Untitled

2025-06-13

```r
library(ggplot2)
library(dplyr)
library(tidyverse)

p = c(0.4,0.4,0.2)
a = c(2.2, 4, 7)
pa = p * a


df = data.frame(p, a, pa) %>%
  arrange(desc(pa)) %>%
  mutate(
    pt = cumsum(p),
    at = cumsum(1/a),
    bt = (1-pt) / (1-at)
  )

M = 100
N = 1000

b = min(df$bt[df$bt > 0])

df = df %>%
  mutate(f = p - b / a) %>%
  mutate(f = ifelse(f > 0, f, 0)) %>%
  mutate(ev = p * a - 1)

bankroll_kelly <- numeric(M)
bankroll_filtered <- numeric(M)

f_kelly <- df$f
f_noEV <- ifelse(df$ev >= 0, df$f, 0)

bankroll_kelly <- matrix(NA, nrow = M, ncol = N)
bankroll_filtered <- matrix(NA, nrow = M, ncol = N)

for (m in 1:M) {
  bankroll1 = 1
  bankroll2 = 1
  for (n in 1:N) {
    outcome = sample(1:3, size = 1, prob = p)

    # Strategy 1: Full Kelly
    payoff1 = f_kelly[outcome] * a[outcome]
    bankroll1 = bankroll1 * (1 - sum(f_kelly) + payoff1)
```

```
    bankroll_kelly[m, n] = bankroll1

    # Strategy 2: No -EV horses
    payoff2 = f_noEV[outcome] * a[outcome]
    bankroll2 = bankroll2 * (1 - sum(f_noEV) + payoff2)
    bankroll_filtered[m, n] = bankroll2
  }

}


avg_kelly = colMeans(bankroll_kelly)
avg_filtered = colMeans(bankroll_filtered)

tail(avg_kelly)
```

```
## [1] 2.155302e+31 2.325444e+31 2.493678e+31 3.070386e+31 3.301800e+31
## [6] 4.086764e+31
```

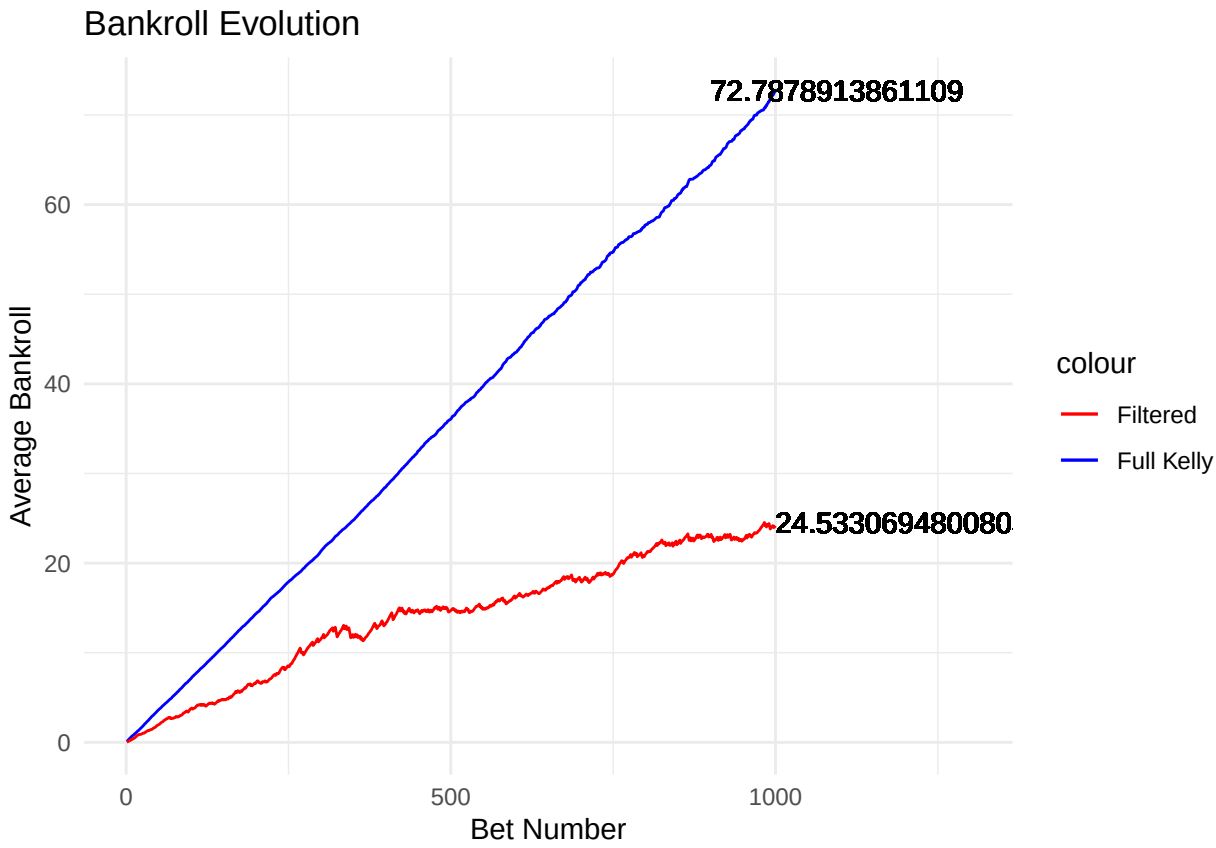
```
tail(avg_filtered)
```

```
## [1] 29606660791 31775825581 25362725428 26486068664 28206269871 31036004309
```

```
plot.data = data.frame(
  n = 1:N,
  avg_kelly = avg_kelly,
  avg_filtered = avg_filtered
)

plot.data <- plot.data %>%
  mutate(
    log_avg_kelly = log(avg_kelly),
    log_avg_filtered = log(avg_filtered)
  )

ggplot(plot.data) +
  geom_line(aes(x = n, y = log_avg_kelly, color = "Full Kelly")) +
  geom_line(aes(x = n, y = log_avg_filtered, color = "Filtered")) +
  labs(title = "Bankroll Evolution", x = "Bet Number", y = "Average Bankroll") +
  scale_color_manual(values = c("Full Kelly" = "blue", "Filtered" = "red")) +
  theme_minimal() +
  xlim(0, N + 300) +
  geom_text(aes(x = N -100, y = max(log_avg_kelly), label = max(log_avg_kelly), hjust = 0)) +
  geom_text(aes(x = N , y = max(log_avg_filtered), label = max(log_avg_filtered), hjust = 0))
```




```
# add points on graph above showing the max of each line
```

full kelly on avg yields 42 more buckaroos