Simulation 1 results visualization notebook

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Offcourse these are non-exhaustive visualizations.

```
library(data.table)
```

```
## Warning: package 'data.table' was built under R version 4.4.2
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.4.2
```

```
library(ggpubr)
```

```
## Warning: package 'ggpubr' was built under R version 4.4.2
```

Simulation 1

```
sim1 <- fread("C:/Users/Qba Liu/Documents/STUDIA/BIOINF_MASTER_BERLIN/MASTER_THESIS/SIMULATION_POLIGON/S
head(sim1)
```

```
##       V1 covariance_structures effect_sizes sample_sizes power_global power_max
##    <int>                <char>        <int>        <int>        <num>     <num>
## 1:     1          Unstructured            1            5            0     0.057
## 2:     2          Unstructured            1            6            0     0.050
## 3:     3          Unstructured            1            7            0     0.040
## 4:     4          Unstructured            1            8            0     0.051
## 5:     5          Unstructured            1            9            0     0.041
## 6:     6          Unstructured            1           10            0     0.051
```

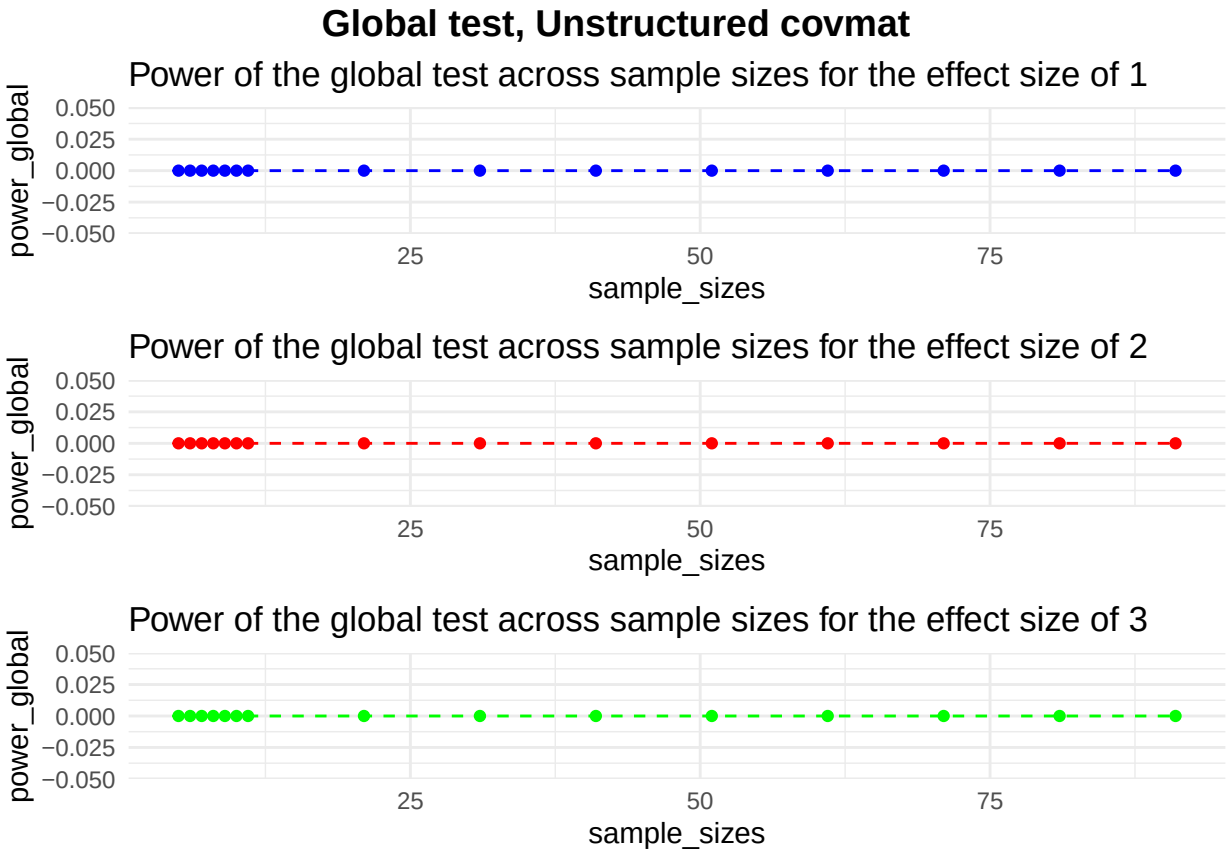
Stratify by the covariance structure

```
sim1_Unst <- sim1[sim1$covariance_structures == 'Unstructured']
sim1_AR1 <- sim1[sim1$covariance_structures == 'AR(1)']
sim1_AR2 <- sim1[sim1$covariance_structures == 'AR(2)']
sim1_Toe <- sim1[sim1$covariance_structures == 'Toeplitz']
```

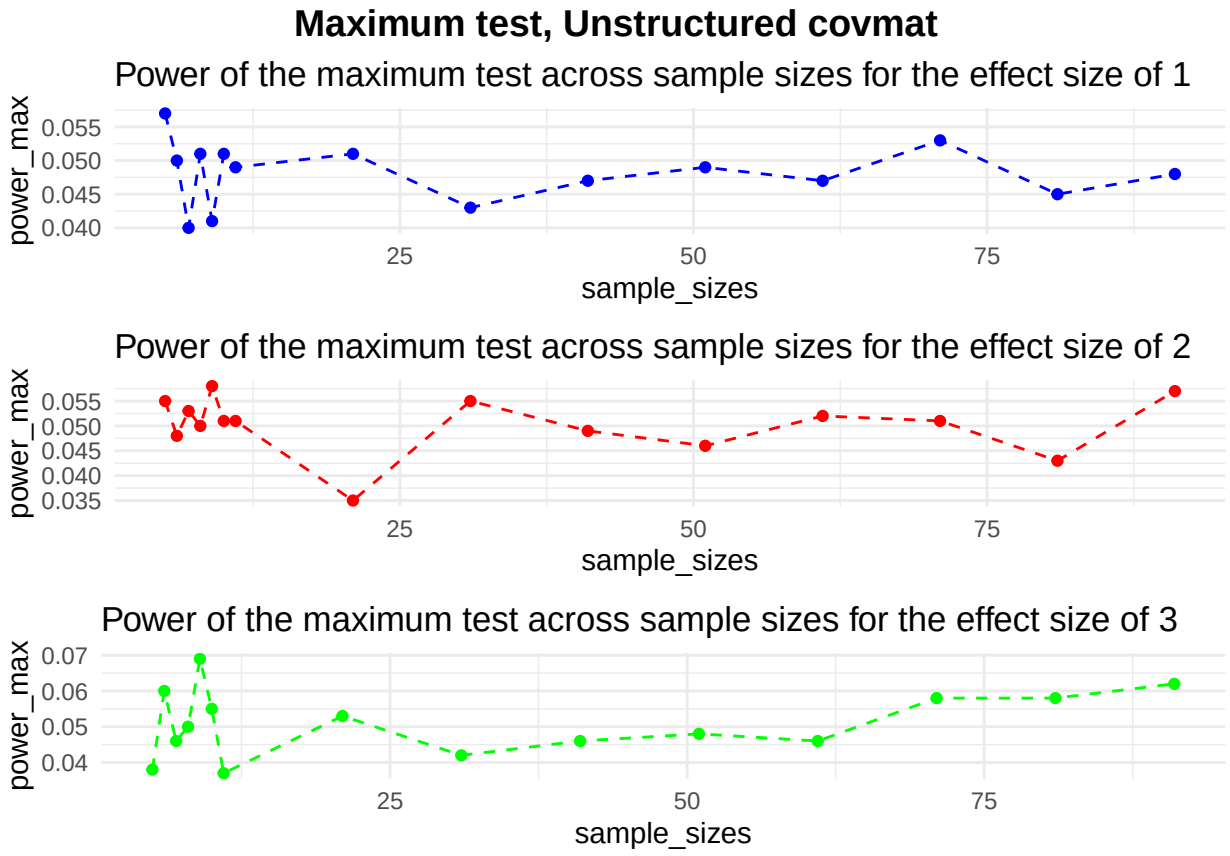
Unstructured covariance matrix

```
plot1 <- ggplot(sim1_Unst[sim1_Unst$effect_sizes == 1,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "blue") +
  geom_line(color = "blue", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 1") +
  theme_minimal()

plot2 <- ggplot(sim1_Unst[sim1_Unst$effect_sizes == 2,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "red") +
  geom_line(color = "red", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 2") +
  theme_minimal()

plot3 <- ggplot(sim1_Unst[sim1_Unst$effect_sizes == 3,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "green") +
  geom_line(color = "green", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 3") +
  theme_minimal()



combined_plot <- ggarrange(plot1, plot2, plot3, ncol = 1, nrow = 3)
annotate_figure(combined_plot,
                top = text_grob("Global test, Unstructured covmat",
                                color = "black", face = "bold", size = 14))
```

Plot the power across the sample sizes for each effect size




```r
plot1 <- ggplot(sim1_Unst[sim1_Unst$effect_sizes == 1,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "blue") +
  geom_line(color = "blue", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 1") +
  theme_minimal()

plot2 <- ggplot(sim1_Unst[sim1_Unst$effect_sizes == 2,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "red") +
  geom_line(color = "red", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 2") +
  theme_minimal()

plot3 <- ggplot(sim1_Unst[sim1_Unst$effect_sizes == 3,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "green") +
  geom_line(color = "green", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 3") +
  theme_minimal()



combined_plot <- ggarrange(plot1, plot2, plot3, ncol = 1, nrow = 3)
annotate_figure(combined_plot,
                top = text_grob("Maximum test, Unstructured covmat",
                                color = "black", face = "bold", size = 14))
```

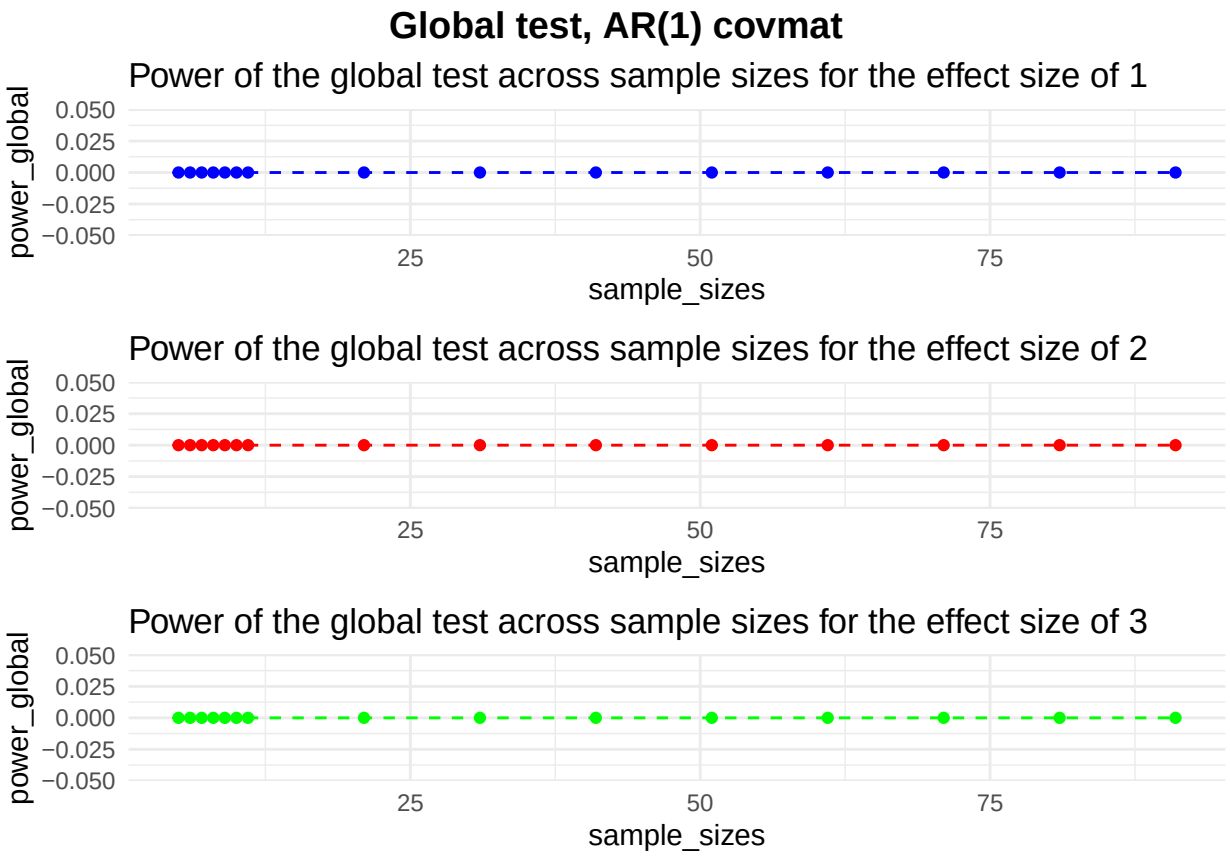


AR(1) covariance matrix

```
plot1 <- ggplot(sim1_AR1[sim1_AR1$effect_sizes == 1,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "blue") +
  geom_line(color = "blue", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 1") +
  theme_minimal()

plot2 <- ggplot(sim1_AR1[sim1_AR1$effect_sizes == 2,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "red") +
  geom_line(color = "red", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 2") +
  theme_minimal()

plot3 <- ggplot(sim1_AR1[sim1_AR1$effect_sizes == 3,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "green") +
  geom_line(color = "green", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 3") +
  theme_minimal()



combined_plot <- ggarrange(plot1, plot2, plot3, ncol = 1, nrow = 3)
```

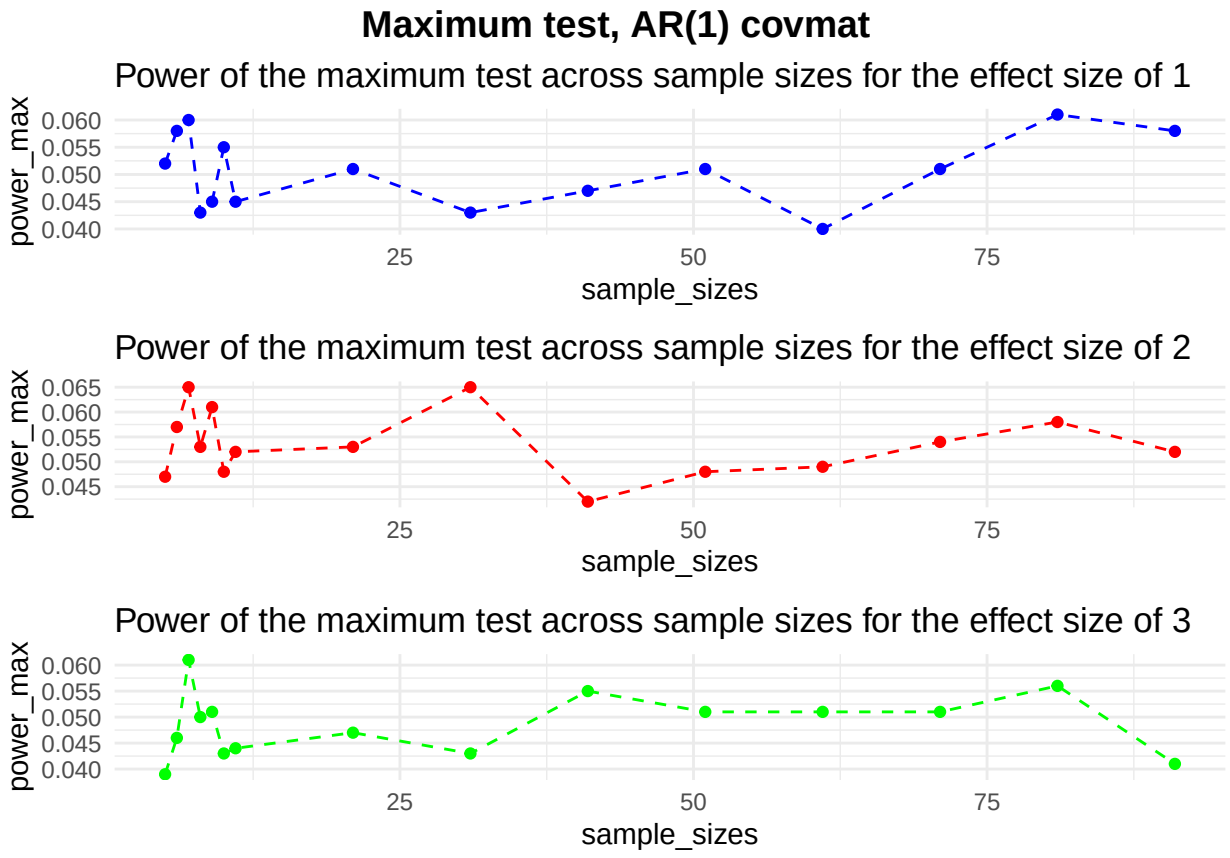
```
annotate_figure(combined_plot,
                top = text_grob("Global test, AR(1) covmat",
                                color = "black", face = "bold", size = 14))
```

Plot the power across the sample sizes for each effect size




```
plot1 <- ggplot(sim1_AR1[sim1_AR1$effect_sizes == 1,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "blue") +
  geom_line(color = "blue", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 1") +
  theme_minimal()

plot2 <- ggplot(sim1_AR1[sim1_AR1$effect_sizes == 2,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "red") +
  geom_line(color = "red", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 2") +
  theme_minimal()

plot3 <- ggplot(sim1_AR1[sim1_AR1$effect_sizes == 3,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "green") +
  geom_line(color = "green", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 3") +
  theme_minimal()
```

```
combined_plot <- ggarrange(plot1, plot2, plot3, ncol = 1, nrow = 3)
annotate_figure(combined_plot,
                top = text_grob("Maximum test, AR(1) covmat",
                                color = "black", face = "bold", size = 14))
```

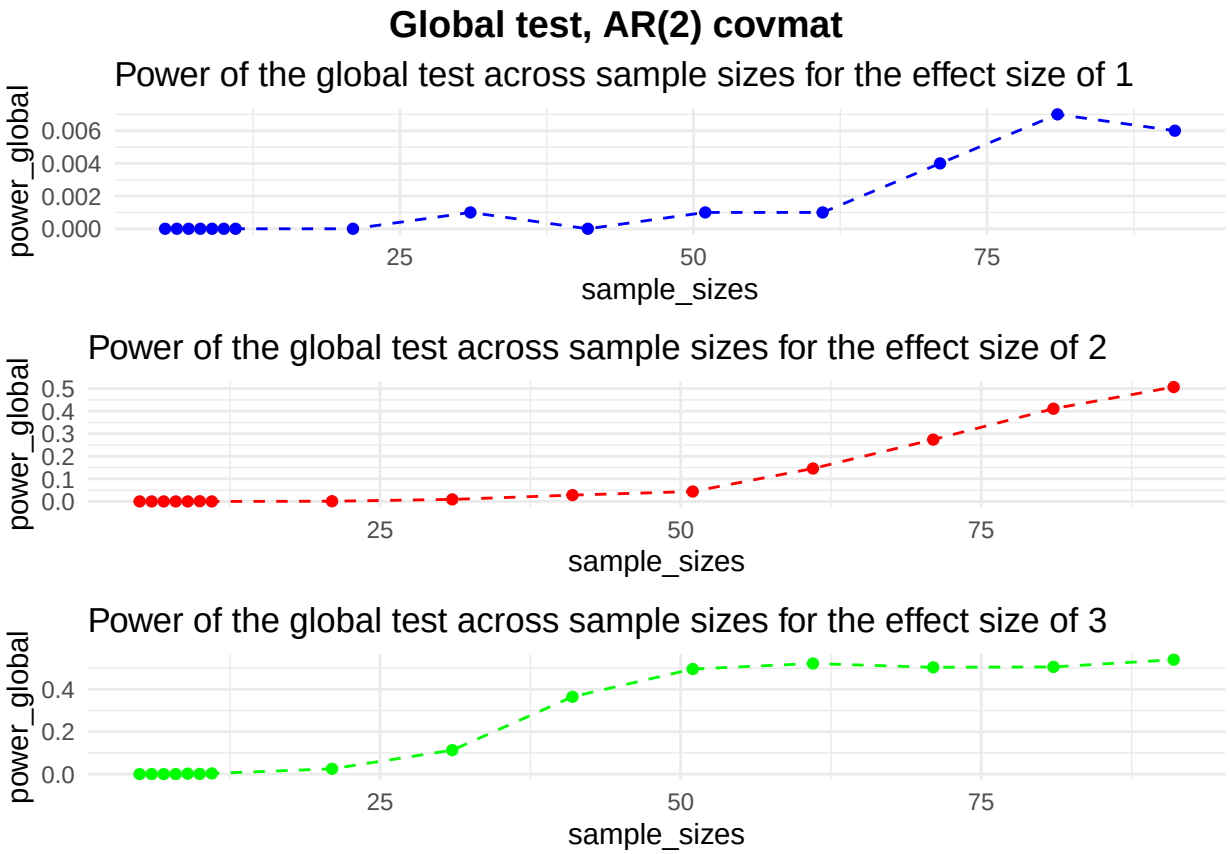


AR(2) covariance matrix

```
plot1 <- ggplot(sim1_AR2[sim1_AR2$effect_sizes == 1,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "blue") +
  geom_line(color = "blue", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 1") +
  theme_minimal()

plot2 <- ggplot(sim1_AR2[sim1_AR2$effect_sizes == 2,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "red") +
  geom_line(color = "red", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 2") +
  theme_minimal()

plot3 <- ggplot(sim1_AR2[sim1_AR2$effect_sizes == 3,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "green") +
  geom_line(color = "green", linetype = "dashed") +
```

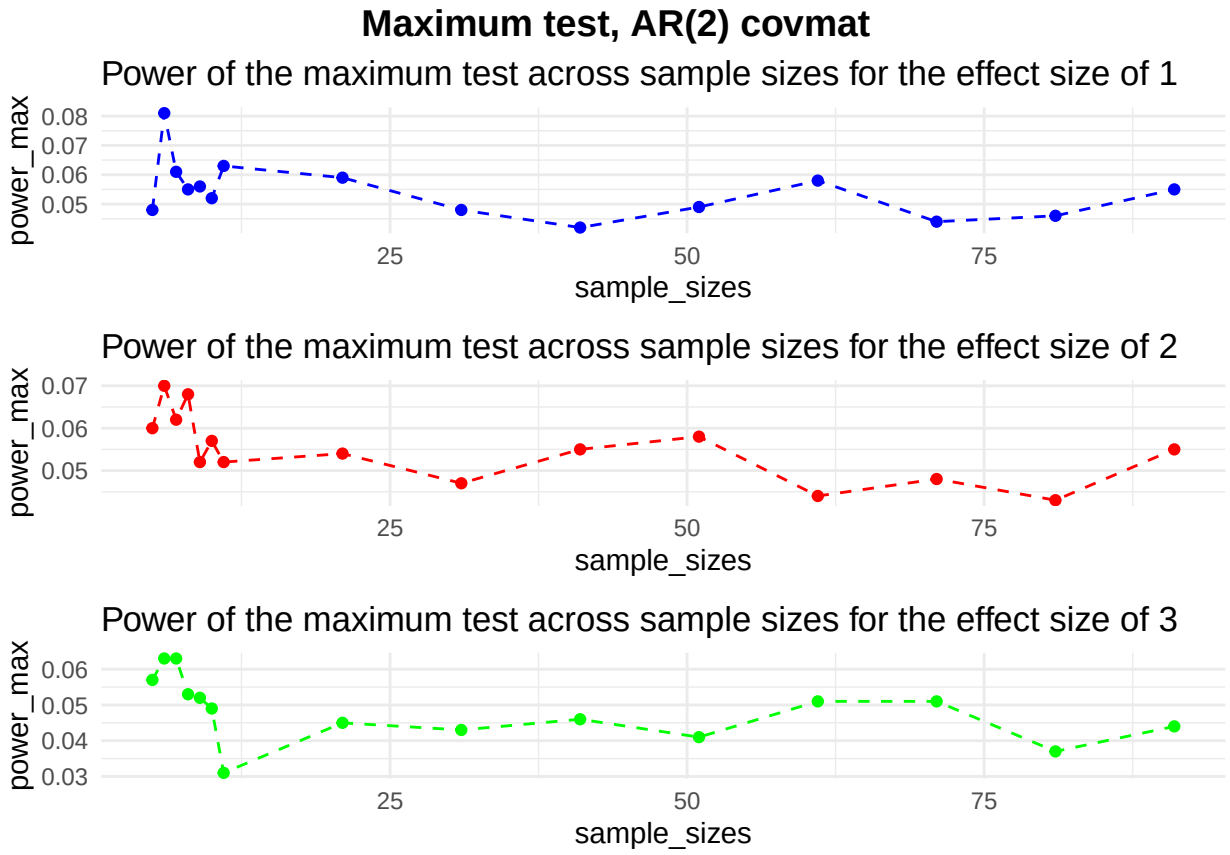
```
  ggtitle("Power of the global test across sample sizes for the effect size of 3") +
  theme_minimal()



combined_plot <- ggarrange(plot1, plot2, plot3, ncol = 1, nrow = 3)
annotate_figure(combined_plot,
                top = text_grob("Global test, AR(2) covmat",
                                color = "black", face = "bold", size = 14))
```

Plot the power across the sample sizes for each effect size




```
plot1 <- ggplot(sim1_AR2[sim1_AR2$effect_sizes == 1,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "blue") +
  geom_line(color = "blue", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 1") +
  theme_minimal()

plot2 <- ggplot(sim1_AR2[sim1_AR2$effect_sizes == 2,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "red") +
  geom_line(color = "red", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 2") +
  theme_minimal()

plot3 <- ggplot(sim1_AR2[sim1_AR2$effect_sizes == 3,], aes(x = sample_sizes, y = power_max)) +
```

```
  geom_point(color = "green") +
  geom_line(color = "green", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 3") +
  theme_minimal()



combined_plot <- ggarrange(plot1, plot2, plot3, ncol = 1, nrow = 3)
annotate_figure(combined_plot,
                top = text_grob("Maximum test, AR(2) covmat",
                                color = "black", face = "bold", size = 14))
```

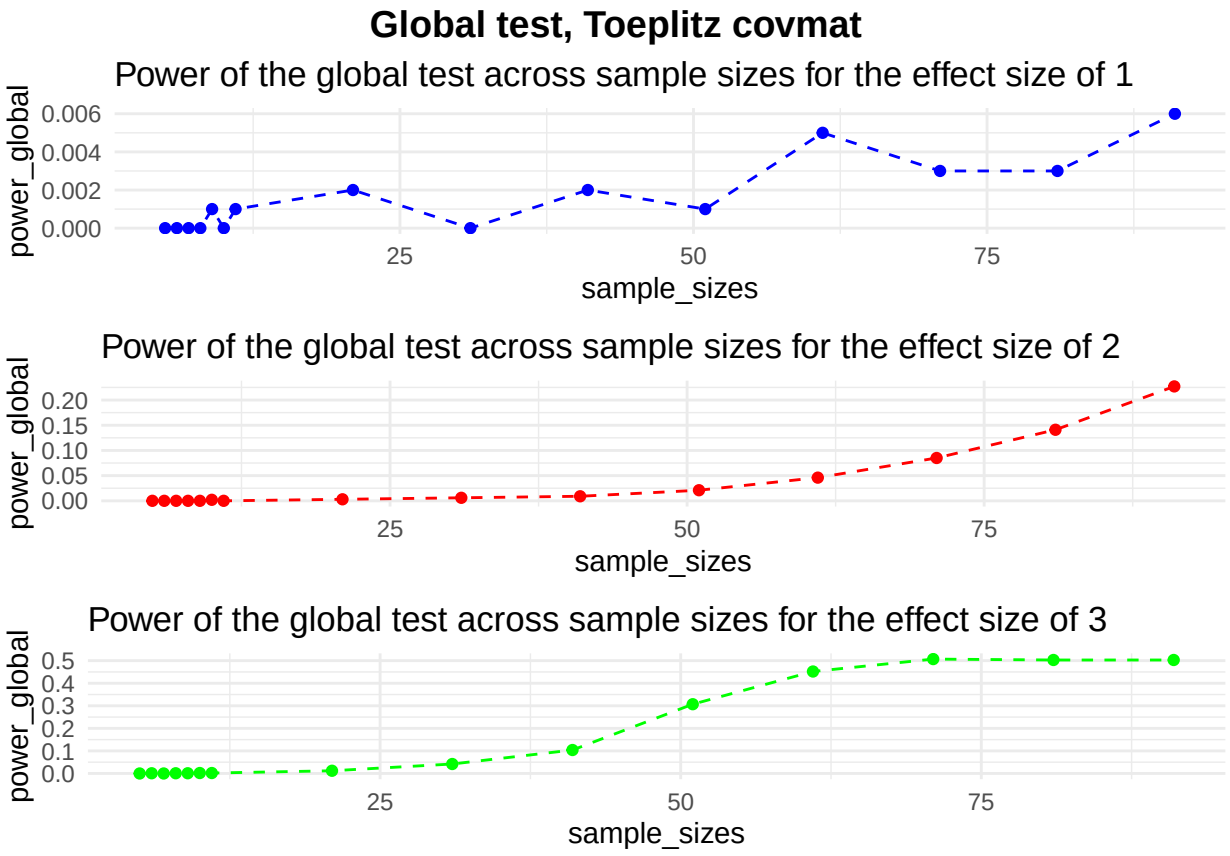


Toeplitz covariance matrix

```
plot1 <- ggplot(sim1_Toe[sim1_Toe$effect_sizes == 1,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "blue") +
  geom_line(color = "blue", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 1") +
  theme_minimal()

plot2 <- ggplot(sim1_Toe[sim1_Toe$effect_sizes == 2,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "red") +
```

```
  geom_line(color = "red", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 2") +
  theme_minimal()

plot3 <- ggplot(sim1_Toe[sim1_Toe$effect_sizes == 3,], aes(x = sample_sizes, y = power_global)) +
  geom_point(color = "green") +
  geom_line(color = "green", linetype = "dashed") +
  ggtitle("Power of the global test across sample sizes for the effect size of 3") +
  theme_minimal()



combined_plot <- ggarrange(plot1, plot2, plot3, ncol = 1, nrow = 3)
annotate_figure(combined_plot,
                top = text_grob("Global test, Toeplitz covmat",
                                color = "black", face = "bold", size = 14))
```

Plot the power across the sample sizes for each effect size




```
plot1 <- ggplot(sim1_Toe[sim1_Toe$effect_sizes == 1,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "blue") +
  geom_line(color = "blue", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 1") +
  theme_minimal()
```

```r
plot2 <- ggplot(sim1_Toe[sim1_Toe$effect_sizes == 2,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "red") +
  geom_line(color = "red", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 2") +
  theme_minimal()

plot3 <- ggplot(sim1_Toe[sim1_Toe$effect_sizes == 3,], aes(x = sample_sizes, y = power_max)) +
  geom_point(color = "green") +
  geom_line(color = "green", linetype = "dashed") +
  ggtitle("Power of the maximum test across sample sizes for the effect size of 3") +
  theme_minimal()



combined_plot <- ggarrange(plot1, plot2, plot3, ncol = 1, nrow = 3)
annotate_figure(combined_plot,
                top = text_grob("Maximum test, Toeplitz covmat",
                                color = "black", face = "bold", size = 14))
```