# Final Project: Quality minus Junk

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Strategy Abstract

In this project, we propose a stock trading strategy in the US market based on stocks’ quality characteristics: profitability, growth, and safety. We constructed an adjusted long-short portfolio which rebalanced each June based on *Quality minus Junk* (Asness and Frazzini 2017) and introduced a similar QMJ factor. Overall, our long-short portfolio achieved an average annualized return of XX, Sharpe ratio of XX from July 1957 to December 2018, beating the original long-short portfolio constructed by Asness and Frazzini (2017).

Background

We define quality as characteristics that investors should be willing to pay a higher price for, all else equal. To apply our general definition of quality, we must identify stock characteristics that should command a higher price.

We can rewrite Gordon’s growth model as following:

We scale price by book values to make them more stationary over time and in cross section.

According to the equation above, quality can be defined based on three key variables:

* *Profitability*

Profitability is the profits per unit of book value. All else equal, more profitable companies should command a higher stock price.

* *Growth*

Investors should also pay a higher price for stocks with growing profits.

* *Safety*

Investors should also pay, all-else-equal, a higher price for a stock with a lower required return, that is, a safer stock. We consider both return-based measure of safety (e.g., market beta) and fundamental-based measures of safety (low volatility of profitability, low leverage, and low credit risk).

Data Sources

We need annual accounting data and monthly pricing data to construct portfolios and then calculated value-weighted returns, which we collected from the Center for Research on Security Prices (CRSP) and Compustat North America Fundamentals (Compustat). To testify our strategy’s performance in terms of exposures to other risk factors, we downloaded Fama-French 3 factors from Kenneth R. French’s website’s data library.

Quality Score Calculation

The quality score calculation is key to our strategy because our portfolio construction is based on sorting by quality scores. Quality consists of three parts: *profitability, growth, and safety*. The quality score calculation requires accounting data and also market equity data. We follow the standard convention (Fama and French 1992) and align accounting variables at the end of the firm’s fiscal year ending anywhere in calendar year t-1 to June of calendar year t. Then in each June, we can calculate quality scores. Specifically, we convert each variable into ranks and standardize to obtain a z-score. More formally, let be the variable of interest and r be the vector of ranks, . Then the z-score of the ranks of is given by , where and are the cross-sectional mean and standard deviation of .

Our *profitability, growth, and safety* scores are the average of the individual z-scores:

Finally, we combine the three measures into a single quality score:

The variable formulas and descriptions are in Table I and table II:

|  |  |
| --- | --- |
| **Table 1** Quality score variables description | |
| Variables | Formula |
| GPOA | (REVT − COGS)/AT |
| ROE | IB/BE |
| ROA | IB/AT |
| CFOA | (NB + DP − ΔWC − CAPX)/AT. |
| GMAR | (REVT − COGS)/SALE |
| ACC | −(ΔWC − DP)/AT |
| WC | ACT − LCT − CHE + DLC + TXP |
| BE | SEQ or CEQ + PSTK or AT – LT – MIB |
| BAB |  |
| LEV | −(DLTT + DLC + MIBT + PSTK)/AT |
| ADJASSET | AT+0.1 \* (ME – BE) |
| TLTA | (DLC + DLTT)/ADJASSET |
| WCTA | (ACT – LCT)/ADJASSET |
| CLCA | LCT/ACT |
| OENEG | Dummy 1(LT > AT) |
| NITA | IB/AT |
| FUTL | PT.LT |
| INTWO | Dummy |
| CHIN |  |
| Altman’s Z-Score |  |
| Olson’s O-Score |  |

Portfolio Construction

In our trading strategy, July at year t to June at year t+1 is an investment period. Each July, we calculate stocks’ quality scores based on accounting data and market equity on the previous December. To form quality-sorted portfolios, we assign stocks into 10 quality-sorted portfolios based on NYSE breakpoints. Then, we could obtain monthly value-weighted returns for each decile by weighting each stock by its lagged market capitalization.

Our strategy is to long high quality stocks and short low quality stocks. Therefore, we form the long-short portfolio (Decile 10 minus Decile 1) from July 1957 to December 2018.

Empirical Result

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | P1 (Low) | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 (High) | H-L |
| **Long Sample U.S., 7/1957 - 12/2018** | | | | | | | | | | | |
| Excess Return | 0.30 | 0.51 | 0.48 | 0.55 | 0.56 | 0.52 | 0.58 | 0.57 | 0.54 | 0.64 | 0.35 |
| CAPM Alpha | -0.39 | -0.08 | -0.08 | 0.04 | 0.05 | 0.01 | 0.06 | 0.06 | 0.08 | 0.12 | 0.51 |
|  | (-3.68) | (-1.00) | (-0.95) | (0.48) | (0.85) | (0.24) | (1.24) | (1.20) | (0.16) | (2.00) | (3.65) |
| 3-factor Alpha | -0.59 | -0.31 | -0.28 | -0.14 | -0.07 | -0.07 | 0.01 | 0.04 | 0.05 | 0.27 | 0.86 |
|  | (-6.81) | (-4.75) | (-4.29) | (-2.03) | (-1.30) | (-1.33) | (0.35) | (0.70) | (1.03) | (5.41) | (7.99) |
| Beta | 1.30 | 1.11 | 1.05 | 0.97 | 0.95 | 0.95 | 0.97 | 0.97 | 1.00 | 0.99 | -0.31 |
| Sharpe Ratio | 0.16 | 0.33 | 0.33 | 0.40 | 0.43 | 0.41 | 0.45 | 0.45 | 0.41 | 0.49 | 0.30 |

Write-up Questions

*Question 1. Why should the investor follow your strategy as opposed to alternative strategies?*

Compared to market value-weighted portfolio, our long-short portfolios achieved higher cumulative returns from July 1957 to December 2018. Besides, after doing regression on the CAPM, our portfolio obtains a significant positive alpha. Thus, our investor could make more money following our quality long-short portfolio instead of longing the whole stock market.

*Question 2. Is your strategy delivering alpha? Is it a mispricing that will be arbitraged away, or is it a compensation for risk?*

Yes. We regress our long-short portfolio returns on CAPM and Fama French 3 factors respectively, and both of the two regressions generate significant alpha. Thus, we think this alpha is a mispricing instead of a compensation for risk.

*Question 3. What are the main costs and risks associated with your strategy?*

The main cost of our strategy is the transaction cost. We refresh our portfolio each month based on market capitalization, which is one source of turnover. Another source of turnover is when we rebalance our portfolio each July. But in reality, quality scores of most firms would not change a lot every year. Thus, the transaction cost of our strategy is not very high.

Our strategy is faced with liquidity risk. Usually, junk stocks have low trading volume and are difficult to short. We would lose money due to high bid-ask spread. Besides, we would face short squeeze risk when we are in the short positions.

*Question 4. Quantify the expected excess return, volatility, and Sharpe ratio.*

*Question 5. Quantify the strategy's performance in terms of exposures to other risk factors. Estimate factor models' alphas and beta. For instance, use the CAPM and/or three-factor Fama and French model.*

*Question 6. To validate your strategy, which robustness exercises can you implement?*

Reference

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