4-exploration

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Need to use the following R packages and functions:

```
# load libraries
library(kableExtra)                    # for printing tables
library(cowplot)                       # for side by side plots
library(lubridate)                     # for dealing with dates
library(maps)                          # for creating maps
library(tidyverse)
library(ggcorrplot)                    # for correlation plots
```

```
## Rows: 599 Columns: 316
```

```
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl  (315): AHECONS, AHEMAN, AHETPI, AWHI, AWHMAN, AWHNONAG, AWOTMAN, CE16OV...
## date   (1): date
```

```
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
## Rows: 479 Columns: 32
```

```
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl  (31): AHECONS, AWHMAN, AWHNONAG, AWOTMAN, CES0600000006, CES0600000039,...
## date  (1): date
```

```
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
## Rows: 120 Columns: 32
```

```
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl  (31): AHECONS, AWHMAN, AWHNONAG, AWOTMAN, CES0600000006, CES0600000039,...
## date  (1): date
```

```
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

Difference Between Total U.S. Unemployment and Black Unemployment

#Create plots to compare:

```r
# set colors to use for graphs
cols <- c("Total U.S."="#f04546","African American"="#3591d1")

# plot both unemployment rates for all years
all_year_plot = econ_data %>%
  ggplot() +
  geom_line(mapping = aes(x=date,y=unemployment_rate, colour = "Total U.S.")) +
  geom_line(mapping = aes(x=date,y=black_unemployment, color = "African American")) +
  ggtitle("Total U.S. vs. African American Unemployment Rate (1972-2021)") +
  theme_bw() +
  theme(axis.title.x = element_text(size = 8)) +
  scale_colour_manual(name="Unemployment Metric",values=cols)  +
  labs(
    x = "Date",
    y = "Unemployment Rate"
  )
# save the plot
ggsave(filename = "~/Desktop/STAT471/unemployment-project/results/all-year-comparison-plot.png",
       plot = all_year_plot,
       device = "png",
       width = 8,
       height = 3)
```

```r
# set colors to use for graphs
cols <- c("Total U.S."="#f04546","African American"="#3591d1")

# plot both unemployment rates after 2010
after_2010_plot= econ_data %>% filter(date > as.Date("2010-01-01")) %>%
  ggplot() +
  geom_line(mapping = aes(x=date,y=unemployment_rate, colour = "Total U.S.")) +
  geom_line(mapping = aes(x=date,y=black_unemployment, color = "African American")) +
  ggtitle("Total U.S. vs. African American Unemployment Rate (2010-2021)") +
  theme_bw() +
  theme(axis.title.x = element_text(size = 8)) +
  scale_colour_manual(name="Unemployment Metric",values=cols)  +
  labs(
    x = "Date",
    y = "Unemployment Rate"
  )
# save the plot
ggsave(filename =
         "~/Desktop/STAT471/unemployment-project/results/after-2010-comparison-plot.png",
       plot = after_2010_plot,
       device = "png",
       width = 8,
       height = 3)
```

```r
# set colors to use for graphs
cols <- c("Total U.S."="#f04546","African American"="#3591d1")

# plot both unemployment rates after 2010
pct_dif_plot= econ_data %>%
  ggplot() +
  geom_line(mapping = aes(x=date,y=percent_dif_unemploy)) +
```

```
  ggtitle("Percent Difference Unemployment Rate Total U.S. vs. African American (1972-2021)") +
  theme_bw() +
  theme(axis.title.x = element_text(size = 8)) +
  labs(
    x = "Date",
    y = "Percent Difference"
  )
# save the plot
ggsave(filename =
         "~/Desktop/STAT471/unemployment-project/results/percent-difference-plot.png",
       plot = pct_dif_plot,
       device = "png",
       width = 8,
       height = 3)
```

Consider Phillips Curve - plot Unemployment vs. Inflation

Does the Phillips Curve hold true for either party?

```
# set colors to use for graphs
cols <- c("Total U.S."="#f04546","African American"="#3591d1")

# plot both unemployment rates after 2010

phillips_curve_US = econ_data %>%
  summarise(year = year(date), unemployment_rate, black_unemployment, inflation) %>%
  group_by(year) %>%
  summarise(unemployment_rate = mean(unemployment_rate), black_unemployment = mean(black_unemployment),
            inflation = mean(inflation)) %>%
  ggplot() +
  geom_line(mapping = aes(x=unemployment_rate,y=inflation, colour = "Total U.S.")) +
  ggtitle("Percent Difference Unemployment Rate Total U.S. vs.
          African American (1972-2021)") +
  theme_bw() +
  scale_colour_manual(name="Unemployment Metric",values=cols)  +
  theme(axis.title.x = element_text(size = 8)) +
  labs(
    x = "Unemployment Rate",
    y = "Inflation"
  )
# save the plot
ggsave(filename =
         "~/Desktop/STAT471/unemployment-project/results/phillips-curve-us-plot.png",
       plot = phillips_curve_US,
       device = "png",
       width = 8,
       height = 3)
```

```
# set colors to use for graphs
cols <- c("Total U.S."="#f04546","African American"="#3591d1")

# plot both unemployment rates after 2010
phillips_curve_black = econ_data %>%
```

```
  summarise(year = year(date), unemployment_rate, black_unemployment, inflation) %>%
  group_by(year) %>%
  summarise(unemployment_rate = mean(unemployment_rate),
            black_unemployment = mean(black_unemployment),
            inflation = mean(inflation)) %>%
  ggplot() +
  geom_line(mapping = aes(x=black_unemployment,y=inflation, colour = "African American")) +
  ggtitle("Percent Difference Unemployment Rate Total U.S. vs.
          African American (1972-2021)") +
  theme_bw() +
  scale_colour_manual(name="Unemployment Metric",values=cols)  +
  theme(axis.title.x = element_text(size = 8)) +
  labs(
    x = "Unemployment Rate",
    y = "Inflation"
  )
# save the plot
ggsave(filename =
         "~/Desktop/STAT471/unemployment-project/results/phillips-curve-black-plot.png",
       plot = phillips_curve_black,
       device = "png",
       width = 8,
       height = 3)
```

```
# set colors to use for graphs
cols <- c("Total U.S."="#f04546","African American"="#3591d1")

# plot both unemployment rates after 2010
fed_funds_plot = econ_data %>%
  ggplot() +
  geom_line(mapping = aes(x=federal_funds_rate,y=unemployment_rate,
                          colour = "Total U.S.")) +
  geom_line(mapping = aes(x=federal_funds_rate,y=black_unemployment,
                          colour = "African American")) +
  ggtitle("Percent Difference Unemployment Rate Total U.S. vs.
          African American (1972-2021)") +
  theme_bw() +
  scale_colour_manual(name="Unemployment Metric",values=cols)  +
  theme(axis.title.x = element_text(size = 8)) +
  labs(
    x = "Federal Funds Rate",
    y = "Unemployment Rate"
  )
# save the plot
ggsave(filename =
         "~/Desktop/STAT471/unemployment-project/results/fed-funds-plot.png",
       plot = fed_funds_plot,
       device = "png",
       width = 8,
       height = 3)
```

##Summary Stats for Train Data

Calculate mean unemployment

```
# All data
mean_all_years = econ_data_train %>%
  summarise("Time" = "1972-2021", "Total U.S." = mean(unemployment_rate),
            "African American" = mean(black_unemployment))

# After 2010
mean_last_10years = econ_data_train %>%
  filter(date > as.Date("2010-01-01")) %>%
  summarise("Time" = "2010-2021", "Total U.S." = mean(unemployment_rate),
            "African American" = mean(black_unemployment))

mean_unemploy = rbind(mean_all_years, mean_last_10years)

mean_unemploy  %>%
  kable(format = "latex", row.names = NA,
        booktabs = TRUE, digits = 2,
        caption = "Mean Unemployment for Both Metrics") %>%
  kable_styling(position = "center") %>%
  save_kable(file =
     "~/Desktop/STAT471/unemployment-project/results/mean-unemployment-chart.pdf",
             self_contained = T)
```

Calculate mean difference between total unemployment and African American unemployment

```
mean_dif = econ_data_train %>%
  summarise(mean_difference = mean(percent_dif_unemploy))

top_5_dif = econ_data_train %>%
  select(date, percent_dif_unemploy) %>%
  arrange(desc(percent_dif_unemploy)) %>%
  head(5)

top_5_dif_after_2010 = econ_data_train %>% filter(date > as.Date("2010-01-01")) %>%
  select(date, percent_dif_unemploy) %>%
  arrange(desc(percent_dif_unemploy)) %>%
  head(5)
```

Which year has highest difference between black and total unemployment?

```
top_5_dif = econ_data_train %>%
  select(date, percent_dif_unemploy) %>%
  arrange(desc(percent_dif_unemploy)) %>%
  head(5)

top_5_dif_after_2010 = econ_data_train %>% filter(date > as.Date("2010-01-01")) %>%
  select(date, percent_dif_unemploy) %>%
```

```
  arrange(desc(percent_dif_unemploy)) %>%
  head(5)
```