HW: Financial Ratio Quantile Strategies

April 13, 2021

1 Understand Your Data

Read all documentation webpages for Zacks Fundamentals B. You will see they supply 6 related tables, FC, FR, MT, MKTV, SHRC and HDM [1]. The strategy coding for this assignment will be reasonably easy. The data assembly, deliberately, is the difficult part.

2 Define the Universe

Choose at least 200 tickers[2] of US equities such that[3] they satisfy the following:

- end-of-day adjusted closing prices are available , over the entire period Jan 2013 through Jan 2020
- debt/market_cap ratio is greater[4] than 0.1 somewhere in the period Jan 2013 through Jan 2020 (preferably more than fleetingly)
- not in the automotive, financial or insurance sector , over the entire period Jan 2013 through Jan 2020[5]

[1] It is easiest to download your data through full-table downloads. Use URLs such as *https://www.quandl.com/api/v3/datatables/ZACKS/MT?qopts.export=true*

[2] You can find the full list of available tickers online

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

[4] This is about 1000-2000 companies, including ASH, ERA, PECK and VIVO.

[5] See the Quandl ZFB fields `ZACKS_SECTOR_CODE`, `ZACKS_X_IND_CODE`, and the classification list

- has feasible calculation of the ratios specified below , over the entire period Jan 2013 through Jan 2020, including for at least one `PER_END_DATE` no more than one year old. Debt ratio of zero is OK.

3 Select Financial Ratios

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

- debt to market cap[6].
- return on investment[7]
- price to earnings[8]

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[9], so ultimately the time series you have will be on daily data[10]. Recall that we did not know any of these numbers until the `FC/FILING_DATE` .

4 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[11].

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

[6] `FR/TOT_DEBT_TOT_EQUITY` in Quandl.

[7] 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. Quandl will report debt as NaN if it was 0.0, but be careful about net versus tot debt.

[8] Compute this 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.

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

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

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

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, 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.

Analyze performance of a top-and-bottom decile trading strategy. Now rank based on *changes* in your ratios rather than the ratios themselves. Play with the effects of sizing positions by rank.

5 Data Example

Here is recent sample data for Eli Lilly (ticker LLY):

5.0.1 SEC Reports

per_end_date	2019-09-30	2019-12-31	2020-03-31	2020-06-30	2020-09-30
filing_date	2019-10-25	2020-02-19	2020-05-01	2020-07-31	2020-10-28
tot_revnu	5476.6	6114.0	5859.8	5499.4	5740.6
eps_diluted_net	1.37	1.77	1.6	1.55	1.33
basic_net_eps	1.37	1.64	1.6	1.55	1.33
tot_lterm_debt	13662.2	13817.9	13982.3	15064.4	16334.6
net_lterm_debt	3848.0	3690.0	-276.3	712.3	1786.0
net_curr_debt	1058.9	995.4	1748.7	-235.4	-914.3
zacks_x_ind_code	225.0	225.0	225.0	225.0	225.0
zacks_sector_code	4.0	4.0	4.0	4.0	4.0
zacks_metrics_ind_code	13.0	13.0	13.0	13.0	13.0
tot_debt_tot_equity	4.3975	5.6749	5.3892	3.8221	3.3871
ret_invst	7.3223	9.0555	8.4781	7.3023	5.6651
free_cash_flow_per_share	2.3576	4.0641	0.1361	2.5664	4.1159
shares_out	960.13	960.13	956.45	956.47	956.58
per_type	Q	Q	Q	Q	Q
mkt_val	107371.45	126190.01	132678.73	157033.3	141593.2

5.0.2 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
2018-11-06	0.842630	-0.890680	101147.632768
2018-11-07	0.876124	4.142738	93.568042
2018-12-31	0.826464	3.910664	99.190289
2019-01-02	0.832507	3.938922	98.470276
2019-02-19	0.778926	3.688203	105.243855
2019-02-20	0.885857	5.237885	107.622403
2019-03-29	0.837386	4.954300	113.851973
2019-04-01	0.841994	4.981270	113.229016
2019-05-02	0.917265	5.421457	103.937306
2019-05-03	6.908324	3.837676	26.179829
2019-06-28	7.249878	4.020894	24.946454
2019-07-01	7.124481	3.953697	25.385533
2019-08-02	7.144761	3.964570	25.313479
2019-08-05	5.630611	8.155089	73.264322
2019-09-30	5.473519	7.935396	75.367023
2019-10-01	5.516435	7.995458	74.780693
2019-10-25	5.554480	8.048674	74.268497
2019-10-28	4.352354	7.249701	80.039612
2019-12-31	3.720165	6.227653	93.641203
2020-01-02	3.698217	6.191987	94.196938
2020-02-19	3.453830	5.794008	100.862141
2020-02-20	5.225211	8.356740	78.717020
2020-03-31	5.348760	8.549034	76.898768
2020-04-01	5.438939	8.689238	75.623774
2020-05-01	4.829656	7.739485	85.164055
2020-05-04	4.877282	7.671248	93.998101
2020-06-30	4.532301	7.127691	101.152884
2020-07-01	4.556724	7.166169	100.610707
2020-07-31	4.951182	7.787704	92.595121
2020-08-03	4.105682	7.841469	97.203820