Recitation04

September 23, 2020

[86]:
```
# Preprocessing by prof m (TL;DR)
concernPolls = pd.read_csv("https://raw.githubusercontent.com/fivethirtyeight/
 ↪covid-19-polls/master/covid_concern_polls.csv")

def avgConcern(d):
    return pd.Series({"very":np.mean(d["very"])})
avgConcernPolls = concernPolls.groupby(["end_date"]).apply( avgConcern )

avgConcernPolls = avgConcernPolls.reset_index()
avgConcernPolls["end_date"] = pd.to_datetime(avgConcernPolls.end_date)
```

0.0.1 Data intro

The (super awesome) media outlet FiveThirtyEight collected data on the US population's concern that they, or a family member, would be impact negatively by the novel coronavirus. The article is here.

FiveThirtyEight often, if not always, keeps an opensource repository of all the data they use in their stories. The data repo link is here and the data we are going to analyze on COVID-19 concerns can be found here.

The raw data has the date a poll was opened, ended, the number of people polled, the sponsor of the poll, and the percentage of those who were "not at all","not very", "somewhat","very" concerned about the spread/impact of COVID-19. Our analysis will explore when more than 50% percent of people polled were very concerned about COVID-19.

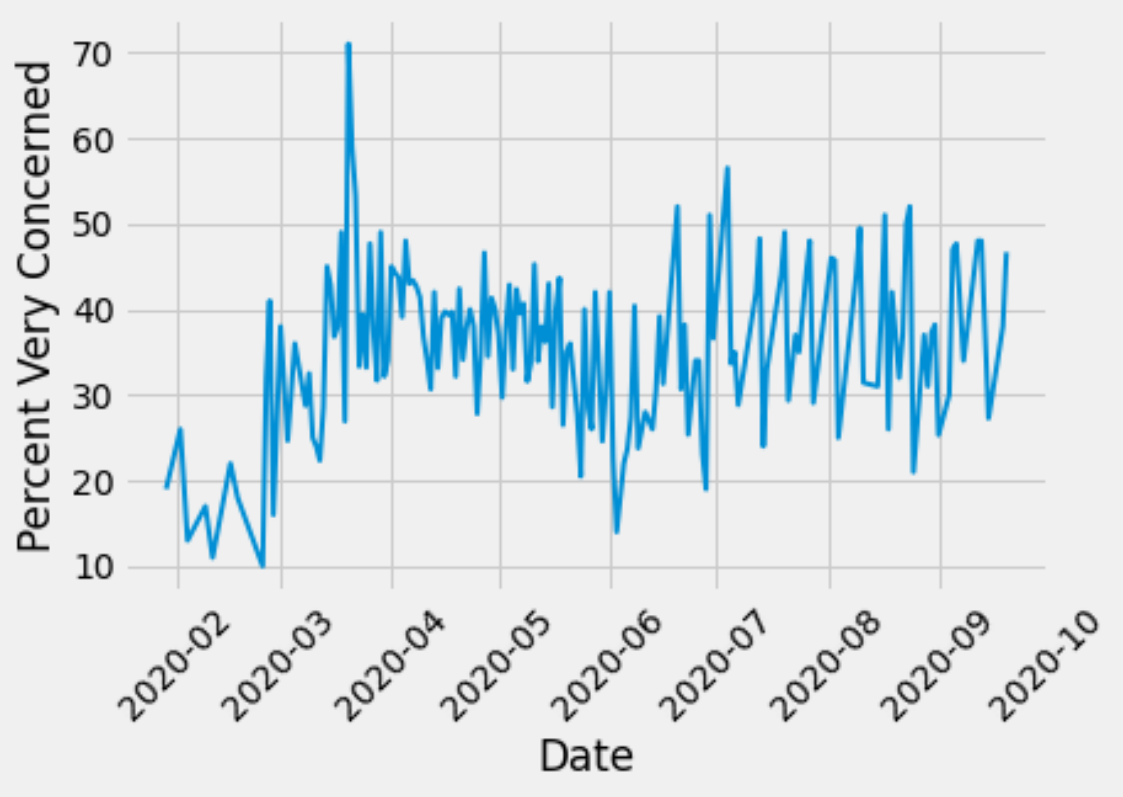
To start (TL;DR code above), prof m downloaded the data and averaged the percent of people very concerned over pools on ending on the same day.

0.0.2 Ploting the percent very concerned about COVID-19 over time

[101]:
```
# Plot the percentage of polled americans that report feeling Very concerned␣
 ↪about COVID-19.
plt.style.use("fivethirtyeight")

fig,ax = plt.subplots()
ax.plot( avgConcernPolls.end_date, avgConcernPolls.very,lw=2 )

ax.set_xlabel("Date")
```

```
ax.set_ylabel("Percent Very Concerned")

plt.xticks(rotation=45)
```

[101]:
```
(array([737456., 737485., 737516., 737546., 737577., 737607., 737638.,
        737669., 737699.]), <a list of 9 Text major ticklabel objects>)
```



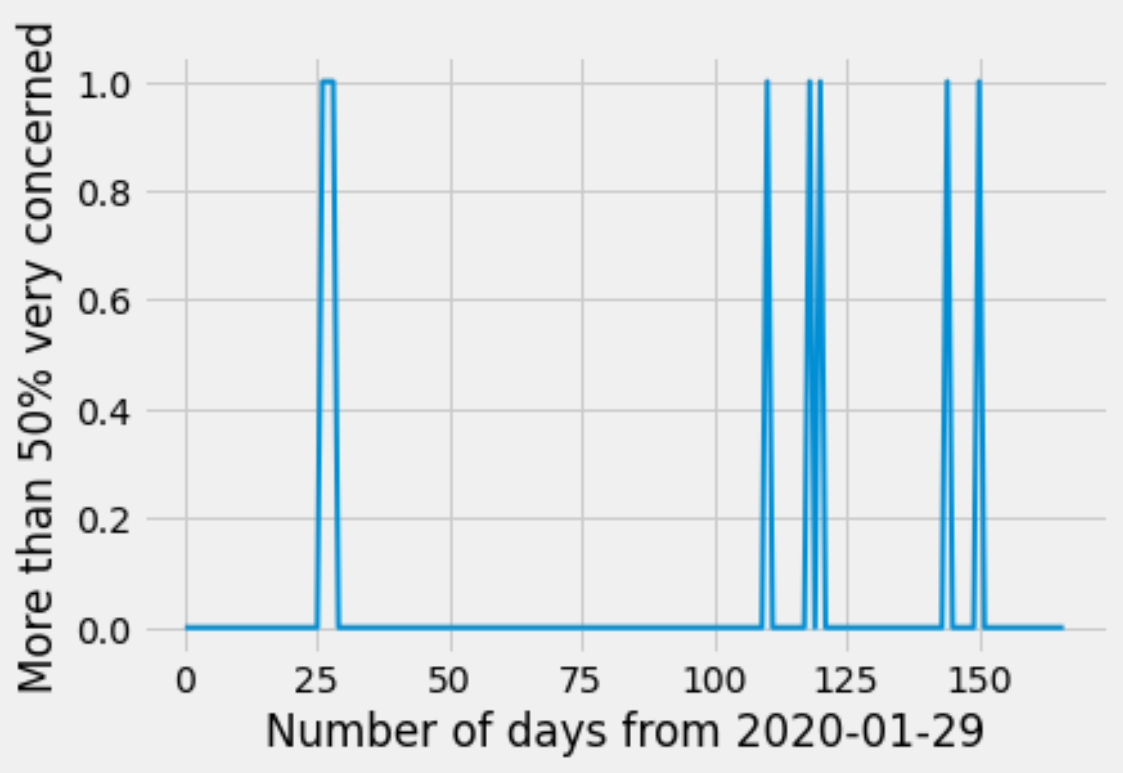
0.0.3 Defining a Bernoulli-distributed random variable to represent those >50% very concerned.

[88]:
```
# Define a Bernoulli r.v. that track when americans feel more than 50% concerned.
veryConcerned = list(avgConcernPolls.very.values)

moreThan50=0
moreThan50Concerned = []
for very in veryConcerned:
    if very > 50.:
        moreThan50=1
    else:
        moreThan50=0
    moreThan50Concerned.append(moreThan50)
```

0.0.4 A plot of >50% very concerned over time.

[103]:
```
fig,ax = plt.subplots()
ax.plot( moreThan50Concerned, lw=2. )

ax.set_xlabel("Number of days from 2020-01-29")
ax.set_ylabel("More than 50% very concerned")
```

[103]:
```
Text(0, 0.5, 'More than 50% very concerned')
```



[105]:
```
# Count the proportion of "1s"
import numpy as np # import the (very handy) numpy module

prop = np.mean( moreThan50Concerned ) # a shortcut using the numpy module
print("Prop of 1s = {:.2f}".format(prop))
```

```
Prop of 1s = 0.05
```

0.0.5 Estimated R.V.

From our dataset, it looks like a reasonable estimate of our Bernoulli-distributed variable (let's say V for very concerned) is the following:

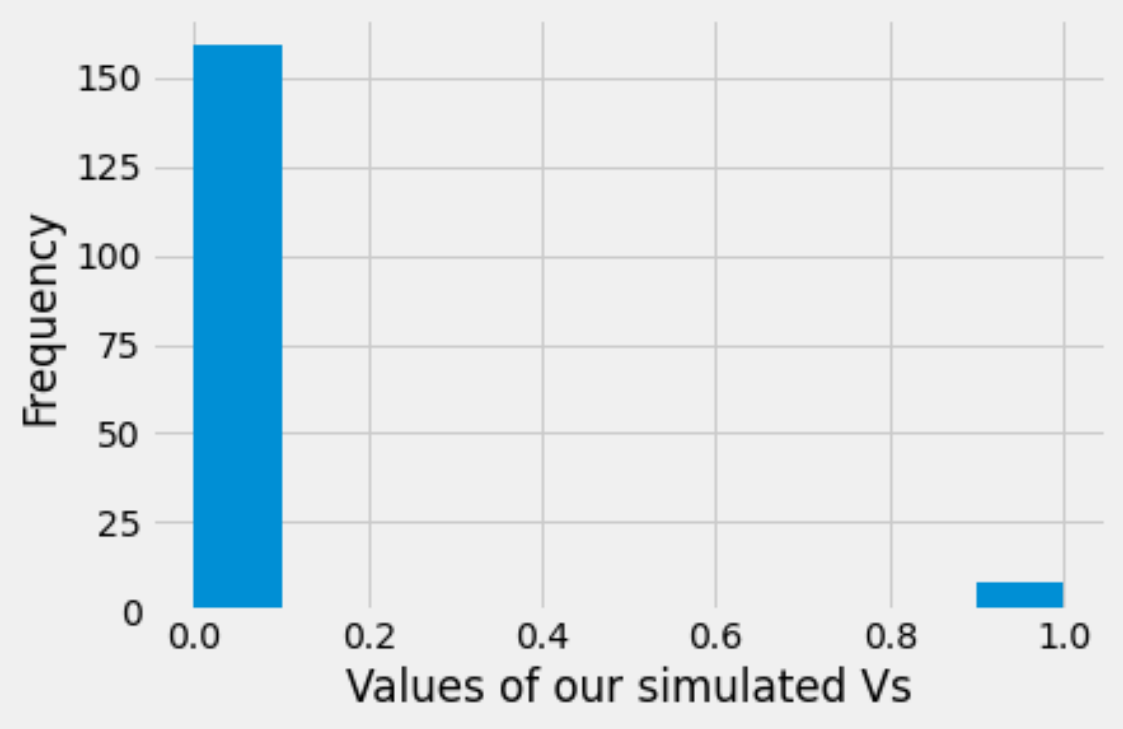
$$V \sim \text{Bern}\,(0.05) \tag{1}$$

We can use this estimate random variable to simulate other potential datasets we could have observed.

0.0.6 Simulate a polling time period

[107]:
```
# simulate a single polling period with bernoulli variables

numberOfDays = len(veryConcerned) # compute the length of a list
simulatedRVS = []

for sim in range(numberOfDays):
    simulatedRV = np.random.binomial(1,prop) # A Bernoulli r.v. with prob equal␣
 ↪to the variable prop (0.05)
    simulatedRVS.append(simulatedRV)
```

[108]:
```
# plot a histogram
fig,ax = plt.subplots()
ax.hist(simulatedRVS)

ax.set_xlabel("Values of our simulated Vs")
ax.set_ylabel("Frequency")

plt.show()
```



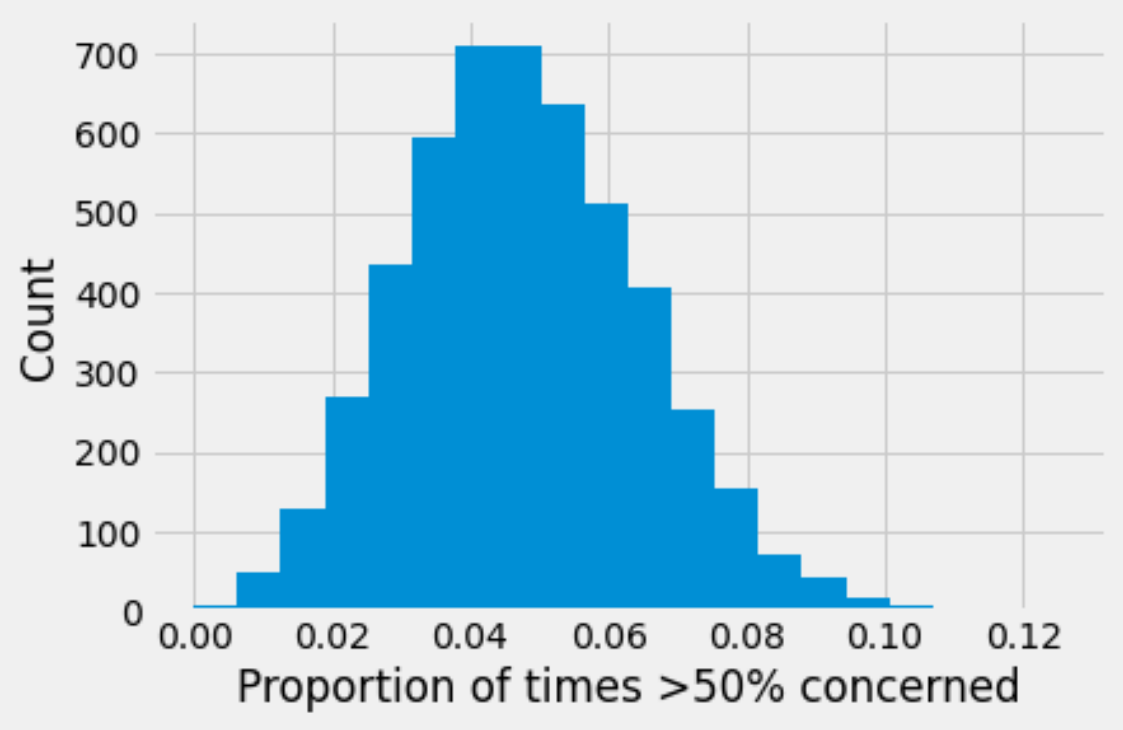
0.0.7 Simulating many potential futures (A brief intro to Monte Carlo estimation)

[93]:
```
# simulate many different scenarios
def simulateConcern(veryConcerned,p):
    numberOfDays = len(veryConcerned)

    simulatedRVS = []

    for sim in range(numberOfDays):
        simulatedRV = np.random.binomial(1,p)
        simulatedRVS.append(simulatedRV)
    return simulatedRVS

propOfConcern = []
for i in range(5*10**3):
    onesAndZeros = simulateConcern(veryConcerned,prop)
    estProp = np.mean(onesAndZeros)
    propOfConcern.append(estProp)
```

[109]:
```
fig,ax = plt.subplots()
ax.hist( propOfConcern,20 )

ax.set_xlabel("Proportion of times >50% concerned")
```

```
ax.set_ylabel("Count")
```

[109]: `Text(0, 0.5, 'Count')`



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