

# FM\_Intro1

18.642

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## Contents

<b>1. Collect historical data</b>	<b>2</b>
1.1 Set start and end date for collection . . . . .	2
1.2 Collect time series data from Yahoo . . . . .	2
1.3 Collect time series data from FRED . . . . .	2
<b>2. Select/Filter/Merge datasets</b>	<b>3</b>
2.1 Select/Filter datasets . . . . .	3
2.2 Merge index_data1, stock_data1, and economic_data1 . . . . .	3
<b>3. Plot time series</b>	<b>4</b>
3.1 S&P 500 Index . . . . .	4
3.2 VIX Index . . . . .	5
3.3 Plot both together . . . . .	6
3.4 ARKK . . . . .	7
3.5 GME . . . . .	8
3.6 Bitcoin . . . . .	9
3.7 Nvidia . . . . .	10
3.8 Bond Yields on the same graph . . . . .	11
3.9 Crude Oil Futures . . . . .	12
<b>4. Save R workspace with all time series</b>	<b>13</b>

# 1. Collect historical data

## 1.1 Set start and end date for collection

```
date_start <- "2011-01-01"
date_end <- "2024-08-31"
```

## 1.2 Collect time series data from Yahoo

```
#      Collect index_data for S&P 500 and VIX indexes ----
#      Source: http://finance.yahoo.com
#
index_data <- tq_get(c("^GSPC", "^VIX"),
                    get = "stock.prices",
                    from = date_start,
                    to = date_end)
```

```
#      Collect stock_data for stocks ----
#      Source: http://finance.yahoo.com
stock_data <- tq_get(c("NVDA",
                      "GE",
                      "AAPL",
                      "GOOG",
                      "AMZN",
                      "XOM",
                      "GME",
                      "ARKK",
                      "AMC",
                      "BTC-USD",
                      "XLF"),
                    get = "stock.prices",
                    from = date_start,
                    to = date_end)
```

## 1.3 Collect time series data from FRED

```
# Source: St. Louis Federal Reserve
##      http://research.stlouisfed.org/fred2/
#
# Series name | Description
# -----
# SP500       | SP500 Stock market index
# VIXCLS      | Vix volatility index
#
# DGS3MO      | 3-Month Treasury, constant maturity rate
# DGS1        | 1-Year Treasury, constant maturity rate
# DGS5        | 5-Year Treasury, constant maturity rate
# DGS10       | 10-Year Treasury, constant maturity rate
#
# DAAA        | Moody's Seasoned Aaa Corporate Bond Yield
# DBAA        | Moody's Seasoned Baa Corporate Bond Yield
#
```

```

# DCOILWTICO | Crude Oil Prices: West Text Intermediate (WTI) - Cushing, Oklahoma
# CBBTCUSD   | Coinbase Bitcoin
economic_data <- tq_get(c(
  "SP500",
  "VIXCLS",
  "DGS3MO",
  "DGS1",
  "DGS5",
  "DGS10",
  "DAAA",
  "DBAA",
  "DCOILWTICO",
  "CBBTCUSD"),
  get = "economic.data",
  from = date_start,
  to = date_end)

```

## 2. Select/Filter/Merge datasets

### 2.1 Select/Filter datasets

The following code creates the object `market_data`. For each dataset:

- 1. Select three columns (symbol, date, price)
- 2. Filter out/remove NA observations
- 3. Rename adjusted to price (for stocks/indexes)---

```

## 2.1 Select three columns (symbol, date, price)
## 2.2 Rename adjusted to price (for stocks/indexes)----
## 2.3 Remove NA observations

index_data1 <- index_data %>%
  dplyr::select(symbol, date, adjusted) %>%
  dplyr::filter(!is.na(adjusted)) %>%
  dplyr::rename(price = adjusted)

stock_data1 <- stock_data %>%
  dplyr::select(symbol, date, adjusted) %>%
  dplyr::filter(!is.na(adjusted)) %>%
  dplyr::rename(price = adjusted)

# economic_data has same 3 columns (no select/rename needed)
economic_data1 <- economic_data %>%
  dplyr::filter(!is.na(price))

```

### 2.2 Merge `index_data1`, `stock_data1`, and `economic_data1`

```

market_data <- index_data1 %>%
  full_join(stock_data1) %>%
  full_join(economic_data1)

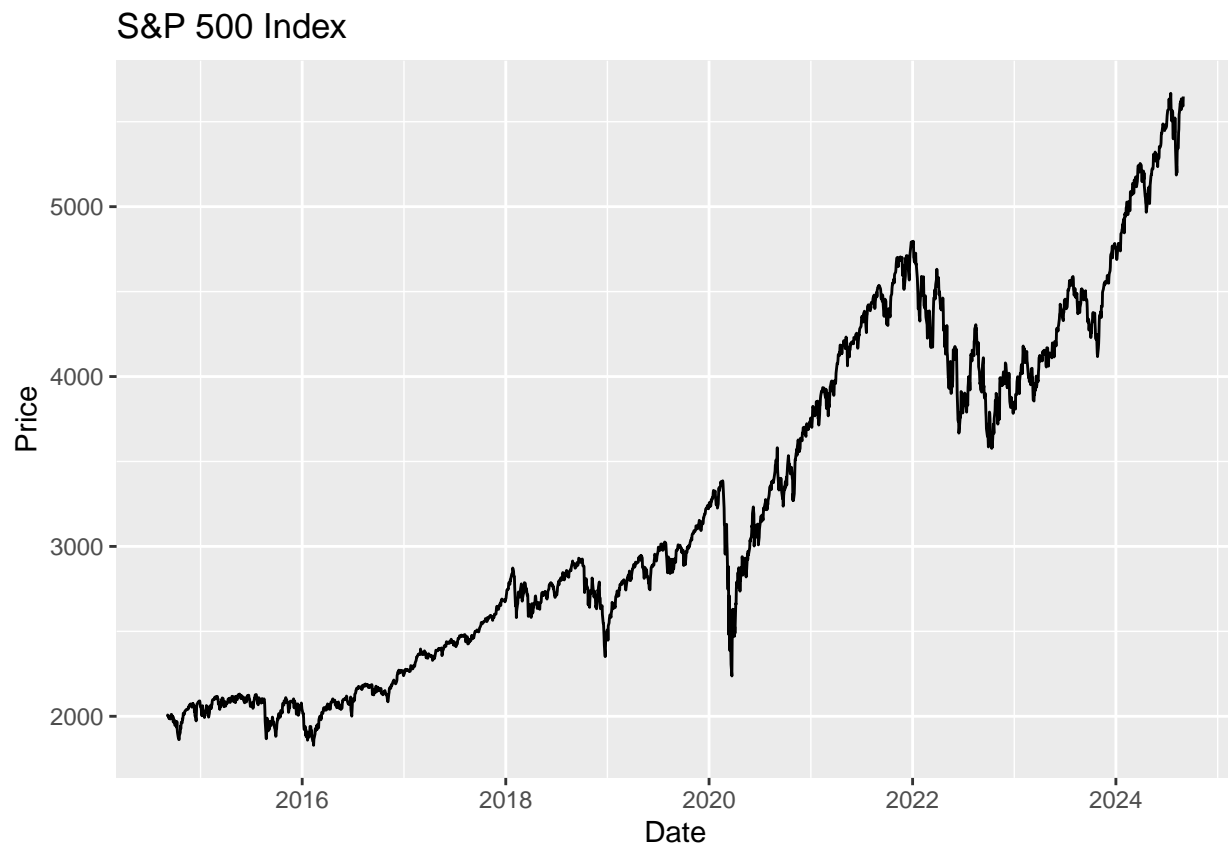
## Joining with `by = join_by(symbol, date, price)`
## Joining with `by = join_by(symbol, date, price)`

```

### 3. Plot time series

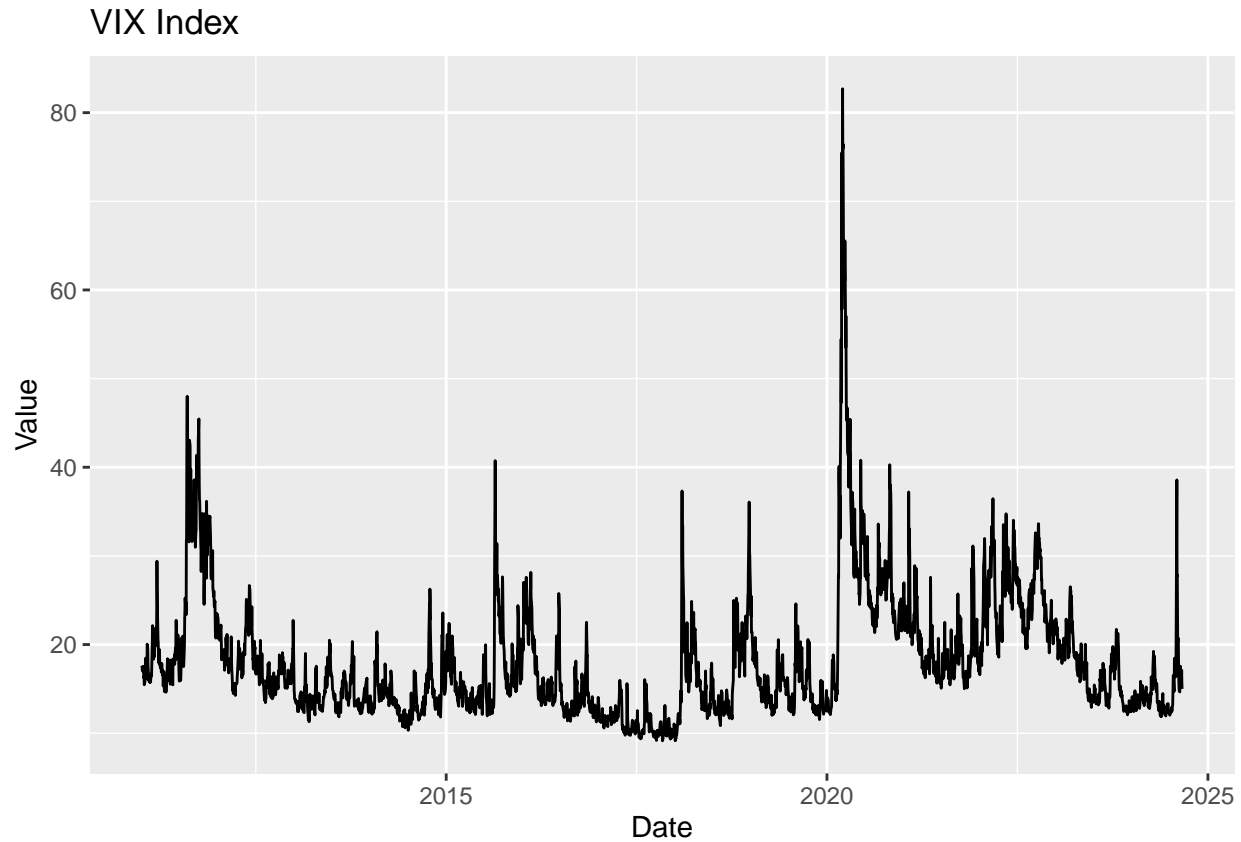
#### 3.1 S&P 500 Index

```
market_data %>%  
  filter(symbol == "SP500") %>%  
  ggplot(market_data, mapping = aes(date, price)) +  
    geom_line() +  
    labs(title="S&P 500 Index", x="Date", y="Price")
```



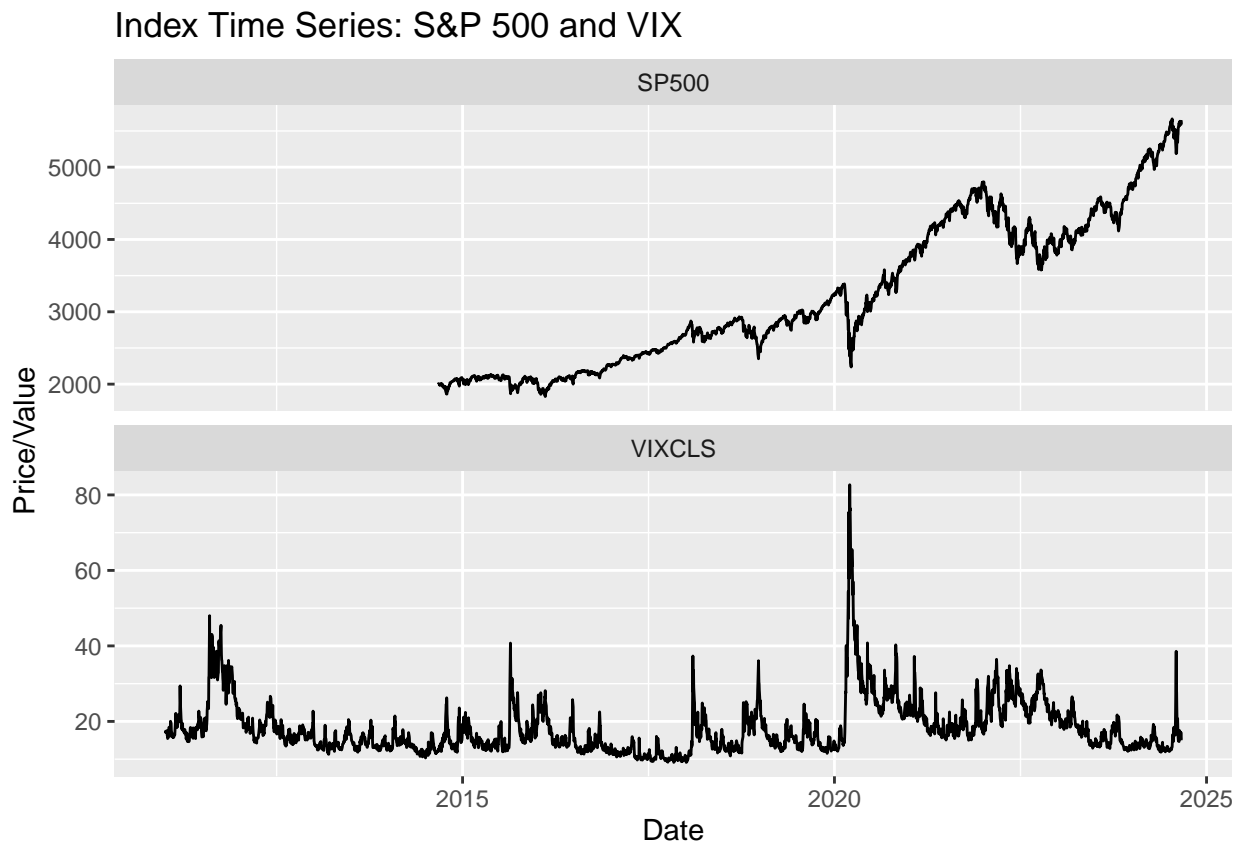
### 3.2 VIX Index

```
market_data %>%  
  filter(symbol == "VIXCLS") %>%  
  ggplot(market_data, mapping = aes(date, price)) +  
  geom_line() +  
  labs(title="VIX Index", x="Date", y="Value")
```



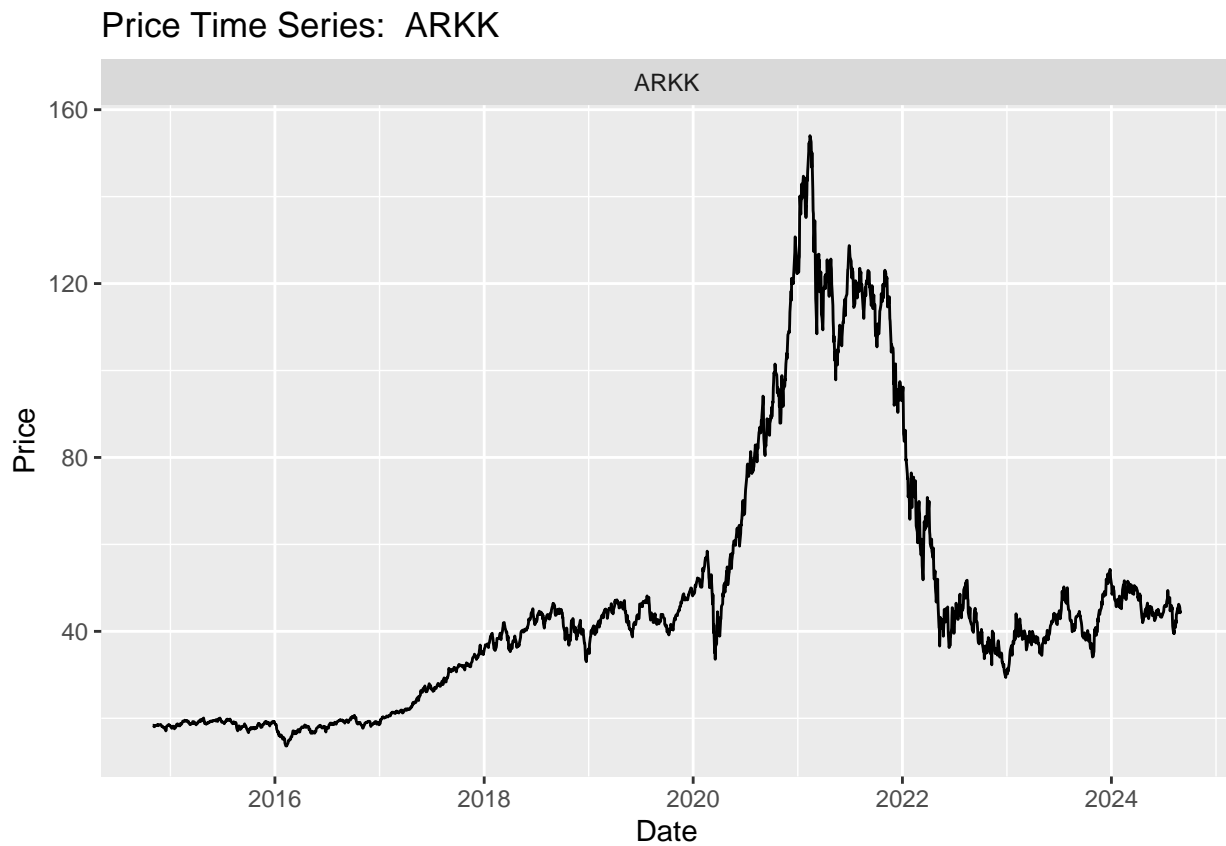
### 3.3 Plot both together

```
market_data %>%  
  filter(symbol %in% c("SP500","VIXCLS")) %>%  
  ggplot( mapping = aes(date,price),col=symbol) +  
  geom_line() +  
  facet_wrap(~ symbol, ncol = 1, scale = "free_y") +  
  labs(x="Date", y="Price/Value", title="Index Time Series: S&P 500 and VIX")
```



### 3.4 ARKK

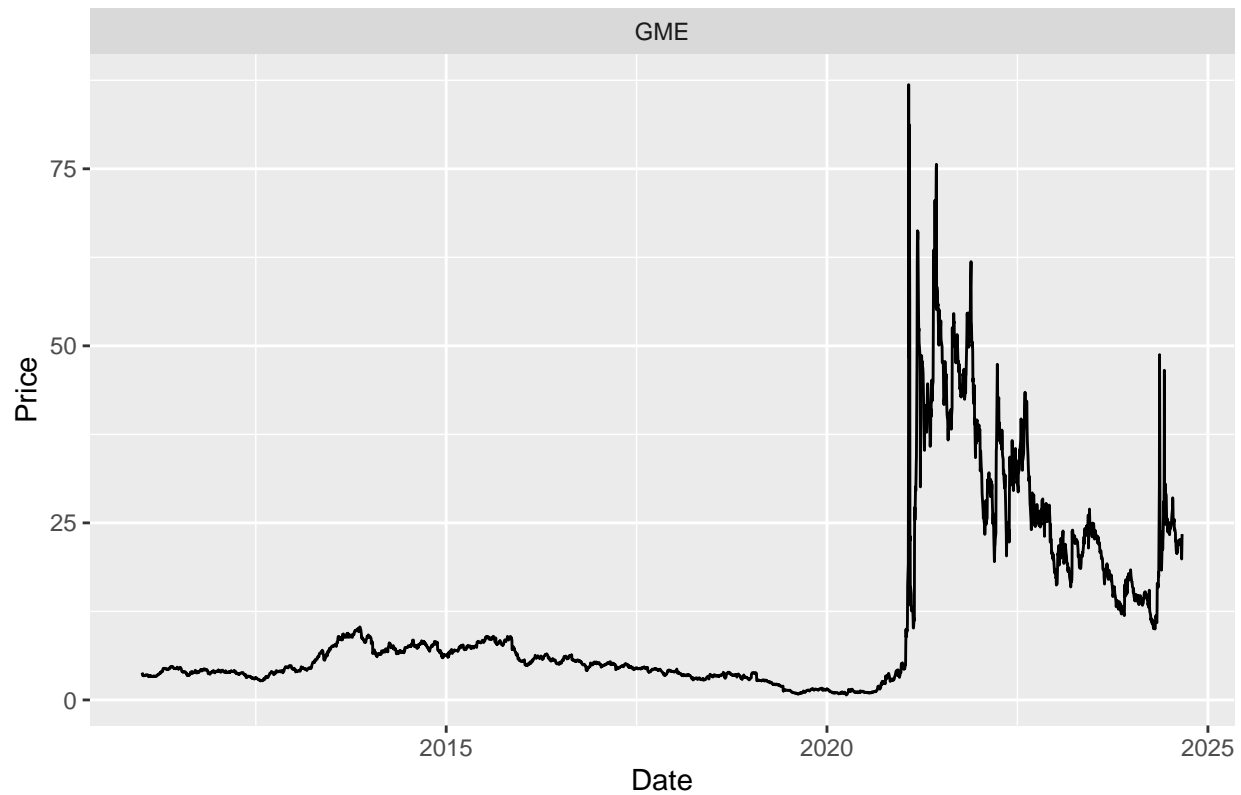
```
market_data %>%  
  filter(symbol %in% c("ARKK")) %>%  
  ggplot( mapping = aes(date,price)) +  
  geom_line() +  
  facet_wrap(~ symbol, ncol = 1, scale = "free_y") +  
  labs(x="Date", y="Price",  
       title="Price Time Series: ARKK")
```



### 3.5 GME

```
market_data %>%  
  filter(symbol %in% c("GME")) %>%  
  ggplot( mapping = aes(date,price)) +  
  geom_line() +  
  facet_wrap(~ symbol, ncol = 1, scale = "free_y") +  
  labs(x="Date", y="Price",  
       title="Price Time Series: GME")
```

Price Time Series: GME

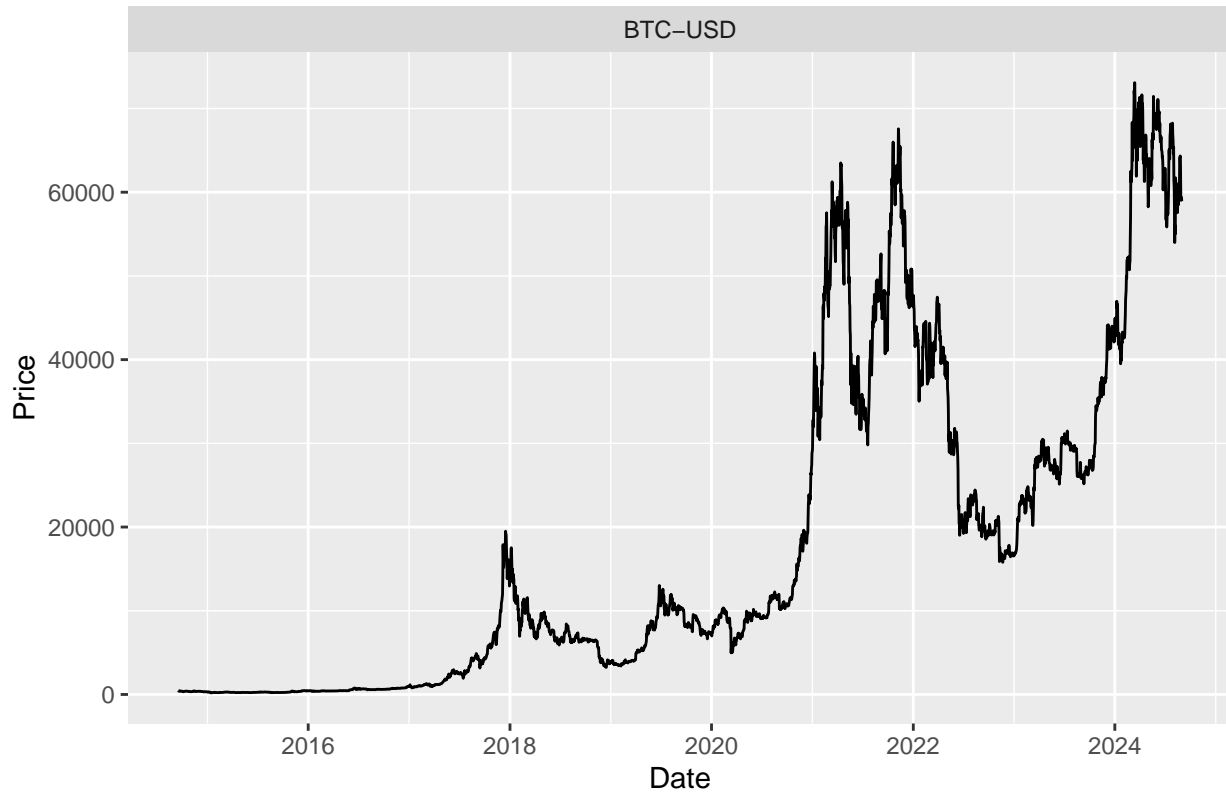




### 3.6 Bitcoin

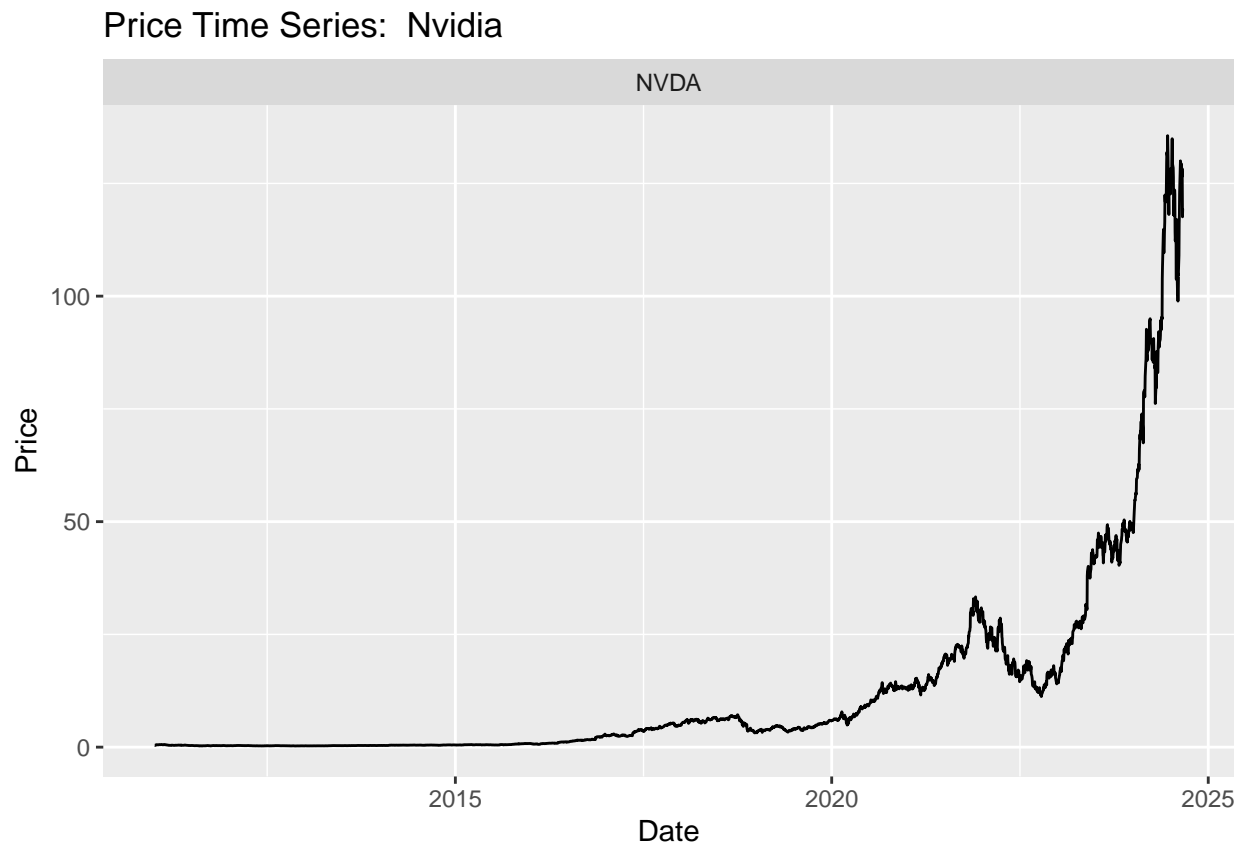
```
market_data %>%  
  filter(symbol %in% c("BTC-USD")) %>%  
  ggplot( mapping = aes(date,price)) +  
  geom_line() +  
  facet_wrap(~ symbol, ncol = 1, scale = "free_y") +  
  labs(x="Date", y="Price",  
       title="Price Time Series: Bitcoin")
```

Price Time Series: Bitcoin



### 3.7 Nvidia

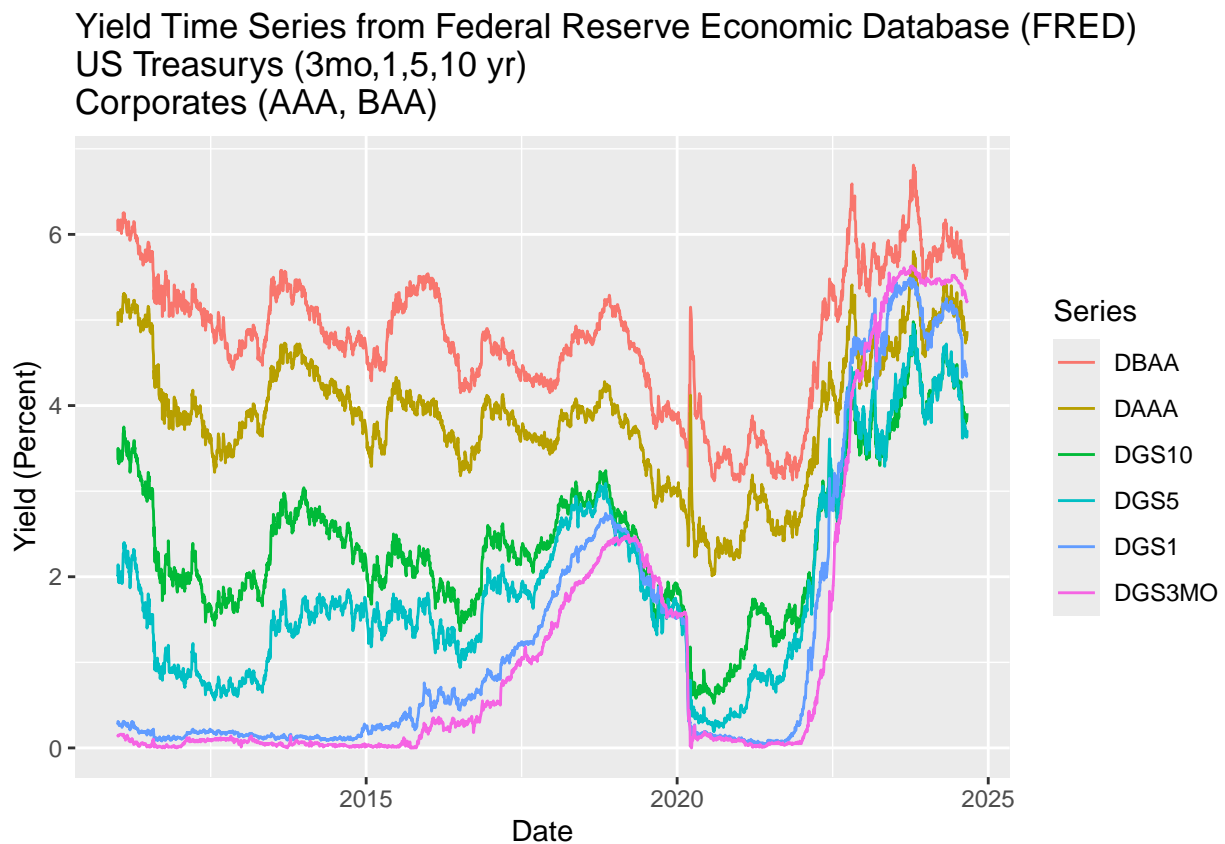
```
market_data %>%  
  filter(symbol %in% c("NVDA")) %>%  
  ggplot( mapping = aes(date,price)) +  
  geom_line() +  
  facet_wrap(~ symbol, ncol = 1, scale = "free_y") +  
  labs(x="Date", y="Price",  
       title="Price Time Series: Nvidia")
```



### 3.8 Bond Yields on the same graph

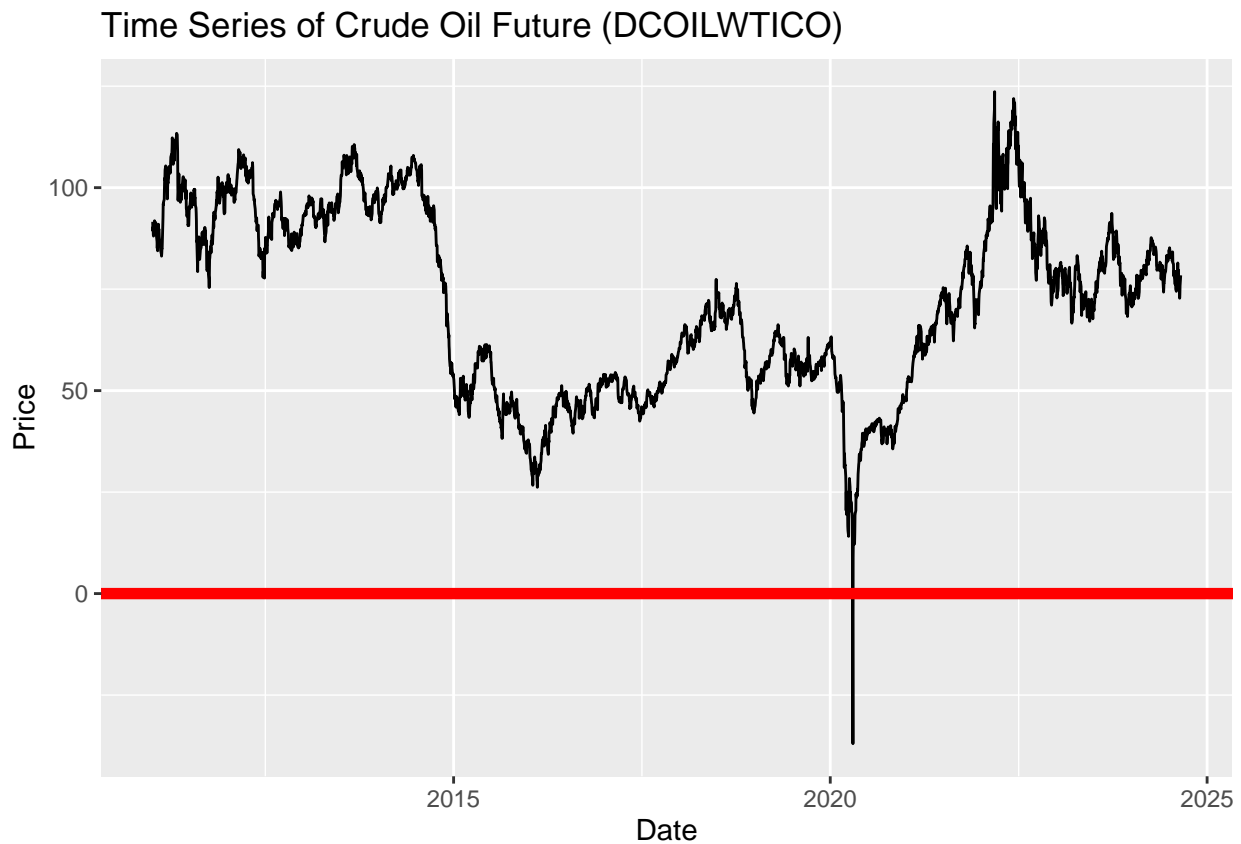
```
list_yields<-c("DGS3MO","DGS1", "DGS5","DGS10","DAAA","DBAA")

market_data %>%
  filter(symbol %in% list_yields) %>%
  mutate(Series = factor(symbol, levels=rev(list_yields))) %>%
  ggplot(market_data,
    mapping = aes(date, price, color = Series)) +
  geom_line() +
  labs(x="Date", y="Yield (Percent)",
    title="Yield Time Series from Federal Reserve Economic Database (FRED) \nUS Treasurys (3mo,1,5,10 yr)
    Corporates (AAA, BAA)")
```



### 3.9 Crude Oil Futures

```
market_data %>%  
  filter(symbol == "DCOILWTICO") %>%  
  ggplot(market_data, mapping = aes(date, price)) +  
  geom_line() +  
  geom_abline(intercept=0,slope=0,col='red',lwd=2)+  
  labs(x="Date", y="Price", title="Time Series of Crude Oil Future (DCOILWTICO)")
```



#### 4. Save R workspace with all time series

```
save(file="data_fm_intro1.Rdata",list=ls())
```

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