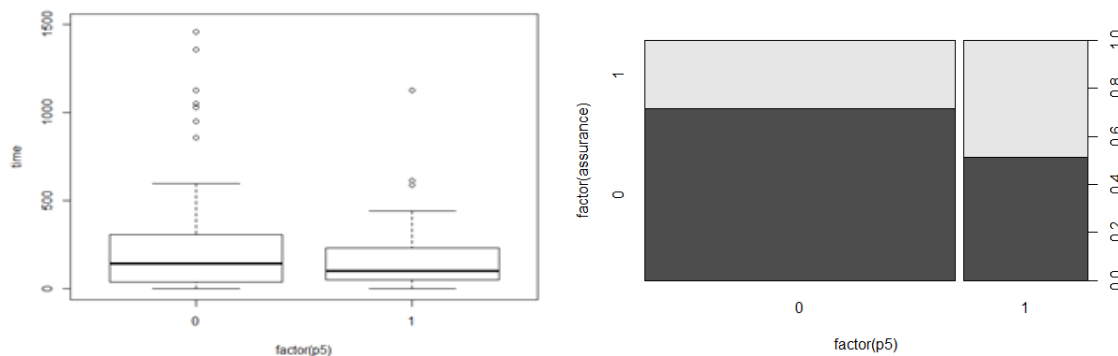
Results

After modelling time versus each individual tactic, an ANOVA table was created for each model using the simple_anova function (**Figure 9**). This allowed us to view each variable's individual contribution to the model. The ANOVA tables served as safeguards against overfitting with the chosen variables, as each added variable was only kept if it improved the R^2 and standard deviation values. In other words, we used ANOVA tables to check that our models didn't simply memorize random noise.

2A) Intimidation

Figure 9. ANOVA model for intimidation

	Df	R2	R2_improve	sd	sd_improve	pval
Intercept	1	0.00000		537.57		
intimidation	1	0.02154	0.02154	533.63	3.940	6.0000e-12
assurance	1	0.04675	0.02521	528.59	5.041	0.0000e+00
diplo	1	0.06202	0.01527	526.22	2.368	2.9960e-09
military	1	0.07354	0.01152	524.87	1.351	1.6649e-07
maxrestime	1	0.12063	0.04708	513.23	11.649	0.0000e+00
dur_assurance	1	0.38128	0.26066	432.07	81.151	0.0000e+00
dur_diplo	1	0.80741	0.42612	241.96	190.118	0.0000e+00
dur_military	1	0.83525	0.02785	224.61	17.341	0.0000e+00
dur_intimidation	1	0.89716	0.06191	178.13	46.485	0.0000e+00
intimidation:dur_diplo	1	0.95023	0.05307	124.39	53.738	0.0000e+00
Residuals	132					

Figure 10. *Bootstrapped confidence interval for coefficient of intimidation*

```
        2.5%          97.5%
    -169.96929     77.08283
```

Figure 11. *Bootstrapped confidence interval for coefficient of intimidation:dur_diplo*

```
        2.5%          97.5%
    -3.2271435    -0.8791176
```

There is insufficient compelling evidence of a nonzero effect of intimidation on the duration of crisis. We are 95% confident that the utilization of intimidation affects crisis duration by -170 to 77 days. Thus, we consider the accuracy of our prediction ambiguous.

Interestingly, we are also 95% confident that the duration of diplomatic engagement would intensify the relationship, if present, between intimidation and crisis duration by -3 to -1 days.

2B) Diplomatic Engagement

Figure 12. *ANOVA model for diplomatic engagement*

	Df	R2	R2_improve	sd	sd_improve	pval
Intercept	1	0.00000		537.57		
diplo	1	0.04665	0.04665	526.74	10.830	0.00000000
dur_assurance	1	0.27430	0.22766	461.21	65.537	0.00000000
ethniccomp	1	0.28602	0.01171	459.11	2.095	0.00020566
assurance	1	0.30813	0.02211	453.58	5.530	0.00000060
dur_diplo	1	0.78715	0.47903	252.50	201.086	0.00000000
intimidation	1	0.80098	0.01382	245.06	7.440	0.00005968
military	1	0.80850	0.00752	241.27	3.787	0.00268240
dur_military	1	0.82480	0.01630	231.63	9.636	0.00001451
dur_intimidation	1	0.86517	0.04037	203.96	27.668	0.00000000
diplo:dur_intimidation	1	0.89395	0.02879	181.57	22.395	0.00000002
Residuals	132					

Figure 13. *Bootstrapped confidence interval for coefficient of diplomatic engagement*

```
        2.5%          97.5%
    -137.20101     40.01363
```

There is insufficient compelling evidence of a nonzero effect of diplomatic engagement on the duration of crisis. We are 95% confident that the utilization of diplomatic engagement affects crisis duration by -137 to 40 days. Thus, we consider the accuracy of our prediction ambiguous.

Figure 14. *Bootstrapped confidence interval for coefficient of diplo: dur_intimidation*

```
        2.5%          97.5%
    -3.2258979    -0.8708385
```

We are also 95% confident that the duration of intimidation would intensify the relationship, if present, between diplomatic engagement and crisis duration by -3 to -.87 days.

2C) Military Involvement

Figure 15. *ANOVA model for military involvement*

	Df	R2	R2_improve	sd	sd_improve	pval
Intercept	1	0.00000		537.57		
military	1	0.02010	0.02010	534.03	3.546	4.4223e-08
year	1	0.04305	0.02295	529.62	4.410	6.4060e-09
diplo	1	0.07823	0.03518	521.66	7.959	3.0000e-12
maxrestime	1	0.11333	0.03510	513.48	8.179	3.0000e-12
dur_assurance	1	0.32992	0.21659	448.01	65.474	0.0000e+00
dur_diplo	1	0.78795	0.45802	252.95	195.055	0.0000e+00
dur_military	1	0.82866	0.04071	228.22	24.735	0.0000e+00
dur_intimidation	1	0.88084	0.05218	191.03	37.187	0.0000e+00
military:dur_diplo	1	0.92076	0.03993	156.36	34.671	0.0000e+00
Residuals	133					

Figure 16. *Bootstrapped confidence interval for coefficient of military involvement*

```
      2.5%          97.5%
 -134.165012      8.449227
```

Figure 17. *Bootstrapped confidence interval for coefficient of military:dur_diplo*

```
      2.5%          97.5%
 -2.3161149    -0.7555178
```

Hence, we can conclude that there is insufficient compelling evidence of a nonzero effect of military involvement on the duration of crisis. We are 95% confident that the utilization of military involvement affects crisis duration by -134 to 8 days. Thus, we consider the accuracy of our prediction ambiguous.

We are also 95% confident that the duration of diplomatic engagement would intensify the relationship, if present, between military involvement and crisis duration by -2 to -0.76 days.

2D) Assurance

Figure 18. *ANOVA model for assurance*

	Df	R2	R2_improve	sd	sd_improve	pval
Intercept	1	0.00000		537.57		
assurance	1	0.01193	0.01193	536.25	1.324	5.3539e-06
year	1	0.02662	0.01469	534.15	2.104	5.5490e-07
endtype	2	0.07091	0.04429	525.62	8.526	0.0000e+00
intimidation	1	0.10171	0.03080	518.72	6.903	0.0000e+00
military	1	0.12930	0.02759	512.56	6.154	0.0000e+00
maxrestime	1	0.18326	0.05396	498.26	14.300	0.0000e+00
dur_assurance	1	0.39824	0.21499	429.28	68.982	0.0000e+00
dur_diplo	1	0.79701	0.39877	250.26	179.018	0.0000e+00
dur_military	1	0.83126	0.03425	229.04	21.225	0.0000e+00
dur_intimidation	1	0.88632	0.05506	188.71	40.331	0.0000e+00
assurance:dur_diplo	1	0.93120	0.04488	147.37	41.335	0.0000e+00
Residuals	130					

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Figure 19. *Bootstrapped confidence interval for coefficient of assurance*

```
        2.5%      97.5%
    -54.09379  71.64393
```

Figure 20: *Bootstrapped confidence interval for coefficient of assurance:dur_diplo*
```
        2.5%         97.5%
    -2.1202262  -0.4132994
```

There is insufficient compelling evidence of a nonzero effect of assurance on the duration of crisis. We are 95% confident that the utilization of assurance affects crisis duration by -54 to 72 days. Thus, we consider the accuracy of our prediction ambiguous.

We are also 95% confident that the duration of diplomatic engagement would intensify the relationship, if present, between assurance and crisis duration by -2 to -.4 days.

Conclusion

From our analysis of the first theory, there is compelling evidence of a nonzero effect of any UN involvement, regardless of the specific tactic used, on the duration of a crisis. We are 95% confident that the presence of UN involvement increases crisis duration by between 70 and 252 days. This proved our initial prediction false; originally, we predicted UN involvement would bring about the end of a crisis more quickly than no involvement. However, after consideration, while we initially assumed the UN's role as a peacekeeper is to decrease the length of conflict, an adequate solution of peace to the conflict might not necessarily be solely ending the conflict as quickly as possible. For example, it might include negotiations between participants or the planning of other future actions. Hence, if the UN is to do its job well, it might take longer time to achieve this solution.

In addition, if the UN is taking the time to deploy a tactic, they might only deploy after a conflict has been ongoing for some time. In other words, a UN intervention takes place only after a conflict has been going on for some time and the UN feels that an intervention is necessary to end the prolonged conflict. Filtering our data in Excel, we found the average length of a crisis that the UN deploys a tactic in is about 309 days, or almost a year; on the other hand, the average length of a crisis the UN doesn't become involved in is only 136 days. With a more comprehensive dataset, it would be interesting to determine if the time it takes for countries to achieve resolution is affected by the point within the conflict the UN steps in (ex. beginning of conflict, middle, or end).

From our analysis of the second question, there is no compelling evidence of a nonzero effect for any specific UN tactic on conflict duration, making the accuracy of our prediction "ambiguous." While the overall relationship reveals an increase in duration of different conflicts when the UN is involved, individual trends don't hold with said overall relationship, indicating a potential aggregation paradox. While there is an absence of compelling evidence for a nonzero effect

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between the presence of the four tactics and the conflict duration, certain tactics, such as military intervention and intimidation, yielded mostly negative intervals even though they contained zero. In other words, the absolute value of the distance of the lower bound of the confidence interval from zero was greater than the absolute value of the same distance of the upper bound. The absence of compelling evidence for a nonzero effect, however, doesn't mean there's *no* effect-- the intervals (specifically, their standard deviations) are wide, which could mask the effect.

In the scenario that there *is* an effect, as our intervals yielded ambiguous results, we did find an interesting interaction between dur_diplo (duration of diplomatic engagement) and each tactic. Supposing that there *is* a negative relationship between military intervention and conflict duration, for example, we found that dur_diplo would modulate that relationship. In other words, with longer diplomatic engagement, since tactics can be used concurrently, conflict duration decreases further as using two tactics together may intensify the effect. However, we did not include interactions between other tactics because when included in the model, they had no effect on R^2.

A potential lurking variable is the severity of the crisis. For an example, more intense tactics such as military involvement are more likely to occur in longer and more intense conflicts such as the Vietnam War. Along the same line of thought, it is also possible that less severe tactics are used for less intense conflicts. Alternatively, a state:tactic interaction might also be a lurking variable. However, we were unable to explore a state:tactic interaction, because our dataset separates state pairs into separate variables (statea and stateb, arbitrarily) and does not include detailed state characteristics as variables. For future studies, it would be interesting to collect that data, delve into inherent differences among states, and see if they might affect our results.

After conducting all of our analyses with the data at hand, our team has concluded that there is no clear relationship between the duration of a crisis and UN involvement; in other words, purely based on length of conflict, there is not enough justification for the UN to utilize as many resources as it does to become involved in ending one. With our current dataset, it is ambiguous whether the UN tactics of intimidation, diplomatic engagement, military involvement, and assurance are effective. With a more comprehensive dataset, it would be interesting to further explore the relation between duration of conflict and UN involvement; specifically, there may be other confounders that, when included in the model, could more clearly show the effect of UN involvement in a conflict.

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