National Weather Disaster Casuality Analysis of USA

Author: Byron.Bian

Date: Thursday, May 14, 2015

Synopsis:
In this analysis report, I will analyze human casualties (pertinent with people health, including fatalities and injuries) as well as economic damage (pertinent with economic consequences, including property & crop loss measured by monetary figures) via exploring the U.S. National Oceanic and Atmospheric Administration's (NOAA) stormd database. By comparing observed event types of weather disasters, the conclusion that which event types have incurred most severe casualties could be drawn and which might facilitate the municipal manager to prioritize resources for these events.In my research report, I used R-Studio and R-Markdown as the major data analysis tools.

Key words: Casualties, Economic Damage, Weather Event, NOAA

Section I: Data Processing

1 In this section, I will firstly load raw data of NOAA into R

```
#Change Time-Zone to USA
Sys.setlocale("LC_TIME","us")
#Load enhanced packages
options(warn=-1)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
##
## The following object is masked from 'package:stats':
##
##     filter
##
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(lubridate)
library(stringr)
```

```
#DataSet file is saved at my current working directory
setwd("E:\\DataScience")
storm.data<-read.table("./repdata_data_StormData.csv",fill=TRUE,sep=
",",header=TRUE,quote="\"'",stringsAsFactors=FALSE)
```

2 In the raw data, there are several descriptive fields whose textual lengths are very long but they might have no contribution to my analysis, so I could cut them off. These fields are:
-COUNTYNAME
-STATEOFFIC
-ZONENAMES
-REMARKS

After the removal of these big textual fields, we can initially view several records of data set.Because our research analysis is casualty, so I could finally extract only columns that are useful to my goal

```
use.data<-storm.data[,c(2,3,8,12,13,23:28)]
use.data<-use.data[!is.na(use.data$BGN_DATE) & str_length(use.data$B
GN_DATE)<=19,]
```

Section II: Data Analysis

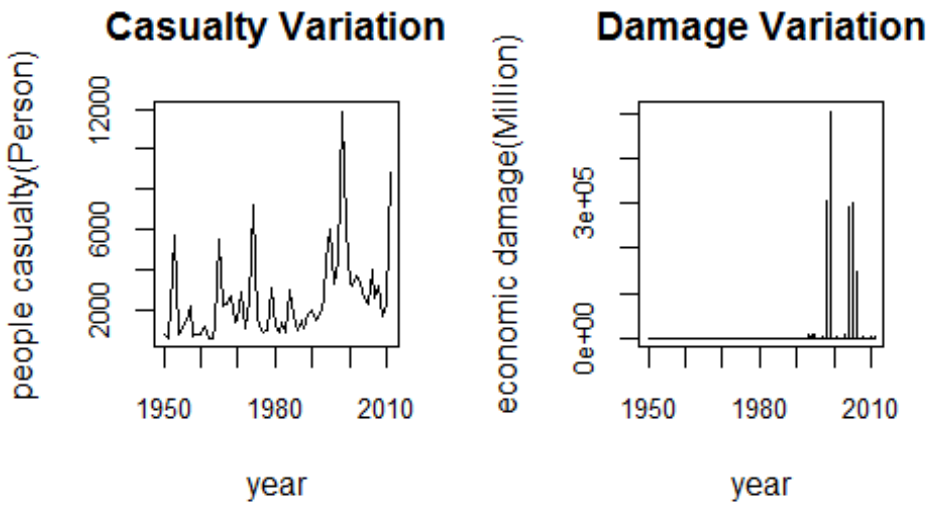
1 Firstly, I will research the casualty trend from starting date of event records to now. By this analysis, we can perceive whether situation of casualty became severe or relatively alleviated. 1.1 Data Preparation

```
#Add additional columns which could be used for further analysis
#Unit of economic damage is Million
use.data<-mutate(use.data,
                 casualty=as.numeric(FATALITIES)+as.numeric(INJURIE
S),
                 eco.dmg=(as.numeric(PROPDMG)*((PROPDMGEXP=="K")*10^
3+(PROPDMGEXP=="M")*10^6+(PROPDMGEXP=="B")*10^9) +
                            as.numeric(CROPDMG)*((PROPDMGEXP=="K")*10^
3+(PROPDMGEXP=="M")*10^6+(PROPDMGEXP=="B")*10^9))/10^6,
                 event.year=year(as.POSIXct(use.data$BGN_DATE,"%m/%d
/%Y",tz="UTC"))
)
use.data<-use.data[!is.na(use.data$event.year),]
head(use.data)
```

1.2 Draw two plots in one panel (One is for Casualty, another is for Damage)

```
par(mfrow=c(1,2),pty="s")
trend.data<-aggregate(casualty~event.year,data=use.data,sum)
with(trend.data,plot(event.year,casualty,type="l",pch=16,cex.axis=.8,
                     xlab="year",
```

```
                    ylab="people casualty(Person)",
                    main="Casualty Variation"))
trend.data<-aggregate(eco.dmg~event.year,data=use.data,sum)
with(use.data,plot(event.year,eco.dmg,type="l",pch=16,cex.axis=.8,
                   xlab="year",
                   ylab="economic damage(Million)",
                   main="Damage Variation"))
```



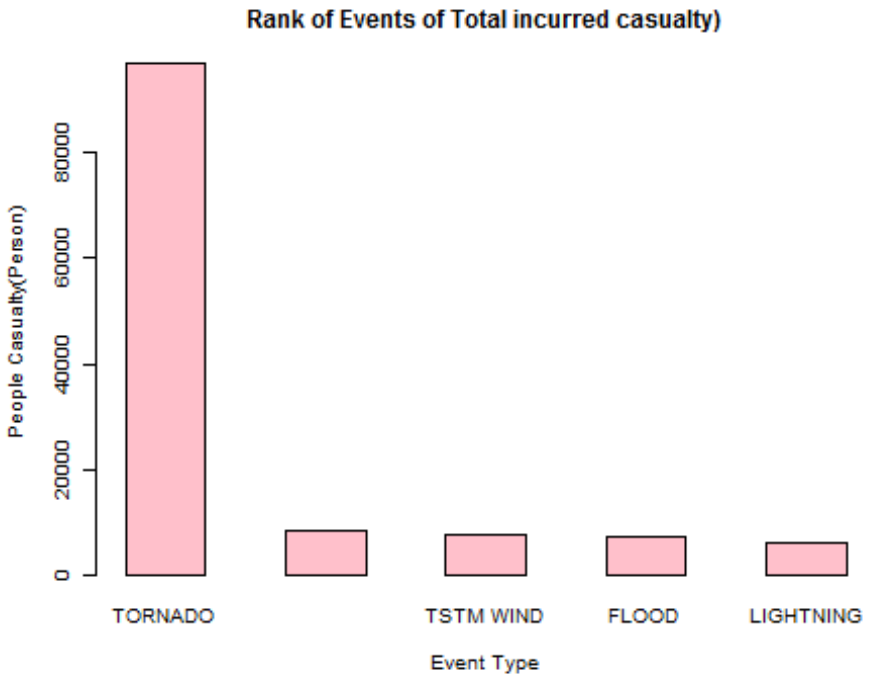

```
rm(trend.data)
```

2 Secondly, I will research the most harmful event types in terms of people casualty

2.1 Draw the plot

```
loss.data<-aggregate(cbind(casualty,eco.dmg)~EVTYPE,data=use.data,su
m)
x<-loss.data[,c(1,2)]
#Only take 5 event types by rank of severe loss
x<-head(x[order(-x$casualty),],5)
y<-t(as.matrix(x[,2]))
colnames(y)<-x[,1]
par(mfrow=c(1,1),cex=.6,oma=c(1,1,1,1))
barplot(y,col="pink",
        xlab="Event Type",
        ylab="People Casualty(Person)",
        main="Rank of Events of Total incurred casualty)",
```

```
        space=1
        )
```



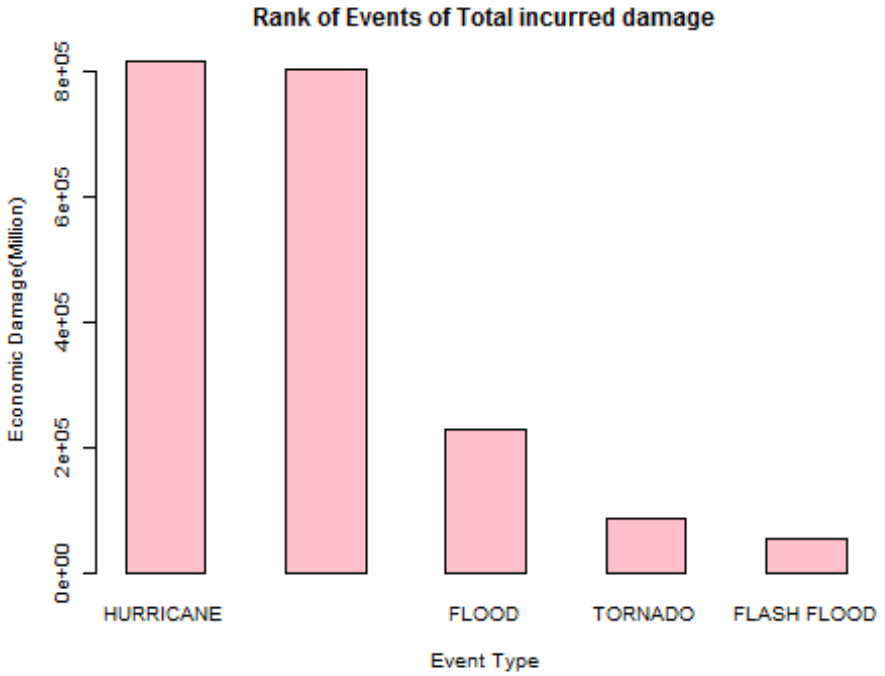
2.3 Report concrete values of foremost 5 event types By total of casualty

```
print(y)
```

```
##      TORNADO EXCESSIVE HEAT TSTM WIND FLOOD LIGHTNING
## [1,]   96938           8427      7441  7247      6001
```

3 Finally, I will research the most harmful event types in terms of economic damage
3.1 Draw the plot

```
x<-loss.data[,c(1,3)]
#Only take 5 event types by rank of severe loss
x<-head(x[order(-x$eco.dmg),],5)
y<-t(as.matrix(x[,2]))
colnames(y)<-x[,1]
par(mfrow=c(1,1),cex=.6,oma=c(1,1,1,1))
barplot(y,col="pink",
        xlab="Event Type",
        ylab="Economic Damage(Million)",
        main="Rank of Events of Total incurred damage",
        space=1
        )
```



3.2 Report concrete values of foremost 5 event types By total of damage

```
print(y)
```

```
##      HURRICANE HURRICANE/TYPHOON    FLOOD  TORNADO FLASH FLOOD
## [1,]  814750.2          802044.3 228869.7 85078.59    54788.94
```

Section III: Results

Based upon the above analysis, we can draw the result that A: Trend of annual losses due to harmful weather events 1 Situation of people casualty has very great fluctuation from 1950 to now, but global trend is increasing 2 Situation of economic damages are much more higher than before (also influenced by increased economy level)

B: Rank of most harmful weather event types that incurred people casualties are
1 TORNADO (96938 cases, far greater than other events)
2 EXCESSIVE HEAT (8427 cases)
3 TSTM WIND (7441 cases)
4 FLOOD (7247 cases)
5 LIGHTING (6001 cases)
So, TORNADO is the top-1 harmful weather event incurred people casualty

C: Rank of most harmful weather event types that incurred economic damages are
1 HURRICANE (814,750 Million)
2 HURRICANE/TYPHOON (802,044 Million)

3 FLOOD (228,869 Million)
4 TORNADO (85,078 Million)
5 FLASH FLOOD (54,788 Million)
So, HURRICAN is the top-1 harmful weather event incurred economic damage

---

Preliminary suggestion to municipal manager:
Please prepare more resources for preventing disastrous weather events of TORNADO/HURRICANE/TYPHOON