# Live Case: S&P500 (REITs)

*Sep 08, 2023*

## Objective

### A1) Role Play?

Greetings Data Commandos!

Imagine you're in the bustling hub of the world's most elite consulting firms, revered across the corporate spectrum.

**A prestigious investment fund is ready to channel $1 Million into the US finance sector. They've enlisted your expertise to delve into the 29 REITs within the Finance sector of the S&P500.**

Real Estate Investment Trusts, commonly known as REITs, offer a distinctive way to engage with real estate markets without the cumbersome process of directly owning property.

**Your mission? Allocate `$1 Million` to the "best" REIT(s). Pinpoint the top 1, 2 or 3 REITs that present the most promising short-term trading opportunities. Dive in and make those data-driven decisions!**

### A2) What are Prof. Sameer's learning objectives for you?

1. Revisit and solidify your knowledge of R programming, acquired or expected to be acquired in earlier courses.
2. Enhance your proficiency in data management and manipulation using the `dplyr` package and other functions in R.
3. Sharpen your skills in data visualization leveraging the `ggplot2`, `ggpubr` and related packages in R.
4. Master the art of addressing a data-centric business challenge while embodying the role of a Consulting Team.
5. Cultivate the capability to compellingly present your solutions to a discerning yet just audience.

## Setup S&P 500 REIT Data

### 1. Load some useful R packages

```
# Load the required libraries, suppressing annoying startup messages
library(dplyr, quietly = TRUE, warn.conflicts = FALSE) # For data manipulation
library(tibble, quietly = TRUE, warn.conflicts = FALSE) # For data manipulation
library(ggplot2, quietly = TRUE, warn.conflicts = FALSE) # For data visualization
library(ggpubr, quietly = TRUE, warn.conflicts = FALSE) # For data visualization

library(gsheet, quietly = TRUE, warn.conflicts = FALSE) # For Google Sheets
library(rmarkdown, quietly = TRUE, warn.conflicts = FALSE) # For writing
library(knitr, quietly = TRUE, warn.conflicts = FALSE) # For tables
library(kableExtra, quietly = TRUE, warn.conflicts = FALSE) # For tables
```

### 2. Read S&P500 data (to derive REIT data)

```
# Read S&P500 stock data present in a Google Sheet.
library(gsheet)
prefix <- "https://docs.google.com/spreadsheets/d/"
sheetID <- "11ahk9uWxBkDqrhNm7qYmiTwrlSC53N1zvXYfv7ttOCM"
url500 <- paste(prefix,sheetID) # Form the URL to connect to
sp500 <- gsheet2tbl(url500) # Read it into a tibble called sp500
```

### 3. Rename Columns

```
# Define a mapping of new column names
new_names <- c(
  "Date", "Stock", "StockName", "Sector", "Industry",
  "MarketCap", "Price", "Low52Wk", "High52Wk",
  "ROE", "ROA", "ROIC", "GrossMargin",
  "OperatingMargin", "NetMargin", "PE",
  "PB", "EVEBITDA", "EBITDA", "EPS",
  "EBITDA_YOY", "EBITDA_QYOY", "EPS_YOY",
  "EPS_QYOY", "PFCF", "FCF",
  "FCF_QYOY", "DebtToEquity", "CurrentRatio",
  "QuickRatio", "DividendYield",
```

```
  "DividendsPerShare_YOY", "PS",
  "Revenue_YOY", "Revenue_QYOY", "Rating"
)
# Rename the columns using the new_names vector
colnames(sp500)<-new_names
```

## 3. Select REIT data

1. The S&P500 shares are divided into multiple Sectors. Each stock belongs to a unique sector. Thus, it makes sense to model Sector as a factor() variable.
2. Set Sector, Rating data columns to be factor data types.

```
sp500$Sector <- as.factor(sp500$Sector)
sp500$Rating <- as.factor(sp500$Rating)
```

## C6. The Finance Sector within the S&P500

1. The Finance sector plays a pivotal role in the overall U.S. economy. Its performance is often closely watched by economists and investors alike, given its profound impact on lending, investment, and overall economic growth. Over the years, regulatory changes, monetary policy, and global economic events have significantly influenced this sector, making it a dynamic and critical component of the S&P 500.
2. We focus on investment opportunities **within the Finance sector** of the S&P500.

- We want to determine the *fundamentally strongest* AND *most reasonably priced* shares for *short-to-medium term* investing.

3. **Industry**: The Finance sector includes many industries within it.

For example:

- **Banks**: JPMorgan Chase, Bank of America, and Wells Fargo, among others, represent the significant banking entities.
- **Insurance Companies**: Companies like Berkshire Hathaway, Allstate operate in this sub-sector, offering a range of insurance products from property and casualty insurance to life insurance.

4. We create a tibble named `finStocks`, filtering the shares that belong to the Finance sector.

```r
finStocks = sp500 %>%
  filter(Sector=="Finance")
```

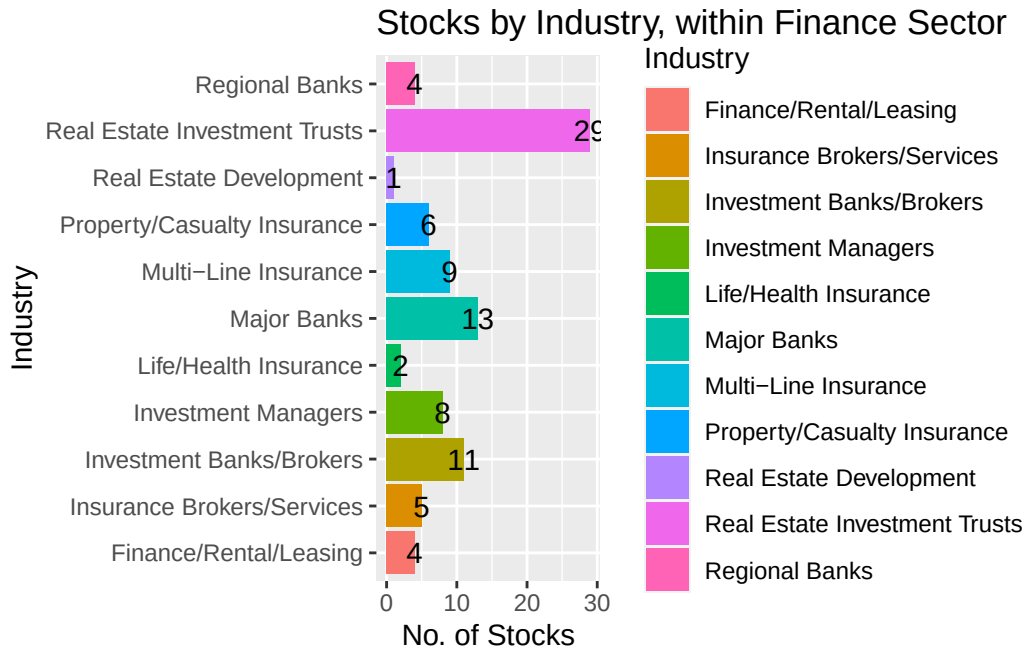
5. Industries within the Finance Sector

- The data shows that the Finance sector consists of a total of 92 companies that belong to different Industries.
- We set the Industry to be factor variable, since they can only assume unique levels.

```r
finStocks$Industry <- as.factor(finStocks$Industry)
```

- The following visualization summarizes the different Industries within the Finance Sector:

```r
ggplot(data = finStocks,
       aes(y = Industry)) +
  geom_bar(aes(fill = Industry)) +
  geom_text(stat='count',
            aes(label=after_stat(count))) +
  labs(title = "Stocks by Industry, within Finance Sector",
       x = "No. of Stocks",
       y = "Industry")
```



- Market Capitalization (Billions of USD) of Industries within the Finance Sector

```
FinanceMarketCap <- finStocks %>%
  mutate(MarketCap_Billions = round(MarketCap/1000000000, 2)) %>%
  group_by(Industry) %>%
  summarise(Market_Cap_BillionUSD = sum(MarketCap_Billions, na.rm = TRUE))  %>%
  arrange(-Market_Cap_BillionUSD)

# Create a summary row
summary_row <- tibble(
  Industry = "Total",
  Market_Cap_BillionUSD = sum(FinanceMarketCap$Market_Cap_BillionUSD)
)
# Append the summary row to the result
FinanceMarketCap <- bind_rows(FinanceMarketCap, summary_row)

# Render the table
FinanceMarketCap %>%
  kable("html", caption = "Market Capitalization (Billions of USD) of Finance Sector") %>%
  kable_styling()
```

Table 0.1: Market Capitalization (Billions of USD) of Finance Sector

| Industry | Market_Cap_BillionUSD |
|---|---|
| Major Banks | 1036.17 |
| Property/Casualty Insurance | 914.48 |
| Real Estate Investment Trusts | 833.22 |
| Investment Banks/Brokers | 594.79 |
| Multi-Line Insurance | 325.86 |
| Investment Managers | 313.20 |
| Insurance Brokers/Services | 248.11 |
| Finance/Rental/Leasing | 172.77 |
| Regional Banks | 140.10 |
| Life/Health Insurance | 43.41 |
| Real Estate Development | 22.27 |
| Total | 4644.38 |

- We focus on investment opportunities within a particular Industry – **Real Estate Investment Trusts**.

## C7. Stock Prices, as of 10/8/2023

1. Stock Prices relative to their 52 Week Low and 52 Week High

- We want to analyze stock prices relative to their 52 Week Low and 52 Week High respectively, to understand their relative price attractiveness.
- For this purpose, we create some additional data columns.

```
finStocks = sp500 %>%
  filter(Sector=="Finance") %>%
  mutate(Low52WkPerc = round((Price - Low52Wk)*100 / Low52Wk,2)) %>%
  mutate(High52WkPerc = round((High52Wk - Price)*100 / Low52Wk,2)) %>%
  mutate(MarketCap_Billions = round(MarketCap/1000000000, 2))
```

- Here, a new column named `Low52WkPerc` is being added. The column contains the percentage change between the current price (`Price`) and its 52-week low (`Low52Wk`). The formula used is:

$$Low52WkPerc = \frac{(CurrentPrice - 52WeekLow) * 100}{52WeekLow}$$

- Another column named `High52WkPerc` represents the percentage change between the 52-week high (`High52Wk`) and the current price (`Price`).
- We round off the data to two decimal places for clarity.

```
finStocks$Price <- round(finStocks$Price,1)
finStocks$Low52Wk <- round(finStocks$Low52Wk,1)
finStocks$High52Wk <- round(finStocks$High52Wk,1)
```

# D. REITs in the S&P500, as of 10/8/2023

1. Real Estate Investment Trusts, commonly known as REITs, stand as a cornerstone for investors seeking diversification in their portfolios. These entities offer a distinctive way to engage with real estate markets without the cumbersome process of directly owning property.
2. In our analysis of the Finance sector, we want to focus attention on a particular Industry within it – **Real Estate Investment Trusts**.
3. Recall: We want to determine the *fundamentally strongest* AND *most reasonably priced*, top 1-3 REITs for *short-to-medium term* investing USD 1 Million.

## D1. Key Characteristics of REITs:

1. **Income Distribution**: One of the most touted features of REITs is their consistent income flow. U.S. tax regulations mandate REITs to distribute at least 90% of their taxable income as dividends. While this can be enticing due to potentially higher yields, it also poses a risk. The high dividend mandate leaves REITs with less retained earnings, potentially hindering their growth or making them more dependent on external financing.
2. **Liquidity versus Direct Ownership**: REITs offer a stark contrast to traditional real estate investments in terms of liquidity. While selling a property might entail prolonged durations, hefty transaction costs, and price negotiations, REIT shares can be traded with the agility of stocks. This flexibility, however, comes at the cost of exposure to stock market volatility.
3. **Tax Implications**: The unique tax structure of REITs is a double-edged sword. While they can dodge corporate taxes by abiding by stringent regulations, such as the income distribution clause, shareholders often have to pay higher individual taxes on REIT dividends compared to qualified stock dividends.
4. **Sectoral Diversification**: REITs don't just represent traditional brick-and-mortar assets. From data centers to timberlands, they span diverse sectors, potentially providing portfolio diversification. However, the granularity in sectors necessitates that investors be judicious and knowledgeable about the specific type of real estate exposure they're obtaining.

## D2. Major U.S. REITs:

1. **American Tower Corporation (AMT)**: Pioneering the realm of communication infrastructures, AMT emphasizes cell tower operations. While it highlights the evolution

of REITs beyond traditional confines, it also underscores the need for REIT investors to comprehend tech industry dynamics, given its tech infrastructure focus.

2. **Prologis (PLD)**: With a niche in logistics and industrial real estate, Prologis stands out in the age of e-commerce. The company's assets, mainly distribution centers, are strategically situated in prime markets. However, the increasing demand for same-day deliveries and supply chain revamps could challenge Prologis' portfolio.
3. **Simon Property Group (SPG)**: Catering predominantly to retail spaces, SPG faces the arduous task of reinventing malls in an era where brick-and-mortar stores battle online retailers. The company's resilience in nurturing mixed-use spaces might determine its long-term growth trajectory.
4. **Equity Residential (EQR)**: As urbanization continues, EQR's focus on high-density urban areas might seem lucrative. But, with telecommuting trends and urban exodus, it's pivotal to monitor how urban rental landscapes evolve.
5. **Digital Realty Trust (DLR)**: In the digital age, DLR taps into the data economy by majoring in data centers. While the tech boom supports such endeavors, DLR's growth could be contingent on global data regulations and tech infrastructure demands.

**References**: Please consider looking into the following well-known sources, which regularly publish information about REITs.

- National Association of Real Estate Investment Trusts (NAREIT) – This organization is a representative voice for REITs in the U.S. They frequently release reports, articles, and data on the REIT industry.
- Major Financial News Outlets - Outlets like The Wall Street Journal, Financial Times, and Bloomberg often feature articles on REITs, especially in their real estate or investment sections.
- The Journal of Real Estate Finance and Economics - This academic journal covers a wide range of topics in real estate, including REITs.

## D3. REITs in the S&P500:

- We create a tibble named `REIT` from within the Finance sector tibble `finStocks`. Specifically, we filter the shares that belong to the `Real Estate Investment Trusts` Industry, within the Finance sector.

```
REIT <- finStocks %>%
  filter(Industry == 'Real Estate Investment Trusts')
```

- The following table lists REITs within the Finance sector of the S&P500

```
REIT %>%
  select(Stock, StockName, Price, MarketCap_Billions)  %>%
  arrange(desc(MarketCap_Billions)) %>%
  kable("html", caption = "REITs within Finance Sector of S&P500") %>%
  kable_styling()
```

Table 0.2: REITs within Finance Sector of S&P500

| Stock | StockName | Price | MarketCap_Billions |
|---|---|---|---|
| PLD | Prologis, Inc. | 108.2 | 103.70 |
| AMT | American Tower Corporation (REIT) | 159.5 | 75.38 |
| EQIX | Equinix, Inc. | 710.8 | 66.68 |
| VTR | Ventas, Inc. | 40.4 | 49.76 |
| PSA | Public Storage | 257.6 | 45.85 |
| WELL | Welltower Inc. | 80.2 | 42.40 |
| CCI | Crown Castle Inc. | 89.3 | 39.43 |
| DLR | Digital Realty Trust, Inc. | 116.2 | 35.79 |
| O | Realty Income Corporation | 48.6 | 34.72 |
| SPG | Simon Property Group, Inc. | 103.0 | 34.23 |
| VICI | VICI Properties Inc. | 28.2 | 29.03 |
| EXR | Extra Space Storage Inc | 118.2 | 25.20 |
| AVB | AvalonBay Communities, Inc. | 166.8 | 23.87 |
| EQR | Equity Residential | 57.5 | 21.93 |
| WY | Weyerhaeuser Company | 29.8 | 21.91 |
| SBAC | SBA Communications Corporation | 192.6 | 21.49 |
| INVH | Invitation Homes Inc. | 31.1 | 19.15 |
| IRM | Iron Mountain Incorporated (Delaware) | 57.8 | 17.12 |
| ARE | Alexandria Real Estate Equities, Inc. | 97.1 | 16.99 |
| MAA | Mid-America Apartment Communities, Inc. | 126.8 | 14.85 |
| ESS | Essex Property Trust, Inc. | 208.1 | 13.40 |
| UDR | UDR, Inc. | 35.0 | 11.58 |
| HST | Host Hotels & Resorts, Inc. | 15.5 | 11.33 |
| REG | Regency Centers Corporation | 57.1 | 10.79 |
| KIM | Kimco Realty Corporation (HC) | 16.7 | 10.60 |
| CPT | Camden Property Trust | 92.8 | 9.93 |
| PEAK | Healthpeak Properties, Inc. | 17.4 | 9.83 |
| BXP | Boston Properties, Inc. | 55.0 | 9.01 |
| FRT | Federal Realty Investment Trust | 87.2 | 7.27 |

- Consider the summary statistics of the Market Capitalization of the REITs within the S&P500

```r
REIT %>% summarise(
  N = n(),
  Mean = mean(MarketCap_Billions),
  SD = sd(MarketCap_Billions),
  Median = median(MarketCap_Billions),
  Q1 = quantile(MarketCap_Billions, 0.25),
  Q3 = quantile(MarketCap_Billions, 0.75),
  Min = min(MarketCap_Billions),
  Max = max(MarketCap_Billions),
  Sum = sum(MarketCap_Billions)
) %>%
  round(2) %>%
  kable("html", caption = "Summary Statistics of Market Capitalizaiton of REITs (Billion U
  kable_styling()
```

Table 0.3: Summary Statistics of Market Capitalizaiton of REITs (Billion USD)

| N | Mean | SD | Median | Q1 | Q3 | Min | Max | Sum |
|---|---|---|---|---|---|---|---|---|
| 29 | 28.73 | 22.5 | 21.91 | 11.58 | 35.79 | 7.27 | 103.7 | 833.22 |

- As can be seen, the S&P500 consists of 29 REITs.

**Recall.. A prestigious investment fund is ready to channel $1 Million into the US finance sector. They've enlisted your expertise to delve into the 29 REITs within the Finance sector of the S&P500.**

**Recall Your mission? Pinpoint the top 1, 2 or 3 REITs that present the most promising short-term trading opportunities. How will you allocate your investment capital of USD 1 Million? Dive in and make those data-driven decisions!**

- We want to determine the *fundamentally strongest* AND *most reasonably priced* shares for *short-to-medium term* investing.

Well done! Our data is now ready for analysis!!

7. Low52WkPerc: Create a new column MarketCapBillions = MarketCap/1000,000,000, as described in the chapter Live Case: S&P500 (1 of 3).

```r
sp500 <- sp500 %>% mutate(MarketCapBillions = round(MarketCap/1000000000))
colnames(sp500)
```

```
 [1] "Date"                 "Stock"                "StockName"
 [4] "Sector"               "Industry"             "MarketCap"
 [7] "Price"                "Low52Wk"              "High52Wk"
[10] "ROE"                  "ROA"                  "ROIC"
[13] "GrossMargin"          "OperatingMargin"      "NetMargin"
[16] "PE"                   "PB"                   "EVEBITDA"
[19] "EBITDA"               "EPS"                  "EBITDA_YOY"
[22] "EBITDA_QYOY"          "EPS_YOY"              "EPS_QYOY"
[25] "PFCF"                 "FCF"                  "FCF_QYOY"
[28] "DebtToEquity"         "CurrentRatio"         "QuickRatio"
[31] "DividendYield"        "DividendsPerShare_YOY" "PS"
[34] "Revenue_YOY"          "Revenue_QYOY"         "Rating"
[37] "MarketCapBillions"
```

## Live Case: S&P500

ISSUE: Analysis of a particular SECTOR We have chosen to deeply analyze the `Real Estate Investment Trusts`

## SECTOR LEVEL ANALYSIS begins here

### Filter the data by sector Finace & Industry Real Estate Investment Trusts, and display the number of stocks in the sector

```
REIT <- finStocks %>%
  filter(Industry == 'Real Estate Investment Trusts')
```

There are 12 number of of stocks in the Industry REIT

### Select the Specific Coulumns from the filtered dataframe `ts` (Industry REIT)

```
ts2 <- REIT %>%
        select(Date, Stock, StockName,Sector,  Industry, MarketCap, Price,Low52Wk, High52W
               ROE, ROA,ROIC,GrossMargin, GrossMargin,
               NetMargin, Rating)

colnames(ts2)
```

```
 [1] "Date"        "Stock"       "StockName"   "Sector"      "Industry"
 [6] "MarketCap"   "Price"       "Low52Wk"     "High52Wk"    "ROE"
[11] "ROA"         "ROIC"        "GrossMargin" "NetMargin"   "Rating"
```

### Arrange the Dataframe by ROE

```
ts3 <- ts2 %>% arrange(desc(ROE))
```

### Top 10 Shares in Sector Based on ROE

```
head(ts3,10)
```

```
# A tibble: 10 x 15
   Date   Stock StockName Sector Industry MarketCap Price Low52Wk High52Wk   ROE
   <chr>  <chr> <chr>     <fct>  <chr>        <dbl> <dbl>   <dbl>    <dbl> <dbl>
 1 10/8/~ SPG   Simon Pr~ Finan~ Real Es~   3.42e10 103      90.8    133.   72.5
 2 10/8/~ IRM   Iron Mou~ Finan~ Real Es~   1.71e10  57.8    44.1     64.5  71.4
 3 10/8/~ EXR   Extra Sp~ Finan~ Real Es~   2.52e10 118.    118.     181.   52.7
 4 10/8/~ PSA   Public S~ Finan~ Real Es~   4.58e10 258.    258.     316.   42.7
 5 10/8/~ CCI   Crown Ca~ Finan~ Real Es~   3.94e10  89.3    88.8    154    22.9
 6 10/8/~ FRT   Federal ~ Finan~ Real Es~   7.27e 9  87.2    85.3    115.   13.6
 7 10/8/~ UDR   UDR, Inc. Finan~ Real Es~   1.16e10  35      34.9     45.5  11.2
 8 10/8/~ BXP   Boston P~ Finan~ Real Es~   9.01e 9  55      46.2     79.4  11.1
 9 10/8/~ AVB   AvalonBa~ Finan~ Real Es~   2.39e10 167.    153.     199.   11
10 10/8/~ HST   Host Hot~ Finan~ Real Es~   1.13e10  15.5    14.5     19.4  11
# i 5 more variables: ROA <dbl>, ROIC <dbl>, GrossMargin <dbl>,
#   NetMargin <dbl>, Rating <fct>
```

### Significance of 52-Week Low Price

The 52-week low price of a stock is a significant indicator for multiple reasons, especially when considering shares listed on major indices like the S&P 500. Here's why this metric is noteworthy:

1. **Historical Perspective**: The 52-week low offers a snapshot of how low the stock has traded over the past year relative to its current price, providing context about its price journey.

2. **Potential Entry Point**: Some investors view stocks that are near their 52-week low as potential buying opportunities, under the assumption that the stock might be undervalued and could rebound.
3. **Psychological Level**: Stocks approaching their 52-week low can be seen as testing a significant support level. If a stock consistently fails to breach its 52-week low, it might indicate that the market values the stock at that level, and it's resistant to falling below it.
4. **Basis for Technical Analysis**: For technical analysts or traders, the 52-week low serves as a critical reference point. A consistent breach of this level might signify a bearish trend, while a rebound can indicate potential recovery.
5. **Yield Implications for Dividend Stocks**: For dividend-paying stocks, a price near the 52-week low (assuming the dividend hasn't been cut) would imply a higher dividend yield, potentially making it attractive for income-seeking investors.

- **Note of Caution:** While the 52-week low is a valuable reference point, it's essential to interpret it in conjunction with other financial and market indicators. A stock trading near its 52-week low doesn't automatically make it a good buy, just as a stock trading near its 52-week high doesn't automatically make it overvalued. Comprehensive analysis, should inform investment decisions.

### Mutate a data column called (Low52WkPerc), then show top 10 ROE stocks

```
ts4 <- ts3 %>% mutate(Low52WkPerc = round((Price - Low52Wk)*100 / Low52Wk,2))
head(ts4[,c(1:3,10,16)],10)
```

```
# A tibble: 10 x 5
   Date      Stock StockName                                ROE Low52WkPerc
   <chr>     <chr> <chr>                                  <dbl>       <dbl>
 1 10/8/2023 SPG   Simon Property Group, Inc.              72.5        13.4
 2 10/8/2023 IRM   Iron Mountain Incorporated (Delaware)   71.4        31.1
 3 10/8/2023 EXR   Extra Space Storage Inc                 52.7         0.08
 4 10/8/2023 PSA   Public Storage                         42.7         0
 5 10/8/2023 CCI   Crown Castle Inc.                      22.9         0.56
 6 10/8/2023 FRT   Federal Realty Investment Trust        13.6         2.23
 7 10/8/2023 UDR   UDR, Inc.                              11.2         0.29
 8 10/8/2023 BXP   Boston Properties, Inc.                11.1        19.0
 9 10/8/2023 AVB   AvalonBay Communities, Inc.            11           8.95
10 10/8/2023 HST   Host Hotels & Resorts, Inc.            11           6.9
```

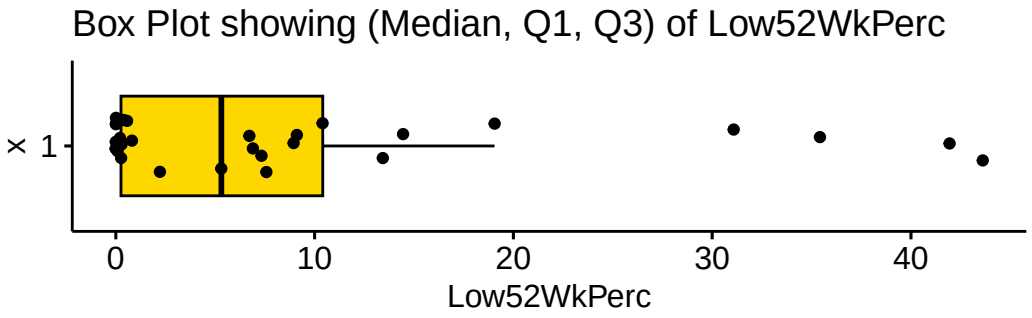
## Summary Statistics of Low52WkPerc (Price rel. to 52-Week Low)

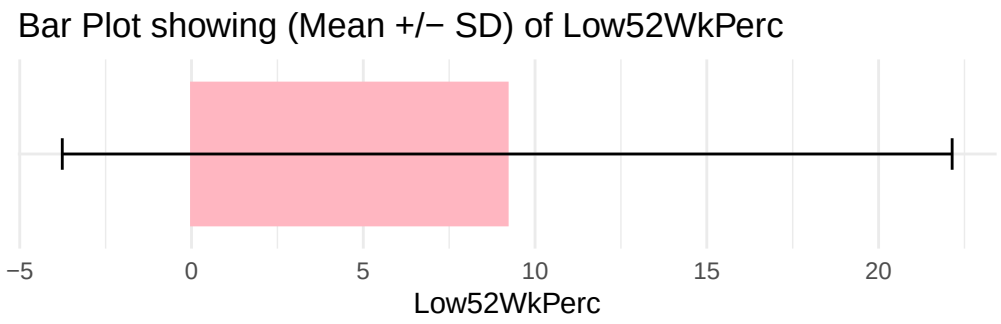
```
summaryStats <- ts4 %>% summarise(
  N = n(),
  Mean = mean(Low52WkPerc),
  SD = sd(Low52WkPerc),
  Median = median(Low52WkPerc),
  Q1 = quantile(Low52WkPerc, 0.25),
  Q3 = quantile(Low52WkPerc, 0.75),
  Min = min(Low52WkPerc),
  Max = max(Low52WkPerc)
)

Low52WkPercQ1 <- summaryStats$Q1 # Save Q1 of Low52WkPerc

summaryStats %>%
  round(2) %>%
  kable("html", caption = "Summary Statistics of Low52WkPerc (Price rel. to 52-Week Low)")
  kable_styling()
```

Table 0.4: Summary Statistics of Low52WkPerc (Price rel. to 52-Week Low)

| N | Mean | SD | Median | Q1 | Q3 | Min | Max |
|---|---|---|---|---|---|---|---|
| 29 | 9.19 | 12.95 | 5.31 | 0.26 | 10.41 | 0 | 43.62 |

*Low52WkPerc for all the REIT Stocks, as shown below*




## Inexpensive Stocks with Low52WkPerc < Q1(Low52WkPerc)

```
ts4 %>%
  select(Stock, StockName, Price, Low52Wk, Low52WkPerc) %>%
  filter(Low52WkPerc < Low52WkPercQ1) %>%
  arrange(Low52WkPerc)%>%
  kable("html", caption = "Inexpensive Stocks with Low52WkPerc < Q1(Low52WkPerc)") %>%
  kable_styling()
```

Table 0.5: Inexpensive Stocks with Low52WkPerc < Q1(Low52WkPerc)

| Stock | StockName | Price | Low52Wk | Low52WkPerc |
|---|---|---|---|---|
| PSA | Public Storage | 257.6 | 257.6 | 0.00 |
| VICI | VICI Properties Inc. | 28.2 | 28.2 | 0.00 |
| PEAK | Healthpeak Properties, Inc. | 17.4 | 17.4 | 0.00 |
| KIM | Kimco Realty Corporation (HC) | 16.7 | 16.7 | 0.00 |
| O | Realty Income Corporation | 48.6 | 48.6 | 0.00 |
| EXR | Extra Space Storage Inc | 118.2 | 118.1 | 0.08 |
| ARE | Alexandria Real Estate Equities, Inc. | 97.1 | 96.9 | 0.21 |

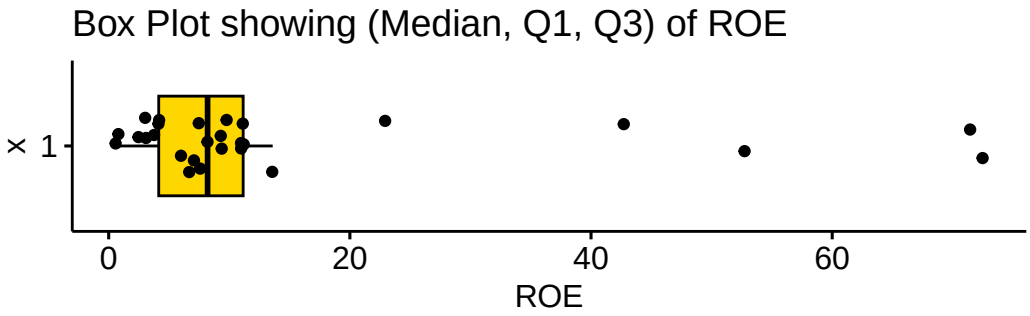
### Summary Statistics of Return on Equity (ROE)

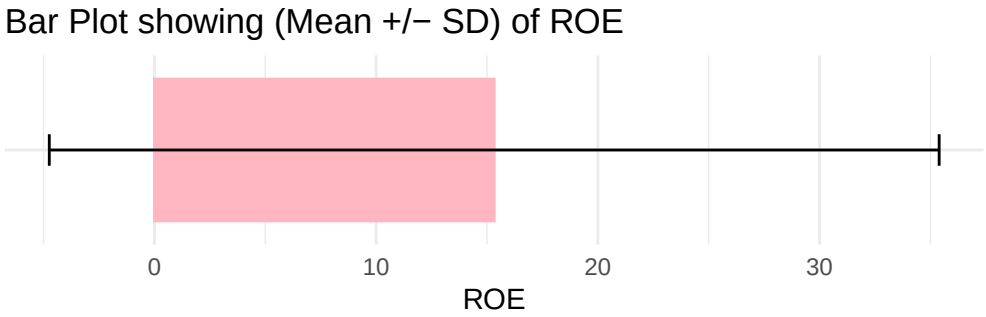
```
summaryStats <- ts4 %>% summarise(
  N = n(),
  Mean = mean(ROE, na.rm = TRUE),
  SD = sd(ROE, na.rm = TRUE),
  Median = median(ROE, na.rm = TRUE),
  Q1 = quantile(ROE, 0.25, na.rm = TRUE),
  Q3 = quantile(ROE, 0.75, na.rm = TRUE),
  Min = min(ROE, na.rm = TRUE),
  Max = max(ROE, na.rm = TRUE)
)

ROE_Q3 <- summaryStats$Q3

summaryStats %>%
  round(2) %>%
  kable("html", caption = "Summary Statistics of Return on Equity (ROE)") %>%
  kable_styling()
```

Table 0.6: Summary Statistics of Return on Equity (ROE)

| N | Mean | SD | Median | Q1 | Q3 | Min | Max |
|---|---|---|---|---|---|---|---|
| 29 | 15.33 | 20.07 | 8.2 | 4.15 | 11.15 | 0.6 | 72.5 |

- ROE for all the Stocks in REIT, as shown below




### Stocks with ROE > Q3(ROE)

```
ts4 %>%
  select(Stock, StockName, Price, ROA, ROE, Low52Wk, Low52WkPerc) %>%
  filter(ROE > ROE_Q3) %>%
  arrange(desc(ROE)) %>%
  kable("html", caption = "Stocks with ROE > Q3(ROE)") %>%
  kable_styling()
```

Table 0.7: Stocks with ROE > Q3(ROE)

| Stock | StockName | Price | ROA | ROE | Low52Wk | Low52WkPerc |
|---|---|---|---|---|---|---|
| SPG | Simon Property Group, Inc. | 103.0 | 6.5 | 72.5 | 90.8 | 13.44 |
| IRM | Iron Mountain Incorporated (Delaware) | 57.8 | 2.3 | 71.4 | 44.1 | 31.07 |
| EXR | Extra Space Storage Inc | 118.2 | 7.0 | 52.7 | 118.1 | 0.08 |
| PSA | Public Storage | 257.6 | 24.1 | 42.7 | 257.6 | 0.00 |
| CCI | Crown Castle Inc. | 89.3 | 4.4 | 22.9 | 88.8 | 0.56 |
| FRT | Federal Realty Investment Trust | 87.2 | 4.8 | 13.6 | 85.3 | 2.23 |
| UDR | UDR, Inc. | 35.0 | 4.0 | 11.2 | 34.9 | 0.29 |

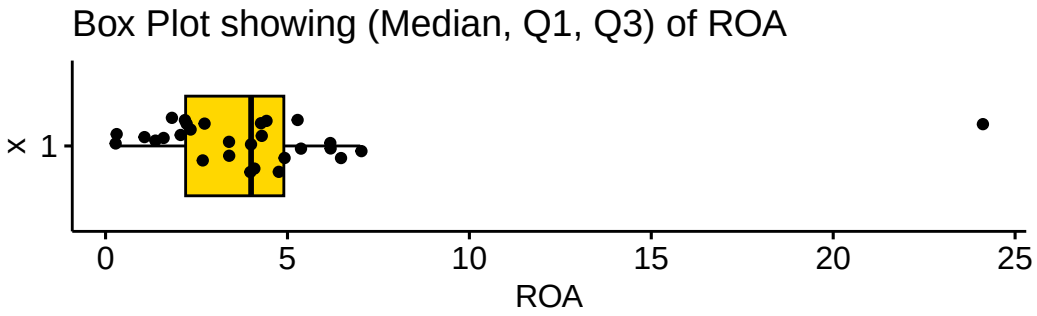
### Summary Statistics of Return on Equity (ROA)

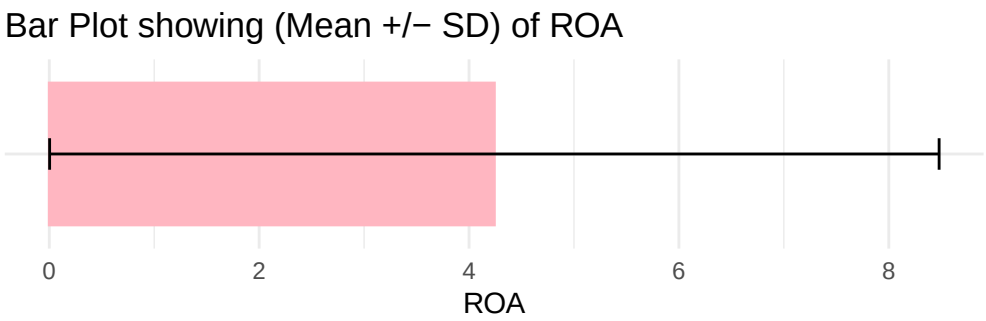
```
summaryStats <- ts4 %>% summarise(
  N = n(),
  Mean = mean(ROA, na.rm = TRUE),
  SD = sd(ROA, na.rm = TRUE),
  Median = median(ROA, na.rm = TRUE),
  Q1 = quantile(ROA, 0.25, na.rm = TRUE),
  Q3 = quantile(ROA, 0.75, na.rm = TRUE),
  Min = min(ROA, na.rm = TRUE),
  Max = max(ROA, na.rm = TRUE)
)

ROA_Q3 <- summaryStats$Q3

summaryStats %>%
  round(2) %>%
  kable("html", caption = "Summary Statistics of Return on Equity (ROA)") %>%
  kable_styling()
```

Table 0.8: Summary Statistics of Return on Equity (ROA)

| N | Mean | SD | Median | Q1 | Q3 | Min | Max |
|---|---|---|---|---|---|---|---|
| 29 | 4.24 | 4.24 | 4 | 2.2 | 4.9 | 0.3 | 24.1 |

- ROA for all the Stocks in REIT, as shown below




### Stocks with ROA > Q3(ROA)

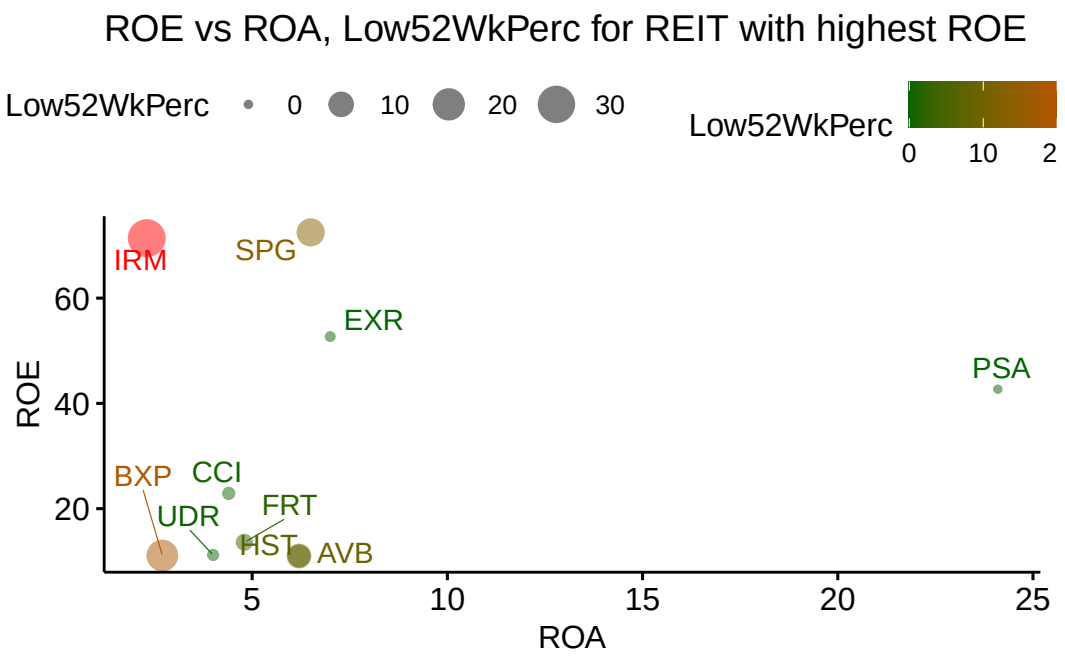
```
ts4 %>%
  select(Stock, StockName, Price, ROA, ROE, Low52Wk, Low52WkPerc) %>%
  filter(ROA > ROA_Q3) %>%
  arrange(desc(ROA)) %>%
  kable("html", caption = "Stocks with ROA > Q3(ROA)") %>%
  kable_styling()
```

Table 0.9: Stocks with ROA > Q3(ROA)

| Stock | StockName | Price | ROA | ROE | Low52Wk | Low52WkPerc |
|---|---|---|---|---|---|---|
| PSA | Public Storage | 257.6 | 24.1 | 42.7 | 257.6 | 0.00 |
| EXR | Extra Space Storage Inc | 118.2 | 7.0 | 52.7 | 118.1 | 0.08 |
| SPG | Simon Property Group, Inc. | 103.0 | 6.5 | 72.5 | 90.8 | 13.44 |
| AVB | AvalonBay Communities, Inc. | 166.8 | 6.2 | 11.0 | 153.1 | 8.95 |
| HST | Host Hotels & Resorts, Inc. | 15.5 | 6.2 | 11.0 | 14.5 | 6.90 |
| VICI | VICI Properties Inc. | 28.2 | 5.4 | 9.4 | 28.2 | 0.00 |
| MAA | Mid-America Apartment Communities, Inc. | 126.8 | 5.3 | 9.8 | 126.3 | 0.40 |

**ROE versus ROA and colored by Price rel. to 52 Week Low**

```
top10 <-
  ts4 %>%
  select(Stock, Price, Low52Wk, Low52WkPerc, ROA, ROE) %>%
  arrange(desc(ROE))%>%
  slice(1:10)

top10$name <- top10$Stock

ggscatter(top10,
          x = "ROA",
          y = "ROE",
          size = "Low52WkPerc",
          color = "Low52WkPerc",
          alpha = 0.5,
          label = "name",
          repel = TRUE,
          title = "ROE vs ROA, Low52WkPerc for REIT with highest ROE") +
  gradient_color(c("darkgreen",  "red"))
```



### Summary Statistics of All key variables in REIT Services

```
ts3 <- na.omit(ts3)

ROESum <- ts3 %>%
  summarise(
    Mean = mean(ROE),
    Median= sd(ROE),
    Median= median(ROE),
    Q1 = quantile(ROE, probs = 0.25, na.rm = TRUE),
    Q3 = quantile(ROE, probs = 0.75, na.rm = TRUE),
    Min = min(ROE),
    max = max(ROE)
  )

ROESum <- round(ROESum,2)


ROASum <- ts3 %>%
  summarise(
    Mean = mean(ROA),
    Median= sd(ROA),
    Median= median(ROA),
    Q1 = quantile(ROA, probs = 0.25, na.rm = TRUE),
    Q3 = quantile(ROA, probs = 0.75, na.rm = TRUE),
    Min = min(ROA),
    max = max(ROA)
  )

ROASum <- round(ROASum,2)

ROICSum <- ts3 %>%
  summarise(
    Mean = mean(ROIC),
    Median= sd(ROIC),
    Median= median(ROIC),
    Q1 = quantile(ROIC, probs = 0.25, na.rm = TRUE),
    Q3 = quantile(ROIC, probs = 0.75, na.rm = TRUE),
    Min = min(ROIC),
    max = max(ROIC)
  )
```

```r
ROICSum <- round(ROICSum,2)

GrossMarginSum <- ts3 %>%
  summarise(
    Mean = mean(GrossMargin),
    Median= sd(GrossMargin),
    Median= median(GrossMargin),
    Q1 = quantile(GrossMargin, probs = 0.25, na.rm = TRUE),
    Q3 = quantile(GrossMargin, probs = 0.75, na.rm = TRUE),
    Min = min(GrossMargin),
    max = max(GrossMargin)
  )

GrossMarginSum <- round(GrossMarginSum,2)

NetMarginSum <- ts3 %>%
  summarise(
    Mean = mean(NetMargin),
    Median= sd(NetMargin),
    Median= median(NetMargin),
    Q1 = quantile(NetMargin, probs = 0.25, na.rm = TRUE),
    Q3 = quantile(NetMargin, probs = 0.75, na.rm = TRUE),
    Min = min(NetMargin),
    max = max(NetMargin)
  )

NetMarginSum <- round(NetMarginSum,2)

Metrics <- c("ROE","ROA","ROIC","GrossMargin","NetMargin")

ftab <- rbind(ROESum, ROASum, ROICSum, GrossMarginSum, NetMarginSum)
ftab <- cbind(Metrics, ftab)
ftab
```

```
      Metrics  Mean Median    Q1    Q3  Min  max
1         ROE 15.33    8.2  4.15 11.15  0.6 72.5
2         ROA  4.32    4.0  2.20  5.05  0.3 24.1
3        ROIC  4.77    4.4  2.40  5.40  0.3 25.0
4 GrossMargin 37.95   35.7 26.25 45.75 -1.3 99.2
5   NetMargin 27.11   23.8 14.10 33.50  1.8 97.3
```

## ANALYSIS OF INDUSTRY REIT

1. Market Cap of all companies in Sector Health Services

```
library(janitor)
library(kableExtra)
# Market Cap by Stock
MCap <- ts3 %>%
  group_by(Stock) %>%
  summarise(
    MarketCapBi = round(sum(na.omit(MarketCap)/1000000000),2))

# Sp500 Market Cap

SP500MarketCap <- sum(ts3$MarketCap/1000000000)

# calculating % market cap
PercentMarketCap <- round(MCap$MarketCapBi*100/SP500MarketCap,2)
MCapTab <- cbind(MCap,PercentMarketCap)

# sorting by PercentMarketCap
MCapTab <- MCapTab %>% arrange(desc(PercentMarketCap))


MCapTab <- MCapTab %>%
  adorn_totals("row")

MCapTab <- knitr::kable(MCapTab, "html") %>% kable_styling()
MCapTab
```

| Stock | MarketCapBi | PercentMarketCap |
|---|---|---|
| PLD | 103.70 | 14.08 |
| EQIX | 66.68 | 9.06 |
| VTR | 49.76 | 6.76 |
| PSA | 45.85 | 6.23 |
| WELL | 42.40 | 5.76 |
| CCI | 39.43 | 5.35 |
| DLR | 35.79 | 4.86 |
| O | 34.72 | 4.72 |
| SPG | 34.23 | 4.65 |
| VICI | 29.03 | 3.94 |

| Stock | MarketCapBi | PercentMarketCap |
|---|---|---|
| EXR | 25.20 | 3.42 |
| AVB | 23.87 | 3.24 |
| EQR | 21.93 | 2.98 |
| WY | 21.91 | 2.98 |
| INVH | 19.15 | 2.60 |
| IRM | 17.12 | 2.32 |
| ARE | 16.99 | 2.31 |
| MAA | 14.85 | 2.02 |
| ESS | 13.40 | 1.82 |
| UDR | 11.58 | 1.57 |
| HST | 11.33 | 1.54 |
| REG | 10.79 | 1.47 |
| KIM | 10.60 | 1.44 |
| CPT | 9.93 | 1.35 |
| PEAK | 9.83 | 1.33 |
| BXP | 9.01 | 1.22 |
| FRT | 7.27 | 0.99 |
| Total | 736.35 | 100.01 |

2. Shares which are most attractively priced in Industry REIT

```
AttrShares <- ts4 %>% arrange(Low52WkPerc)
AttrShares <- AttrShares[, c(2:4,7,8,10,11,16)]

AttrShares <- knitr::kable(AttrShares, "html") %>% kable_styling()
AttrShares
```

| Stock | StockName | Sector | Price | Low52Wk | ROE | ROA | Low52Wk |
|---|---|---|---|---|---|---|---|
| PSA | Public Storage | Finance | 257.6 | 257.6 | 42.7 | 24.1 | |
| VICI | VICI Properties Inc. | Finance | 28.2 | 28.2 | 9.4 | 5.4 | |
| PEAK | Healthpeak Properties, Inc. | Finance | 17.4 | 17.4 | 8.2 | 3.4 | |
| KIM | Kimco Realty Corporation (HC) | Finance | 16.7 | 16.7 | 4.1 | 2.2 | |
| O | Realty Income Corporation | Finance | 48.6 | 48.6 | 3.0 | 1.8 | |
| EXR | Extra Space Storage Inc | Finance | 118.2 | 118.1 | 52.7 | 7.0 | |
| ARE | Alexandria Real Estate Equities, Inc. | Finance | 97.1 | 96.9 | 3.1 | 1.6 | |
| SBAC | SBA Communications Corporation | Finance | 192.6 | 192.1 | NA | 4.9 | |
| UDR | UDR, Inc. | Finance | 35.0 | 34.9 | 11.2 | 4.0 | |
| CPT | Camden Property Trust | Finance | 92.8 | 92.5 | 4.2 | 2.2 | |
| MAA | Mid-America Apartment Communities, Inc. | Finance | 126.8 | 126.3 | 9.8 | 5.3 | |
| CCI | Crown Castle Inc. | Finance | 89.3 | 88.8 | 22.9 | 4.4 | |

| Stock | StockName | Sector | Price | Low52Wk | ROE | ROA | Low52Wk |
|---|---|---|---|---|---|---|---|
| AMT | American Tower Corporation (REIT) | Finance | 159.5 | 158.2 | NA | 1.4 | |
| FRT | Federal Realty Investment Trust | Finance | 87.2 | 85.3 | 13.6 | 4.8 | |
| EQR | Equity Residential | Finance | 57.5 | 54.6 | 7.6 | 4.1 | |
| ESS | Essex Property Trust, Inc. | Finance | 208.1 | 195.0 | 9.3 | 4.3 | |
| HST | Host Hotels & Resorts, Inc. | Finance | 15.5 | 14.5 | 11.0 | 6.2 | |
| REG | Regency Centers Corporation | Finance | 57.1 | 53.2 | 6.0 | 3.4 | |
| WY | Weyerhaeuser Company | Finance | 29.8 | 27.7 | 6.7 | 4.0 | |
| AVB | AvalonBay Communities, Inc. | Finance | 166.8 | 153.1 | 11.0 | 6.2 | |
| INVH | Invitation Homes Inc. | Finance | 31.1 | 28.5 | 3.8 | 2.1 | |
| PLD | Prologis, Inc. | Finance | 108.2 | 98.0 | 7.5 | 4.3 | |
| SPG | Simon Property Group, Inc. | Finance | 103.0 | 90.8 | 72.5 | 6.5 | |
| VTR | Ventas, Inc. | Finance | 40.4 | 35.3 | 0.8 | 0.3 | |
| BXP | Boston Properties, Inc. | Finance | 55.0 | 46.2 | 11.1 | 2.7 | |
| IRM | Iron Mountain Incorporated (Delaware) | Finance | 57.8 | 44.1 | 71.4 | 2.3 | |
| DLR | Digital Realty Trust, Inc. | Finance | 116.2 | 85.8 | 2.5 | 1.1 | |
| WELL | Welltower Inc. | Finance | 80.2 | 56.5 | 0.6 | 0.3 | |
| EQIX | Equinix, Inc. | Finance | 710.8 | 494.9 | 7.1 | 2.7 | |

## PROFITABILITY OF INDUSTRY REIT

1. Shares have highest ROE within REIT

```
AttrShares <- ts4 %>% arrange(desc(ROE))
AttrShares <- AttrShares[, c(2:4,7,8,10,11,16)]

AttrShares <- knitr::kable(AttrShares, "html") %>% kable_styling()
AttrShares
```

| Stock | StockName | Sector | Price | Low52Wk | ROE | ROA | Low52Wk |
|---|---|---|---|---|---|---|---|
| SPG | Simon Property Group, Inc. | Finance | 103.0 | 90.8 | 72.5 | 6.5 | |
| IRM | Iron Mountain Incorporated (Delaware) | Finance | 57.8 | 44.1 | 71.4 | 2.3 | |
| EXR | Extra Space Storage Inc | Finance | 118.2 | 118.1 | 52.7 | 7.0 | |
| PSA | Public Storage | Finance | 257.6 | 257.6 | 42.7 | 24.1 | |
| CCI | Crown Castle Inc. | Finance | 89.3 | 88.8 | 22.9 | 4.4 | |
| FRT | Federal Realty Investment Trust | Finance | 87.2 | 85.3 | 13.6 | 4.8 | |
| UDR | UDR, Inc. | Finance | 35.0 | 34.9 | 11.2 | 4.0 | |
| BXP | Boston Properties, Inc. | Finance | 55.0 | 46.2 | 11.1 | 2.7 | |
| AVB | AvalonBay Communities, Inc. | Finance | 166.8 | 153.1 | 11.0 | 6.2 | |
| HST | Host Hotels & Resorts, Inc. | Finance | 15.5 | 14.5 | 11.0 | 6.2 | |

| Stock | StockName | Sector | Price | Low52Wk | ROE | ROA | Low52Wk |
|---|---|---|---|---|---|---|---|
| MAA | Mid-America Apartment Communities, Inc. | Finance | 126.8 | 126.3 | 9.8 | 5.3 | |
| VICI | VICI Properties Inc. | Finance | 28.2 | 28.2 | 9.4 | 5.4 | |
| ESS | Essex Property Trust, Inc. | Finance | 208.1 | 195.0 | 9.3 | 4.3 | |
| PEAK | Healthpeak Properties, Inc. | Finance | 17.4 | 17.4 | 8.2 | 3.4 | |
| EQR | Equity Residential | Finance | 57.5 | 54.6 | 7.6 | 4.1 | |
| PLD | Prologis, Inc. | Finance | 108.2 | 98.0 | 7.5 | 4.3 | |
| EQIX | Equinix, Inc. | Finance | 710.8 | 494.9 | 7.1 | 2.7 | |
| WY | Weyerhaeuser Company | Finance | 29.8 | 27.7 | 6.7 | 4.0 | |
| REG | Regency Centers Corporation | Finance | 57.1 | 53.2 | 6.0 | 3.4 | |
| CPT | Camden Property Trust | Finance | 92.8 | 92.5 | 4.2 | 2.2 | |
| KIM | Kimco Realty Corporation (HC) | Finance | 16.7 | 16.7 | 4.1 | 2.2 | |
| INVH | Invitation Homes Inc. | Finance | 31.1 | 28.5 | 3.8 | 2.1 | |
| ARE | Alexandria Real Estate Equities, Inc. | Finance | 97.1 | 96.9 | 3.1 | 1.6 | |
| O | Realty Income Corporation | Finance | 48.6 | 48.6 | 3.0 | 1.8 | |
| DLR | Digital Realty Trust, Inc. | Finance | 116.2 | 85.8 | 2.5 | 1.1 | |
| VTR | Ventas, Inc. | Finance | 40.4 | 35.3 | 0.8 | 0.3 | |
| WELL | Welltower Inc. | Finance | 80.2 | 56.5 | 0.6 | 0.3 | |
| AMT | American Tower Corporation (REIT) | Finance | 159.5 | 158.2 | NA | 1.4 | |
| SBAC | SBA Communications Corporation | Finance | 192.6 | 192.1 | NA | 4.9 | |

2. Shares have highest ROA within REIT

```
AttrShares <- ts4 %>% arrange(desc(ROA))
AttrShares <- AttrShares[, c(2:4,7,8,10,11,16)]

AttrShares <- knitr::kable(AttrShares, "html") %>% kable_styling()
AttrShares
```

| Stock | StockName | Sector | Price | Low52Wk | ROE | ROA | Low52Wk |
|---|---|---|---|---|---|---|---|
| PSA | Public Storage | Finance | 257.6 | 257.6 | 42.7 | 24.1 | |
| EXR | Extra Space Storage Inc | Finance | 118.2 | 118.1 | 52.7 | 7.0 | |
| SPG | Simon Property Group, Inc. | Finance | 103.0 | 90.8 | 72.5 | 6.5 | |
| AVB | AvalonBay Communities, Inc. | Finance | 166.8 | 153.1 | 11.0 | 6.2 | |
| HST | Host Hotels & Resorts, Inc. | Finance | 15.5 | 14.5 | 11.0 | 6.2 | |
| VICI | VICI Properties Inc. | Finance | 28.2 | 28.2 | 9.4 | 5.4 | |
| MAA | Mid-America Apartment Communities, Inc. | Finance | 126.8 | 126.3 | 9.8 | 5.3 | |
| SBAC | SBA Communications Corporation | Finance | 192.6 | 192.1 | NA | 4.9 | |
| FRT | Federal Realty Investment Trust | Finance | 87.2 | 85.3 | 13.6 | 4.8 | |
| CCI | Crown Castle Inc. | Finance | 89.3 | 88.8 | 22.9 | 4.4 | |
| ESS | Essex Property Trust, Inc. | Finance | 208.1 | 195.0 | 9.3 | 4.3 | |

| Stock | StockName | Sector | Price | Low52Wk | ROE | ROA | Low52Wk |
|---|---|---|---|---|---|---|---|
| PLD | Prologis, Inc. | Finance | 108.2 | 98.0 | 7.5 | 4.3 | |
| EQR | Equity Residential | Finance | 57.5 | 54.6 | 7.6 | 4.1 | |
| UDR | UDR, Inc. | Finance | 35.0 | 34.9 | 11.2 | 4.0 | |
| WY | Weyerhaeuser Company | Finance | 29.8 | 27.7 | 6.7 | 4.0 | |
| PEAK | Healthpeak Properties, Inc. | Finance | 17.4 | 17.4 | 8.2 | 3.4 | |
| REG | Regency Centers Corporation | Finance | 57.1 | 53.2 | 6.0 | 3.4 | |
| BXP | Boston Properties, Inc. | Finance | 55.0 | 46.2 | 11.1 | 2.7 | |
| EQIX | Equinix, Inc. | Finance | 710.8 | 494.9 | 7.1 | 2.7 | |
| IRM | Iron Mountain Incorporated (Delaware) | Finance | 57.8 | 44.1 | 71.4 | 2.3 | |
| CPT | Camden Property Trust | Finance | 92.8 | 92.5 | 4.2 | 2.2 | |
| KIM | Kimco Realty Corporation (HC) | Finance | 16.7 | 16.7 | 4.1 | 2.2 | |
| INVH | Invitation Homes Inc. | Finance | 31.1 | 28.5 | 3.8 | 2.1 | |
| O | Realty Income Corporation | Finance | 48.6 | 48.6 | 3.0 | 1.8 | |
| ARE | Alexandria Real Estate Equities, Inc. | Finance | 97.1 | 96.9 | 3.1 | 1.6 | |
| AMT | American Tower Corporation (REIT) | Finance | 159.5 | 158.2 | NA | 1.4 | |
| DLR | Digital Realty Trust, Inc. | Finance | 116.2 | 85.8 | 2.5 | 1.1 | |
| VTR | Ventas, Inc. | Finance | 40.4 | 35.3 | 0.8 | 0.3 | |
| WELL | Welltower Inc. | Finance | 80.2 | 56.5 | 0.6 | 0.3 | |