

## Using Economic Freedom and Statistical Analysis to Teach Principles of Macroeconomics

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### Abstract:

As statistics becomes further entrenched within economics, administrators' desire to see statistics woven into a range of economics offerings increases. This article presents a means by which to incorporate statistical concepts into a principles-level Macroeconomics course while reinforcing the role that economic freedom plays in generating superior economic outcomes.

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## I. Introduction

As the economics profession waxes empiric and the world at large becomes increasingly data-driven, so, too, does the emphasis on statistics for undergraduates. While students typically have had the option of pursuing quantitative analysis through statistics and econometrics, many business schools now require courses in statistics in order to receive a degree. Economics majors oftentimes must show further proficiency in econometrics and/or forecasting techniques. However, while increased quantitative skills offer value to students both in the classroom and on the job market, students tend to be less than eager when confronted with the subject of statistics.

Increasing quantitative skills, while beneficial, should also be viewed with a modicum of caution. Arming students with ever-more statistical tools raises the opportunity for rote computation absent economic reasoning to occur along with the dangers that aggregate from performing such blunders. Instead of slogging through compulsory statistical exercises in order to satisfy course requirements, the following exercises allow students to utilize World Bank data and draw unique conclusions based upon their particular analysis by pairing quantitative methods with economic analysis. Furthermore, the particular nature of these assignments allows the importance of economic freedom to emerge both to the individual student (when the student completes the assignment) and to the class as a whole (when the results are aggregated).

The following exercises were used in a principles-level Macroeconomics course in the 2011 spring semester at Duquesne University to achieve the goal of incorporating statistical analysis with economic reasoning to confirm the critical importance of economic freedom. The data for these exercises come from two publicly available datasets. The first source is the World Bank's *World Development Indicators*, available at <<http://data.worldbank.org>>. The formerly subscription-only dataset contains over 1,100 separate series for over 200 countries since 1960, covering traditional

economic indicators along with a wide range of other areas of interest such as health, education, and environment.<sup>1</sup> The second source is the Fraser Institute's *Economic Freedom of the World*, available at <<http://www.freetheworld.com>>. First published in 1996, this report looks to characterize the amount of economic freedom evident in countries around the world.<sup>2</sup> The most recent report provides an overall economic freedom score, derived from five sub-categories, for 141 countries annually from 2000 – 2008 and every five years from 1970 – 2000. These are the only data required for the statistical analysis portion of the assignments.

There are two stages to each assignment. First, students complete the assignment as it individually pertains to them. Students are assigned a country at the beginning of the semester, so the outcome of each student's work will be unique. Second, results from various statistical tests are aggregated across the class and presented as a whole to give a data-based picture of the world. For a more descriptive analysis, please see the sample assignment presented below.

The assignments also allow for the student to aggregate country-specific information towards completing an original research paper by the end of the semester. Not only do the assignments provide a store of country-specific data to access, but completing the assignments over the course of the semester allows for potential research ideas to emerge. Further, properly utilizing data is easier for students once the data has been synthesized prior to beginning the final research project.

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<sup>1</sup> Not all series contains full data for all countries across the entire 1960-2009 time span.

<sup>2</sup> From Gwartney and Lawson (1996): "Individuals have economic freedom when property they acquire without the use of force, fraud, or theft is protected from physical invasions by others and they are free to use, exchange, or give their property as long as their actions do not violate the identical rights of others. An index of economic freedom should measure the extent to which rightly acquired property is protected and individuals are engaged in voluntary transactions."

## II. Sample Assignment

The following five questions constitute a sample assignment:

1. Find the file in the Assignments section called “Economic Freedom of the World – Executive Summary.” This short summary gives an overview to the annual report that scores countries according to their economic freedom. What is the definition of economic freedom? How does it relate to the concept of “good institutions” that we discussed in class? What are areas used to construct the Economic Freedom of the World index?
2. Create a line graph for your country with respect to your country’s economic freedom score from 2000-2008. (Sorting the data by country may help in collecting data more quickly for your country.) Did your country become more free over the time span? Less free?

(For Questions 3-5, it may help to sort the Economic Freedom of the World data by year and then by country, as it was originally presented to you.)

3. Pick nine (9) countries alphabetically close to your country in the Economic Freedom of the World dataset. (For example, if your country is Argentina, then you could use Albania, Algeria, Australia, Austria, etc. You may not be able to pick the nine nearest, but try not to stray too far alphabetically from your country.) With these ten countries (yours and 9 others), create a scatter plot of the 2008 Economic Freedom of the World score vs. 2009 GDP per capita. (Note: This is ten points of data, one per country.) Then, add a trendline to this scatter plot. Is it upward sloping or downward sloping? What does that imply about the relationship between the two measures? Calculate the correlation coefficient between these two variables; how do you interpret this value?
4. For the same ten countries you used in Question 3, create two scatter plots: (1) 2009 GDP per capita vs. 2009 under-5 mortality rate and (2) 2008 Economic Freedom of the World score vs. 2009 under-5 mortality rate. Again, make certain to add trendlines to each of your scatter plots. What do these trendlines say about the relationships between the variables in each of these scatter plots? Again, calculate the two appropriate correlation coefficients; how do you interpret these values?
5. Perform the same analysis as in Question 4, only use life expectancy at birth instead of under-5 mortality rate.

At the student level, the goals of the assignment are clear. For the first two questions, students forge an understanding—both statistically and theoretically—of the overall nature of economic freedom along with its footprint within their particular country. For the last three questions, students expand beyond

their particular country and, by virtue of statistical analysis, make data-based claims on the relationship between economic freedom, GDP per capita, and a pair of commonly accepted quality-of-life indicators (under-5 mortality rate and life expectancy at birth).<sup>3</sup> Given the theoretical relationship between these variables established through class lecture, students can make individual assessments of how their data matches economic theory.

<Table 1 about here.>

After completing the assignment, the instructor then provides an in-class exercise in aggregating the student's individual results to expand the lessons taken from the exercise. Aggregation across the different questions achieves different goals. Table 1 shows the actual results from the in-class exercise pertaining to the sample assignment. Concerning the second question, students were asked whether, from 2000 to 2008, the economic freedom in their country was rising, falling, or did not change. While students can learn about economic freedom in general and about economic freedom within their country, the overall trends of economic freedom across the world would require additional individual analysis on the part of the student. The simple aggregation exercise provides a glimpse—even if imperfect, which is worth discussing—into the larger trends of economic freedom across the world.

For the final three questions, aggregation provides a statistically more robust view of the relationships between the variables. A sample of ten, of course, is not large enough to make conclusive claims; however, aggregating the result of the entire class is, in the least, in the spirit of the Central Limit Theorem and allows for more broad-reaching conclusions. For the five correlations presented to the students, each was asked whether they found, within their personal sample, a positive correlation or a negative correlation. As is evidenced in Table 1, students occasionally generate a random sample for themselves that yields a theoretically inconsistent result (i.e., one student generated a sample that

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<sup>3</sup> The World Bank dataset provides a host of quality-of-life indicators that could easily substitute into this assignment.

yielded a negative relationship between economic freedom and GDP per capita). Taking the entire class as a whole, however, generates undeniable results with regards to the actual correlation between the series. The aggregation process allows for a number of potential avenues for discussion, such as the nature of sampling and measurement problems inherent in analyses of this type. Should an increase in precision be desired, results from the class can be aggregated into ranges of correlation coefficients; for example, instead of merely tracking a positive or negative correlation, results can be tallied into groupings with a range of 0.2 (in other words, the number of students with correlation coefficients between 0.8 and 1.0, between 0.6 and 0.8, etc.).

To see a brief outline of the remaining assignments, please see the Appendix.

### **III. Summary**

Presented herein are assignments used to incorporate statistical analysis and economic freedom into a principles-level macroeconomics course. While the aggregated results of the specific assignments are presented, the broad framework presented here is readily flexible to support a broad range of particular nuances desired by the instructor, from particular datasets of interest to stressing particular statistical concepts. The mixture of both individual work and classroom discussion allows for a useful means by which to simultaneously stress the importance of economic freedom in the modern world economy as well as to emphasize data-based concept exploration.



## Appendix

Below are the brief outlines of additional assignments that utilize the general framework described above. General analysis questions have been omitted from each required task for space reasons and can be added to fit particular points of interest within any class.

### Assignment A – General economic indicators

- Generate a line graph that shows the evolution of each of the following indicators within your country from 1960 to 2009: GDP, GDP per capita, GDP per capita growth rate
- For the student's individual country, perform a hypothesis test that the GDP per capita growth rate is significantly different from 2%.
- Provide a descriptive economic comparison between your country and two border countries.
- Calculate the correlation coefficient between your country and each of the two neighboring countries over the three series listed above (for a total of six calculations).

### Assignment B – Economic freedom and the labor market

- Generate a line graph that shows the evolution of labor market freedom within your country from 2000-2008.
- Pick nine alphabetically close countries and generate a scatter plot and correlation coefficient between 2008 Labor Market Freedom and 2009 GDP per capita.
- Pick nine alphabetically close countries and generate a scatter plot and correlation coefficient between 2004 Labor Market Freedom and 2004 unemployment rate, 2004 youth unemployment rate, and 2004 long-term unemployment rate.

### Assignment C – Economic freedom and inflation

- Create a line graph showing the evolution within your country of the Economic Freedom of the World Access to Sound Money score.
- Pick nine alphabetically close countries and generate a scatter plot and correlation coefficient between 2008 Access to Sound Money score and 2009 GDP per capita.
- Select nine alphabetically close countries that have at least ten years of data, and generate a scatter plot and correlation coefficient between the lending interest rate and the rate of inflation.
- For your country, provide all available time series data on the lending interest rate and the inflation rate. From these series, derive the real interest rate in your country, and create a line graph to represent the evolution of the real interest rate in your country over time.

## References

Fraser Institute. 1996-2010. *Economic Freedom of the World*. <http://www.freetheworld.com> (accessed January 5, 2011).

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**Table 1 - Aggregation results**

	<u>Freedom Increased</u>	<u>Freedom Decreased</u>
Comparison of 2000 EFW to 2008 EFW	16	17
<u>Correlation calculation</u>	<u># of positive correlations</u>	<u># of negative correlations</u>
2008 EFW and 2009 GDPpc	32	1
2009 GDPpc and 2009 U-5	1	32
2008 EFW and 2009 U-5	4	29
2009 GDPpc and 2008 LEaB	32	1
2008 EFW and 2008 LEaB	30	3

**Notes:** EFW - Economic Freedom of the World Index  
GDPpc - Gross Domestic Product per capita  
U-5 - Under-5 Mortality Rate  
LEaB - Life Expectancy at Birth