# DATA 605 - HW 10

Avery Davidowitz

2022-10-27

### Import Libraries

```
library(markovchain)
```

## Create Markov chains

The states of the chain represent how much money Smith currently has. The transition matrix represents the probabilities of the bets at a given state. States 0 and 8 are absorbing states with a P00 and P88 equal to 1.

```
#timid strat Markov chain object
statesNames_timid <- c("0","1","2","3","4","5","6","7","8")
mc_timid <- new("markovchain", transitionMatrix=matrix(c(1,0,0,0,0,0,0,0,0,
                                                         .6,0,.4,0,0,0,0,0,0,
                                                         0,.6,0,.4,0,0,0,0,0,
                                                         0,0,.6,0,.4,0,0,0,0,
                                                         0,0,0,.6,0,.4,0,0,0,
                                                         0,0,0,0,.6,0,.4,0,0,
                                                         0,0,0,0,0,.6,0,.4,0,
                                                         0,0,0,0,0,0,.6,0,.4,
                                                         0,0,0,0,0,0,0,0,1),byrow=TRUE,
nrow=9, dimnames=list(statesNames_timid,statesNames_timid)))
#bold strat Markov chain object
statesNames_bold <- c("0","1","2","4","8")
mc_bold <- new("markovchain", transitionMatrix=matrix(c(1,0,0,0,0,
                                                        .6,0,.4,0,0,
                                                        .6,0,0,.4,0,
                                                        .6,0,0,0,.4,
                                                        0,0,0,0,1),byrow=TRUE,
nrow=5, dimnames=list(statesNames_bold,statesNames_bold)))
```

### Absorbtion Probabilities

The absorption probabilities of the Markov chain ending in either state 0 or 8 represent the probability that the Smith will lose and stay in prison or win and escape.

```
ap_timid <- absorptionProbabilities(mc_timid)
ap_bold <- absorptionProbabilities(mc_bold)
ap_timid
```

```
##           0         8
## 1 0.9796987 0.02030135
## 2 0.9492466 0.05075337
## 3 0.9035686 0.09643140
## 4 0.8350515 0.16494845
## 5 0.7322760 0.26772403
## 6 0.5781126 0.42188739
## 7 0.3468676 0.65313243
```

```
ap_bold
```

```
##       0     8
## 1 0.936 0.064
## 2 0.840 0.160
## 4 0.600 0.400
```

## Conclusion

As seen below if the prisoner Smith starts at 1 dollar and gambles using the bold strategy they are more likely to escape.

```
# Question A)
ap_timid["1","8"]
```

```
## [1] 0.02030135
```

```
# Question B)
ap_bold["1","8"]
```

```
## [1] 0.064
```

```
# Question C)
ap_bold["1","8"] > ap_timid["1","8"]
```

```
## [1] TRUE
```