# HW: Financial Ratio Quantile Strategies

## January 22, 2026

## 1 Introduction

Here you will consider a few financial accounting ratios, as an approximation of "quantamental" models that typically take much more numerous and carefully defined financial accounting into consideration. You will then investigate profit opportunity of a quantile-based long-short scheme.

## 2 Understand Your Data

Read all Nasdaq documentation webpages for *Zacks Fundamentals B*. You will see they supply 6 related tables, FC, FR, MT, MKTV, SHRC and HDM. We have copies as of January 2024 available to you on the class Canvas site.

The strategy coding for this assignment will be reasonably easy. The data assembly, deliberately, is the difficult part.

## 3 Define the Universe

Choose at least 200 tickers of US equities such that[1] they satisfy the following:

- end-of-day adjusted closing prices are available , over the entire period Jan 2018 through Jun 2023

- the market value (as reported in MKTV[2]) never dips below \$100MM, over the entire period Jan 2018 through Jun 2023

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[1]We will not concern ourselves with *selection bias* in this exercise.

[2]The table reports market values in units of millions of dollars. The restriction here cuts our population to 4000+ companies.

- debt/market_cap ratio is greater[3] than 0.1 somewhere in the period Jan 2018 through Jun 2023(preferably more than fleetingly)

- not in the automotive, financial or insurance sector , over the entire period Jan 2018 through Jun 2023[4]

- has feasible calculation of the ratios specified below , over the entire period Jan 2018 through Jun 2023, including for at least one `per_end_date` no more than one year old. A debt ratio of zero is OK.

You will find that these restrictions leave an "investable universe" of 1200 or so companies.

# 4 Select Financial Ratios

For this assignment, we will work with the following ratios:

- debt to market cap[5].

- return on investment[6]

- price to earnings[7]

Note that these data items are reported (at best) quarterly. Use annual numbers *only* when quarterly ones do not exist. As the equity price changes day-to-day, each ratio changes accordingly[8], so ultimately the time series

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[3]This is about 1000-2000 companies, including AMZN, CAT, FLEX, POOL, SUN and WYNN.

[4]See the Nasdaq Zacks ZFB fields `zacks_sector_code`, `zacks_x_ind_code`, and the classification list

[5] `FR/tot_debt_tot_equity` in Nasdaq Zacks. In this homework we pretend that it is OK to treat market capitalization and book equity as equivalent, though they are not the same thing.

[6] Based on `FR/ret_invst`, `MKTV/mkt_val, FC/net_lterm_debt`, `FC/tot_lterm_debt`. Investment is defined here as market cap plus long term debt. Use net debt where available, total debt otherwise. Nasdaq Zacks will report debt as NaN if it was 0.0, but be careful about net versus tot debt.

[7] Computable based on `FC/eps_diluted_net, basic_net_eps, SHRS/shares_out`, `MKTV/mkt_val`, use the basic version (GAAP) if no diluted number is available. Treat negative earnings per share as 0.001.

[8]In many cases `per_end_date` is not a trading day, so go ahead and forward fill equity price from the previous trading day.

you have will be on daily data[9]. Recall that we did not know any of these numbers until the `FC/filing_date` .

As an example, consider $V$, return on investment. Say that our entity had successive report dates of March 31 and June 30, filing dates April 3 and July 6, so $V^{3-31}$ and $V^{6-30}$ were known the day after the filing dates, on April 4 and July 7. Our equity price series, which we take (also a bit problematically) as adjusted close prices, will be $P^t$. We have a debt number $D$ for each report date as well.

We can infer the "return" $R$ for a given report date as the unknown element in

$$V = \frac{R}{D + M}$$

and we assume it doesn't change day-to-day. Rather only the market value element $M$ changes daily, and we estimate the corresponding $\tilde{V}$ values according to the filing dates. So for example our inferred values look like

$$\tilde{V}^{7\text{-}6} = \frac{R^{3\text{-}31}}{D^{3\text{-}31} + M^{7\text{-}6}}$$

but the next day is just after the filing date so we have

$$\tilde{V}^{7\text{-}7} = \frac{R^{6\text{-}30}}{D^{6\text{-}30} + M^{7\text{-}7}}$$

where

$$M^{7\text{-}6} = M^{3\text{-}31} \frac{P^{7\text{-}6}}{P^{3\text{-}31}}$$

and

$$M^{7\text{-}7} = M^{6\text{-}30} \frac{P^{7\text{-}7}}{P^{6\text{-}30}}.$$

# 5   Analysis

Study performance of weekly or monthly quantile trading strategies using each of these single ratios as well as your choice of least one nontrivial combination of them[10].

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[9]If you have memory errors when joining data, you are probably mistakenly creating a combinatorial explosion in your merging code.

[10]That is to say, at least 4 types of scores.

Set initial capital to be 10 times the gross notional of your first month's set of positions. You may assume zero trading costs, that trading fractional shares and arbitrary positions sizes are possible, that all securities are easy to borrow with a repo rate equal to your funding rate minus 100bp[11], and that the portfolio capital is equal to the initial capital, adjusted for all realized and unrealized PL to date. Choose either a constant funding rate, or rolling 3-month LIBOR/SOFR[12].

Analyze performance of a top-and-bottom decile trading strategy. Consider Sharpe ratios and associated metrics, risk metrics such as downside beta, tail metrics and maximum drawdown, and comparisons of PL to traded notional.

Now rank based on *changes* in your ratios rather than the ratios themselves. Play with the effects of sizing positions by rank, for example by doubling or halving the most "attractive" vigintiles, on the theory that they are either particularly attractive, or are untrustworthy outliers respectively.

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[11]This repo rate may therefore sometimes become negative.
[12]Daily blended LIBOR/SOFR data is available on the class website.

# 6 Data Example

Here is recent sample data for Waste Management (ticker WM):

## 6.0.1 SEC Reports

| per_end_date | 2023-06-30 | 2023-09-30 | 2023-12-31 | 2024-03-31 | 2024-06-30 | 2024-09-30 |
|---|---|---|---|---|---|---|
| filing_date | 2023-07-26 | 2023-10-25 | 2024-02-13 | 2024-04-25 | 2024-07-25 | 2024-10-28 |
| tot_revnu | 5119.000000 | 5198.000000 | 5217.000000 | 5159.000000 | 5402.000000 | 5609.000000 |
| eps_diluted_net | 1.510000 | 1.630000 | 1.220000 | 1.750000 | 1.690000 | 1.880000 |
| basic_net_eps | 1.520000 | 1.640000 | 1.230000 | 1.760000 | 1.700000 | 1.890000 |
| tot_lterm_debt | 14855.000000 | 15133.000000 | 15895.000000 | 15762.000000 | 16501.000000 | 15977.000000 |
| net_lterm_debt | 282.000000 | 328.000000 | 912.000000 | -158.000000 | 428.000000 | 295.000000 |
| net_curr_debt | NaN | NaN | NaN | NaN | NaN | NaN |
| zacks_x_ind_code | 287.000000 | 287.000000 | 287.000000 | 287.000000 | 287.000000 | 287.000000 |
| zacks_sector_code | 16.000000 | 16.000000 | 16.000000 | 16.000000 | 16.000000 | 16.000000 |
| zacks_metrics_ind_code | NaN | NaN | NaN | NaN | NaN | NaN |
| tot_debt_tot_equity | 2.218200 | 2.215000 | 2.353400 | 2.274400 | 2.247100 | 2.088900 |
| ret_invst | 2.814100 | 2.995600 | 2.057800 | 3.095400 | 2.839000 | 3.173400 |
| free_cash_flow_per_share | 2.192800 | 3.656100 | 4.482700 | 1.732300 | 2.941500 | 4.372500 |
| shares_out | 405.060000 | 402.770000 | 402.770000 | 401.080000 | 401.320000 | 401.370000 |
| per_type | Q | Q | Q | Q | Q | Q |
| mkt_val | 70245.410000 | 61399.090000 | 72137.080000 | 85490.860000 | 85616.500000 | 83323.490000 |

## 6.0.2 Ratios On Key Dates

(Using `MKTV/mkt_val, FC/net_lterm_debt` to infer operating income)

| Date | Debt_To_Mkt_Cap | Return_On_Inv | Price_To_Earnings |
|---|---|---|---|
| 2022-10-26 | 1.891277 | 2.634588 | 109.896458 |
| 2022-10-27 | 2.029799 | 3.106361 | 99.569072 |
| 2022-12-30 | 2.040269 | 3.122265 | 99.058098 |
| 2023-01-03 | 2.038320 | 3.119305 | 99.152812 |
| 2023-02-07 | 2.115096 | 3.235886 | 95.553684 |
| 2023-02-08 | 2.270112 | 2.423785 | 121.236072 |
| 2023-03-31 | 2.089139 | 2.234389 | 131.738209 |
| 2023-04-03 | 2.080215 | 2.225033 | 132.303367 |
| 2023-04-27 | 2.109044 | 2.255253 | 130.494863 |
| 2023-04-28 | 2.218444 | 2.393665 | 124.782115 |
| 2023-06-30 | 2.115070 | 2.282654 | 130.880818 |
| 2023-07-03 | 2.139997 | 2.309427 | 129.356315 |
| 2023-07-26 | 2.223811 | 2.399427 | 124.480925 |
| 2023-07-27 | 2.346040 | 2.975598 | 106.538755 |
| 2023-09-29 | 2.512278 | 3.185491 | 99.489084 |
| 2023-10-02 | 2.532714 | 3.211284 | 98.686332 |
| 2023-10-25 | 2.334197 | 2.960639 | 107.079336 |
| 2023-10-26 | 2.073791 | 2.805577 | 98.440449 |
| 2023-12-29 | 1.877599 | 2.541350 | 108.726575 |
| 2024-01-02 | 1.872267 | 2.534167 | 109.036182 |
| 2024-02-13 | 1.685688 | 2.282649 | 121.104771 |
| 2024-02-14 | 2.116358 | 1.852862 | 161.536257 |
| 2024-03-28 | 1.970425 | 1.726437 | 173.499906 |
| 2024-04-01 | 1.972646 | 1.728362 | 173.304551 |
| 2024-04-25 | 1.974594 | 1.730051 | 173.133615 |
| 2024-04-26 | 2.307417 | 3.140420 | 119.223466 |
| 2024-06-28 | 2.272374 | 3.092638 | 121.062038 |
| 2024-07-01 | 2.315573 | 3.151541 | 118.803545 |
| 2024-07-25 | 2.424912 | 3.300647 | 113.446717 |
| 2024-07-26 | 2.433978 | 3.073831 | 115.735094 |