Analyzing Economic Indicators of Disaster Resilience Following Hurricane Katrina

Mark L. Dottore, Department of Finance, Insurance, and Business Law, Pamplin College of Business, Virginia Tech, Blacksburg, VA, USA
Christopher W. Zobel, Department of Business Information Technology, Pamplin College of Business, Virginia Tech, Blacksburg, VA, USA

ABSTRACT

Many different metrics have been developed to measure the capacity for resilience to a disaster event. In order to track the dynamic response of a community in the aftermath of a disaster, however, it is necessary to consider measures that vary over time and for which data points are actually available on a relatively frequent basis. Unemployment, construction GDP, leisure and hospitality GDP, manufacturing GDP and information and communication technology GDP are all examples of measures which provide the opportunity to quantitatively assess the relative rate and extent of community recovery at regular time intervals following a disaster. By quantitatively analyzing the relative amount of resilience exhibited by a community we may gain better insight into its ability to recover, and thus develop a better understanding of the factors that allow it to return to normal levels of activity. The authors apply their analytical approach to compare the communities of New Orleans, Louisiana and Gulfport, Mississippi in the context of Hurricane Katrina.

Keywords: Disaster Resilience, Economic Indicators, Gross Domestic Product (GDP), Quantitative Modeling, Time Series

INTRODUCTION

The National Climatic Data Center (NCDC) has reported that the United States suffered 144 climate-related disasters between 1980 and 2012 in which overall damages met or exceeded $1 billion USD (NCDC, 2013). In 2011 alone, the total economic impact of natural disasters in the United States exceeded $55 billion USD just in property damages (NRC, 2012), and the total worldwide economic losses from disasters in 2012 was forecast to exceed $140 billion USD, due in large part to Hurricane Sandy and the extensive drought suffered by the United States (Swiss Re, 2012). These numbers stress the importance of ongoing efforts to help communities and organizations become more resilient, i.e., to help them both prepare for and recover quickly from such disaster events.

In order to judge the effectiveness of actions taken to improve such resilience, it is important to first establish a means of measuring the relative overall impact of a disaster event on the community of concern. We specifically

DOI: 10.4018/ijban.2014010105
define disaster resilience to be the ability to prepare and plan for, absorb, recover from, or more successfully adapt to actual or potential adverse events (NRC, 2012). This echoes many other definitions of this concept that are found in the literature and indicates a need to consider resilience in the context of an active response to a disaster event.

With this need in mind, this paper focuses on measuring economic resilience to a disaster in the context of analyzing time series data for different economic indicators. By considering multiple indicators, rather than just a single measure of economic “health”, we are better able to capture the complexity of economic resilience and to illustrate the complex impacts of a disaster on a community. This recognition of the multi-dimensional nature of resilience is an important aspect of much of the existing work analytically quantifying resilient behavior (Bruneau et al., 2003; Cutter et al., 2010; Dottore, 2013; Zobel, 2011b). One particular issue of importance, in terms of representing this multi-dimensionality, is that the data for all such possible indicators is not necessarily collected on a regular basis. Access to consistent and timely sources of data is necessary in order to quantitatively assess the relative rate and extent of community recovery at regular time intervals following a disaster.

The following discussion seeks to illustrate the potential for creating a weighted combination of such multiple indicators of economic resilience in order to compare the overall resilience of different communities that have been affected by the same disaster event. We focus, in particular, on the communities of New Orleans, Louisiana and Gulfport, Mississippi and provide a comparison of them in the context of the impacts that they each suffered due to Hurricane Katrina in 2005. Our intent is not to provide a comprehensive and exhaustive look at the different economic indicators available for representing resilient behavior, but rather to discuss the issues and opportunities associated with using real-world time series data to comparatively measure the resilience of different communities. By quantitatively analyzing the relative amount of resilience exhibited by each community we may gain better insight into their ability to recover, and thus develop a better understanding of the factors that allow them to return to normal levels of activity.

The study of resilience is an important part of the broader field of disaster management, which is generally described as encompassing four different operational phases: mitigation, preparedness, response, and recovery (Altay et al., 2006). Although resilient behavior is most often associated with the ability to recover from a disaster, the resilience of a community can also be improved through efforts to mitigate against future events, as well as by preparing for an impending disaster and responding to the needs of the community immediately after the disaster has struck (Tierney et al., 2007). Insights gained from the study of resilience thus are relevant to much of the larger body of research being done in disaster management, from disaster response operations (Barbarosoglu et al., 2004), to humanitarian relief logistics (Kovács et al., 2007), to long-term community recovery and sustainability (Smith et al., 2007). This relevance serves as additional motivation for the discussion that follows.

We begin by providing some background on Hurricane Katrina and specifically on its impact on both Gulfport and New Orleans. We then discuss the process by which we derived a representative set of economic indicators of community resilience for these two locations, and following the work of (Bruneau et al., 2003) and (Zobel, 2011a) we propose a preliminary approach for quantifying the combination of loss and recovery time based on the area beneath the response curve. The paper concludes with an analysis and discussion of the modeling results, and with suggestions for possible future extensions.

APPLICATION EXAMPLE: HURRICANE KATRINA

Hurricane Katrina originated as a tropical depression on August 23, 2005, and increased into a tropical storm as it moved through the
Classification Trees as Proxies
[www.igi-global.com/article/classification-trees-as-proxies/126244?camid=4v1a](www.igi-global.com/article/classification-trees-as-proxies/126244?camid=4v1a)