Human Freedom Index Project

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```r
library(tidyverse)
hfi <- read_csv("data/hfi_cc_2019.csv")
```

```r
glimpse(hfi)
```

```
## Rows: 1,620
## Columns: 120
## $ year                              <dbl> 2017, 2017, 2017, 2017, 2017, 20...
## $ ISO_code                          <chr> "ALB", "DZA", "AGO", "ARG", "ARM...
## $ countries                         <chr> "Albania", "Algeria", "Angola", ...
## $ region                            <chr> "Eastern Europe", "Middle East &...
## $ hf_score                          <chr> "7.84", "4.99", "5.4", "6.86", "...
## $ hf_rank                           <chr> "38", "155", "151", "77", "54", ...
## $ hf_quartile                       <chr> "1", "4", "4", "2", "2", "1", "1...
## $ pf_rol_procedural                 <chr> "6.7", "-", "-", "7.1", "-", "8....
## $ pf_rol_civil                      <chr> "4.5", "-", "-", "5.8", "-", "7....
## $ pf_rol_criminal                   <chr> "4.7", "-", "-", "4.3", "-", "7....
## $ pf_rol                            <chr> "5.3", "3.8", "3.4", "5.7", "4.9...
## $ pf_ss_homicide                    <chr> "9.1", "9.5", "8.1", "8", "9", "...
## $ pf_ss_disappearances_disap        <chr> "10", "10", "10", "5", "10", "10...
## $ pf_ss_disappearances_violent      <chr> "10", "9.5", "9.7", "10", "10", ...
## $ pf_ss_disappearances_organized    <chr> "10", "5", "7.5", "7.5", "7.5", ...
## $ pf_ss_disappearances_fatalities   <chr> "10", "9.9", "9.9", "10", "10", ...
## $ pf_ss_disappearances_injuries     <chr> "10", "9.9", "7.2", "10", "10", ...
## $ pf_ss_disappearances              <chr> "10", "8.9", "8.9", "8.5", "9.5"...
## $ pf_ss_women_fgm                   <chr> "10", "10", "10", "10", "10", "1...
## $ pf_ss_women_inheritance_widows    <chr> "-", "-", "-", "-", "-", "-", "-...
## $ pf_ss_women_inheritance_daughters <chr> "-", "-", "-", "-", "-", "-", "-...
## $ pf_ss_women_inheritance           <chr> "7.5", "0", "5", "10", "7.5", "1...
## $ pf_ss_women                       <chr> "8.8", "5", "7.5", "10", "8.8", ...
## $ pf_ss                             <chr> "9.3", "7.8", "8.1", "8.8", "9.1...
## $ pf_movement_domestic              <chr> "10", "10", "5", "10", "10", "10...
## $ pf_movement_foreign               <chr> "10", "5", "5", "10", "5", "10",...
## $ pf_movement_women                 <chr> "10", "2.5", "10", "10", "10", "...
## $ pf_movement                       <chr> "10", "5.8", "6.7", "10", "8.3",...
## $ pf_religion_estop_establish       <chr> "-", "-", "-", "-", "-", "-", "-...
## $ pf_religion_estop_operate         <chr> "-", "-", "-", "-", "-", "-", "-...
## $ pf_religion_estop                 <chr> "10", "5", "10", "7.5", "5", "10...
## $ pf_religion_harassment            <chr> "9.6", "6.9", "8.9", "9", "8.6",...
## $ pf_religion_restrictions          <chr> "8", "3", "7.5", "6.9", "5.1", "...
## $ pf_religion                       <chr> "9.2", "4.9", "8.8", "7.8", "6.2...
## $ pf_association_association        <chr> "10", "5", "2.5", "7.5", "7.5", ...
## $ pf_association_assembly           <chr> "10", "5", "2.5", "10", "7.5", "...
## $ pf_association_political_establish <chr> "-", "-", "-", "-", "-", "-", "-...
```

```
## $ pf_association_political_operate   <chr> "-", "-", "-", "-", "-", "-", "-...
## $ pf_association_political           <chr> "10", "5", "2.5", "5", "5", "10"...
## $ pf_association_prof_establish       <chr> "-", "-", "-", "-", "-", "-", "-...
## $ pf_association_prof_operate         <chr> "-", "-", "-", "-", "-", "-", "-...
## $ pf_association_prof                 <chr> "10", "5", "5", "7.5", "5", "10"...
## $ pf_association_sport_establish      <chr> "-", "-", "-", "-", "-", "-", "-...
## $ pf_association_sport_operate        <chr> "-", "-", "-", "-", "-", "-", "-...
## $ pf_association_sport                <chr> "10", "5", "7.5", "7.5", "7.5", ...
## $ pf_association                      <chr> "10", "5", "4", "7.5", "6.5", "1...
## $ pf_expression_killed                <chr> "10", "10", "10", "10", "10", "1...
## $ pf_expression_jailed                <chr> "10", "9.5", "10", "10", "10", "...
## $ pf_expression_influence             <chr> "5", "2.7", "2.7", "5.7", "3.3",...
## $ pf_expression_control               <chr> "5.3", "4", "2.5", "5.5", "4.3",...
## $ pf_expression_cable                 <chr> "10", "10", "7.5", "10", "7.5", ...
## $ pf_expression_newspapers            <chr> "10", "7.5", "5", "10", "7.5", "...
## $ pf_expression_internet              <chr> "10", "7.5", "7.5", "10", "7.5",...
## $ pf_expression                       <chr> "8.6", "7.3", "6.5", "8.7", "7.2...
## $ pf_identity_legal                   <chr> "0", "-", "10", "10", "7", "7", ...
## $ pf_identity_sex_male                <chr> "10", "0", "0", "10", "10", "10"...
## $ pf_identity_sex_female              <chr> "10", "0", "0", "10", "10", "10"...
## $ pf_identity_sex                     <chr> "10", "0", "0", "10", "10", "10"...
## $ pf_identity_divorce                 <chr> "7.5", "0", "5", "10", "7.5", "1...
## $ pf_identity                         <chr> "5.8", "0", "5", "10", "8.2", "9...
## $ pf_score                            <chr> "8.01", "5.2", "5.98", "8.04", "...
## $ pf_rank                             <chr> "46", "146", "121", "41", "72", ...
## $ ef_government_consumption           <chr> "8.1", "2.7", "6.3", "5.4", "7.2...
## $ ef_government_transfers             <chr> "7.3", "7.8", "8.9", "6.3", "7.3...
## $ ef_government_enterprises           <chr> "8", "0", "6", "6", "8", "10", "...
## $ ef_government_tax_income            <chr> "9", "7", "10", "7", "5", "6", "...
## $ ef_government_tax_payroll           <chr> "7", "2", "9", "1", "5", "5", "3...
## $ ef_government_tax                   <chr> "8", "4.5", "9.5", "4", "5", "5....
## $ ef_government_soa                   <chr> "6.2", "2.9", "3.1", "6.9", "9.5...
## $ ef_government                       <chr> "7.5", "3.6", "6.8", "5.7", "7.4...
## $ ef_legal_judicial                   <chr> "2.5", "4.3", "1.4", "3.6", "4",...
## $ ef_legal_courts                     <chr> "3.1", "4.3", "1.7", "3", "4.2",...
## $ ef_legal_protection                 <chr> "4.6", "4.8", "3.3", "4.4", "5.8...
## $ ef_legal_military                   <chr> "8.3", "4.2", "3.3", "7.5", "5.8...
## $ ef_legal_integrity                  <chr> "4.2", "5", "4.2", "3.3", "5", "...
## $ ef_legal_enforcement                <chr> "4.4", "4.4", "2.3", "3.6", "5.2...
## $ ef_legal_restrictions               <chr> "6.6", "6.6", "5.5", "6.9", "9.8...
## $ ef_legal_police                     <chr> "6.8", "6.1", "3.4", "3.7", "5.8...
## $ ef_legal_crime                      <chr> "6.2", "6.7", "4.3", "4.1", "7",...
## $ ef_legal_gender                     <chr> "1", "0.8", "0.8", "0.8", "1", "...
## $ ef_legal                            <chr> "5.1", "4.7", "3", "4", "5.9", "...
## $ ef_money_growth                     <dbl> 9.3, 7.0, 9.4, 5.0, 8.6, 9.0, 8....
## $ ef_money_sd                         <chr> "9.7", "8.5", "4.2", "6", "9.5",...
## $ ef_money_inflation                  <dbl> 9.6, 8.9, 3.7, 4.9, 9.8, 9.6, 9....
## $ ef_money_currency                   <chr> "10", "5", "5", "10", "10", "10"...
## $ ef_money                            <chr> "9.6", "7.3", "5.6", "6.5", "9.5...
## $ ef_trade_tariffs_revenue            <chr> "9.6", "8.5", "9.2", "6.7", "9",...
## $ ef_trade_tariffs_mean               <chr> "9.3", "6.2", "7.7", "7.3", "8.8...
## $ ef_trade_tariffs_sd                 <chr> "8.1", "5.9", "4.3", "5.9", "8.1...
## $ ef_trade_tariffs                    <chr> "9", "6.9", "7.1", "6.6", "8.6",...
## $ ef_trade_regulatory_nontariff       <chr> "6", "4.8", "4.9", "4.6", "5.7",...
```
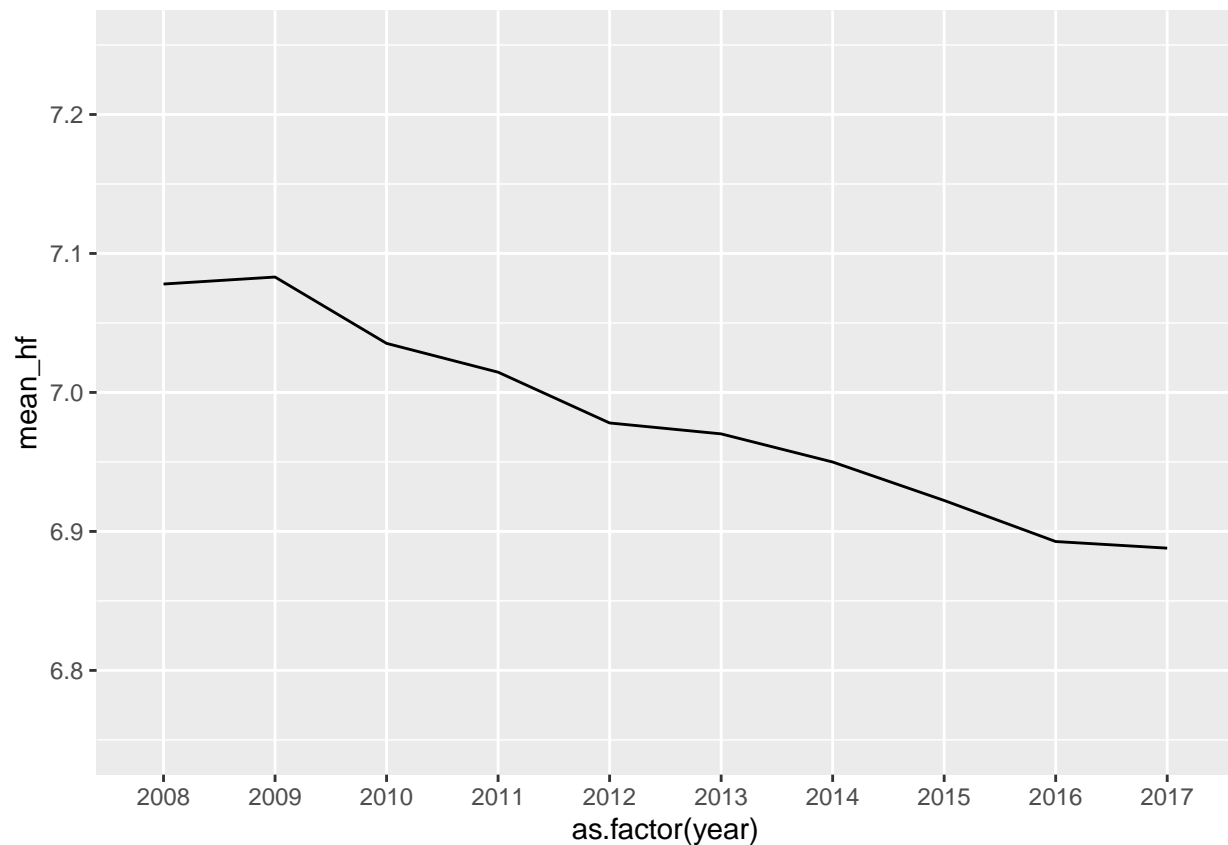
```
## $ ef_trade_regulatory_compliance      <chr> "9.4", "0.5", "2.5", "5.2", "9",...
## $ ef_trade_regulatory                  <chr> "7.7", "2.6", "3.7", "4.9", "7.4...
## $ ef_trade_black                       <chr> "10", "0", "0", "10", "10", "10"...
## $ ef_trade_movement_foreign            <chr> "6.3", "3.7", "2.9", "5.4", "5.1...
## $ ef_trade_movement_capital            <chr> "5.4", "0", "3.1", "0.8", "5.4",...
## $ ef_trade_movement_visit              <chr> "8.3", "1.1", "0.1", "8", "10", ...
## $ ef_trade_movement                    <chr> "6.7", "1.6", "2", "4.7", "6.8",...
## $ ef_trade                             <chr> "8.3", "2.8", "3.2", "6.5", "8.2...
## $ ef_regulation_credit_ownership       <chr> "10", "0", "5", "5", "10", "10",...
## $ ef_regulation_credit_private         <chr> "9.1", "5.3", "9.2", "4.3", "7.8...
## $ ef_regulation_credit_interest        <chr> "10", "10", "6", "9", "10", "10"...
## $ ef_regulation_credit                 <chr> "9.7", "5.1", "6.7", "6.1", "9.3...
## $ ef_regulation_labor_minwage          <chr> "5.6", "5.6", "10", "2.8", "6.7"...
## $ ef_regulation_labor_firing           <chr> "5.4", "4.1", "4.4", "2.2", "5.7...
## $ ef_regulation_labor_bargain          <chr> "6.4", "6", "7.2", "3.3", "6.8",...
## $ ef_regulation_labor_hours            <chr> "8", "6", "4", "10", "10", "10",...
## $ ef_regulation_labor_dismissal        <chr> "6.3", "7.8", "6.6", "2.5", "9.3...
## $ ef_regulation_labor_conscription     <chr> "10", "3", "0", "10", "0", "10",...
## $ ef_regulation_labor                  <chr> "6.9", "5.4", "5.4", "5.1", "6.4...
## $ ef_regulation_business_adm           <chr> "6.3", "3.7", "2.4", "2.5", "4.6...
## $ ef_regulation_business_bureaucracy   <chr> "6.7", "1.8", "1.3", "7.1", "6.2...
## $ ef_regulation_business_start         <chr> "9.7", "9.3", "8.7", "9.6", "9.9...
## $ ef_regulation_business_bribes        <chr> "4.1", "3.8", "1.9", "3.3", "4.6...
## $ ef_regulation_business_licensing     <chr> "6", "8.7", "8.1", "5.4", "9.3",...
## $ ef_regulation_business_compliance    <chr> "7.2", "7", "6.8", "6.5", "7.1",...
## $ ef_regulation_business               <chr> "6.7", "5.7", "4.9", "5.7", "6.9...
## $ ef_regulation                        <chr> "7.8", "5.4", "5.7", "5.6", "7.5...
## $ ef_score                             <chr> "7.67", "4.77", "4.83", "5.67", ...
## $ ef_rank                              <chr> "30", "159", "158", "147", "27",...
```

Question 1

How has overall freedom around the world changed over time?

```r
hfscore_by_year <- hfi %>%
  filter(hf_score != "-") %>%
  group_by(year) %>%
  summarize(mean_hf = mean(as.numeric(hf_score)))

ggplot(data = hfscore_by_year,
       aes(x = as.factor(year), y = mean_hf, group = 1)) +
  geom_line(stat = "identity") +
  ylim(6.75, 7.25)
```
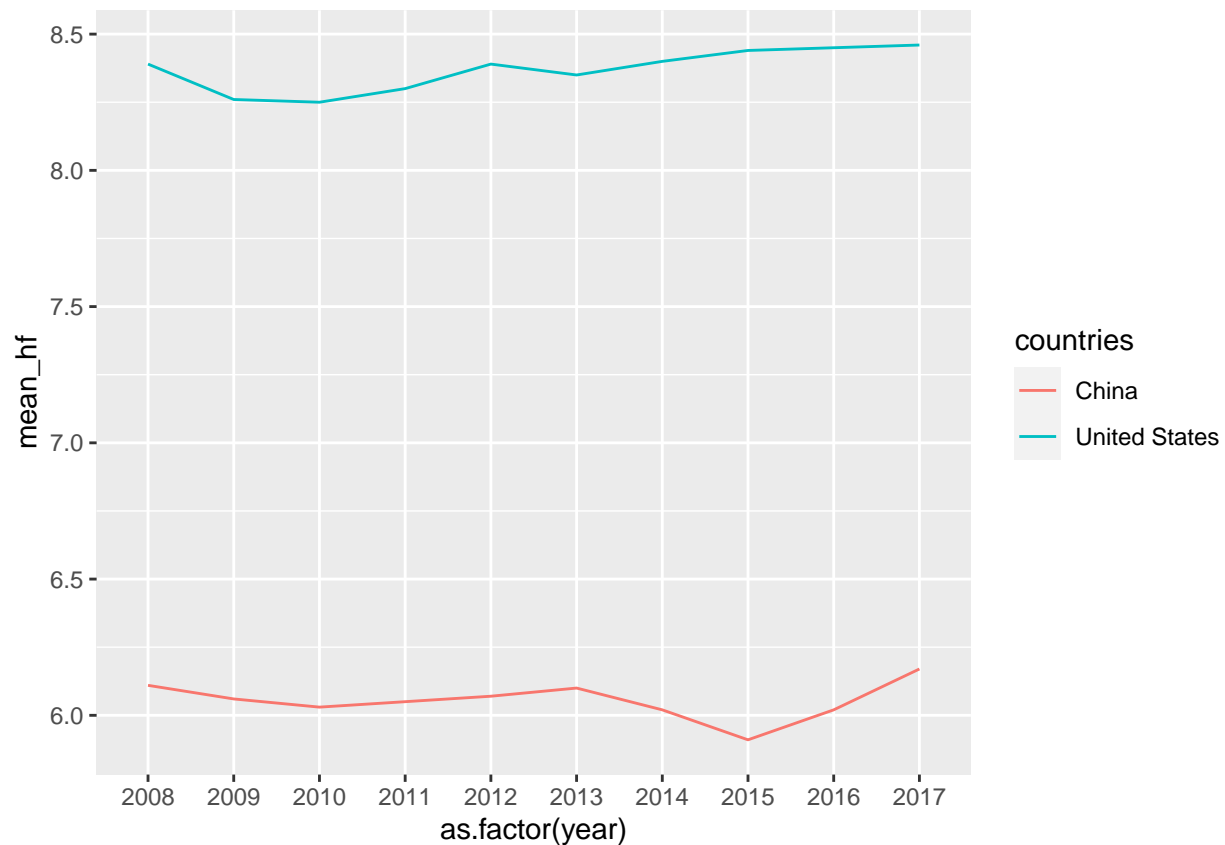
Question 2

How has overall freedom in the U.S. and China changed over time?

```
hfscore_china_us <- hfi %>%
  filter(hf_score != "-" &
           (countries == "China" | countries == "United States")) %>%
  group_by(year, countries) %>%
  summarize(mean_hf = mean(as.numeric(hf_score)))

ggplot(data = hfscore_china_us,
       aes(x = as.factor(year), y = mean_hf, group = countries, color = countries)) +
  geom_line(stat = "identity")
```

Question 3

In countries with the highest overall freedom scores, which freedoms are particularly high?

```
hfi %>%
  filter(hf_rank != "-") %>%
  group_by(countries) %>%
  mutate(avg_rank = mean(as.numeric(hf_rank))) %>%
  distinct(countries, avg_rank) %>%
  arrange(desc(avg_rank)) %>%
  summarize(countries, avg_rank)
```

```
## # A tibble: 162 x 2
##     countries  avg_rank
##     <chr>         <dbl>
##  1 Albania         47.4
##  2 Algeria        148.
##  3 Angola         142.
##  4 Argentina       88
##  5 Armenia         53.4
##  6 Australia        5.1
##  7 Austria         13.2
##  8 Azerbaijan     121.
##  9 Bahamas         46.9
## 10 Bahrain         90.6
## # ... with 152 more rows
```

Question 4

What is the correlation between economic and personal freedom?

```
corr_efpf <- hfi %>%
  filter(pf_score != "-" & ef_score != "-") %>%
  group_by(countries) %>%
  mutate(corr_ef_pf = cor(as.numeric(ef_score), as.numeric(pf_score))) %>%
  distinct(countries, corr_ef_pf) %>%
  summarize(countries, corr_ef_pf)
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
ggplot(data = corr_efpf, aes(x = corr_ef_pf)) +
  geom_histogram(bins = 20)
```