Advanced Quantitative Methods
Homework 2: time-series & panel data

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Please submit by email in PDF format. Add R code in a separate `.R` *file, or SPSS code in a separate* `.sps` *file, or Stata code in a separate* `.do` *file, or the code for any other package you use separately. Alternatively, you can integrate R code and responses in R Markdown and submit both in PDF format (easiest is to use HTML format and then in the web browser save as PDF).*

Please note the revised submission date.

Percentages with an asterisk indicate that positive rather than negative marking will be applied.

(5*%) of the grade is used for an overall evaluation of the clarity and presentation of your code.

Questions

1. Using the `usatime.dta` data (Table 1),[1] the model we will be looking at is: $immig_t = \beta_0 + \beta_1 wages_t + \beta_2 gnppc_t + \beta_3 unemp_t + \varepsilon_t$.
   (a) (5%) Run the OLS regression and present coefficients, standard errors, and t-tests (e.g. p-values or stars) in publishable table format.
   (b) (5%) Plot the dependent variable, all independent variables, and the residuals over time. In a few sentences about each, what do you observe?
   (c) Run Durbin-Watson (4%), Breusch-Godfrey (4%) tests and the Gauss-Newton regression (4%) on the residuals. What do you conclude?
   (d) (8%) Take first differences for all four variables and re-estimate (and present) the model. Repeat the tests on the new residuals. What do you conclude?
   (e) (10%) Write a 300 word summary what you *substantively*, in layman terms, conclude about the relationship between immigration levels, wages, GNP per capita, and unemployment rates?

[1] `http://www.joselkink.net/wp-content/uploads/2013/01/usatime.dta`; see also `http://www.joselkink.net/wp-content/uploads/2013/01/usatime.txt`.

`year`	Year
`immig`	Immigration
`uspop`	Population
`money`	Money stock
`strikes`	Strikes
`coffee`	Coffee consumption
`suicide`	Suicide rate (per 100,000)
`emp`	Employment (male)
`unemp`	Unemployment rate
`gnp`	Gross National Product
`gnppc`	Gross National Product per capita
`cpi`	Consumer Price Index
`wages`	Wages
`copper`	Price of copper (not US specific)
`wheat`	Price of wheat (not US specific)
`chicken`	Price of chicken (not US specific)
`phone`	Price of New York - San Francisco phone call
`oil`	Oil price (not US specific)

Table 1: Variables in `uswages.csv`, all annual data on the United States.

2. Using the same data, investigate the regression: $log(wages)_t = \beta_0 + \beta_1 log(gnppc)_t + \beta_2 strikes_t + \varepsilon_t$.

   (a) (5%) Test for unit roots in $wages$ and $log(wages)$.

   (b) (5%) Perform a unit root test on the residuals.

   (c) (10%) Assuming the model is cointegrated, estimate the short-term and long-term elasticity between wages and GNP per capita.

3. This question will make use of the replication data of Neumayer (2003) (see Table 2 and Figure 1 for download instructions). The model we will look at is: $homiciderate_{it} = \beta_0 + \beta_1 popdensity_{it} + \beta_2 lngdp_{it} + \beta_3 freedom_{it} + \beta_4 freedom_{it}^2 + \beta_5 femlabourpart_{it} + \beta_6 deathpen_{it} + \varepsilon_{it}$. All the below models have to be presented in publishable table format - they can be combined in one or two tables, with columns per model.

   (a) (5%) Estimate a pooled model with the above variables.

   (b) (5%) Estimate a model with country fixed effects.

   (c) (5%) Estimate a model with time fixed effects and panel-corrected standard errors.

   (d) (5%) Estimate a model with time fixed and country random effects.

   (e) (5%) Estimate a model with country random effects and a lagged dependent variable.

   (f) (10%) What do you substantively conclude (300 words) about the explanation of homicide rates and the possibilities for policy intervention to reduce them?

`country`	Country identifier
`year`	Year identifier
`homiciderate`	Homicide rate (per 100,000 people
`popdensity`	Population density (per sq. km)
`lngdp`	Log of GDP per capita
`freedom`	Freedom House democracy score
`femlabourpart`	Female labour force participation
`deathpen`	Death penalty (dummy)

Table 2: Variables in the `homicide.dta` data set

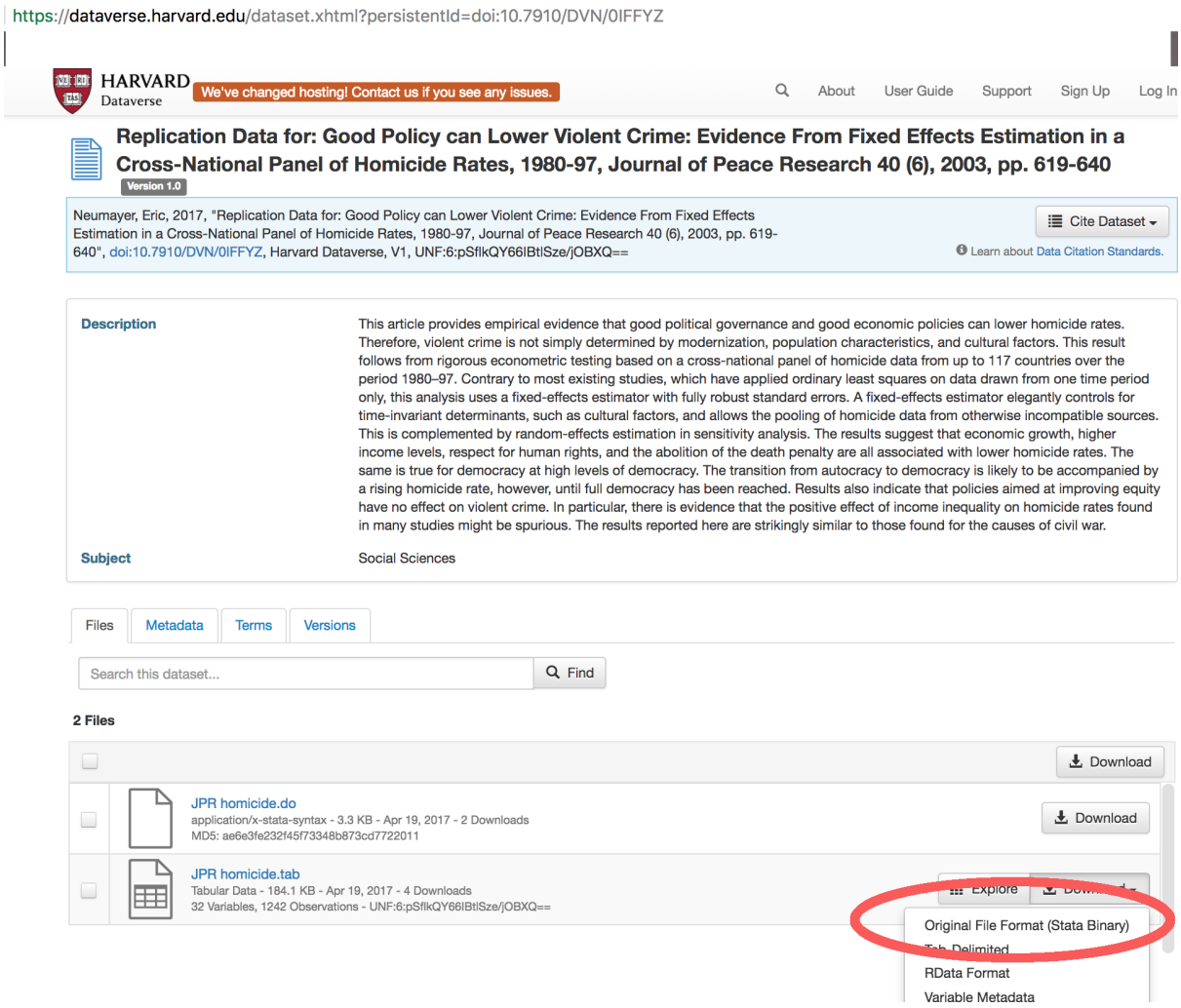

Figure 1: Download instructions for the Neumayer (2003) replication data. Download in Stata format and open this in R.

Grade conversion scheme

Score	Grade		Score	Grade		Score	Grade		Score	Grade	
	UCD	TCD		UCD	TCD		UCD	TCD		UCD	TCD
97-100%	A+	A+	85-87%	B	B	74-76%	C-	C	54-64%	E+	D
94-96%	A	A	83-84%	B-	B	71-73%	D+	C	44-53%	E	D
91-93%	A-	A	80-82%	C+	C+	68-70%	D	C	33-43%	E-	D
88-90%	B+	B+	77-79%	C	C	65-67%	D-	C	0-32%	F	F

Neumayer, Eric. 2003. "Good policy can lower violent crime: Evidence from fixed effects estimation in a cross-national panel of homicide rates, 1980-1997." *Journal of Peace Research* 40(6):619–640.