

## Regression III: Homework 2

(Due 4:30PM July 12, 2010)

The goal of this homework is to get you to think about investigating non-linearity in hypothesized linear relationships as well as developing and testing hypotheses about non-linearity.

Using the same dataset that you used in the last homework, we want to assess the extent of the non-linear relationship between democracy and repression. A considerable amount of research has been done suggesting that this relationship is non-linear. Some have suggested that the relationship is quadratic (Fein, 1995) while others suggest there is a threshold effect (Davenport and Armstrong, 2004). The questions below will guide you through an assessment of the non-linearity in this relationship.

1. Estimate a purely additive model (i.e., no interactions) using the dummy variable for violent dissent as well as population and GDP/capita in some form. Using at least one of the methods in class, assess the extent to which the relationship between democracy and repression is non-linear.
2. Using a B-spline (from the `splines` package) to estimate a smooth relationship between repression and democracy.
  - How many knots should you use?
  - What degree of the spline should you use?
3. Using a generalized additive model, assess the evidence in favor of an interactive effect between the smoothed democracy term and violent dissent. That is, estimate a model that allows a different smoothed effect of democracy for each of the values of violent dissent.
4. Given both the information gleaned from this homework and the results from the previous homework, what would be the model you would present to describe the relationship between repression, democracy and violent dissent controlling for population and GDP/capita?

## References

- Davenport, Christian and David Armstrong. 2004. "Democracy and the Violation of Human Rights: A Statistical Analysis from 1976-1996." *American Journal of Political Science* 48(3):538-554.
- Fein, Helen. 1995. "More Murder in the Middle: Life-Integrity Violations and Democracy in the World." *Human Rights Quarterly* 17:170-191.