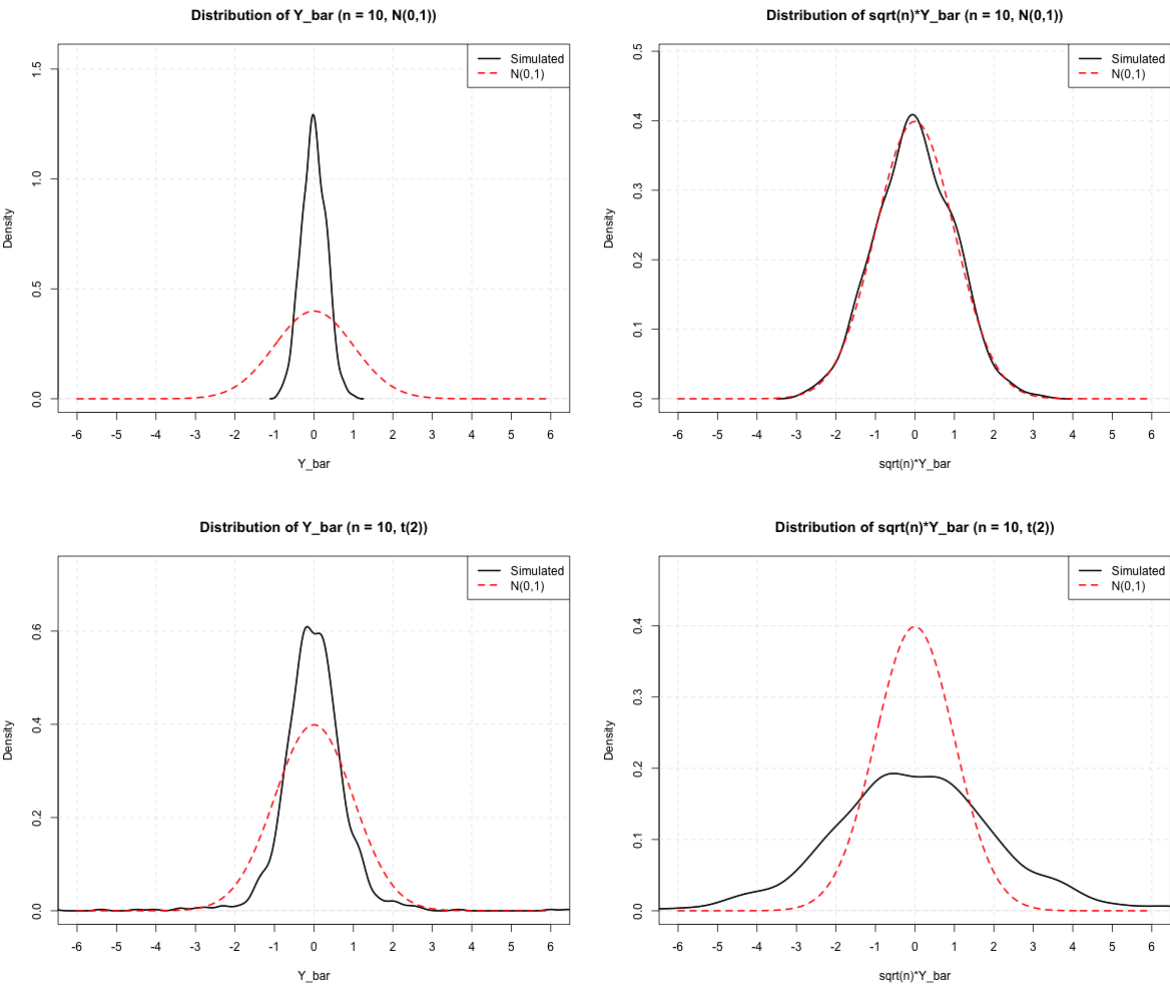


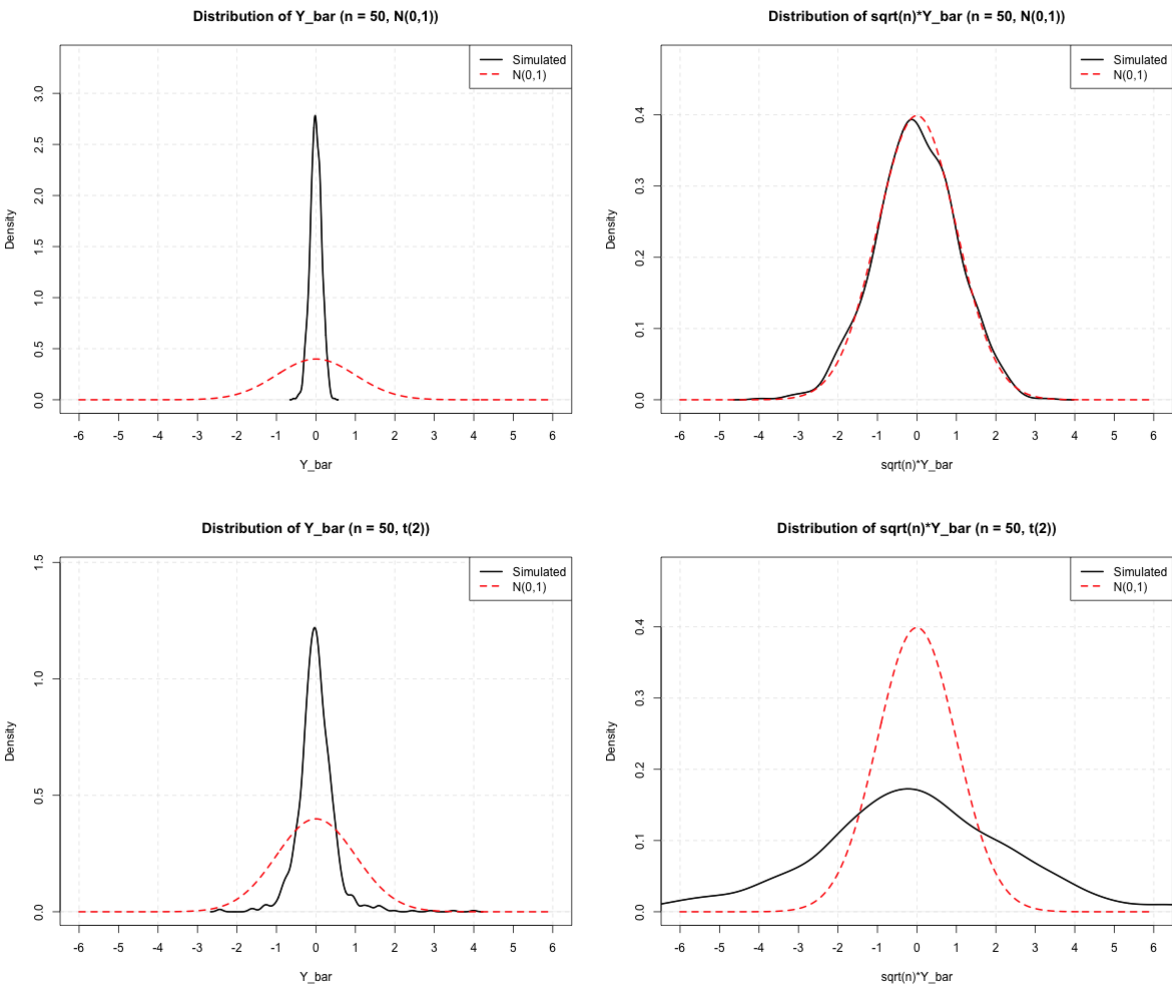
Homework: 2024/10/30

1.

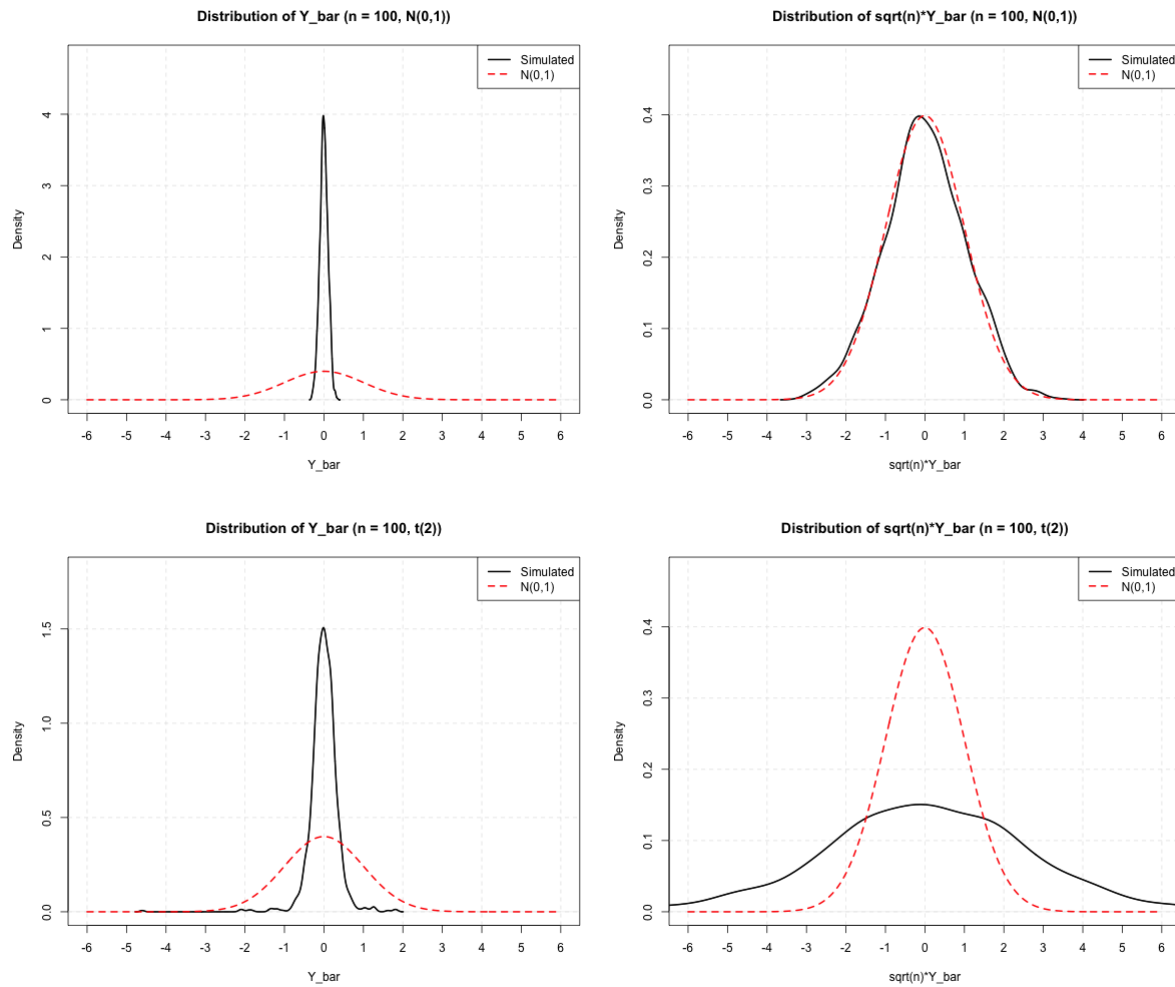
Result for $n = 10$



Result for $n = 50$



Result for $n = 100$



By these simulations, we can see that the distribution of $n^{1/2} \bar{Y}$ is closer to the normal distribution than the distribution of \bar{Y} for both $N(0, 1)$ and $t(2)$ distributions.

As the sample size n increases, we can see there's a peak at the center of the density function of \bar{Y} , this is because the variance of \bar{Y} decreases as n increases.

Comparing the density functions of $n^{1/2} \bar{Y}$ when applying $N(0, 1)$ and $t(2)$ distributions, we can see that when applying $N(0, 1)$ distribution, the density function of $n^{1/2} \bar{Y}$ is more similar to the normal distribution. But when n goes to infinity, both of the density function will be like the distribution of $N(0, 1)$ according to the central limit theorem.

2.

Result of individual Wald tests

Part a: Individual Wald Tests ($H_0: \beta_j = 0$)

	Coefficient	Estimate	Std_Error	t_value	p_value
xones	xones	0.215519353	0.061958219	3.4784627	0.0005490618
xdfy	xdfy	-1.167618067	0.927018939	-1.2595407	0.2084322820
xinfl	xinfl	-0.379379508	0.642884239	-0.5901210	0.5553804406
xsvar	xsvar	-0.101604035	0.393862529	-0.2579683	0.7965392642
xtms	xtms	-0.329207402	0.206163991	-1.5968230	0.1109472182
xtbl	xtbl	-0.317573893	0.113024303	-2.8097841	0.0051549300
xdfr	xdfr	0.275242786	0.148556414	1.8527829	0.0645120943
xdp	xdp	0.045320259	0.012360937	3.6664096	0.0002727608
xltr	xltr	0.126357857	0.073946585	1.7087720	0.0881238502
xep	xep	-0.002077709	0.008739102	-0.2377485	0.8121751096
xbmr	xbmr	0.028790417	0.032257027	0.8925316	0.3725443638
xntis	xntis	0.070079631	0.126154466	0.5555065	0.5788007321

Significant coefficients at 5% level:

	Coefficient	Estimate	Std_Error	t_value	p_value
xones	xones	0.21551935	0.06195822	3.478463	0.0005490618
xtbl	xtbl	-0.31757389	0.11302430	-2.809784	0.0051549300
xdp	xdp	0.04532026	0.01236094	3.666410	0.0002727608

According to the result of individual Wald tests, we can see that the p-values of intercept, tbl, xdp are less than 0.05, which means we can reject the null hypothesis of these coefficients.

Result of joint Wald tests

Part b: Joint Wald Test

$H_0: \beta_1 = 0$ and $\beta_2 + \beta_3 = 0$

Linear hypothesis test:

xones = 0

xdfy + xinfl = 0

Model 1: restricted model

Model 2: $y \sim (x - 1)$

	Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
1	494	0.97081				
2	492	0.93777	2	0.033039	8.6671	0.0001999 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

According to the result of joint Wald tests, we can see that the p-value is less than 0.05, which means we can reject the null hypothesis. The statistical meaning of this result is we reject that $\beta_1 = 0$ and (or) $\beta_2 + \beta_3 = 0$ at 5% significance level. We can see the result is aligned to the result of individual Wald tests of β_1 .