

## Homework I

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### I. Deviant aggressive behavior

Theory I tells us that an individual will learn to do things if they receive awards and will avoid things if they receive punishment. The outcome is conducting deviant aggressive behavior and the exogenous features are awards and punishment. Therefore, if this theory is true, an appropriate social policy to reduce deviant aggressive behavior is to apply punishment to those who commit deviant aggressive behavior and give awards to those who stop others from conducting deviant aggressive behavior. Punishments mentioned here can be fine, some jail time, etc. and awards could be money awards. Because of the punishment, people will avoid conducting deviant aggressive behavior. And because of the awards, more people will try to stop others from conducting deviant aggressive behavior. In this way, deviant aggressive behavior may be reduced.

Theory II suggests when an individual is very unsatisfied with his/ her personal life, he/ she will express the deviant aggressive behavior towards personal authority figures. The outcome is conducting deviant aggressive behavior and the exogenous features are authority figures and frustrating personal life. If this theory is true, an appropriate social policy to reduce deviant aggressive behavior is to enhance equality in society and weaken the authority. Let's take public officials as an example. Even if the public officials have more power, do not put them in a high status, and do not make people think that those public officials are at a higher rank (Some countries see public officials as "public servant", this may help). Instead, put everyone in the society in a relatively equal status (Given the fact that it is almost impossible for absolute equality). Without a "strong" authority figure as a target, deviant aggressive behavior may reduce. But still, I believe the best policy should be making people less frustrated in his/her personal life. For example, giving people better social welfare, giving students less academic pressure, etc.

Theory III suggests that "deviant aggressive behavior is the rational action of oppressed individuals". The outcome is conducting deviant aggressive behavior and the exogenous feature is oppression. If this theory is true, an appropriate social policy to reduce deviant aggressive behavior is to reduce the systematical discrimination. This is a tricky situation. Because no social policy can satisfy every individual in society. It is impossible to eliminate systematic discrimination because there will always be someone who is more hurt by rule. The only way we can take is to control deviant aggressive behavior. Thus, I think one way to reduce the systematical discrimination is to apply a policy that benefits the most people. For example, taking the majority voting in the decision process. Though deviant aggressive behavior will not be eliminated, at least, it can be controlled at a minimum level. But doing benefits to most people may not always work. For example, if there is a small group of people who have enough money and power to cause great harm and there is a large group of people who do not have enough resources to cause great harm, maybe it is also appropriate for the social policy to favor the smaller group. For example, applying the flat tax rate, which will favor rich people. It really depends on the real situation which social policy to take (can be totally opposite), but I think the major rule is to satisfy those who are more likely to cause greater harm and who are more likely to conduct deviant aggressive behavior or may conduct more deviant aggressive behavior.

Theory IV suggests that people conduct aggressive behavior because they contact with a deviant subculture. The outcome is conducting deviant aggressive behavior and the exogenous feature is contacting the deviant subculture. If this theory is true, an appropriate social policy will be cut the contact between deviant subculture from the public. For example, putting members of deviant subculture into jail, kill them (like terrorists), and stop showing deviant aggressive behavior through media, like TV or the Internet. Also, appropriate education will be very important, teaching people to behave well and not to conduct deviant aggressive may also help to reduce deviant aggressive behavior in society.

## **II. Waiting until the last minute**

a. The reasons the observation might be true are:

1. the behavior of myself fits the observation, I often do things at the last minute. For example, buying tickets, doing assignments, going to class, etc.
2. The behavior of other people fits the observation, I have witnessed students not doing their assignments and professors not grading papers until the last minute.

The world around me does function just like this observation, therefore I believe it might be true.

b. Submission time  $\sim \beta_1$  The difficulty of the task +  $\beta_2$  The pressure from peers +  $\beta_3$  The importance of the task

The endogenous feature is the submission time of the task (minutes before the deadline). And the exogenous features are the difficulty of the task, the pressure from peers (if peers finish their task early), and the importance of the task.

c. Submission time  $\sim \beta_1$  Rewards of doing things early +  $\beta_2$  Punishment of doing things late

The endogenous feature is the submission time of the task (minutes before the deadline). And the exogenous features are the rewards of doing things early and the punishment of doing things late.

d. For model B.

Prediction 1: Given the model, holding all the other factors constant, when facing a multitask situation, rational people will do the most important thing first and leave the least important thin last. In the real-world situation, assignments are clearly not the priority task in many students' life. Therefore, if a student prefers networking or clubbing, he/ she is more likely to do the academic things late, but he/ she will go networking or clubbing first.

Prediction 2: Given the model, holding all the other factors constant, if peers do things at the last minute, one will also do things at the last minute. Also, there is a lot of research out there that supports the idea that people's behaviors are affected by peers. Therefore, if an individual is surrounded by a group of diligent people (go to a good university), he/ she will tend to do things earlier. And if an individual is surrounded by a group of lazy people (go to a working place with a lazy environment), he/ she will tend to do things at the

last minute.

For model C.

Prediction 1: Given the model, holding all the other factors constant, if doing things early is beneficial to people, they will do things early. Therefore, before the holidays, people will do things early, so that they can make sure that their holidays will not be ruined by the task unfinished. The reward here is having nice and uninterrupted holidays.

Prediction 2: Given the model, holding all the other factors constant, if doing things late will cause harm to people, they will do things at the last minute. Therefore, in most situations, people will do things at the last minute because as long as one finishes the task before the deadline, there will be no punishment. If there is a punishment, for example, in a rolling basis job application process, people will tend to submit applications early.

### III. Selecting and fitting a model

1.

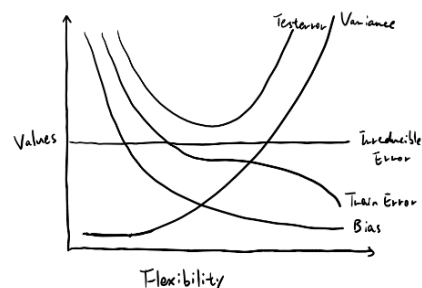
a. A flexible model will be better. Because of the small number of predictors, the variance will be limited for a flexible model; and because of the extremely large sample size, a flexible model will fit more parameters.

b. An inflexible model will be better. Because the sample size is small and the number of predictors is big, the number of predictors cannot be fully explained by a small number of observations. A flexible model may overfit the data. Therefore, an inflexible model is a better choice in this situation.

c. A flexible model will be better. The relationship between the predictors and response is highly non-linear suggests that the degree of freedom is high, in this situation a flexible model can fit the data better than an inflexible model and provides a more accurate result.

d. An inflexible model will be better. Since the variance is extremely high, a flexible model will just try to fit all the variance, while an inflexible model like a linear model will just fit data linearly, thus the variance will be smaller. Therefore, an inflexible model is a better choice in this situation.

2.



This should be the graph of Bias, Train Error, Irreducible error, variance, and test error given the flexibility of the model.

**Bias and variance:** This is a very typical graph of the bias-variance tradeoff. When the model gets more flexible, the bias decreases and the variance increases. And when the model gets less flexible, the bias increases and the variance decreases. Bias is the error from erroneous assumptions in the learning algorithm. The more flexible the model is, the more factors can be taken into consideration, therefore leads to a better fit. The variance is an error from sensitivity to small fluctuations in the training set. As the model becomes more flexible, the model is more likely to overfit.

**Train Error:** With the model becomes more flexible, the training error will decrease. A flexible model can fit the data better, but eventually, as the model becomes too flexible, it will overfit the data, the training error will be very low.

**Test error:** If the model is very inflexible, it is too simple to fit the data well, therefore, we will have an underfit problem; and if the model is too flexible, it will overfit the data. So, in terms of the test error, both cases will have a large test error. If the model is not too flexible nor too inflexible, the test error will be small. Therefore, we will see a U shape here in the graph.

**Irreducible error:** Irreducible error is constant. Because it is embedded in the data, it has nothing to do with the model we choose.