DATA 608 Story Two

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Overview

The assignment as provided is: "The Federal Reserve's policies and broader economic trends are often reflected in the interplay between interest rates, market prices, and bond yields. These indicators are critical for understanding economic health and investor sentiment. Your task is to analyze their relationships to determine whether patterns or trends are evident.

Research Question:

Are there visible relationships among interest rates, market prices (DJIA), and bond yields (10-year Treasury)? Your analysis should explore the potential interactions and correlations between these key economic indicators over the past 25 years."

To answer these questions, I'm instructed to collect monthly data for the below from the FRED API that's maintained by the Federal Reserve Bank of St. Louis * Down Jones Industrial Average * 10-Year Treasury Yield * Unemployment Rate

Additionally, the assignment states: "You must use base R for this assignment (e.g., plot, lines, par). External libraries such as ggplot2 are not permitted."

API Setup

I created an account with the St. Louis Fed and received an API key. This key is stored in the `.Renviron` file as "FRED_API_KEY" and will be referenced that way below.

```
# these are baseline R libraries
library(httr)
library(jsonlite)

FRED_API_KEY <- Sys.getenv("FRED_API_KEY")
dj_id <- "DJIA"
treasury_id <- "DGS1"
unemp_id <- "UNRATE"
observ_start <- "2000-01-01"
observ_end <- "2024-12-31"
frequency <- "m"
agg_method <- "avg"
file_type <- "json"
fred_obs_url <- "https://api.stlouisfed.org/fred/series/observations"
```

Down Jowns Industrial API Call + Cleanup

This section performs an API call to FRED using some of the above declared parameters.

Please Note: the earliest date available for this data is January 1st, 2015.

```r
djia_res <- GET(fred_obs_url, query = list(
  series_id = dj_id,
  api_key = FRED_API_KEY,
  observation_start = observ_start,
  observation_end = observ_end,
  frequency = frequency,
  aggregation_method = agg_method,
  file_type = file_type
))

djia_raw <- fromJSON(content(djia_res, "text"))
djia_df <- as.data.frame(djia_raw$observations)

djia_df
```

```
##     realtime_start realtime_end       date    value
## 1       2025-02-16   2025-02-16 2015-02-01        .
## 2       2025-02-16   2025-02-16 2015-03-01 17931.75
## 3       2025-02-16   2025-02-16 2015-04-01 17970.51
## 4       2025-02-16   2025-02-16 2015-05-01 18124.71
## 5       2025-02-16   2025-02-16 2015-06-01 17927.22
## 6       2025-02-16   2025-02-16 2015-07-01 17795.02
## 7       2025-02-16   2025-02-16 2015-08-01 17061.59
## 8       2025-02-16   2025-02-16 2015-09-01 16339.95
## 9       2025-02-16   2025-02-16 2015-10-01 17182.28
## 10      2025-02-16   2025-02-16 2015-11-01 17723.77
## 11      2025-02-16   2025-02-16 2015-12-01 17542.86
## 12      2025-02-16   2025-02-16 2016-01-01 16305.25
## 13      2025-02-16   2025-02-16 2016-02-01 16299.90
## 14      2025-02-16   2025-02-16 2016-03-01 17302.14
## 15      2025-02-16   2025-02-16 2016-04-01 17844.37
## 16      2025-02-16   2025-02-16 2016-05-01 17692.32
## 17      2025-02-16   2025-02-16 2016-06-01 17754.87
## 18      2025-02-16   2025-02-16 2016-07-01 18341.18
## 19      2025-02-16   2025-02-16 2016-08-01 18495.19
## 20      2025-02-16   2025-02-16 2016-09-01 18267.40
## 21      2025-02-16   2025-02-16 2016-10-01 18184.55
## 22      2025-02-16   2025-02-16 2016-11-01 18697.33
## 23      2025-02-16   2025-02-16 2016-12-01 19712.42
## 24      2025-02-16   2025-02-16 2017-01-01 19908.15
## 25      2025-02-16   2025-02-16 2017-02-01 20424.14
## 26      2025-02-16   2025-02-16 2017-03-01 20823.06
## 27      2025-02-16   2025-02-16 2017-04-01 20684.69
## 28      2025-02-16   2025-02-16 2017-05-01 20936.81
## 29      2025-02-16   2025-02-16 2017-06-01 21317.80
## 30      2025-02-16   2025-02-16 2017-07-01 21581.25
## 31      2025-02-16   2025-02-16 2017-08-01 21914.08
## 32      2025-02-16   2025-02-16 2017-09-01 22173.41
## 33      2025-02-16   2025-02-16 2017-10-01 23036.24
## 34      2025-02-16   2025-02-16 2017-11-01 23557.93
## 35      2025-02-16   2025-02-16 2017-12-01 24545.38
## 36      2025-02-16   2025-02-16 2018-01-01 25804.02
## 37      2025-02-16   2025-02-16 2018-02-01 24981.55
## 38      2025-02-16   2025-02-16 2018-03-01 24582.17
```

```
## 39      2025-02-16   2025-02-16 2018-04-01 24304.21
## 40      2025-02-16   2025-02-16 2018-05-01 24572.53
## 41      2025-02-16   2025-02-16 2018-06-01 24790.11
## 42      2025-02-16   2025-02-16 2018-07-01 24978.23
## 43      2025-02-16   2025-02-16 2018-08-01 25629.99
## 44      2025-02-16   2025-02-16 2018-09-01 26232.67
## 45      2025-02-16   2025-02-16 2018-10-01 25609.34
## 46      2025-02-16   2025-02-16 2018-11-01 25258.68
## 47      2025-02-16   2025-02-16 2018-12-01 23805.55
## 48      2025-02-16   2025-02-16 2019-01-01 24157.80
## 49      2025-02-16   2025-02-16 2019-02-01 25605.53
## 50      2025-02-16   2025-02-16 2019-03-01 25722.62
## 51      2025-02-16   2025-02-16 2019-04-01 26401.58
## 52      2025-02-16   2025-02-16 2019-05-01 25744.79
## 53      2025-02-16   2025-02-16 2019-06-01 26160.10
## 54      2025-02-16   2025-02-16 2019-07-01 27089.19
## 55      2025-02-16   2025-02-16 2019-08-01 26058.23
## 56      2025-02-16   2025-02-16 2019-09-01 26900.21
## 57      2025-02-16   2025-02-16 2019-10-01 26736.80
## 58      2025-02-16   2025-02-16 2019-11-01 27797.05
## 59      2025-02-16   2025-02-16 2019-12-01 28167.01
## 60      2025-02-16   2025-02-16 2020-01-01 28879.99
## 61      2025-02-16   2025-02-16 2020-02-01 28519.73
## 62      2025-02-16   2025-02-16 2020-03-01 22637.42
## 63      2025-02-16   2025-02-16 2020-04-01 23293.90
## 64      2025-02-16   2025-02-16 2020-05-01 24271.02
## 65      2025-02-16   2025-02-16 2020-06-01 26062.27
## 66      2025-02-16   2025-02-16 2020-07-01 26385.83
## 67      2025-02-16   2025-02-16 2020-08-01 27821.37
## 68      2025-02-16   2025-02-16 2020-09-01 27733.40
## 69      2025-02-16   2025-02-16 2020-10-01 28005.11
## 70      2025-02-16   2025-02-16 2020-11-01 29124.04
## 71      2025-02-16   2025-02-16 2020-12-01 30148.58
## 72      2025-02-16   2025-02-16 2021-01-01 30821.35
## 73      2025-02-16   2025-02-16 2021-02-01 31283.91
## 74      2025-02-16   2025-02-16 2021-03-01 32373.29
## 75      2025-02-16   2025-02-16 2021-04-01 33803.29
## 76      2025-02-16   2025-02-16 2021-05-01 34270.31
## 77      2025-02-16   2025-02-16 2021-06-01 34289.91
## 78      2025-02-16   2025-02-16 2021-07-01 34798.80
## 79      2025-02-16   2025-02-16 2021-08-01 35243.97
## 80      2025-02-16   2025-02-16 2021-09-01 34688.42
## 81      2025-02-16   2025-02-16 2021-10-01 35055.52
## 82      2025-02-16   2025-02-16 2021-11-01 35848.57
## 83      2025-02-16   2025-02-16 2021-12-01 35641.33
## 84      2025-02-16   2025-02-16 2022-01-01 35456.15
## 85      2025-02-16   2025-02-16 2022-02-01 34648.48
## 86      2025-02-16   2025-02-16 2022-03-01 34029.74
## 87      2025-02-16   2025-02-16 2022-04-01 34314.99
## 88      2025-02-16   2025-02-16 2022-05-01 32379.46
## 89      2025-02-16   2025-02-16 2022-06-01 31446.71
## 90      2025-02-16   2025-02-16 2022-07-01 31535.32
## 91      2025-02-16   2025-02-16 2022-08-01 33009.56
## 92      2025-02-16   2025-02-16 2022-09-01 30649.56
```

```
## 93      2025-02-16   2025-02-16 2022-10-01 30570.68
## 94      2025-02-16   2025-02-16 2022-11-01 33417.96
## 95      2025-02-16   2025-02-16 2022-12-01 33482.26
## 96      2025-02-16   2025-02-16 2023-01-01 33656.00
## 97      2025-02-16   2025-02-16 2023-02-01 33648.26
## 98      2025-02-16   2025-02-16 2023-03-01 32483.48
## 99      2025-02-16   2025-02-16 2023-04-01 33731.28
## 100     2025-02-16   2025-02-16 2023-05-01 33316.80
## 101     2025-02-16   2025-02-16 2023-06-01 33904.98
## 102     2025-02-16   2025-02-16 2023-07-01 34777.20
## 103     2025-02-16   2025-02-16 2023-08-01 34880.66
## 104     2025-02-16   2025-02-16 2023-09-01 34318.89
## 105     2025-02-16   2025-02-16 2023-10-01 33319.49
## 106     2025-02-16   2025-02-16 2023-11-01 34704.50
## 107     2025-02-16   2025-02-16 2023-12-01 36947.93
## 108     2025-02-16   2025-02-16 2024-01-01 37763.95
## 109     2025-02-16   2025-02-16 2024-02-01 38720.52
## 110     2025-02-16   2025-02-16 2024-03-01 39105.52
## 111     2025-02-16   2025-02-16 2024-04-01 38401.22
## 112     2025-02-16   2025-02-16 2024-05-01 39129.39
## 113     2025-02-16   2025-02-16 2024-06-01 38903.73
## 114     2025-02-16   2025-02-16 2024-07-01 40086.03
## 115     2025-02-16   2025-02-16 2024-08-01 40310.81
## 116     2025-02-16   2025-02-16 2024-09-01 41490.88
## 117     2025-02-16   2025-02-16 2024-10-01 42494.20
## 118     2025-02-16   2025-02-16 2024-11-01 43716.93
## 119     2025-02-16   2025-02-16 2024-12-01 43655.57
```

This cleans up the table to just have the month in `yyyy-mm-dd` format and the associated value.

```
djia_df <- djia_df[, c("date", "value")]
djia_df$value <- as.numeric(djia_df$value)
```

```
## Warning: NAs introduced by coercion
```

```
djia_df
```

```
##           date    value
## 1   2015-02-01       NA
## 2   2015-03-01 17931.75
## 3   2015-04-01 17970.51
## 4   2015-05-01 18124.71
## 5   2015-06-01 17927.22
## 6   2015-07-01 17795.02
## 7   2015-08-01 17061.59
## 8   2015-09-01 16339.95
## 9   2015-10-01 17182.28
## 10  2015-11-01 17723.77
## 11  2015-12-01 17542.86
## 12  2016-01-01 16305.25
## 13  2016-02-01 16299.90
## 14  2016-03-01 17302.14
## 15  2016-04-01 17844.37
## 16  2016-05-01 17692.32
## 17  2016-06-01 17754.87
## 18  2016-07-01 18341.18
```

```
## 19  2016-08-01 18495.19
## 20  2016-09-01 18267.40
## 21  2016-10-01 18184.55
## 22  2016-11-01 18697.33
## 23  2016-12-01 19712.42
## 24  2017-01-01 19908.15
## 25  2017-02-01 20424.14
## 26  2017-03-01 20823.06
## 27  2017-04-01 20684.69
## 28  2017-05-01 20936.81
## 29  2017-06-01 21317.80
## 30  2017-07-01 21581.25
## 31  2017-08-01 21914.08
## 32  2017-09-01 22173.41
## 33  2017-10-01 23036.24
## 34  2017-11-01 23557.93
## 35  2017-12-01 24545.38
## 36  2018-01-01 25804.02
## 37  2018-02-01 24981.55
## 38  2018-03-01 24582.17
## 39  2018-04-01 24304.21
## 40  2018-05-01 24572.53
## 41  2018-06-01 24790.11
## 42  2018-07-01 24978.23
## 43  2018-08-01 25629.99
## 44  2018-09-01 26232.67
## 45  2018-10-01 25609.34
## 46  2018-11-01 25258.68
## 47  2018-12-01 23805.55
## 48  2019-01-01 24157.80
## 49  2019-02-01 25605.53
## 50  2019-03-01 25722.62
## 51  2019-04-01 26401.58
## 52  2019-05-01 25744.79
## 53  2019-06-01 26160.10
## 54  2019-07-01 27089.19
## 55  2019-08-01 26058.23
## 56  2019-09-01 26900.21
## 57  2019-10-01 26736.80
## 58  2019-11-01 27797.05
## 59  2019-12-01 28167.01
## 60  2020-01-01 28879.99
## 61  2020-02-01 28519.73
## 62  2020-03-01 22637.42
## 63  2020-04-01 23293.90
## 64  2020-05-01 24271.02
## 65  2020-06-01 26062.27
## 66  2020-07-01 26385.83
## 67  2020-08-01 27821.37
## 68  2020-09-01 27733.40
## 69  2020-10-01 28005.11
## 70  2020-11-01 29124.04
## 71  2020-12-01 30148.58
## 72  2021-01-01 30821.35
```

```
## 73  2021-02-01 31283.91
## 74  2021-03-01 32373.29
## 75  2021-04-01 33803.29
## 76  2021-05-01 34270.31
## 77  2021-06-01 34289.91
## 78  2021-07-01 34798.80
## 79  2021-08-01 35243.97
## 80  2021-09-01 34688.42
## 81  2021-10-01 35055.52
## 82  2021-11-01 35848.57
## 83  2021-12-01 35641.33
## 84  2022-01-01 35456.15
## 85  2022-02-01 34648.48
## 86  2022-03-01 34029.74
## 87  2022-04-01 34314.99
## 88  2022-05-01 32379.46
## 89  2022-06-01 31446.71
## 90  2022-07-01 31535.32
## 91  2022-08-01 33009.56
## 92  2022-09-01 30649.56
## 93  2022-10-01 30570.68
## 94  2022-11-01 33417.96
## 95  2022-12-01 33482.26
## 96  2023-01-01 33656.00
## 97  2023-02-01 33648.26
## 98  2023-03-01 32483.48
## 99  2023-04-01 33731.28
## 100 2023-05-01 33316.80
## 101 2023-06-01 33904.98
## 102 2023-07-01 34777.20
## 103 2023-08-01 34880.66
## 104 2023-09-01 34318.89
## 105 2023-10-01 33319.49
## 106 2023-11-01 34704.50
## 107 2023-12-01 36947.93
## 108 2024-01-01 37763.95
## 109 2024-02-01 38720.52
## 110 2024-03-01 39105.52
## 111 2024-04-01 38401.22
## 112 2024-05-01 39129.39
## 113 2024-06-01 38903.73
## 114 2024-07-01 40086.03
## 115 2024-08-01 40310.81
## 116 2024-09-01 41490.88
## 117 2024-10-01 42494.20
## 118 2024-11-01 43716.93
## 119 2024-12-01 43655.57
```

10-Year Treasury Yield API Call + Cleanup Above, I separated API call and cleanup into separate chunks so I could explain what I was doing. Below, I've combined them into one chunk for efficiency.

Please Note: the earliest date available for this data is January 1st, 2000.

```
dgs1_res <- GET(fred_obs_url, query = list(
  series_id = treasury_id,
```

```
  api_key = FRED_API_KEY,
  observation_start = observ_start,
  observation_end = observ_end,
  frequency = frequency,
  aggregation_method = agg_method,
  file_type = file_type
))

dgs1_raw <- fromJSON(content(dgs1_res, "text"))
dgs1_df <- as.data.frame(dgs1_raw$observations)

dgs1_df <- dgs1_df[, c("date", "value")]
dgs1_df$value <- as.numeric(dgs1_df$value)

dgs1_df
```

```
##           date value
## 1   2000-01-01  6.12
## 2   2000-02-01  6.22
## 3   2000-03-01  6.22
## 4   2000-04-01  6.15
## 5   2000-05-01  6.33
## 6   2000-06-01  6.17
## 7   2000-07-01  6.08
## 8   2000-08-01  6.18
## 9   2000-09-01  6.13
## 10  2000-10-01  6.01
## 11  2000-11-01  6.09
## 12  2000-12-01  5.60
## 13  2001-01-01  4.81
## 14  2001-02-01  4.68
## 15  2001-03-01  4.30
## 16  2001-04-01  3.98
## 17  2001-05-01  3.78
## 18  2001-06-01  3.58
## 19  2001-07-01  3.62
## 20  2001-08-01  3.47
## 21  2001-09-01  2.82
## 22  2001-10-01  2.33
## 23  2001-11-01  2.18
## 24  2001-12-01  2.22
## 25  2002-01-01  2.16
## 26  2002-02-01  2.23
## 27  2002-03-01  2.57
## 28  2002-04-01  2.48
## 29  2002-05-01  2.35
## 30  2002-06-01  2.20
## 31  2002-07-01  1.96
## 32  2002-08-01  1.76
## 33  2002-09-01  1.72
## 34  2002-10-01  1.65
## 35  2002-11-01  1.49
## 36  2002-12-01  1.45
## 37  2003-01-01  1.36
```

```
## 38  2003-02-01  1.30
## 39  2003-03-01  1.24
## 40  2003-04-01  1.27
## 41  2003-05-01  1.18
## 42  2003-06-01  1.01
## 43  2003-07-01  1.12
## 44  2003-08-01  1.31
## 45  2003-09-01  1.24
## 46  2003-10-01  1.25
## 47  2003-11-01  1.34
## 48  2003-12-01  1.31
## 49  2004-01-01  1.24
## 50  2004-02-01  1.24
## 51  2004-03-01  1.19
## 52  2004-04-01  1.43
## 53  2004-05-01  1.78
## 54  2004-06-01  2.12
## 55  2004-07-01  2.10
## 56  2004-08-01  2.02
## 57  2004-09-01  2.12
## 58  2004-10-01  2.23
## 59  2004-11-01  2.50
## 60  2004-12-01  2.67
## 61  2005-01-01  2.86
## 62  2005-02-01  3.03
## 63  2005-03-01  3.30
## 64  2005-04-01  3.32
## 65  2005-05-01  3.33
## 66  2005-06-01  3.36
## 67  2005-07-01  3.64
## 68  2005-08-01  3.87
## 69  2005-09-01  3.85
## 70  2005-10-01  4.18
## 71  2005-11-01  4.33
## 72  2005-12-01  4.35
## 73  2006-01-01  4.45
## 74  2006-02-01  4.68
## 75  2006-03-01  4.77
## 76  2006-04-01  4.90
## 77  2006-05-01  5.00
## 78  2006-06-01  5.16
## 79  2006-07-01  5.22
## 80  2006-08-01  5.08
## 81  2006-09-01  4.97
## 82  2006-10-01  5.01
## 83  2006-11-01  5.01
## 84  2006-12-01  4.94
## 85  2007-01-01  5.06
## 86  2007-02-01  5.05
## 87  2007-03-01  4.92
## 88  2007-04-01  4.93
## 89  2007-05-01  4.91
## 90  2007-06-01  4.96
## 91  2007-07-01  4.96
```

```
## 92  2007-08-01  4.47
## 93  2007-09-01  4.14
## 94  2007-10-01  4.10
## 95  2007-11-01  3.50
## 96  2007-12-01  3.26
## 97  2008-01-01  2.71
## 98  2008-02-01  2.05
## 99  2008-03-01  1.54
## 100 2008-04-01  1.74
## 101 2008-05-01  2.06
## 102 2008-06-01  2.42
## 103 2008-07-01  2.28
## 104 2008-08-01  2.18
## 105 2008-09-01  1.91
## 106 2008-10-01  1.42
## 107 2008-11-01  1.07
## 108 2008-12-01  0.49
## 109 2009-01-01  0.44
## 110 2009-02-01  0.62
## 111 2009-03-01  0.64
## 112 2009-04-01  0.55
## 113 2009-05-01  0.50
## 114 2009-06-01  0.51
## 115 2009-07-01  0.48
## 116 2009-08-01  0.46
## 117 2009-09-01  0.40
## 118 2009-10-01  0.37
## 119 2009-11-01  0.31
## 120 2009-12-01  0.37
## 121 2010-01-01  0.35
## 122 2010-02-01  0.35
## 123 2010-03-01  0.40
## 124 2010-04-01  0.45
## 125 2010-05-01  0.37
## 126 2010-06-01  0.32
## 127 2010-07-01  0.29
## 128 2010-08-01  0.26
## 129 2010-09-01  0.26
## 130 2010-10-01  0.23
## 131 2010-11-01  0.25
## 132 2010-12-01  0.29
## 133 2011-01-01  0.27
## 134 2011-02-01  0.29
## 135 2011-03-01  0.26
## 136 2011-04-01  0.25
## 137 2011-05-01  0.19
## 138 2011-06-01  0.18
## 139 2011-07-01  0.19
## 140 2011-08-01  0.11
## 141 2011-09-01  0.10
## 142 2011-10-01  0.11
## 143 2011-11-01  0.11
## 144 2011-12-01  0.12
## 145 2012-01-01  0.12
```

```
## 146 2012-02-01  0.16
## 147 2012-03-01  0.19
## 148 2012-04-01  0.18
## 149 2012-05-01  0.19
## 150 2012-06-01  0.19
## 151 2012-07-01  0.19
## 152 2012-08-01  0.18
## 153 2012-09-01  0.18
## 154 2012-10-01  0.18
## 155 2012-11-01  0.18
## 156 2012-12-01  0.16
## 157 2013-01-01  0.15
## 158 2013-02-01  0.16
## 159 2013-03-01  0.15
## 160 2013-04-01  0.12
## 161 2013-05-01  0.12
## 162 2013-06-01  0.14
## 163 2013-07-01  0.12
## 164 2013-08-01  0.13
## 165 2013-09-01  0.12
## 166 2013-10-01  0.12
## 167 2013-11-01  0.12
## 168 2013-12-01  0.13
## 169 2014-01-01  0.12
## 170 2014-02-01  0.12
## 171 2014-03-01  0.13
## 172 2014-04-01  0.11
## 173 2014-05-01  0.10
## 174 2014-06-01  0.10
## 175 2014-07-01  0.11
## 176 2014-08-01  0.11
## 177 2014-09-01  0.11
## 178 2014-10-01  0.10
## 179 2014-11-01  0.13
## 180 2014-12-01  0.21
## 181 2015-01-01  0.20
## 182 2015-02-01  0.22
## 183 2015-03-01  0.25
## 184 2015-04-01  0.23
## 185 2015-05-01  0.24
## 186 2015-06-01  0.28
## 187 2015-07-01  0.30
## 188 2015-08-01  0.38
## 189 2015-09-01  0.37
## 190 2015-10-01  0.26
## 191 2015-11-01  0.48
## 192 2015-12-01  0.65
## 193 2016-01-01  0.54
## 194 2016-02-01  0.53
## 195 2016-03-01  0.66
## 196 2016-04-01  0.56
## 197 2016-05-01  0.59
## 198 2016-06-01  0.55
## 199 2016-07-01  0.51
```

```
## 200 2016-08-01  0.57
## 201 2016-09-01  0.59
## 202 2016-10-01  0.66
## 203 2016-11-01  0.74
## 204 2016-12-01  0.87
## 205 2017-01-01  0.83
## 206 2017-02-01  0.82
## 207 2017-03-01  1.01
## 208 2017-04-01  1.04
## 209 2017-05-01  1.12
## 210 2017-06-01  1.20
## 211 2017-07-01  1.22
## 212 2017-08-01  1.23
## 213 2017-09-01  1.28
## 214 2017-10-01  1.40
## 215 2017-11-01  1.56
## 216 2017-12-01  1.70
## 217 2018-01-01  1.80
## 218 2018-02-01  1.96
## 219 2018-03-01  2.06
## 220 2018-04-01  2.15
## 221 2018-05-01  2.27
## 222 2018-06-01  2.33
## 223 2018-07-01  2.39
## 224 2018-08-01  2.45
## 225 2018-09-01  2.56
## 226 2018-10-01  2.65
## 227 2018-11-01  2.70
## 228 2018-12-01  2.66
## 229 2019-01-01  2.58
## 230 2019-02-01  2.55
## 231 2019-03-01  2.49
## 232 2019-04-01  2.42
## 233 2019-05-01  2.34
## 234 2019-06-01  2.00
## 235 2019-07-01  1.96
## 236 2019-08-01  1.77
## 237 2019-09-01  1.80
## 238 2019-10-01  1.61
## 239 2019-11-01  1.57
## 240 2019-12-01  1.55
## 241 2020-01-01  1.53
## 242 2020-02-01  1.41
## 243 2020-03-01  0.33
## 244 2020-04-01  0.18
## 245 2020-05-01  0.16
## 246 2020-06-01  0.18
## 247 2020-07-01  0.15
## 248 2020-08-01  0.13
## 249 2020-09-01  0.13
## 250 2020-10-01  0.13
## 251 2020-11-01  0.12
## 252 2020-12-01  0.10
## 253 2021-01-01  0.10
```

```
## 254 2021-02-01  0.07
## 255 2021-03-01  0.08
## 256 2021-04-01  0.06
## 257 2021-05-01  0.05
## 258 2021-06-01  0.07
## 259 2021-07-01  0.08
## 260 2021-08-01  0.07
## 261 2021-09-01  0.08
## 262 2021-10-01  0.11
## 263 2021-11-01  0.18
## 264 2021-12-01  0.30
## 265 2022-01-01  0.55
## 266 2022-02-01  1.00
## 267 2022-03-01  1.34
## 268 2022-04-01  1.89
## 269 2022-05-01  2.06
## 270 2022-06-01  2.65
## 271 2022-07-01  3.02
## 272 2022-08-01  3.28
## 273 2022-09-01  3.89
## 274 2022-10-01  4.43
## 275 2022-11-01  4.73
## 276 2022-12-01  4.68
## 277 2023-01-01  4.69
## 278 2023-02-01  4.93
## 279 2023-03-01  4.68
## 280 2023-04-01  4.68
## 281 2023-05-01  4.91
## 282 2023-06-01  5.24
## 283 2023-07-01  5.37
## 284 2023-08-01  5.37
## 285 2023-09-01  5.44
## 286 2023-10-01  5.42
## 287 2023-11-01  5.28
## 288 2023-12-01  4.96
## 289 2024-01-01  4.79
## 290 2024-02-01  4.92
## 291 2024-03-01  4.99
## 292 2024-04-01  5.14
## 293 2024-05-01  5.16
## 294 2024-06-01  5.11
## 295 2024-07-01  4.90
## 296 2024-08-01  4.43
## 297 2024-09-01  4.03
## 298 2024-10-01  4.20
## 299 2024-11-01  4.33
## 300 2024-12-01  4.23
```

Unemployment Rate API Call + Cleanup

This section performs an API call to FRED using the same parameters as the above requests, with the only change needed being the `series_id`

Please Note: the earliest date available for this data is January 1st, 2000.

```r
unrate_res <- GET(fred_obs_url, query = list(
  series_id = unemp_id,
  api_key = FRED_API_KEY,
  observation_start = observ_start,
  observation_end = observ_end,
  frequency = frequency,
  aggregation_method = agg_method,
  file_type = file_type
))

unrate_raw <- fromJSON(content(unrate_res, "text"))
unrate_df <- as.data.frame(unrate_raw$observations)

unrate_df <- unrate_df[, c("date", "value")]
unrate_df$value <- as.numeric(unrate_df$value)

unrate_df
```

```
##           date value
## 1   2000-01-01   4.0
## 2   2000-02-01   4.1
## 3   2000-03-01   4.0
## 4   2000-04-01   3.8
## 5   2000-05-01   4.0
## 6   2000-06-01   4.0
## 7   2000-07-01   4.0
## 8   2000-08-01   4.1
## 9   2000-09-01   3.9
## 10  2000-10-01   3.9
## 11  2000-11-01   3.9
## 12  2000-12-01   3.9
## 13  2001-01-01   4.2
## 14  2001-02-01   4.2
## 15  2001-03-01   4.3
## 16  2001-04-01   4.4
## 17  2001-05-01   4.3
## 18  2001-06-01   4.5
## 19  2001-07-01   4.6
## 20  2001-08-01   4.9
## 21  2001-09-01   5.0
## 22  2001-10-01   5.3
## 23  2001-11-01   5.5
## 24  2001-12-01   5.7
## 25  2002-01-01   5.7
## 26  2002-02-01   5.7
## 27  2002-03-01   5.7
## 28  2002-04-01   5.9
## 29  2002-05-01   5.8
## 30  2002-06-01   5.8
## 31  2002-07-01   5.8
## 32  2002-08-01   5.7
## 33  2002-09-01   5.7
## 34  2002-10-01   5.7
## 35  2002-11-01   5.9
```

```
## 36  2002-12-01   6.0
## 37  2003-01-01   5.8
## 38  2003-02-01   5.9
## 39  2003-03-01   5.9
## 40  2003-04-01   6.0
## 41  2003-05-01   6.1
## 42  2003-06-01   6.3
## 43  2003-07-01   6.2
## 44  2003-08-01   6.1
## 45  2003-09-01   6.1
## 46  2003-10-01   6.0
## 47  2003-11-01   5.8
## 48  2003-12-01   5.7
## 49  2004-01-01   5.7
## 50  2004-02-01   5.6
## 51  2004-03-01   5.8
## 52  2004-04-01   5.6
## 53  2004-05-01   5.6
## 54  2004-06-01   5.6
## 55  2004-07-01   5.5
## 56  2004-08-01   5.4
## 57  2004-09-01   5.4
## 58  2004-10-01   5.5
## 59  2004-11-01   5.4
## 60  2004-12-01   5.4
## 61  2005-01-01   5.3
## 62  2005-02-01   5.4
## 63  2005-03-01   5.2
## 64  2005-04-01   5.2
## 65  2005-05-01   5.1
## 66  2005-06-01   5.0
## 67  2005-07-01   5.0
## 68  2005-08-01   4.9
## 69  2005-09-01   5.0
## 70  2005-10-01   5.0
## 71  2005-11-01   5.0
## 72  2005-12-01   4.9
## 73  2006-01-01   4.7
## 74  2006-02-01   4.8
## 75  2006-03-01   4.7
## 76  2006-04-01   4.7
## 77  2006-05-01   4.6
## 78  2006-06-01   4.6
## 79  2006-07-01   4.7
## 80  2006-08-01   4.7
## 81  2006-09-01   4.5
## 82  2006-10-01   4.4
## 83  2006-11-01   4.5
## 84  2006-12-01   4.4
## 85  2007-01-01   4.6
## 86  2007-02-01   4.5
## 87  2007-03-01   4.4
## 88  2007-04-01   4.5
## 89  2007-05-01   4.4
```

```
## 90  2007-06-01   4.6
## 91  2007-07-01   4.7
## 92  2007-08-01   4.6
## 93  2007-09-01   4.7
## 94  2007-10-01   4.7
## 95  2007-11-01   4.7
## 96  2007-12-01   5.0
## 97  2008-01-01   5.0
## 98  2008-02-01   4.9
## 99  2008-03-01   5.1
## 100 2008-04-01   5.0
## 101 2008-05-01   5.4
## 102 2008-06-01   5.6
## 103 2008-07-01   5.8
## 104 2008-08-01   6.1
## 105 2008-09-01   6.1
## 106 2008-10-01   6.5
## 107 2008-11-01   6.8
## 108 2008-12-01   7.3
## 109 2009-01-01   7.8
## 110 2009-02-01   8.3
## 111 2009-03-01   8.7
## 112 2009-04-01   9.0
## 113 2009-05-01   9.4
## 114 2009-06-01   9.5
## 115 2009-07-01   9.5
## 116 2009-08-01   9.6
## 117 2009-09-01   9.8
## 118 2009-10-01  10.0
## 119 2009-11-01   9.9
## 120 2009-12-01   9.9
## 121 2010-01-01   9.8
## 122 2010-02-01   9.8
## 123 2010-03-01   9.9
## 124 2010-04-01   9.9
## 125 2010-05-01   9.6
## 126 2010-06-01   9.4
## 127 2010-07-01   9.4
## 128 2010-08-01   9.5
## 129 2010-09-01   9.5
## 130 2010-10-01   9.4
## 131 2010-11-01   9.8
## 132 2010-12-01   9.3
## 133 2011-01-01   9.1
## 134 2011-02-01   9.0
## 135 2011-03-01   9.0
## 136 2011-04-01   9.1
## 137 2011-05-01   9.0
## 138 2011-06-01   9.1
## 139 2011-07-01   9.0
## 140 2011-08-01   9.0
## 141 2011-09-01   9.0
## 142 2011-10-01   8.8
## 143 2011-11-01   8.6
```

```
## 144 2011-12-01   8.5
## 145 2012-01-01   8.3
## 146 2012-02-01   8.3
## 147 2012-03-01   8.2
## 148 2012-04-01   8.2
## 149 2012-05-01   8.2
## 150 2012-06-01   8.2
## 151 2012-07-01   8.2
## 152 2012-08-01   8.1
## 153 2012-09-01   7.8
## 154 2012-10-01   7.8
## 155 2012-11-01   7.7
## 156 2012-12-01   7.9
## 157 2013-01-01   8.0
## 158 2013-02-01   7.7
## 159 2013-03-01   7.5
## 160 2013-04-01   7.6
## 161 2013-05-01   7.5
## 162 2013-06-01   7.5
## 163 2013-07-01   7.3
## 164 2013-08-01   7.2
## 165 2013-09-01   7.2
## 166 2013-10-01   7.2
## 167 2013-11-01   6.9
## 168 2013-12-01   6.7
## 169 2014-01-01   6.6
## 170 2014-02-01   6.7
## 171 2014-03-01   6.7
## 172 2014-04-01   6.2
## 173 2014-05-01   6.3
## 174 2014-06-01   6.1
## 175 2014-07-01   6.2
## 176 2014-08-01   6.1
## 177 2014-09-01   5.9
## 178 2014-10-01   5.7
## 179 2014-11-01   5.8
## 180 2014-12-01   5.6
## 181 2015-01-01   5.7
## 182 2015-02-01   5.5
## 183 2015-03-01   5.4
## 184 2015-04-01   5.4
## 185 2015-05-01   5.6
## 186 2015-06-01   5.3
## 187 2015-07-01   5.2
## 188 2015-08-01   5.1
## 189 2015-09-01   5.0
## 190 2015-10-01   5.0
## 191 2015-11-01   5.1
## 192 2015-12-01   5.0
## 193 2016-01-01   4.8
## 194 2016-02-01   4.9
## 195 2016-03-01   5.0
## 196 2016-04-01   5.1
## 197 2016-05-01   4.8
```

```
## 198 2016-06-01   4.9
## 199 2016-07-01   4.8
## 200 2016-08-01   4.9
## 201 2016-09-01   5.0
## 202 2016-10-01   4.9
## 203 2016-11-01   4.7
## 204 2016-12-01   4.7
## 205 2017-01-01   4.7
## 206 2017-02-01   4.6
## 207 2017-03-01   4.4
## 208 2017-04-01   4.4
## 209 2017-05-01   4.4
## 210 2017-06-01   4.3
## 211 2017-07-01   4.3
## 212 2017-08-01   4.4
## 213 2017-09-01   4.3
## 214 2017-10-01   4.2
## 215 2017-11-01   4.2
## 216 2017-12-01   4.1
## 217 2018-01-01   4.0
## 218 2018-02-01   4.1
## 219 2018-03-01   4.0
## 220 2018-04-01   4.0
## 221 2018-05-01   3.8
## 222 2018-06-01   4.0
## 223 2018-07-01   3.8
## 224 2018-08-01   3.8
## 225 2018-09-01   3.7
## 226 2018-10-01   3.8
## 227 2018-11-01   3.8
## 228 2018-12-01   3.9
## 229 2019-01-01   4.0
## 230 2019-02-01   3.8
## 231 2019-03-01   3.8
## 232 2019-04-01   3.7
## 233 2019-05-01   3.6
## 234 2019-06-01   3.6
## 235 2019-07-01   3.7
## 236 2019-08-01   3.6
## 237 2019-09-01   3.5
## 238 2019-10-01   3.6
## 239 2019-11-01   3.6
## 240 2019-12-01   3.6
## 241 2020-01-01   3.6
## 242 2020-02-01   3.5
## 243 2020-03-01   4.4
## 244 2020-04-01  14.8
## 245 2020-05-01  13.2
## 246 2020-06-01  11.0
## 247 2020-07-01  10.2
## 248 2020-08-01   8.4
## 249 2020-09-01   7.8
## 250 2020-10-01   6.9
## 251 2020-11-01   6.7
```

```
## 252 2020-12-01   6.7
## 253 2021-01-01   6.4
## 254 2021-02-01   6.2
## 255 2021-03-01   6.1
## 256 2021-04-01   6.1
## 257 2021-05-01   5.8
## 258 2021-06-01   5.9
## 259 2021-07-01   5.4
## 260 2021-08-01   5.1
## 261 2021-09-01   4.7
## 262 2021-10-01   4.5
## 263 2021-11-01   4.2
## 264 2021-12-01   3.9
## 265 2022-01-01   4.0
## 266 2022-02-01   3.8
## 267 2022-03-01   3.7
## 268 2022-04-01   3.7
## 269 2022-05-01   3.6
## 270 2022-06-01   3.6
## 271 2022-07-01   3.5
## 272 2022-08-01   3.6
## 273 2022-09-01   3.5
## 274 2022-10-01   3.6
## 275 2022-11-01   3.6
## 276 2022-12-01   3.5
## 277 2023-01-01   3.5
## 278 2023-02-01   3.6
## 279 2023-03-01   3.5
## 280 2023-04-01   3.4
## 281 2023-05-01   3.6
## 282 2023-06-01   3.6
## 283 2023-07-01   3.5
## 284 2023-08-01   3.7
## 285 2023-09-01   3.8
## 286 2023-10-01   3.9
## 287 2023-11-01   3.7
## 288 2023-12-01   3.8
## 289 2024-01-01   3.7
## 290 2024-02-01   3.9
## 291 2024-03-01   3.9
## 292 2024-04-01   3.9
## 293 2024-05-01   4.0
## 294 2024-06-01   4.1
## 295 2024-07-01   4.2
## 296 2024-08-01   4.2
## 297 2024-09-01   4.1
## 298 2024-10-01   4.1
## 299 2024-11-01   4.2
## 300 2024-12-01   4.1
```

Data Merging and Cleanup

This section combines the three different dataframes into one, taking care to not drop rows when there's a null value in some but not all fields. The end result is a table that can be piped into a visualization, which is

covered in the next section.

```
#I checked the console and these were all characters. They need to be date format or the visualizations
djia_df$date <- as.Date(djia_df$date)
dgs1_df$date <- as.Date(dgs1_df$date)
unrate_df$date <- as.Date(unrate_df$date)

#this is just changing the column names to reflect what I want them to be after the merge, otherwise I'
colnames(djia_df) <- c("month_date", "djia")
colnames(dgs1_df) <- c("month_date", "dgs1")
colnames(unrate_df) <- c("month_date", "unemp_rate")

fred_df <- merge(djia_df, dgs1_df, by = "month_date", all = TRUE)
fred_df <- merge(fred_df, unrate_df, by = "month_date", all = TRUE)

fred_df
```

```
##     month_date     djia dgs1 unemp_rate
## 1   2000-01-01       NA 6.12        4.0
## 2   2000-02-01       NA 6.22        4.1
## 3   2000-03-01       NA 6.22        4.0
## 4   2000-04-01       NA 6.15        3.8
## 5   2000-05-01       NA 6.33        4.0
## 6   2000-06-01       NA 6.17        4.0
## 7   2000-07-01       NA 6.08        4.0
## 8   2000-08-01       NA 6.18        4.1
## 9   2000-09-01       NA 6.13        3.9
## 10  2000-10-01       NA 6.01        3.9
## 11  2000-11-01       NA 6.09        3.9
## 12  2000-12-01       NA 5.60        3.9
## 13  2001-01-01       NA 4.81        4.2
## 14  2001-02-01       NA 4.68        4.2
## 15  2001-03-01       NA 4.30        4.3
## 16  2001-04-01       NA 3.98        4.4
## 17  2001-05-01       NA 3.78        4.3
## 18  2001-06-01       NA 3.58        4.5
## 19  2001-07-01       NA 3.62        4.6
## 20  2001-08-01       NA 3.47        4.9
## 21  2001-09-01       NA 2.82        5.0
## 22  2001-10-01       NA 2.33        5.3
## 23  2001-11-01       NA 2.18        5.5
## 24  2001-12-01       NA 2.22        5.7
## 25  2002-01-01       NA 2.16        5.7
## 26  2002-02-01       NA 2.23        5.7
## 27  2002-03-01       NA 2.57        5.7
## 28  2002-04-01       NA 2.48        5.9
## 29  2002-05-01       NA 2.35        5.8
## 30  2002-06-01       NA 2.20        5.8
## 31  2002-07-01       NA 1.96        5.8
## 32  2002-08-01       NA 1.76        5.7
## 33  2002-09-01       NA 1.72        5.7
## 34  2002-10-01       NA 1.65        5.7
## 35  2002-11-01       NA 1.49        5.9
## 36  2002-12-01       NA 1.45        6.0
## 37  2003-01-01       NA 1.36        5.8
```

```
## 38  2003-02-01       NA 1.30        5.9
## 39  2003-03-01       NA 1.24        5.9
## 40  2003-04-01       NA 1.27        6.0
## 41  2003-05-01       NA 1.18        6.1
## 42  2003-06-01       NA 1.01        6.3
## 43  2003-07-01       NA 1.12        6.2
## 44  2003-08-01       NA 1.31        6.1
## 45  2003-09-01       NA 1.24        6.1
## 46  2003-10-01       NA 1.25        6.0
## 47  2003-11-01       NA 1.34        5.8
## 48  2003-12-01       NA 1.31        5.7
## 49  2004-01-01       NA 1.24        5.7
## 50  2004-02-01       NA 1.24        5.6
## 51  2004-03-01       NA 1.19        5.8
## 52  2004-04-01       NA 1.43        5.6
## 53  2004-05-01       NA 1.78        5.6
## 54  2004-06-01       NA 2.12        5.6
## 55  2004-07-01       NA 2.10        5.5
## 56  2004-08-01       NA 2.02        5.4
## 57  2004-09-01       NA 2.12        5.4
## 58  2004-10-01       NA 2.23        5.5
## 59  2004-11-01       NA 2.50        5.4
## 60  2004-12-01       NA 2.67        5.4
## 61  2005-01-01       NA 2.86        5.3
## 62  2005-02-01       NA 3.03        5.4
## 63  2005-03-01       NA 3.30        5.2
## 64  2005-04-01       NA 3.32        5.2
## 65  2005-05-01       NA 3.33        5.1
## 66  2005-06-01       NA 3.36        5.0
## 67  2005-07-01       NA 3.64        5.0
## 68  2005-08-01       NA 3.87        4.9
## 69  2005-09-01       NA 3.85        5.0
## 70  2005-10-01       NA 4.18        5.0
## 71  2005-11-01       NA 4.33        5.0
## 72  2005-12-01       NA 4.35        4.9
## 73  2006-01-01       NA 4.45        4.7
## 74  2006-02-01       NA 4.68        4.8
## 75  2006-03-01       NA 4.77        4.7
## 76  2006-04-01       NA 4.90        4.7
## 77  2006-05-01       NA 5.00        4.6
## 78  2006-06-01       NA 5.16        4.6
## 79  2006-07-01       NA 5.22        4.7
## 80  2006-08-01       NA 5.08        4.7
## 81  2006-09-01       NA 4.97        4.5
## 82  2006-10-01       NA 5.01        4.4
## 83  2006-11-01       NA 5.01        4.5
## 84  2006-12-01       NA 4.94        4.4
## 85  2007-01-01       NA 5.06        4.6
## 86  2007-02-01       NA 5.05        4.5
## 87  2007-03-01       NA 4.92        4.4
## 88  2007-04-01       NA 4.93        4.5
## 89  2007-05-01       NA 4.91        4.4
## 90  2007-06-01       NA 4.96        4.6
## 91  2007-07-01       NA 4.96        4.7
```

```
## 92  2007-08-01       NA 4.47        4.6
## 93  2007-09-01       NA 4.14        4.7
## 94  2007-10-01       NA 4.10        4.7
## 95  2007-11-01       NA 3.50        4.7
## 96  2007-12-01       NA 3.26        5.0
## 97  2008-01-01       NA 2.71        5.0
## 98  2008-02-01       NA 2.05        4.9
## 99  2008-03-01       NA 1.54        5.1
## 100 2008-04-01       NA 1.74        5.0
## 101 2008-05-01       NA 2.06        5.4
## 102 2008-06-01       NA 2.42        5.6
## 103 2008-07-01       NA 2.28        5.8
## 104 2008-08-01       NA 2.18        6.1
## 105 2008-09-01       NA 1.91        6.1
## 106 2008-10-01       NA 1.42        6.5
## 107 2008-11-01       NA 1.07        6.8
## 108 2008-12-01       NA 0.49        7.3
## 109 2009-01-01       NA 0.44        7.8
## 110 2009-02-01       NA 0.62        8.3
## 111 2009-03-01       NA 0.64        8.7
## 112 2009-04-01       NA 0.55        9.0
## 113 2009-05-01       NA 0.50        9.4
## 114 2009-06-01       NA 0.51        9.5
## 115 2009-07-01       NA 0.48        9.5
## 116 2009-08-01       NA 0.46        9.6
## 117 2009-09-01       NA 0.40        9.8
## 118 2009-10-01       NA 0.37       10.0
## 119 2009-11-01       NA 0.31        9.9
## 120 2009-12-01       NA 0.37        9.9
## 121 2010-01-01       NA 0.35        9.8
## 122 2010-02-01       NA 0.35        9.8
## 123 2010-03-01       NA 0.40        9.9
## 124 2010-04-01       NA 0.45        9.9
## 125 2010-05-01       NA 0.37        9.6
## 126 2010-06-01       NA 0.32        9.4
## 127 2010-07-01       NA 0.29        9.4
## 128 2010-08-01       NA 0.26        9.5
## 129 2010-09-01       NA 0.26        9.5
## 130 2010-10-01       NA 0.23        9.4
## 131 2010-11-01       NA 0.25        9.8
## 132 2010-12-01       NA 0.29        9.3
## 133 2011-01-01       NA 0.27        9.1
## 134 2011-02-01       NA 0.29        9.0
## 135 2011-03-01       NA 0.26        9.0
## 136 2011-04-01       NA 0.25        9.1
## 137 2011-05-01       NA 0.19        9.0
## 138 2011-06-01       NA 0.18        9.1
## 139 2011-07-01       NA 0.19        9.0
## 140 2011-08-01       NA 0.11        9.0
## 141 2011-09-01       NA 0.10        9.0
## 142 2011-10-01       NA 0.11        8.8
## 143 2011-11-01       NA 0.11        8.6
## 144 2011-12-01       NA 0.12        8.5
## 145 2012-01-01       NA 0.12        8.3
```

```
## 146 2012-02-01       NA 0.16        8.3
## 147 2012-03-01       NA 0.19        8.2
## 148 2012-04-01       NA 0.18        8.2
## 149 2012-05-01       NA 0.19        8.2
## 150 2012-06-01       NA 0.19        8.2
## 151 2012-07-01       NA 0.19        8.2
## 152 2012-08-01       NA 0.18        8.1
## 153 2012-09-01       NA 0.18        7.8
## 154 2012-10-01       NA 0.18        7.8
## 155 2012-11-01       NA 0.18        7.7
## 156 2012-12-01       NA 0.16        7.9
## 157 2013-01-01       NA 0.15        8.0
## 158 2013-02-01       NA 0.16        7.7
## 159 2013-03-01       NA 0.15        7.5
## 160 2013-04-01       NA 0.12        7.6
## 161 2013-05-01       NA 0.12        7.5
## 162 2013-06-01       NA 0.14        7.5
## 163 2013-07-01       NA 0.12        7.3
## 164 2013-08-01       NA 0.13        7.2
## 165 2013-09-01       NA 0.12        7.2
## 166 2013-10-01       NA 0.12        7.2
## 167 2013-11-01       NA 0.12        6.9
## 168 2013-12-01       NA 0.13        6.7
## 169 2014-01-01       NA 0.12        6.6
## 170 2014-02-01       NA 0.12        6.7
## 171 2014-03-01       NA 0.13        6.7
## 172 2014-04-01       NA 0.11        6.2
## 173 2014-05-01       NA 0.10        6.3
## 174 2014-06-01       NA 0.10        6.1
## 175 2014-07-01       NA 0.11        6.2
## 176 2014-08-01       NA 0.11        6.1
## 177 2014-09-01       NA 0.11        5.9
## 178 2014-10-01       NA 0.10        5.7
## 179 2014-11-01       NA 0.13        5.8
## 180 2014-12-01       NA 0.21        5.6
## 181 2015-01-01       NA 0.20        5.7
## 182 2015-02-01       NA 0.22        5.5
## 183 2015-03-01 17931.75 0.25        5.4
## 184 2015-04-01 17970.51 0.23        5.4
## 185 2015-05-01 18124.71 0.24        5.6
## 186 2015-06-01 17927.22 0.28        5.3
## 187 2015-07-01 17795.02 0.30        5.2
## 188 2015-08-01 17061.59 0.38        5.1
## 189 2015-09-01 16339.95 0.37        5.0
## 190 2015-10-01 17182.28 0.26        5.0
## 191 2015-11-01 17723.77 0.48        5.1
## 192 2015-12-01 17542.86 0.65        5.0
## 193 2016-01-01 16305.25 0.54        4.8
## 194 2016-02-01 16299.90 0.53        4.9
## 195 2016-03-01 17302.14 0.66        5.0
## 196 2016-04-01 17844.37 0.56        5.1
## 197 2016-05-01 17692.32 0.59        4.8
## 198 2016-06-01 17754.87 0.55        4.9
## 199 2016-07-01 18341.18 0.51        4.8
```

```
## 200 2016-08-01 18495.19 0.57        4.9
## 201 2016-09-01 18267.40 0.59        5.0
## 202 2016-10-01 18184.55 0.66        4.9
## 203 2016-11-01 18697.33 0.74        4.7
## 204 2016-12-01 19712.42 0.87        4.7
## 205 2017-01-01 19908.15 0.83        4.7
## 206 2017-02-01 20424.14 0.82        4.6
## 207 2017-03-01 20823.06 1.01        4.4
## 208 2017-04-01 20684.69 1.04        4.4
## 209 2017-05-01 20936.81 1.12        4.4
## 210 2017-06-01 21317.80 1.20        4.3
## 211 2017-07-01 21581.25 1.22        4.3
## 212 2017-08-01 21914.08 1.23        4.4
## 213 2017-09-01 22173.41 1.28        4.3
## 214 2017-10-01 23036.24 1.40        4.2
## 215 2017-11-01 23557.93 1.56        4.2
## 216 2017-12-01 24545.38 1.70        4.1
## 217 2018-01-01 25804.02 1.80        4.0
## 218 2018-02-01 24981.55 1.96        4.1
## 219 2018-03-01 24582.17 2.06        4.0
## 220 2018-04-01 24304.21 2.15        4.0
## 221 2018-05-01 24572.53 2.27        3.8
## 222 2018-06-01 24790.11 2.33        4.0
## 223 2018-07-01 24978.23 2.39        3.8
## 224 2018-08-01 25629.99 2.45        3.8
## 225 2018-09-01 26232.67 2.56        3.7
## 226 2018-10-01 25609.34 2.65        3.8
## 227 2018-11-01 25258.68 2.70        3.8
## 228 2018-12-01 23805.55 2.66        3.9
## 229 2019-01-01 24157.80 2.58        4.0
## 230 2019-02-01 25605.53 2.55        3.8
## 231 2019-03-01 25722.62 2.49        3.8
## 232 2019-04-01 26401.58 2.42        3.7
## 233 2019-05-01 25744.79 2.34        3.6
## 234 2019-06-01 26160.10 2.00        3.6
## 235 2019-07-01 27089.19 1.96        3.7
## 236 2019-08-01 26058.23 1.77        3.6
## 237 2019-09-01 26900.21 1.80        3.5
## 238 2019-10-01 26736.80 1.61        3.6
## 239 2019-11-01 27797.05 1.57        3.6
## 240 2019-12-01 28167.01 1.55        3.6
## 241 2020-01-01 28879.99 1.53        3.6
## 242 2020-02-01 28519.73 1.41        3.5
## 243 2020-03-01 22637.42 0.33        4.4
## 244 2020-04-01 23293.90 0.18       14.8
## 245 2020-05-01 24271.02 0.16       13.2
## 246 2020-06-01 26062.27 0.18       11.0
## 247 2020-07-01 26385.83 0.15       10.2
## 248 2020-08-01 27821.37 0.13        8.4
## 249 2020-09-01 27733.40 0.13        7.8
## 250 2020-10-01 28005.11 0.13        6.9
## 251 2020-11-01 29124.04 0.12        6.7
## 252 2020-12-01 30148.58 0.10        6.7
## 253 2021-01-01 30821.35 0.10        6.4
```

```
## 254 2021-02-01 31283.91 0.07        6.2
## 255 2021-03-01 32373.29 0.08        6.1
## 256 2021-04-01 33803.29 0.06        6.1
## 257 2021-05-01 34270.31 0.05        5.8
## 258 2021-06-01 34289.91 0.07        5.9
## 259 2021-07-01 34798.80 0.08        5.4
## 260 2021-08-01 35243.97 0.07        5.1
## 261 2021-09-01 34688.42 0.08        4.7
## 262 2021-10-01 35055.52 0.11        4.5
## 263 2021-11-01 35848.57 0.18        4.2
## 264 2021-12-01 35641.33 0.30        3.9
## 265 2022-01-01 35456.15 0.55        4.0
## 266 2022-02-01 34648.48 1.00        3.8
## 267 2022-03-01 34029.74 1.34        3.7
## 268 2022-04-01 34314.99 1.89        3.7
## 269 2022-05-01 32379.46 2.06        3.6
## 270 2022-06-01 31446.71 2.65        3.6
## 271 2022-07-01 31535.32 3.02        3.5
## 272 2022-08-01 33009.56 3.28        3.6
## 273 2022-09-01 30649.56 3.89        3.5
## 274 2022-10-01 30570.68 4.43        3.6
## 275 2022-11-01 33417.96 4.73        3.6
## 276 2022-12-01 33482.26 4.68        3.5
## 277 2023-01-01 33656.00 4.69        3.5
## 278 2023-02-01 33648.26 4.93        3.6
## 279 2023-03-01 32483.48 4.68        3.5
## 280 2023-04-01 33731.28 4.68        3.4
## 281 2023-05-01 33316.80 4.91        3.6
## 282 2023-06-01 33904.98 5.24        3.6
## 283 2023-07-01 34777.20 5.37        3.5
## 284 2023-08-01 34880.66 5.37        3.7
## 285 2023-09-01 34318.89 5.44        3.8
## 286 2023-10-01 33319.49 5.42        3.9
## 287 2023-11-01 34704.50 5.28        3.7
## 288 2023-12-01 36947.93 4.96        3.8
## 289 2024-01-01 37763.95 4.79        3.7
## 290 2024-02-01 38720.52 4.92        3.9
## 291 2024-03-01 39105.52 4.99        3.9
## 292 2024-04-01 38401.22 5.14        3.9
## 293 2024-05-01 39129.39 5.16        4.0
## 294 2024-06-01 38903.73 5.11        4.1
## 295 2024-07-01 40086.03 4.90        4.2
## 296 2024-08-01 40310.81 4.43        4.2
## 297 2024-09-01 41490.88 4.03        4.1
## 298 2024-10-01 42494.20 4.20        4.1
## 299 2024-11-01 43716.93 4.33        4.2
## 300 2024-12-01 43655.57 4.23        4.1
```

Visualizations

I spent a while trying to figure out how to complete the assignment task of producing charts for 25 years of data while also grappling with the DJIA only going back to 2015. Putting all three together on a chart where Treasury Yield and Unemployment Rate start in 2000 and the DJIA starting in 2015 created a whole lot of ugly options.

Instead, I'm producing two visualizations. Step 3 in the assignment said to create ONE visualization but the submission requirements state to submit a PDF with two. Therefore, I will create two:

1. Treasury Yield and Unemployment Rates on a monthly level from 2000 through 2024
2. All three stats starting in January 2015 and extendint through 2024

Treasury Yield and Unemployment Rate

The graph below is a combination line and bar chart showing the generally inverse relationship between the unemployment rate and ten year treasury yields. When unemployment rises during economic downturns, like the 2008 financial crisis or the 2020 covid lock downs, the yield for ten year treasury bonds decreases. This happens because investors seek out safe havens to park their money to ride things out. The inverse happens during strong economies because the Federal Reserve is ge

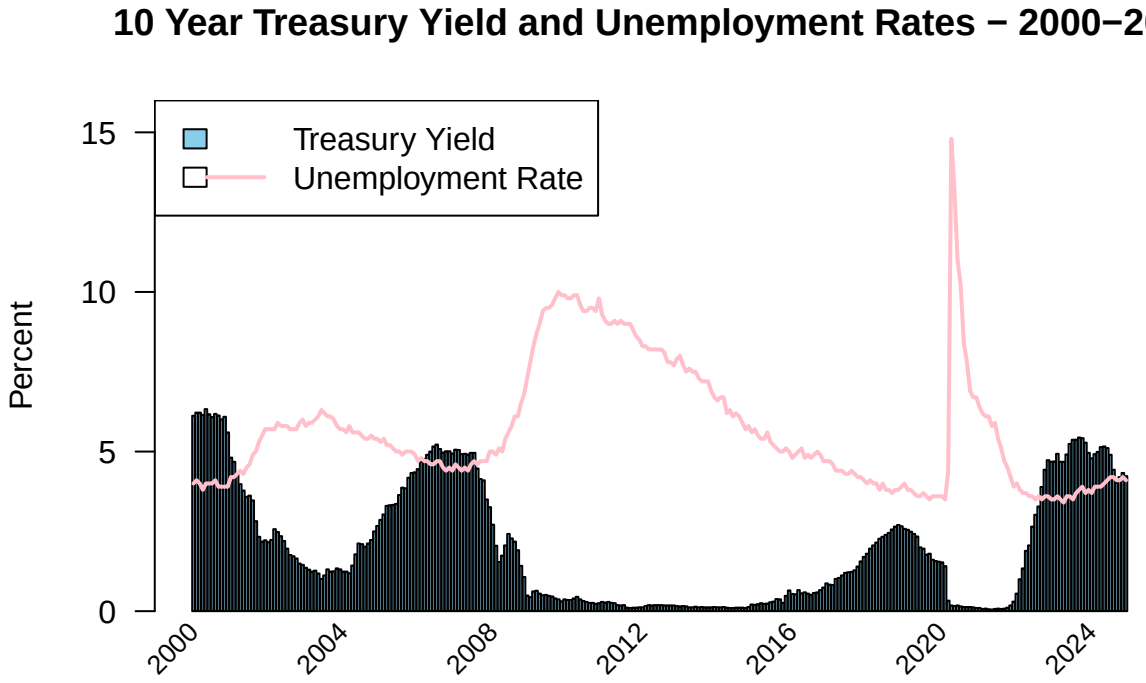
The more prevalent relationship that is not part of this assignment would be assessing the relationship between 10 Year Treasury yields, unemployment rates, and Federal Reserve benchmark interest rates.

```
years <- format(fred_df$month_date, "%Y")
unique_years <- unique(years)
year_labels <- unique_years[as.numeric(unique_years) %% 4 == 0]
year_i <- match(year_labels, years)

yield_bars <- barplot(fred_df$dgs1,
                      las = 2,
                      col = "skyblue",
                      ylab = "Percent",
                      main = "10 Year Treasury Yield and Unemployment Rates - 2000-2024",
                      ylim = c(0, 16),
                      xaxt = "n")

lines(yield_bars, fred_df$unemp_rate, type = "l", col = "pink", lwd = 2)
text(yield_bars[year_i], par("usr")[3] - 0.5, labels = year_labels, srt = 45, adj = 1, xpd = TRUE, cex =

legend("topleft", legend = c("Treasury Yield", "Unemployment Rate"),
       fill = c("skyblue", NA), col = c(NA, "pink"), lty = c(NA, 1), lwd = 2)
```



All Three Metrics

This is a combined bar and line chart showing all three metrics from January 2015 through December 2024.

The chart shows that the stock market, as represented by the DJIA, is not an effective economic indicator. Regardless of what's happening with the Treasury Yield and Unemployment Rate, such as the stretch around the 2008 financial crisis, the stocks quickly rebound and continue marching upwards while the other metrics represent a harder slog.

```
m3_df <- fred_df[fred_df$month_date >= as.Date("2015-01-01"), ]
years_m3 <- format(m3_df$month_date, "%Y")
uy_m3 <- unique(years_m3)
yim <- match(uy_m3, years_m3)

par(mar = c(5, 5, 4, 5))

djia_bars <- barplot(m3_df$djia, beside = TRUE,
                         ylim = c(0, max(m3_df$djia, na.rm = TRUE)),
                         xaxt = "n",
                         las = 2, cex.names = 0.8,
                         xlab = "Year", col = "grey")

par(new = TRUE)
plot(m3_df$month_date, m3_df$dgs1, type = "l", col = "pink", lwd = 3,
     axes = FALSE, xlab = "", ylab = "",
     ylim = c(0, max(m3_df$dgs1, m3_df$unemp_rate, na.rm = TRUE)))

lines(m3_df$month_date, m3_df$unemp_rate, col = "blue", lwd = 3)

text(djia_bars[yim], par("usr")[3] - 0.05 * diff(par("usr")[3:4]),
     labels = uy_m3, srt = 45, adj = 1, xpd = TRUE, cex = 0.8)

axis(4, las = 1, cex.axis = 0.8,
```

```
     at = pretty(c(0, max(m3_df$dgs1, m3_df$unemp_rate, na.rm = TRUE))),
     labels = formatC(pretty(c(0, max(m3_df$dgs1, m3_df$unemp_rate, na.rm = TRUE))),
                      format = "f", digits = 2))

legend("topleft", legend = c("Dow Jones Industrial Average", "10-Year Treasury Yield", "Unemployment Ra
       col = c("grey", "pink", "blue"), lwd = 2, lty = c(NA, 1, 1),
       pch = c(15, NA, NA), bty = "n")
```