Stocks

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### Setup

### Exploring tidyquant - <https://cran.r-project.org/web/packages/tidyquant/vignettes/TQ01-core-functions-in-tidyquant.html>

*# looking at key ratios for Tesla*  
*# tq\_get lets you pull prices, financials, etc.*  
**tq\_get\_options**()

## [1] "stock.prices" "stock.prices.google" "stock.prices.japan"   
## [4] "financials" "key.ratios" "dividends"   
## [7] "splits" "economic.data" "exchange.rates"   
## [10] "metal.prices" "quandl" "quandl.datatable"   
## [13] "alphavantager" "rblpapi"

*# pulling key ratios returns a two-column dataset. The 'data' column is a list*  
tesla\_ratios\_all <- **tq\_get**("TSLA", get = "key.ratios")  
tesla\_ratios\_all

## # A tibble: 7 x 2  
## section data   
## <chr> <list>   
## 1 Financials <tibble [150 × 5]>  
## 2 Profitability <tibble [170 × 5]>  
## 3 Growth <tibble [160 × 5]>  
## 4 Cash Flow <tibble [50 × 5]>   
## 5 Financial Health <tibble [240 × 5]>  
## 6 Efficiency Ratios <tibble [80 × 5]>   
## 7 Valuation Ratios <tibble [40 × 5]>

## Inspecting lists and practicing purrr

*# Working with lists*  
tesla\_ratios\_list <- tesla\_ratios\_all$data *# this saves the list column as a new object - a list of 7*  
tesla\_Financial <- tesla\_ratios\_all$data[1] *# this creates a list of just the first sub section - a list of 1*  
tesla\_Financial2 <- tesla\_ratios\_all$data[[1]] *# this unnests the list. A data frame - 150 rows and 5 columns*  
  
*# inspecting a list element*  
*# look at the variable names in the raw data*  
**names**(tesla\_Financial2)

## [1] "sub.section" "group" "category" "date" "value"

*# save it as a factor*  
tesla\_Financial2$sub.section <- **as.factor**(tesla\_Financial2$sub.section)  
*# look at the unique values in sub section*  
**levels**(tesla\_Financial2$sub.section)

## [1] "Financials"

*# the ratios in Financial are not split into sub-sections*  
  
*# inspecting Growth ratios*  
tesla\_Growth <- tesla\_ratios\_all$data[[2]]  
**levels**(**as.factor**(tesla\_Growth$sub.section))

## [1] "Margin of Sales %" "Profitability"

**levels**(**as.factor**(tesla\_Growth$category)) *# see all of the ratios*

## [1] "Asset Turnover (Average)" "COGS"   
## [3] "EBT Margin" "Financial Leverage (Average)"  
## [5] "Gross Margin" "Interest Coverage"   
## [7] "Net Int Inc & Other" "Net Margin %"   
## [9] "Operating Margin" "Other"   
## [11] "R&D" "Return on Assets %"   
## [13] "Return on Equity %" "Return on Invested Capital %"  
## [15] "Revenue" "SG&A"   
## [17] "Tax Rate %"

**glimpse**(tesla\_Growth) *# see how the data is formatted*

## Observations: 170  
## Variables: 5  
## $ sub.section <chr> "Margin of Sales %", "Margin of Sales %", "Margin ...  
## $ group <dbl> 16, 16, 16, 16, 16, 16, 16, 16, 16, 16, 17, 17, 17...  
## $ category <chr> "Revenue", "Revenue", "Revenue", "Revenue", "Reven...  
## $ date <date> 2008-12-01, 2009-12-01, 2010-12-01, 2011-12-01, 2...  
## $ value <dbl> 100.00, 100.00, 100.00, 100.00, 100.00, 100.00, 10...

*# Creating named lists*  
*# Step 1 - do it for one*  
tesla\_Growth\_levels <- **levels**(**as.factor**(tesla\_Growth$sub.section))  
  
*# Step 2 - make it a recipe*  
*# I want to get a list of the distinct ratios for each section*  
*# first try with just map*  
subsection\_levels <- **map**(tesla\_ratios\_all$data, ~**levels**(**as.factor**(.x$sub.section))) *#yay!!!*  
  
*# Main list I want - all categories of ratios*  
tesla\_ratios\_all$categories <- **map**(tesla\_ratios\_all$data, ~**levels**(**as.factor**(.x$category)))   
tesla\_ratios\_all *# now it's a list column*

## # A tibble: 7 x 3  
## section data categories  
## <chr> <list> <list>   
## 1 Financials <tibble [150 × 5]> <chr [15]>  
## 2 Profitability <tibble [170 × 5]> <chr [17]>  
## 3 Growth <tibble [160 × 5]> <chr [4]>   
## 4 Cash Flow <tibble [50 × 5]> <chr [5]>   
## 5 Financial Health <tibble [240 × 5]> <chr [24]>  
## 6 Efficiency Ratios <tibble [80 × 5]> <chr [8]>   
## 7 Valuation Ratios <tibble [40 × 5]> <chr [4]>

*# make a new named list using the section names*   
categories <- **map**(tesla\_ratios\_all$data, ~**levels**(**as.factor**(.x$category))) %>%  
 **set\_names**(tesla\_ratios\_all$section)   
*# YAYY!!! So much easier than I realized*  
  
*# export list to look at*  
**print**(categories[1:7])

## $Financials  
## [1] "Book Value Per Share \* USD" "Cap Spending USD Mil"   
## [3] "Dividends USD" "Earnings Per Share USD"   
## [5] "Free Cash Flow Per Share \* USD" "Free Cash Flow USD Mil"   
## [7] "Gross Margin %" "Net Income USD Mil"   
## [9] "Operating Cash Flow USD Mil" "Operating Income USD Mil"   
## [11] "Operating Margin %" "Payout Ratio % \*"   
## [13] "Revenue USD Mil" "Shares Mil"   
## [15] "Working Capital USD Mil"   
##   
## $Profitability  
## [1] "Asset Turnover (Average)" "COGS"   
## [3] "EBT Margin" "Financial Leverage (Average)"  
## [5] "Gross Margin" "Interest Coverage"   
## [7] "Net Int Inc & Other" "Net Margin %"   
## [9] "Operating Margin" "Other"   
## [11] "R&D" "Return on Assets %"   
## [13] "Return on Equity %" "Return on Invested Capital %"  
## [15] "Revenue" "SG&A"   
## [17] "Tax Rate %"   
##   
## $Growth  
## [1] "10-Year Average" "3-Year Average" "5-Year Average" "Year over Year"   
##   
## $`Cash Flow`  
## [1] "Cap Ex as a % of Sales" "Free Cash Flow Growth % YOY"   
## [3] "Free Cash Flow/Net Income" "Free Cash Flow/Sales %"   
## [5] "Operating Cash Flow Growth % YOY"  
##   
## $`Financial Health`  
## [1] "Accounts Payable" "Accounts Receivable"   
## [3] "Accrued Liabilities" "Cash & Short-Term Investments"  
## [5] "Current Ratio" "Debt/Equity"   
## [7] "Financial Leverage" "Intangibles"   
## [9] "Inventory" "Long-Term Debt"   
## [11] "Net PP&E" "Other Current Assets"   
## [13] "Other Long-Term Assets" "Other Long-Term Liabilities"   
## [15] "Other Short-Term Liabilities" "Quick Ratio"   
## [17] "Short-Term Debt" "Taxes Payable"   
## [19] "Total Assets" "Total Current Assets"   
## [21] "Total Current Liabilities" "Total Liabilities"   
## [23] "Total Liabilities & Equity" "Total Stockholders' Equity"   
##   
## $`Efficiency Ratios`  
## [1] "Asset Turnover" "Cash Conversion Cycle"   
## [3] "Days Inventory" "Days Sales Outstanding"  
## [5] "Fixed Assets Turnover" "Inventory Turnover"   
## [7] "Payables Period" "Receivables Turnover"   
##   
## $`Valuation Ratios`  
## [1] "Price to Book" "Price to Cash Flow" "Price to Earnings"   
## [4] "Price to Sales"

### More practice - making a tibble

*# Pulling multiple stocks from tidyquant*  
test <- **tq\_get**(**c**("TSLA", "DATA"), get = "key.ratios")  
*# This results in a tibble with the stock repeated 7 times for each section*  
**names**(test)

## [1] "symbol" "section" "data"

*# Making a tibble*  
stocks\_tbl <- **tibble**(  
 name = **levels**(**as.factor**(test$symbol)),  
 Ratios = "this shall be a list?")

### Test some code - pulling and visualizing indicators for TSLA

*# Pull the indicators I care about for one stock - TSLA*  
*# Pull an entire section*  
tesla\_ratios <- tesla\_ratios\_all %>%  
 **filter**(section == "Valuation Ratios") %>%  
 **unnest**()   
  
*# Visualize the different ratios within that section*   
tesla\_ratios %>%  
 **ggplot**(**aes**(x = date, y = value)) +  
 **geom\_line**(**aes**(col = **factor**(category, levels = **c**("Price to Earnings", "Price to Cash Flow", "Price to Book", "Price to Sales"))),   
 size = 1) +   
 **labs**(title = "10-Year Historical Valuation Ratios for TSLA", x = "",   
 y = "", col = "") +  
 **theme\_tq**() +  
 **scale\_color\_tq**()

## Applying purrr

### Make my Portfolio Dataset with All the Data

*# Pull key ratios*   
*# specify the stock - this will be the .x*  
stock = "TSLA"  
  
key\_ratios <- **tq\_get**(stock, get = "key.ratios") *# results in a tibble*

### Run first recipe - pulling all the tidyquant information for multiple stocks

*# Read TD Ameritrade stocks as a list*  
stocks <- (**str\_split**("AMZN  
ANSS  
ASCMA  
BDFFX  
BEXFX  
C  
CS  
DAL  
DATA  
DDD  
GLIBA  
KGFHY  
KROTY  
KW  
LEXEA  
LGF.B  
LSXMA  
LSXMK  
LTRPA  
MANH  
PATI  
PRMTX  
RSTAY  
SMCI  
SSP  
SSYS  
SU  
TM  
TSLA  
UA  
UAA  
WCN", pattern="\n"))  
  
*# make a smaller subset*  
stocks\_subset <- **head**(stocks[[1]])  
**glimpse**(stocks)

## List of 1  
## $ : chr [1:32] "AMZN" "ANSS" "ASCMA" "BDFFX" ...

*# turn it into a recipe - ex. map(people, ~ length(.x$starships))*  
*# remember I can hover over map to see the arguments. map(.x, .f)*  
*# for the [list, vector, column, dataframe!.. hence .x], do [.f]*   
*# map(stocks\_subset, ~ tq\_get(.x, "key\_ratios"))*  
*# test my recipe!*  
key\_ratios2 <- **map**(stocks\_subset, ~ **tq\_get**(.x, "key\_ratios")) *# results in a list of six*  
  
*# inspect my new list!*   
key\_ratios2[1:2] *#look at the first two list items*

## [[1]]  
## # A tibble: 7 x 2  
## section data   
## <chr> <list>   
## 1 Financials <tibble [150 × 5]>  
## 2 Profitability <tibble [170 × 5]>  
## 3 Growth <tibble [160 × 5]>  
## 4 Cash Flow <tibble [50 × 5]>   
## 5 Financial Health <tibble [240 × 5]>  
## 6 Efficiency Ratios <tibble [80 × 5]>   
## 7 Valuation Ratios <tibble [40 × 5]>   
##   
## [[2]]  
## # A tibble: 7 x 2  
## section data   
## <chr> <list>   
## 1 Financials <tibble [150 × 5]>  
## 2 Profitability <tibble [170 × 5]>  
## 3 Growth <tibble [160 × 5]>  
## 4 Cash Flow <tibble [50 × 5]>   
## 5 Financial Health <tibble [240 × 5]>  
## 6 Efficiency Ratios <tibble [80 × 5]>   
## 7 Valuation Ratios <tibble [40 × 5]>

*# not helpful*  
*# let's name it something that makes sense. What did I do/what was I going for with this list?*  
my\_portfolio\_subset <- key\_ratios2 %>%  
 **set\_names**(stocks\_subset)  
*# That worked! my\_portfolio\_subset is now a named list of 6 stocks*  
*# Each stock is a tibble*   
*# Each tibble has a list column called data that is a data frame of all the ratios over time*

### Make and run second recipe - Extract a key metric from each stock - Return on Investment

*# start with one - TSLA*  
*# 1. extract a filtered dataframe of all the ROIs over time*  
tesla\_ROI <- **as.data.frame**(tesla\_ratios\_all$data[2]) %>%  
 **filter**(category == "Return on Invested Capital %") %>%  
 **select**(-1,-2) %>%  
 **rename**(key\_ratio = category)  
   
**glimpse**(**levels**(**as.factor**(tesla\_ROI$category)))  
  
*# Take the average*   
tesla\_avg\_ROI <- **mean**(tesla\_ROI$value, na.rm=T)  
*# Save it as a percentage*  
tesla\_avg\_ROI <- **round**((**mean**(tesla\_ROI$value, na.rm=T))/100,2)  
  
*# condense it*  
avg\_ROI <- **round**(tesla\_avg\_ROI/100,2)  
  
*# Make my recipe*  
*# map(.x, ~f) - for each stock, calculate its return on invested capital*  
my\_portfolio\_Profitability <- **map**(my\_portfolio\_subset, ~ (.x$data[[2]]))   
  
my\_portfolio\_ROI <- **map**(my\_portfolio\_Profitability, ~**filter**(.x, category == "Return on Invested Capital %"))  
  
my\_portfolio\_avg\_ROI <- **map**(my\_portfolio\_ROI, ~**round**((**mean**(.x$value, na.rm=T))/100,2))  
my\_portfolio\_avg\_ROI

### Make third recipe - Pull key indicators and compile them into a tibble

*# Now I have a list of stocks in the format I want it to look like.*   
*# Time to make the data what I want - extract key indicators*  
  
*# Start with one - TSLA*   
tesla\_ratios\_all  
  
## Indicator group 1 - Financials  
*# Share Price, Revenue, and Earnings per Share most recent values*  
tesla\_i1 <- tesla\_ratios\_all %>%  
 **filter**(section == "Financials") %>%  
 **unnest**() %>%   
 **filter**(!**is.na**(date)) %>%   
 **group\_by** (category) %>%  
 **slice**(**which.max**(date)) %>%  
 **filter**(group %in% **c**(1, 6, 10)) %>%   
 **select**(category, value)   
tesla\_i1$value <- **as.numeric**(**as.character**(tesla\_i1$value))  
  
## Next section - Profitability  
*# Bunch of indicators*  
tesla\_i2 <- tesla\_ratios\_all %>%  
 **filter**(section == "Profitability") %>%  
 **unnest**() %>%   
 **filter**(!**is.na**(date)) %>%   
 **group\_by** (category) %>%  
 **slice**(**which.max**(date)) %>%  
 **arrange**(group) %>%  
 **filter**(group %in% **c**(18, 20, 22, 25, 26, 27:31)) %>%   
 **select**(category, value)  
  
*# Next section- growth. All the indicators!*  
tesla\_i3 <- tesla\_ratios\_all %>%  
 **filter**(section == "Growth") %>%  
 **unnest**() %>%   
 **filter**(!**is.na**(date)) %>%   
 **group\_by** (category) %>%  
 **slice**(**which.max**(date)) %>%  
 **select**(category, value)  
  
*# Last group of indicators- Valuation Ratio*  
*# Just Price to Earnings for now*  
tesla\_i4 <- tesla\_ratios\_all %>%  
 **filter**(section == "Valuation Ratios") %>%  
 **unnest**() %>%   
 **filter**(!**is.na**(date)) %>%   
 **group\_by** (category) %>%  
 **slice**(**which.max**(date)) %>%  
 **filter**(group == 86) %>%   
 **select**(category, value)  
  
*# Check price to earnings just for fun*  
tesla\_i1[1,2]/tesla\_i1[2,2]  
tesla\_i4[1,2] *# Hm.. doesn't match. Oh well*  
  
*# Make final tibble for TSLA*  
TSLA <- **rbind**(tesla\_i1, tesla\_i2, tesla\_i3, tesla\_i4)  
TSLA$category <- **as.character**(TSLA$category)  
TSLA$value <- **as.numeric**(TSLA$value)  
TSLA

### Compile tibbles into a named list - My Indicators

*# Make my recipe*  
  
*# Fist for one section*  
test <- **map**(my\_portfolio\_subset, ~ (.x %>%  
 **filter**(section == "Financials") %>%  
 **unnest**() %>%   
 **filter**(!**is.na**(date)) %>%   
 **group\_by** (category) %>%  
 **slice**(**which.max**(date)) %>%  
 **filter**(group %in% **c**(1, 6, 10)) %>%   
 **select**(category, value) %>%  
 **mutate**(Indicator = **as.character**(category), Value = **as.numeric**(value)) %>%  
 **select**(Indicator, Value)))  
**glimpse**(test[1])  
  
*# Now for the whole thing*  
my\_indicators <- **map**(my\_portfolio\_subset, ~ **rbind**((.x %>%  
 **filter**(section == "Financials") %>%  
 **unnest**() %>%   
 **filter**(!**is.na**(date)) %>%   
 **group\_by** (category) %>%  
 **slice**(**which.max**(date)) %>%  
 **filter**(group %in% **c**(1, 6, 10)) %>%   
 **select**(category, value)),  
 (.x %>%  
 **filter**(section == "Profitability") %>%  
 **unnest**() %>%   
 **filter**(!**is.na**(date)) %>%   
 **group\_by** (category) %>%  
 **slice**(**which.max**(date)) %>%  
 **arrange**(group) %>%  
 **filter**(group %in% **c**(18, 20, 22, 25, 26, 27:31)) %>%   
 **select**(category, value)),  
 (.x %>%  
 **filter**(section == "Growth") %>%  
 **unnest**() %>%   
 **filter**(!**is.na**(date)) %>%   
 **group\_by** (category) %>%  
 **slice**(**which.max**(date)) %>%  
 **select**(category, value)),  
 (.x %>%  
 **filter**(section == "Valuation Ratios") %>%  
 **unnest**() %>%   
 **filter**(!**is.na**(date)) %>%   
 **group\_by** (category) %>%  
 **slice**(**which.max**(date)) %>%  
 **filter**(group == 86) %>%   
 **select**(category, value))  
))

## Done! View List

**print**(my\_indicators) # a lovely named list

$AMZN

# A tibble: 18 x 2

# Groups: category [18]

category value

<chr> <dbl>

1 Book Value Per Share \* USD 51.0

2 Earnings Per Share USD 6.15

3 Revenue USD Mil 177866

4 Gross Margin 22.9

5 R&D 12.7

6 Operating Margin 2.31

7 Tax Rate % 20.2

8 Net Margin % 1.71

9 Asset Turnover (Average) 1.66

10 Return on Assets % 2.83

11 Financial Leverage (Average) 4.74

12 Return on Equity % 12.9

13 Return on Invested Capital % 7.09

14 10-Year Average 28.2

15 3-Year Average 26.0

16 5-Year Average 23.8

17 Year over Year 30.8

18 Price to Earnings 190.

$ANSS

# A tibble: 18 x 2

# Groups: category [18]

category value

<chr> <dbl>

1 Book Value Per Share \* USD 27.2

2 Earnings Per Share USD 2.98

3 Revenue USD Mil 1095

4 Gross Margin 86.3

5 R&D 18.5

6 Operating Margin 35.7

7 Tax Rate % 34.5

8 Net Margin % 23.7

9 Asset Turnover (Average) 0.38

10 Return on Assets % 9.03

11 Financial Leverage (Average) 1.31

12 Return on Equity % 11.6

13 Return on Invested Capital % 11.4

14 10-Year Average 11.0

15 3-Year Average 5.38

16 5-Year Average 6.54

17 Year over Year 10.8

18 Price to Earnings 49.5

$ASCMA

# A tibble: 18 x 2

# Groups: category [18]

category value

<chr> <dbl>

1 Book Value Per Share \* USD 12.1

2 Earnings Per Share USD -8.82

3 Revenue USD Mil 553

4 Gross Margin 78.5

5 R&D NA

6 Operating Margin 3.75

7 Tax Rate % NA

8 Net Margin % -19.4

9 Asset Turnover (Average) 0.26

10 Return on Assets % -5.14

11 Financial Leverage (Average) 14.4

12 Return on Equity % -56.4

13 Return on Invested Capital % 2.15

14 10-Year Average -0.63

15 3-Year Average 0.86

16 5-Year Average 9.92

17 Year over Year -2.97

18 Price to Earnings -1.30

$BDFFX

# A tibble: 18 x 2

# Groups: category [18]

category value

<chr> <dbl>

1 Book Value Per Share \* USD 27.9

2 Earnings Per Share USD -11.8

3 Revenue USD Mil 11759

4 Gross Margin 18.9

5 R&D 11.7

6 Operating Margin -13.9

7 Tax Rate % NA

8 Net Margin % -16.7

9 Asset Turnover (Average) 0.46

10 Return on Assets % -7.64

11 Financial Leverage (Average) 6.76

12 Return on Equity % -43.6

13 Return on Invested Capital % -11.5

14 10-Year Average 232.

15 3-Year Average 54.3

16 5-Year Average 95.4

17 Year over Year 68.0

18 Price to Earnings -26.3

$BEXFX

# A tibble: 18 x 2

# Groups: category [18]

category value

<chr> <dbl>

1 Book Value Per Share \* USD 27.9

2 Earnings Per Share USD -11.8

3 Revenue USD Mil 11759

4 Gross Margin 18.9

5 R&D 11.7

6 Operating Margin -13.9

7 Tax Rate % NA

8 Net Margin % -16.7

9 Asset Turnover (Average) 0.46

10 Return on Assets % -7.64

11 Financial Leverage (Average) 6.76

12 Return on Equity % -43.6

13 Return on Invested Capital % -11.5

14 10-Year Average 232.

15 3-Year Average 54.3

16 5-Year Average 95.4

17 Year over Year 68.0

18 Price to Earnings -26.3

$C

# A tibble: 18 x 2

# Groups: category [18]

category value

<chr> <dbl>

1 Book Value Per Share \* USD 81.1

2 Earnings Per Share USD -2.98

3 Revenue USD Mil 71671

4 Gross Margin NA

5 R&D NA

6 Operating Margin NA

7 Tax Rate % 129.

8 Net Margin % -11.2

9 Asset Turnover (Average) 0.04

10 Return on Assets % -0.44

11 Financial Leverage (Average) 10.2

12 Return on Equity % -4.16

13 Return on Invested Capital % NA

14 10-Year Average -1.3

15 3-Year Average -2.5

16 5-Year Average 0.33

17 Year over Year 2.31

18 Price to Earnings -24.6