

## Question one : social policy

## theory I:

If deviant aggressive behavior is resulted from personal experience, social policy should introduce punishment for deviant behavior and award for behavior that obey the social norms and laws. For example, people who commit murder will be punished by spending time in jail, or sex assault will resulted to no promotion in the future or even be forced to leave the company. Another method is the media. Media can broadcast and thus strengthen the disadvantage of violating social generally accept rules, and arouse tension and guilty in people's mind. Once the violations happen, the public opinion will criticize the violator, forcing he/she comes back to the norms. Besides punishment, awards can be used to encourage people to obey the social norms and rules. For example, People who work hard will get promotion, those who pay back money on time will enjoy more credit and line of the credit. In this way, rational people would be guided to obey the social rules.

## theory ii:

if theory ii is true, and people will express their anger to the authority which resulted from the frustration in personal life, social policy should try to let people express this frustration routinely and relatively peacefully. But the hardest part is letting people identify their emotion health and realize it can be solved through outside intervention. Social policy can help to support the Anonymous meeting where people encountering problems in life come together to share their pressure, frustration and listen to each other routinely. To do this, the minority group should be located and service should be introduced properly to their neighborhood. Volunteers should be trained and committed to work for these people's good. Besides outside routine self therapy, social atmosphere with less oppression and inequality should be built through law. For example, victims of domestic violence is not uncommon in family, and some of them would express their oppressed anger through killing the batterers. Unluckily, most victims are women whose social status and identification of personal value depend heavily on their husband. Inequality of rights brings in dispiriting frustration. Society should work it best to identify the inequality and set law to solidify the justice. If the woman could know their tragic life is not their fault at the very beginning, and if there are law which will firmly support them, and public opinion will punish the batterers instead of themselves, the hope of incoming justice will stop the burst of deviant aggressive behaviors.

## theory iii:

If social rule itself brings in discriminates among people and introduce inequality, and rational people will violate it to pursue their freedom and interest, I think the society should try to examine their own structure at first. If needed, the improper rules should be adjusted or deleted to pursue a

more justified society. If the conflicts of different groups' interest could not be recognized in time, the conflicts will be accumulated and can be so huge that it will led to revolution to the whole society. Society should offer channel to express different interests in life, and offer auto-organized institutions to represent interests of groups and take actions to make it happen. Furthermore, the sampling of opinion from different people should be done representatively, so that minority group's interest can be still important among the majority's interest.

theory iv:

If deviant aggressive behaviors are social role of deviant subculture, social policy can use media to clarity the subculture and reduce the irrational worship and the induced blinded sense of belonging to the subculture. Although we should welcome different cultures, aggressive behaviors would be too expensive to the whole society if it just acts as an identity to a culture and will cause damage to others. Generally society should try to accept the diversity of different cultures and show respect to them, and respect is based on understanding. Social policy should encourage communication among different cultures.

Question 2: waiting until the last minute:

1.

from my experience, a reasonable explanation can be: the efficiency of working is highest near the due date, and it goes up as the time approaches the deadline. Some people who often wait until the last minute to accomplish their task would like to use their time on work in a most efficient way, and thus would like to wait until the last minute to do a job.

2. general model:

People's goal is to minimize the time that they spend on work, and the efficiency is related to the time to the due date and equal to and below their maximum value.

argmin Total time (optimize on time start)

Total time = Workload / efficiency

efficiency is proportional to  $\min(k \cdot (\text{due} - \text{time\_start}), k \cdot \text{maximum value\_i})$  [ $k > 0$ ]

3. alternative model:

people's intention to start to work is driven by the tension caused by the work. The tension of work is proportional to the time to the due date. And as time that is left is shrinking, tension of a person will arouse, and when the tension on this work is above the personal threshold of the max accepted

tension, rational people would set out to work until finish it. Tension is proportional to the time left for accomplishing and the workload, it is also affected by personal characteristics:

tension<sub>t\_i</sub> is proportional to the time left for work [due<sub>t</sub> - t<sub>present</sub>] and the outside tension

every person has a personal threshold of tolerance to tension: tension<sub>threshold\_i</sub>

time start:  $t : \text{tension}_{t_i} > \text{tension}_{\text{threshold}_i}$

4. if model one is true:

prediction 1:

when facing a work with a large workload, a person would start to work earlier than when he/she is facing work with smaller workload. Since there is a physical limitation of a human's efficiency, a person would still face the risk of missing the deadline if the time left is insufficient even with the maximum efficiency. Although a person would like to spend less time on work according to my model one, the time needed is proportional to the workload for a given person. In order to accomplish the work in time, a person must leave more time for work with larger workload.

prediction 2:

a person with higher efficiency would start to do work later than a person with lower efficiency when they face the same work. As the person with higher efficiency can accomplish work with less time, he/she can wait a little bit later to accomplish the work with his/her highest efficiency and the time left is still efficient for them to accomplish the work. So compared with people with lower efficiency, people with higher efficiency can wait a bit later to set out to work.

if the alternative model is true:

prediction 3:

If a work was given an extension, a person would start to work on it later. Work with longer time to be accomplish than they originally was will arouse less tension for a person than they would without that extension. When people feel less pressure, they would not start to work on it until the time left is able to arouse their tension again.

prediction 4:

Given a person's tolerance to tension, when more pressure is added to him/her from outside, for example, his/her boss text to his employee everyday to ask for update, he/she would prefer to set out to work earlier than they would normally. That is because the tension they feel is added by the

extra pressure, and as time goes closer to the due date, the tension will be more early above his/her tension tolerance threshold than that would on relaxing occasion, causing earlier action on work.

Question 3: selecting and fitting models:

1. flexible model vs inflexible model

a.

A flexible model would be better. as inflexible model will not be able to capture the variation in the large dataset with small number of predictors, and would result in high bias to the performance of the model. For example, a linear model with only one predictor—year can not represent the exponential growth of species.

b.

I prefer to use an inflexible model, because the flexible model is about to drive itself to an extreme occasion when the model captures every random variation in that small dataset with so many predictors, but in fact it overfits the random error in the dataset. The overfitting model will cause high variance, and the performance of model on testing data would be poor because of the model itself brings in lots of noise. For example, we only have 10 observation of box office of a movie, but we got dozens of predictors: year, previous box office of actors1 to actors10, daily scores of review from website and there are 30 days et al., and we would like to generate a model to explain the success factors of box office, it is more than likely the generated model might be able to fit the variation of this movie box office data but will be faint facing another movie's data.

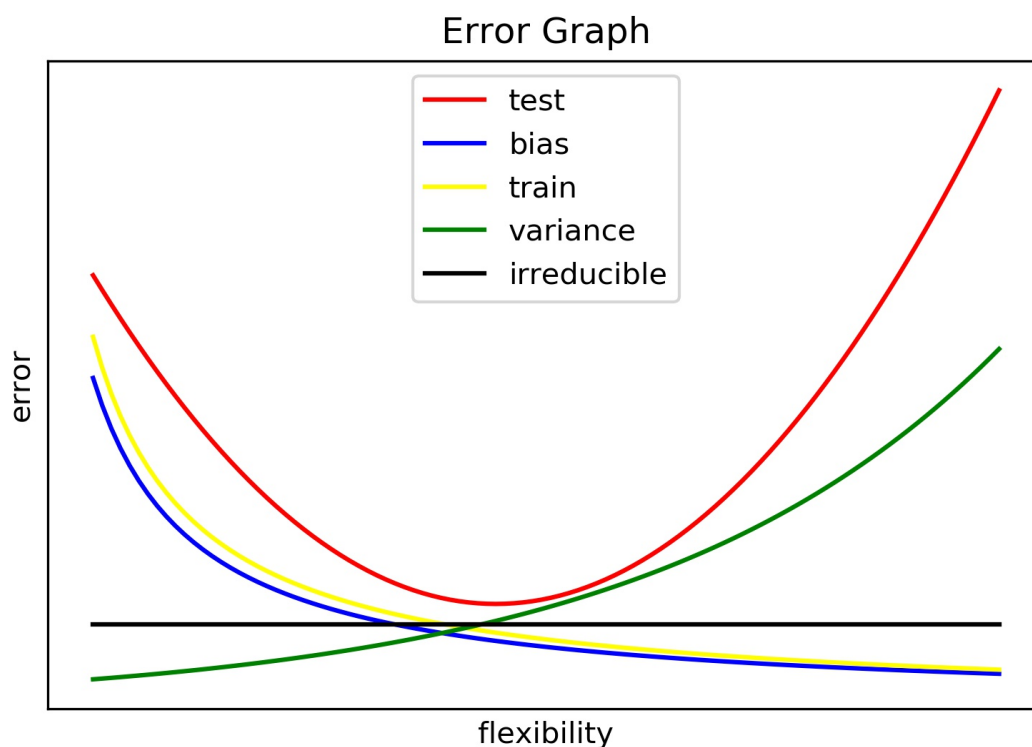
c.

In this case, a flexible model would be better as it can use diversified combination of predictors, for example, the polynomial of different orders to capture the non-linear relationship between the predictors and the response, increasing the explanation ability of model. We can not expect a linear model to capture the variation of a binomial expression.

d.

I think inflexible model can perform better in this case, because flexible model will try to interpret the variance of its training set and will result in problem of overfitting. If we use a flexible model to explain the change of price of stock, we might be able to capture the change given the training data in a small timespan, but when the seemingly powerful model is applied on the test dataset, it is more than likely that it will fail to give an even modest prediction. That is because the variance of price in stock market is high(high risk), and if we drive our model to get the variation, it will also capture the variation of random variables and the prediction/explanation of unpredictable variation will shadow the prediction/explanation of factors that we really care about.

## 2.bias - variance: graph



$\text{Bias}(E[f - E(\hat{f})])$  is the expectation of difference between true value with the expectation of predicted value. Train error( $\sum (y - \tilde{f}(x))^2$ ) is the difference between predicted value with the training data.

As the flexibility of a model increases, the bias and the train error will decrease gradually. A more flexible model are more capable to capture the variation of data with many combination of predictors, and thus increases its fitness to training data.

$\text{Variance}(E[E(\hat{f}) - \hat{f}]^2)$  of a model is the variance of predicted value. As the flexibility of a model increases, the model will gradually change its shape to fit the training data, and becoming increasingly able to capture and represent the variance of training data.

Test error( $\sum (y - \tilde{f}(x))^2$ ) measures the difference between the true value and the predicted value of data untrained. It will decrease and then increase as a model becomes more and more flexible. This is due the fact that there will be a trade off between bias and variance as the flexibility change. As the flexibility increases, the model is becoming more capable to fit the data, but after a point, it is

becoming overfitting, capturing the variance of random variable. At first, the model is learning the pattern in the data and will be able to give a good prediction, but it will suffer from overfitting and give a poor performance in testing dataset. The fitness of model to data is increasing and then decreasing, decreasing and increasing the test error.

Irreducible error  $Var(\sigma^2)$  is the variation of random variable caused by the problem itself. Data have noise naturally, and irreducible error will never change given a problem as the noise will not be affected by our observation.