

TUT2

```
set.seed(1010)
resu10 <- c()
ml10 <- c()
for (i in c(1:1000)) {
  n <- 10
  sample <- runif(n, min = 0, max = 1)
  trans_samp <- data.frame('x' = (-sample+1)^(-0.5)*3)
  beta <- (sum(trans_samp)/n)/2
  ml10 <- c(ml10, min(trans_samp))
  resu10 <- c(resu10, beta)
}
mean(ml10)
```

```
## [1] 3.153708
```

```
var(ml10)
```

```
## [1] 0.02516036
```

```
#mean(resu10)
#var(resu10)
```

```
resu10t <- tibble(index=1:1000, resu10)
gg10 <- ggplot(resu10t, aes(x=resu10))+geom_histogram(aes(y=..density..), binwidth = 0.5)+
  labs(x='MOM estimator value', y='density', title='1000 simulations of MOM estimator, n=10', su
ml10t <- tibble(index=1:1000, ml10)
ggml10 <- ggplot(ml10t, aes(x=ml10))+geom_histogram(aes(y=..density..), bins=10)+
  labs(x='ML estimator value', y='density', title='1000 simulations of ML estimator, n=10', subt
```

```
set.seed(1010)
resu50 <- c()
ml50 <- c()
  n <- 50
for (i in c(1:1000)) {

sample <- runif(n, min = 0, max = 1)
```

```
trans_samp <- data.frame('x' = (-sample+1)^(-0.5)*3)
beta <- (sum(trans_samp)/n)/2
ml50 <- c(ml50, min(trans_samp))
resu50 <- c(resu50, beta)
}
mean(ml50)
```

```
## [1] 3.029941
```

```
var(ml50)
```

```
## [1] 0.001010616
```

```
# mean(resu50)
# var(resu50)
resu50t <- tibble(index=1:1000, resu50)
gg50 <- ggplot(resu50t, aes(x=resu50))+geom_histogram(aes(y=..density..), binwidth = 0.5)+
  labs(x='MOM estimator value', y='density', title='1000 simulations of MOM estimator, n=50', su

ml50t <- tibble(index=1:1000, ml50)
ggml50 <- ggplot(ml50t, aes(x=ml50))+geom_histogram(aes(y=..density..), bins=10)+
  labs(x='ML estimator value', y='density', title='1000 simulations of ML estimator, n=50', subt
```

```
set.seed(1010)
resu100 <- c()
ml100 <- c()
n <- 100
for (i in c(1:1000)) {

sample <- runif(n, min = 0, max = 1)
trans_samp <- data.frame('x' = (-sample+1)^(-0.5)*3)
ml100 <- c(ml100, min(trans_samp))
beta <- (sum(trans_samp)/n)/2
resu100 <- c(resu100, beta)
}
mean(ml100)
```

```
## [1] 3.014519
```

```
var(ml100)
```

```
## [1] 0.0002141284
```

```

# mean(resu100)
# var(resu100)
resu100t <- tibble(index=1:1000, resu100)
gg100 <- ggplot(resu100t, aes(x=resu100))+geom_histogram(aes(y=..density..), binwidth = 0.5)+
  labs(x='MOM estimator value', y='density', title='1000 simulations of MOM estimator, n=100', s
  ml100t <- tibble(index=1:1000, ml100)
ggml100 <- ggplot(ml10t, aes(x=ml100))+geom_histogram(aes(y=..density..), bins=10)+
  labs(x='ML estimator value', y='density', title='1000 simulations of ML estimator, n=100', sub

```

```

set.seed(1010)
resu1000 <- c()
ml1000 <- c()
n <- 1000
for (i in c(1:1000)) {

  sample <- runif(n, min = 0, max = 1)
  trans_samp <- data.frame('x'= (-sample+1)^(-0.5)*3)
  ml1000 <- c(ml1000, min(trans_samp))
  beta <- (sum(trans_samp)/n)/2
  resu1000 <- c(resu1000, beta)
}

mean(ml1000)

```

```
## [1] 3.001569
```

```
var(ml1000)
```

```
## [1] 2.563756e-06
```

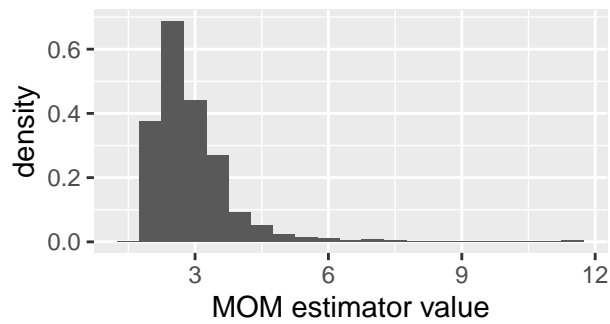
```

#mean(resu1000)
#var(resu1000)
resu1000t <- tibble(index=1:1000, resu1000)
gg1000 <- ggplot(resu1000t, aes(x=resu1000))+geom_histogram(aes(y=..density..), binwidth = 0.5)+
  labs(x='MOM estimator value', y='density', title='1000 simulations of MOM estimator, n=1000',
  ml1000t <- tibble(index=1:1000, ml1000)
ggml1000 <- ggplot(ml1000t, aes(x=ml1000))+geom_histogram(aes(y=..density..), bins=10)+
  labs(x='ML estimator value', y='density', title='1000 simulations of ML estimator, n=1000', su

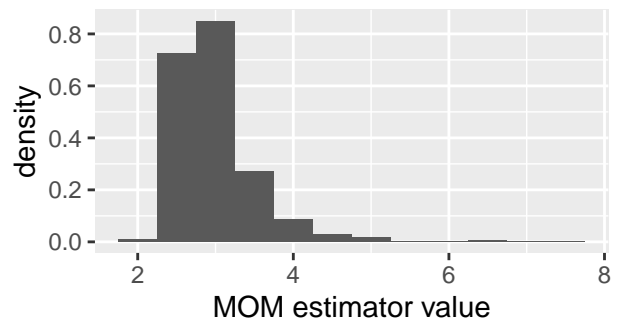
```

```
grid.arrange(gg10, gg50, gg100, gg1000)
```

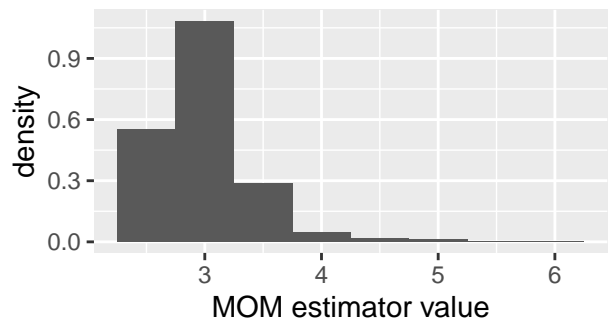
1000 simulations of MOM estimator
n=10



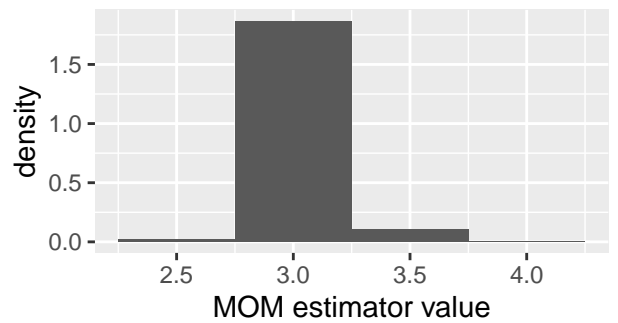
1000 simulations of MOM estimator
n=50



1000 simulations of MOM estimator
n=100

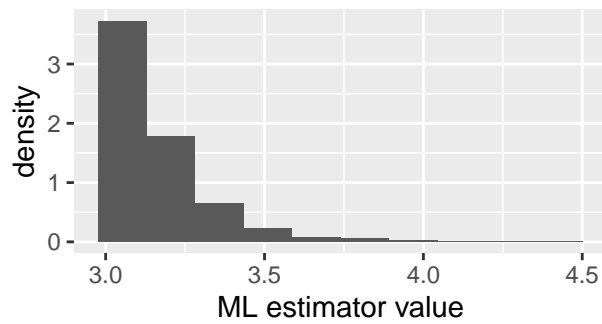


1000 simulations of MOM estimator
n=1000

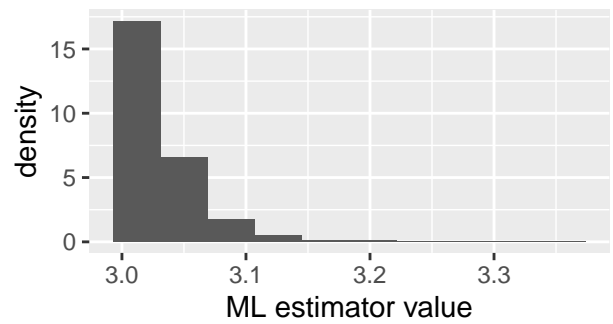


```
grid.arrange(ggml10, ggml50, ggml100, ggml1000)
```

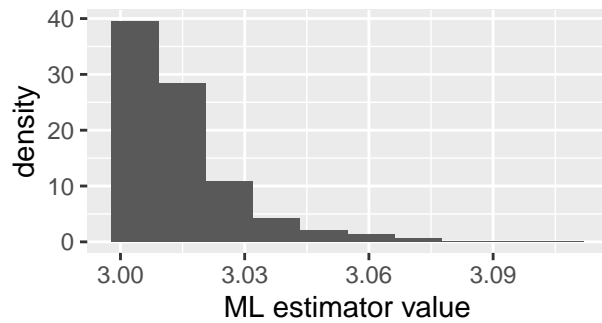
1000 simulations of ML estimator, $n=10$



1000 simulations of ML estimator, $n=50$



1000 simulations of ML estimator, $n=100$



1000 simulations of ML estimator, $n=1000$

