College: COBE
Department/Unit/Discipline: Economics
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"Ten years ago "Ivan the Terrible," as the deadly hurricane was dubbed, ripped across the Gulf Coast as the strongest storm of the 2004 season. Ten years later, Hurricane Ivan serves as a reminder that the time to prepare for the next hurricane is now" (FEMA 2014). This mentality regarding disaster planning and mitigation can be related to any natural disaster, not just hurricanes. Nature is not something we can control and natural disasters do happen and will continue to happen. What we can control, however, is our planning and response to these disasters. An important component of this planning and response is the preemptive, ex ante measures taken to reduce the ex post damages caused by these disasters.

As an economics student at the University of Wisconsin-Whitewater, I believe this is an ideal topic for exploring resource allocation and efficiency issues that have a real world impact on social welfare. This topic also allows me to utilize the skills I have learned in the classroom to not only explore optimal decision strategies regarding investment in disaster mitigation versus disaster recovery, but also to further expand my knowledge of issues related to the environment and sustainability, two of my interests. My past courses in economics, particularly ECON 345, "Econometrics," and my knowledge of the statistical analysis and data management program Stata, have prepared me well to undertake this study and will be vital resources for successfully completing this project.

Looking into ex ante natural disaster spending, I would like to not only discover what is the optimal disaster mitigation investment needed to deter possible damages, but I would also like to determine other factors which may be related to and affect damage spending. To accomplish this, I ask and econometrically analyze the following two questions: (1) What has the impact of disaster mitigation spending been on the monetized value of natural disaster damages experienced over the last five decades in the United States, controlling for other important factors such as population density, income levels, etc.? (2) How do mitigation spending and other socio-economic factors affect the number of natural disaster incidences experienced over time, again controlling for relevant factors?

Development of the Project
I plan to use county level data collected from the Federal Emergency Management Agency (FEMA), the Spatial Hazard Events and Losses Database for the United States (SHELDUS), the United States Census Bureau (CB), and the Bureau of Labor Statistics (BLS), to examine the two questions posed above. Specifically, this analysis will examine the causal impact different factors have on the amount of damages experienced in counties across the United States. This will include factors such as mitigation spending, year of event, event type, household income, poverty, unemployment, population density, etc. The mitigation spending data span from 1964 to 2013, and allows me to examine the primary question in my project regarding the impact of mitigation spending on subsequent disaster spending. Importantly, each year of mitigation spending affects not only future post-disaster spending, but also future mitigation spending which the panel nature of the dataset allows me to explore. I will be analyzing the data using two different models to answer my two primary research questions.

The first model will use the amount of damages (in terms of dollars spent after an event has taken place) as the dependent variable (this data has been obtained from SHELDUS from 1964-2014). I will then examine how mitigation spending (in terms of dollars spent on mitigation projects in all past years), the number of incidences, and the other control variables affect the dollar value of

R1: Good to include supporting evidence.

R4: This may not be a familiar term for all reviewers. Should explain.

R1: Goal of project stated.

R4: This is a helpful intro - is there literature on financial planning for natural disasters? Would be helpful here.

R4: Illustrates the connection for you.

R3: OK, I see the objective now… as well as the specific research questions to be addressed. Good!

R1: Specific research questions delineated.

R3: Specific activities for addressing the research question. The activities seem to directly address the project goals.
R4: Relevant and logical approach.

R3: This seems like a huge pool of data but this is not an area I am familiar with so maybe it is good to assure the reviewer that you can handle this amount of data.

damages. The second model will use the number of incidences as the dependent variable. Then, using the mitigation spending (like in the first model) and other control variables, I will attempt to determine which of these factors impact the number of incidences. The observations for this project are county-by-year level data for the United States of America from 1964-2014. Specific controls that will be used in the models include mitigation spending, number of incidences, amount of damages, income levels, education levels, population density, and more socio-economic controls. Inclusion of additional controls is necessary to accurately isolate the impact of the variables of interest (mitigation spending) and also allows for other relationships of interest to be explored. For example, a county with a higher median household income level may spend more money on mitigation spending, which could in turn reduce the amount of post-disaster spending required in that county. On the other hand, in an area with high levels of median household income, those people may on average have more "things," i.e. expensive houses, electronics, cars, lake houses, etc., which if there is a natural disaster, would more likely be destroyed.

> **R4:** These models make sense and the analysis sounds interesting and relevant for natural disaster recovery planning.

Anticipated Results

Since I will be looking at mitigation spending in terms of cumulative mitigation spending, I expect to see that damage spending will be reduced in later years because past mitigation spending has accumulated over the years and resulted in reductions in ex post damages experienced. For example, take a county which had a large flood in 1970. This county requests mitigation spending from FEMA, and is granted $100,000 every year to spend against future floods. Let us then observe that there have not been anymore floods in this county until 1980. Now this county has received $100,000 for 10 years, and the damages from flooding have been significantly reduced. This is more of an effective model, because we cannot assume that all mitigation spending in one year will be utilized in the following year. It will accrue over time, and therefore it is vital to look at all past years of spending together with each current year.

> **R3:** Nicely stated in the proposal.
> **R4:** Hypothesis for this research.

Timeline	Goals and Objectives	Actions:	How Actions Support Goals and Objectives
Goal I:			
10/4/2014	First objective: Literature review, data collection	Looking through the FEMA databases as well as collecting data from SHELDUS, US Census Bureau, Bureau of Labor	Necessary for the ability to pursue my project topic and develop a data set for analyses.
10/11/2014	Second objective: Merging into one manageable dataset	Utilizing Stata to combine all important data sets together	Data is easy to manage, regress, analyze, correct, and store in Stata.
Goal II:			

> **R3:** The project is feasible and the timeline is pretty detailed, however, this does not include NCUR, or UR Day on the timeline.
>
> **R4:** The table is helpful and makes sense.

10/18/2014	First objective: Regression	Running the main regressions on my models	Regression allows one to observe more than just correlation of data; one can begin to determine causation among variables.
10/25/2014	Second objective: Analysis of Regression and correction	Analyzing significant data results and attempting to correct for typical econometric problems in data set	Significant data results will quantitatively prove or disprove my theories and hypotheses.
Goal III:			
11/21/2014	First objective: Further analysis of data	Determining the econometric problems and their respective corrections, running further regressions with more data	When running data regressions over multiple years, varying observation sizes, there are always econometric problems which arise; these need to be solved.
12/1/2014	Second objective: Final drafts of paper and presentation	Writing/creating both my final drafts of my final paper and presentation for my independent study and to whom?	As per my independent study requirements, I will be writing a final paper and preparing a presentation on my final findings.

R1: It is good to acknowledge potential problems. It is even better to provide possible solutions or alternative approaches to these potential problems

R3: The project is feasible and the timeline is pretty detailed, however, this does not include NCUR, or UR Day on the timeline.

R1: This word was presumably left out – proof reading your proposal is important.

R2: Text could be more succinct and not double spaced (below). Add UR Day and NCUR to timeline.

Evaluation:

1) Are project activities and outcomes connected to the stated goals and objectives? **Strongly agree.**

2) Project feasibility. How realistic and appropriate is the study for this student in the time

available? **Appropriate, but there are inherent unknowns in this type of project since one cannot necessarily predict the problems encountered in the econometric analysis and without any description for possible solutions and/or alternative strategies, it is not clear to the reader whether the proposed timeline, which is very compact, can be adhered to.**

3) Likelihood of project outcomes. Is the project likely to result in a data set, creative performance, art object, or academic project that can be presented and/or published? **Likely.**

Timeline	Goals and Objectives	Actions:	How Actions Support Goals and Objectives
		use in future presentations of my	
3/27/2015- 3/29-2015	Third objective: Attending MEA, Midwest Economics Association	Being a able to visit a conference of other student/faculty/researchers' presentations	I would like to attend the MEA conference to be able to discover what other topics in

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10/4/2014	First objective: Literature review, data collection	Looking through the FEMA databases as well as collecting data from SHELDUS, US Census Bureau	Necessary for the ability to pursue my project topic and develop a data set for analyses.
10/11/2014	Second objective: Merging into one manageable dataset	Utilizing Stata to combine all important data sets together	Data is easy to manage, regress, analyze, correct, and store in
Goal II:			
10/18/2014	First objective: Regression	Running the main regressions on my models	Regression allows one to observe more than just correlation of data; one can begin to determine
10/25/2014	Second objective: Analysis of Regression and correction	Analyzing significant data results and attempting to correct for typical econometric problems in data to	Significant data results will quantitatively prove or disprove my theories and hypotheses
Goal III:			

11/21/2014	First objective: Further analysis of data	Determining the econometric problems and their respective corrections, running	When running data regressions over multiple years, varying observation sizes,
12/1/2014	Second objective: Final drafts of paper and presentation	Writing/creating both my final drafts of my final paper and presentation for my independent	As per my independent study requirements, I will be writing a final paper and preparing a