

Hw5, Q1b

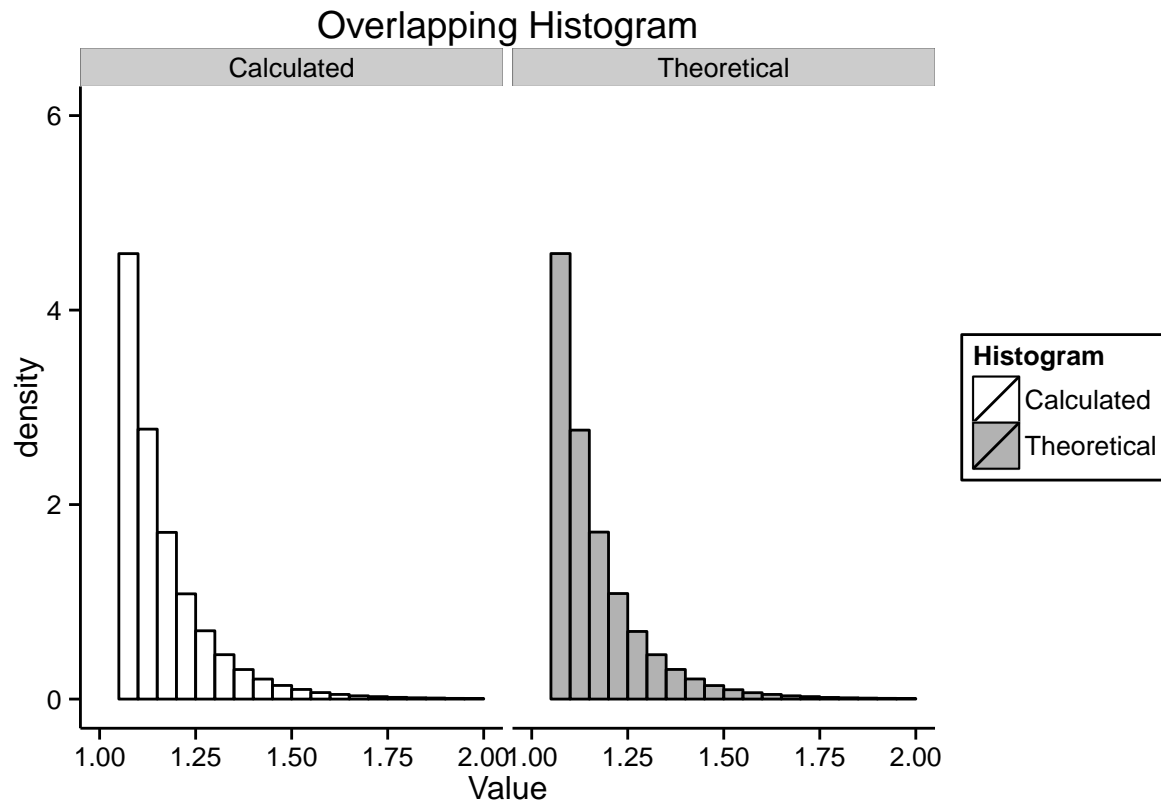
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```
#install.packages("actuar")
library(actuar)
library(plyr)
require(ggplot2)
theoretical <- data.frame( dat = rpareto1(1000000, shape = 10, min = 1))
theoretical$da <- "Theoretical"
calculated <- data.frame(dat = (1-runif(1000000))^-1/10)
calculated$da <- "Calculated"
thcalc <- rbind(theoretical, calculated)
```

I checked that my method worked via simulation. I simulated large sample from a pareto distribution – in R, I used `rpareto1(1000000, shape = a, min= 1)`. Next, I simulated a large sample from my calculation using a uniform distribution – that is, $(1-\text{runif}(1000000))^{-1/a}$. I plotted the two distributions below.

```
ggplot(thcalc, aes(dat)) +
  geom_histogram(alpha = 0.5, aes(y = ..density.., fill = da),
    position = 'identity', binwidth = 0.05, color =
      "black") +
  xlim(1,2) +
  ylim(0, 6) +
  facet_grid(. ~ da)+
  labs(x = "Value", title = "Overlapping Histogram") +
  theme_bw() +
  theme(legend.background = element_rect(colour = "black"),
    plot.background = element_blank() ,
    panel.grid.major = element_blank() ,
    panel.grid.minor = element_blank() ,
    panel.border = element_blank(),
    axis.line = element_line(color = 'black')) +
  scale_fill_manual(name = "Histogram", values = c("white", "grey40"))
```



To convince myself that they were the same, I plotted them over the top of one another, and outlined each bar in black. If there was a noticeable difference, I should be able to see a gap between the white and grey on these distributions. However, I see none. This directly checks that my method works for generating pareto rvs.

```
ggplot(thcalc, aes(dat, fill = da)) +
  geom_histogram(alpha = 0.5, aes(y = ..density..),
    position = 'identity', binwidth = 0.05, color =
      "black") +
  xlim(1,2) +
  ylim(0, 6) +
  labs(x = "Value", title = "Overlapping Histogram") +
  theme_bw() +
  theme(legend.background = element_rect(colour = "black"),
    plot.background = element_blank(),
    panel.grid.major = element_blank(),
    panel.grid.minor = element_blank(),
    panel.border = element_blank(),
    axis.line = element_line(color = 'black')) +
  scale_fill_manual(name = "Histogram", values = c("white", "grey40"))
```

