Live Case: S&P500 (3)

Aug 10, 2023. -=-

Agenda: Analyzing a particular Sector within the S&P500 Index *We have chosen to deeply analyze the HEALTH TECHNOLOGY Sector.*

S&P 500 Data - PRELIMINARY SETUP

1. We will continue our analysis of the S&P 500. Load the data, as described in the chapter Live Case: S&P500 (1 of 3)

```
# 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
```

2. Rename columns, as described in the chapter Live Case: S&P500 (1 of 3).

```
suppressPackageStartupMessages(library(dplyr))

# 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
sp500 <- sp500 %>%
  rename_with(~ new_names, everything())
```

3. Remove Rows containing no data or Null values, as described in the chapter Live Case: S&P500 (1 of 3).

```
# Check for blank or null values in the "Stock" column
hasNull <- any(sp500$Stock == "" | is.null(sp500$Stock))
if (hasNull) {
    # Remove rows with null or blank values from the dataframe tibble
    sp500 <- sp500[!(is.null(sp500$Stock) | sp500$Stock == ""), ]
}
```

4. The S&P500 shares are divided into multiple Sectors. Thus, model Sector as a factor() variable, as described in the chapter Live Case: S&P500 (1 of 3).

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

5. Stock Ratings: The S&P500 shares have Technical Ratings such as {Buy, Sell, ..}. Model the data column Rating as a factor() variable, as described in the chapter Live Case: S&P500 (1 of 3).

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

6. Low52WkPerc: Create a new column to track Share Prices relative to their 52 Week Low, as described in the chapter Live Case: S&P500 (1 of 3).

```
sp500 <- sp500 %>% mutate(Low52WkPerc = round((Price - Low52Wk)*100 / Low52Wk,2))
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] "Low52WkPerc"
```

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

7. Creating a new column MarketCapBillions = MarketCap/1000,000,000

```
sp500 <- sp500 %>% mutate(MarketCapBillions = 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] "Low52WkPerc"         "MarketCapBillions"
```

SECTOR LEVEL ANALYSIS begins here

Filter the data by sector Health Services, and display the number of stocks in the sector

```
ts <- sp500 %>%
        filter(Sector=='Health Services')

nrow(ts)
```

```
[1] 12
```

There are 12 number of of stocks in the sector Health Services

Select the Specific Coulumns from the filtered dataframe `ts` (Health Services)

```
ts2 <- ts %>%
        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 Health Services 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 9/30/~ DVA   DaVita I~ Healt~ Medical~   8.63e 9  94.6    65.3    117    56
 2 9/30/~ MOH   Molina H~ Healt~ Managed~   1.91e10 328.    256.     374    28.4
 3 9/30/~ UNH   UnitedHe~ Healt~ Managed~   4.67e11 504.    446.     558.   27.2
 4 9/30/~ HUM   Humana I~ Healt~ Managed~   6.03e10 486.    423.     571.   20.9
 5 9/30/~ IQV   IQVIA Ho~ Healt~ Service~   3.60e10 197.    166.     242.   19.7
 6 9/30/~ ELV   Elevance~ Healt~ Managed~   1.03e11 435.    412      550.   17.3
 7 9/30/~ CI    The Cign~ Healt~ Managed~   8.47e10 286.    240.     340.   14.6
 8 9/30/~ DGX   Quest Di~ Healt~ Service~   1.37e10 122.    122.     158.   12.5
```

```
 9 9/30/~ UHS   Universa~ Healt~ Hospita~   7.81e 9 126.     82.5    159.   11.6
10 9/30/~ CNC   Centene ~ Healt~ Managed~   3.73e10  68.9    60.8     87.8  10.4
# i 5 more variables: ROA <dbl>, ROIC <dbl>, GrossMargin <dbl>,
#   NetMargin <dbl>, Rating <fct>
```

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 9/30/2023 DVA   DaVita Inc.                         56         44.9
 2 9/30/2023 MOH   Molina Healthcare Inc               28.4       28.0
 3 9/30/2023 UNH   UnitedHealth Group Incorporated    27.2       13.1
 4 9/30/2023 HUM   Humana Inc.                        20.9       14.9
 5 9/30/2023 IQV   IQVIA Holdings, Inc.               19.7       18.7
 6 9/30/2023 ELV   Elevance Health, Inc.              17.3        5.68
 7 9/30/2023 CI    The Cigna Group                    14.6       19.0
 8 9/30/2023 DGX   Quest Diagnostics Incorporated     12.5        0.16
 9 9/30/2023 UHS   Universal Health Services, Inc.    11.6       52.4
10 9/30/2023 CNC   Centene Corporation                10.4       13.3
```

Summary Statistics of ROE

```
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)
ROESum
```

```
# A tibble: 1 x 6
   Mean Median    Q1    Q3   Min   max
  <dbl>  <dbl> <dbl> <dbl> <dbl> <dbl>
1  21.6   12.5  11.6  19.7   8.3    56
```

Summary Statistics of All key variables in Sector Health 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)
  )

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)
```

```r
ftab <- cbind(Metrics, ftab)
ftab
```

```
      Metrics  Mean Median   Q1   Q3 Min  max
1         ROE 21.62   12.5 11.6 19.7 8.3 56.0
2         ROA  4.44    4.3  4.2  5.1 2.7  5.9
3        ROIC  5.70    6.0  5.1  6.3 3.7  7.4
4 GrossMargin 23.26   25.5 23.0 27.1 7.9 32.8
5   NetMargin  6.08    5.7  5.0  7.5 3.9  8.3
```

Summary Statistics of ROE by each Sector of S&P500

```r
SectorROE <- sp500 %>%
  group_by(Sector) %>%
  summarise(
    Mean = mean(na.omit(ROE)),
    Median= sd(na.omit(ROE)),
    Median= median(na.omit(ROE)),
    Q1 = quantile(na.omit(ROE), probs = 0.25, na.rm = TRUE),
    Q3 = quantile(na.omit(ROE), probs = 0.75, na.rm = TRUE),
    Min = min(na.omit(ROE)),
    max = max(na.omit(ROE))
  )

cbind(Sector = SectorROE$Sector, round(SectorROE[,2:7],2))
```

```
                   Sector   Mean Median    Q1    Q3     Min    max
1     Commercial Services  37.98  26.40 16.40 43.60     3.5  175.2
2          Communications   8.10   9.10  0.55 16.15    -8.0   23.2
3       Consumer Durables  12.23  16.65  6.85 25.38   -51.4   45.2
4   Consumer Non-Durables 129.53  19.60  6.40 33.90   -11.5 2878.8
5       Consumer Services  33.02  11.40  1.55 44.95  -185.6  359.9
6   Distribution Services  81.10  34.20 22.15 56.45     5.1  371.2
7   Electronic Technology  31.51  18.75  8.10 36.80   -14.8  160.1
8         Energy Minerals  43.12  26.95 23.78 41.45    18.0  230.2
9                 Finance  22.13  11.00  7.82 16.67   -14.7  714.3
10        Health Services  20.63  17.30 12.05 24.05     8.3   56.0
11      Health Technology  19.87  13.10  6.80 22.73   -49.3  173.5
12    Industrial Services  21.04  22.60 10.70 31.10     7.7   36.5
```

```
13    Non-Energy Minerals  13.84  13.50  3.40 21.80    -3.8   36.8
14     Process Industries  25.72  18.60 15.35 24.62   -13.2  125.5
15 Producer Manufacturing  25.42  20.20 13.02 30.00   -13.6   95.9
16           Retail Trade  74.34  28.70 14.47 44.00 -1224.5 2065.3
17    Technology Services  33.17  18.00 10.70 31.82   -70.6  416.6
18         Transportation  36.39  33.50 20.85 49.08     4.1  104.4
19              Utilities   8.12   8.70  7.65 10.60   -47.6   35.5
```

ANALYSIS OF HEALTH SERVICES SECTOR

1. Market Cap of all companies in Sector Health Services

```
library(janitor)
library(kableExtra)
# Market Cap by Stock
MCap <- ts3 %>%
  group_by(Stock) %>%
  summarise(
    MarketCapCr = sum(na.omit(MarketCap)/10000000))

# Sp500 Market Cap

SP500MarketCap <- sum(ts3$MarketCap/10000000)

# calculating % market cap
PercentMarketCap <- round(MCap$MarketCapCr*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	MarketCapCr	PercentMarketCap
IQV	3602.9303	42.91

Stock	MarketCapCr	PercentMarketCap
LH	1781.3030	21.22
DGX	1367.6957	16.29
DVA	863.0589	10.28
UHS	781.2901	9.31
Total	8396.2781	100.01

2. Shares which are most attractively priced in Sector Health Services

```
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	L
DGX	Quest Diagnostics Incorporated	Health Services	121.9	121.7	12.5	5.9	
ELV	Elevance Health, Inc.	Health Services	435.4	412.0	17.3	6.1	
UNH	UnitedHealth Group Incorporated	Health Services	504.2	445.7	27.2	8.3	
CNC	Centene Corporation	Health Services	68.9	60.8	10.4	3.3	
HUM	Humana Inc.	Health Services	486.5	423.3	20.9	6.5	
LH	Laboratory Corporation of America Holdings	Health Services	201.1	172.1	8.3	4.2	
IQV	IQVIA Holdings, Inc.	Health Services	196.8	165.8	19.7	4.3	
CI	The Cigna Group	Health Services	286.1	240.5	14.6	4.5	
MOH	Molina Healthcare Inc	Health Services	327.9	256.2	28.4	7.0	
HCA	HCA Healthcare, Inc.	Health Services	246.1	178.3	NA	11.0	
DVA	DaVita Inc.	Health Services	94.6	65.3	56.0	2.7	
UHS	Universal Health Services, Inc.	Health Services	125.7	82.5	11.6	5.1	

PROFITABILITY OF HEALTH SERVICES SECTOR

1. Shares have highest ROE within Sector Technology Services

```
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	Lo
DVA	DaVita Inc.	Health Services	94.6	65.3	56.0	2.7	
MOH	Molina Healthcare Inc	Health Services	327.9	256.2	28.4	7.0	
UNH	UnitedHealth Group Incorporated	Health Services	504.2	445.7	27.2	8.3	
HUM	Humana Inc.	Health Services	486.5	423.3	20.9	6.5	
IQV	IQVIA Holdings, Inc.	Health Services	196.8	165.8	19.7	4.3	
ELV	Elevance Health, Inc.	Health Services	435.4	412.0	17.3	6.1	
CI	The Cigna Group	Health Services	286.1	240.5	14.6	4.5	
DGX	Quest Diagnostics Incorporated	Health Services	121.9	121.7	12.5	5.9	
UHS	Universal Health Services, Inc.	Health Services	125.7	82.5	11.6	5.1	
CNC	Centene Corporation	Health Services	68.9	60.8	10.4	3.3	
LH	Laboratory Corporation of America Holdings	Health Services	201.1	172.1	8.3	4.2	
HCA	HCA Healthcare, Inc.	Health Services	246.1	178.3	NA	11.0	

2. Shares have highest ROA within Sector Health Services

```
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	Lo
HCA	HCA Healthcare, Inc.	Health Services	246.1	178.3	NA	11.0	
UNH	UnitedHealth Group Incorporated	Health Services	504.2	445.7	27.2	8.3	
MOH	Molina Healthcare Inc	Health Services	327.9	256.2	28.4	7.0	
HUM	Humana Inc.	Health Services	486.5	423.3	20.9	6.5	
ELV	Elevance Health, Inc.	Health Services	435.4	412.0	17.3	6.1	
DGX	Quest Diagnostics Incorporated	Health Services	121.9	121.7	12.5	5.9	
UHS	Universal Health Services, Inc.	Health Services	125.7	82.5	11.6	5.1	
CI	The Cigna Group	Health Services	286.1	240.5	14.6	4.5	
IQV	IQVIA Holdings, Inc.	Health Services	196.8	165.8	19.7	4.3	
LH	Laboratory Corporation of America Holdings	Health Services	201.1	172.1	8.3	4.2	
CNC	Centene Corporation	Health Services	68.9	60.8	10.4	3.3	
DVA	DaVita Inc.	Health Services	94.6	65.3	56.0	2.7	

3. Shares have highest NetMargin within Sector Health Services

```r
AttrShares <- ts4 %>% arrange(desc(NetMargin))
AttrShares <- AttrShares[, c(2:4,7,8,10,11,14,16)]

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

Stock	StockName	Sector	Price	Low52Wk	ROE	ROA	N
HCA	HCA Healthcare, Inc.	Health Services	246.1	178.3	NA	11.0	
DGX	Quest Diagnostics Incorporated	Health Services	121.9	121.7	12.5	5.9	
IQV	IQVIA Holdings, Inc.	Health Services	196.8	165.8	19.7	4.3	
UNH	UnitedHealth Group Incorporated	Health Services	504.2	445.7	27.2	8.3	
LH	Laboratory Corporation of America Holdings	Health Services	201.1	172.1	8.3	4.2	
UHS	Universal Health Services, Inc.	Health Services	125.7	82.5	11.6	5.1	
DVA	DaVita Inc.	Health Services	94.6	65.3	56.0	2.7	
ELV	Elevance Health, Inc.	Health Services	435.4	412.0	17.3	6.1	
CI	The Cigna Group	Health Services	286.1	240.5	14.6	4.5	
HUM	Humana Inc.	Health Services	486.5	423.3	20.9	6.5	
MOH	Molina Healthcare Inc	Health Services	327.9	256.2	28.4	7.0	
CNC	Centene Corporation	Health Services	68.9	60.8	10.4	3.3	