



NOVA SCHOOL OF  
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Data Analytics for Finance

Final Project

## **Total Accruals Investment Strategy**

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## Overview

The scope of this project is to build an investment strategy based on Total Accruals as a signal. Firstly, Total Accruals is defined in accounting as the sum of revenues earned and expenses incurred which impact a company's net income on the income statement, although cash related to the transaction has not yet been transferred. According to the Congressional Research Service<sup>1</sup>, Accruals also affect the balance sheet, as they involve non-cash assets and liabilities, such as accounts payable, accounts receivable, accrued tax liabilities, and accrued interest earned or payable.

What makes Total Accruals worth exploiting as a trading signal is its relation to the accrual anomaly, which arises from the fact many investors ignore accruals in earnings releases and therefore stocks with lower levels of accruals in their earnings become undervalued<sup>2</sup>. Intuitively, Total Accruals' foundation as a predictor of security returns or risk is its usefulness to identify companies that rely heavily on future cash-flows (hence having fewer real cash flows incoming and more uncertainty in earnings), therefore it implies to sell companies with high values of total accruals (Richardson, Sloan, Soliman and Tuna, 2005).

In order to implement the trading strategy, we assign securities a signal based on their company's Total Accruals divided by Total Assets. This ratio allows us to compare companies of different sizes and set our securities in descending order (the smaller the signal the better the outlook) to implement our trading strategy. To abbreviate the name of our signal "Total Accruals divided by Total Assets" we refer to it as "taccruals\_at" throughout this paper.

Using our trading signal, we also attempt to construct and evaluate a trading strategy both as a standalone investment (lacking diversification and being more exposed to market risk) and a broadly diversified portfolio (which incorporates a more market-neutral approach). During our analysis, which follows the logic of going long in stocks with low taccruals\_at and shorting high taccruals\_at, we arrive at the conclusion that the standalone investment does not seem to outperform our value-weighted stock market portfolio benchmark, while the broadly diversified portfolios approach has a better Info Sharpe (risk-adjusted return measure) and less drawdowns than the famous 60/40 portfolio (60% Vanguard Total Stock Market ETF (VTI) and 40% Vanguard Total Bond Market ETF (BND)) which we used as a benchmark for that case.

## Strategy Analysis

The first step of the analysis consists of sorting our stocks monthly into terciles (Bottom 1/3, Middle 1/3, Top 1/3) based on our signal taccruals\_at. Since high values of taccruals\_at is a supposed indicator of poor performance, we organised the data in a descending order (starting from the bottom)

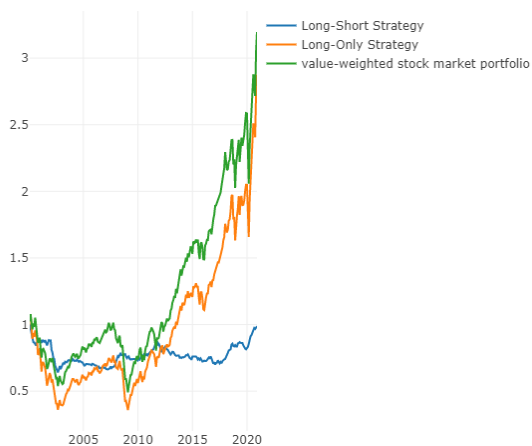
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<sup>1</sup> Congressional Research Service. "Cash Versus Accrual Basis of Accounting: An Introduction <https://crsreports.congress.gov/product/pdf/R/R43811>"

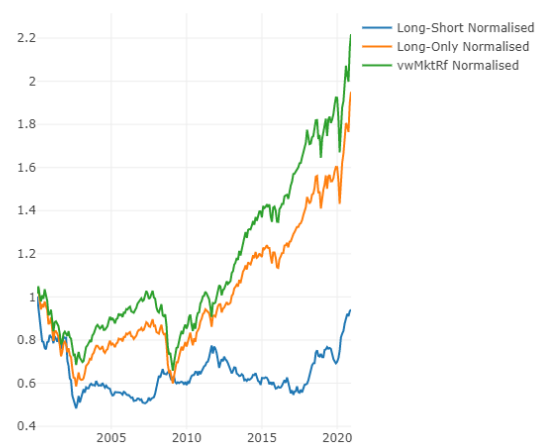
<sup>2</sup> Accrual Anomaly. QuantPedia. (n.d.). <https://quantpedia.com/strategies/accrual-anomaly/>.

to have the Top 1/3 contain stocks with less `taccruals_at` (and have a higher expected return) as compared to the Bottom 1/3 and Middle 1/3. After forming value-weighted portfolios for each of the terciles and implementing excess returns which gives a notion of how much the portfolio returns exceed the risk free rate, we formed a long-short strategy portfolio that is long the Top 1/3 and short the Bottom 1/3, as well as a long-only strategy portfolio that goes long the Top 1/3. Intuitively, we expect the long-short strategy to be a safer option because the shorted stocks offer a hedge against market risk and in case the shorted stocks do perform very badly, we can expect even higher gains from this strategy, whereas the long-only portfolio is more exposed to market risk although expected to provide higher (and riskier) returns. To evaluate the performance of the strategies, we plot panels showing cumulative excess returns for the portfolios, in both an unlevered scenario, where each portfolio is subject to their own different volatility, and a levered scenario, where we lever the portfolios to an annualised volatility of 10% and hence get a better perspective of the actual risk-adjusted returns.

Growth of 1 Euro - Long-only vs Long-Short vs vwMktRf



Growth of 1 Euro - Portfolios at annualized volatility of 10%



panels showing cumulative excess returns for the portfolios & leveraged portfolios

By looking at the evolution of cumulative excess returns, from the last period of roughly 20 years, specially by looking at the graph with the portfolios normalised to an annualised volatility of 10% for a better view of risk-adjusted performance, we conclude that the long-only strategy slightly underperforms the value-weighted stock market portfolio (vwMktRf) whereas the long-short portfolio underperforms the other two portfolios while offering a very poor hedge as it's also affected by some of the largest drawdowns also suffered by the other two portfolios, especially in the early years of the sample until 2007. An interesting take from the panels is the fact that, despite the long-short portfolio performance being poor in most of the period, it showed unusual upside potential during periods of economic downturn such as the 2008 crisis. A possible intuition for this may be the fact companies with very high `taccruals_at` (which this portfolio shorts) may have been specially affected during the crisis, either defaulting or entering distress, therefore having their stock prices lower at such a rate that makes the strategy's shorting gains more than offset the losses in long positions.

To better explore the performance of the portfolios we plot a table below with performance measures for the portfolios for different time periods. It is intended to give an insight for the first half, second half and complete period of our sample with measures such as annualised average returns, Sharpe Ratios, and an alpha analysis in the perspective of the Capital Asset Pricing Model (CAPM) and Fama-French 3 factor model (FF3). The CAPM, describes the relationship between systematic risk and expected return for assets, while trying to evaluate whether a stock is valued fairly when its market risk and the time value of money (by using excess returns) are compared to its expected return<sup>3</sup>. The FF3, complements the CAPM by adding size risk and value risk factors to the market risk factors<sup>4</sup>.

	First Half (feb.2000 – aug.2010)			Second Half (sep.2010-dec.2020)			Full Period		
Portfolios	Long-Only	Long Short	vwMktRf	Long-Only	Long Short	vwMktRf	Long-Only	Long Short	vwMktRf
Average Annualised Return	-0.0255	-0.0229	-0.0105	0.1612	0.0258	0.1478	0.0675	0.0013	0.0683
Annualised Sharpe Ratios	-0.1248	-0.3419	-0.0630	1.0531	0.4560	1.0207	0.3702	0.0212	0.4318
CAPM	alpha=	alpha=	alpha*=	alpha=	alpha=	alpha*=	alpha=	alpha=	alpha*=
	-0.0130	-0.0223	0	0.0091	0.0336	0	-0.0089	0.0001	0
	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=
	-0.8557	-1.085	infinity	0.8018	1.8501	infinity	-0.9089	0.0039	infinity
FF3	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio
	= -0.0669	= -0.3561	= 0	= 0.0532	= 0.5311	= 0	= -0.0480	= 0.0009	= 0
	alpha=	alpha=	alpha*=	alpha=	alpha=	alpha*=	alpha=	alpha=	alpha*=
	-0.0087	-0.0146	0	-0.0001	0.0127	0	-0.0083	0.0022	0
FF3	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=	t-stat=
	-0.5966	-0.6921	infinity	-0.0064	0.7589	infinity	-0.9290	0.1668	infinity
	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio	Info Ratio
	= -0.0450	= -0.2420	= 0	= -0.0004	= 0.2055	= 0	= -0.0452	= 0.0370	= 0

\*Note: By definition vwMktRf's CAPM and FF3 alphas are zero as it represents our suitable market index

By looking at the table above, we conclude the first half of our sample is the one where all portfolios had the worst performance. During that period, all portfolios had a negative annualised Sharpe Ratio, meaning they all lost money, specially the Long-Short, with an annualised SR of -0.34 way under our market index (-0.06) and long-only (-0.12). The second half is already more optimistic for all portfolios, most likely because the first was affected by the early 2000s recession and Great Recession of 2008, and while the recent covid pandemic caused the market to crash in March 2020 and made great damages to the economic tissue of many nations, the market quickly recovered with a large bull run backed by large amounts of liquidity entering equity markets. As opposed to the other portfolios, the long-short portfolio does not show a great risk adjusted performance in this period, with a less optimistic annualised SR of just +0.46, compared to the market index (+1.02) and long-only

<sup>3</sup>[https://www.investopedia.com/terms/c/capm.asp#:~:text=The%20Capital%20Asset%20Pricing%20Model%20\(CAPM\)%20describes%20the%20relationship%20between,assets%20and%20cost%20of%20capital.](https://www.investopedia.com/terms/c/capm.asp#:~:text=The%20Capital%20Asset%20Pricing%20Model%20(CAPM)%20describes%20the%20relationship%20between,assets%20and%20cost%20of%20capital.)

<sup>4</sup><https://www.investopedia.com/terms/f/famaandfrenchthreefactormodel.asp>

(+1.05). Without diving into much more detail, it is important to consider the t-statistics in the table (relative to the CAPM and FF3) are extremely low, and we would expect to get t-tests of at least  $\pm 1.96$  to discuss the values of alpha with a 95% confidence level. Since we cannot reject the null hypothesis that the alphas are zero, it is unwise to make claims about the alphas and consequently the Information Ratios, which should provide a good view on the performance of the portfolios relative to the market index (benchmark), given it is a simple ratio between the alphas and volatility.

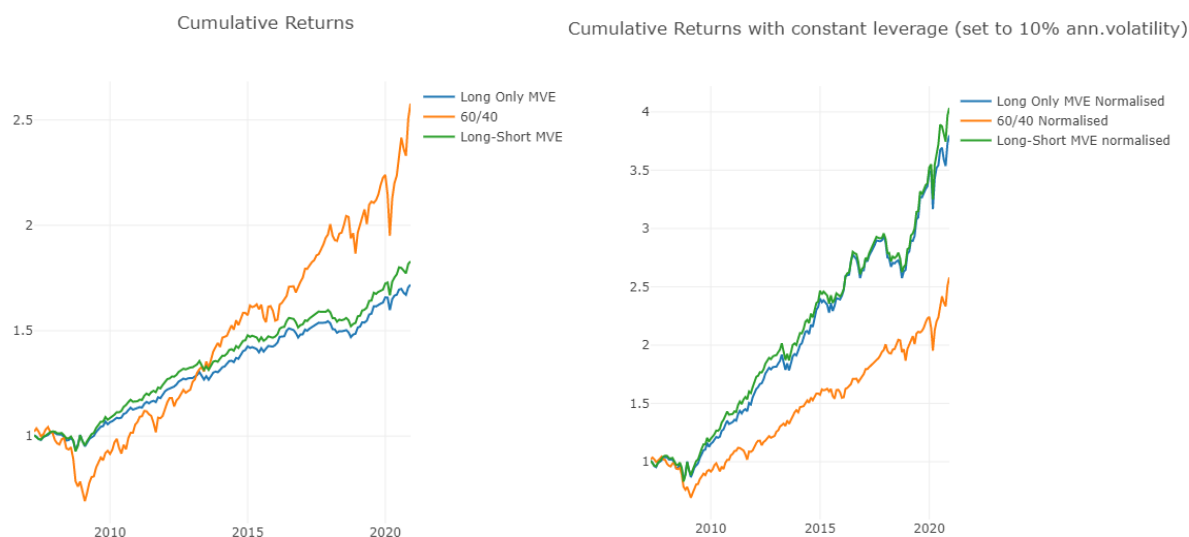
Curiously, our discoveries of poor performance of the `taccruals_at` strategy as a standalone investment, specially in the first half period, are in line with a paper written by Mohanram on Analysts' Cash Flow Forecasts and the Decline of the Accruals Anomaly, which states that since 2002 the accruals anomaly has apparently weakened, perhaps explained by the increasing incidence of analysts' cash flow forecasts that provides markets with forecasts of future accruals, therefore reducing the negative relationship between accruals and future returns. The anomaly becomes weaker with more accurate forecasts (Mohanram, 2014).

## Strategy as part of a diversified portfolio

In order to obtain a diversified portfolio, we use a mean-variance optimization approach, which aims to make the selection of portfolios based on the means and variances of their returns. The selection begins through attaining the higher expected return portfolio for a given level of variance or the lower variance portfolio for a given expected return (Bodie, 2015).

Firstly, we obtained the tangency portfolio which is the portfolio fully invested in risky assets that maximises the Sharpe Ratio. Secondly, given a risk-free rate, we build an efficient frontier of optimal portfolios as the combination of the tangency portfolio and the risk-free asset, whose weights an investor chooses based on his risk aversion level (the more weight on the risky asset, the more the risk they are exposed to). In the context of our `taccruals_at` portfolios, we built a version using the long-only portfolio and another one with our long-short portfolio, with both the cases being combined with a comparison diversified 60/40 ETF portfolio, which is invested 60% in the Vanguard Total Stock Market ETF (VTI) and 40% in the Vanguard Total Bond Market ETF (BND). The selection of this 60/40 portfolio is mostly based on the fact it provides exposure to the US equity market but also exposure to a less risky broad, market-weighted US bond index, hence it is a great benchmark for our diversified strategy.

To analyse the performance of our mean-variance efficient (MVE) portfolios and along with our comparison diversified portfolio (60/40), we plot the cumulative returns showing cumulative returns for the portfolios and cumulative returns with a constant leverage applied to each portfolio so that they all have an annualized volatility of 10% over the full sample.



cumulative returns of mean-variance efficient portfolios along with comparison (60/40) portfolio

As seen from the plots above, the Long-only and Long-short MVE portfolios closely move in tandem. If we look at the left graph (unlevered returns) we observe how more stable the MVE portfolios are comparing to the 60/40, as seen by the example of the MVE avoiding the 2008 crisis drawdown that nearly wipes out the 60/40 portfolio. In the right side, where annualized leverages are matched (and assuming we are free to use leverage to freely move along the efficient frontier to match our desired risk), the MVE portfolios achieve cumulative returns of nearly 400% when the 60/40 approaches 250% by the period's end. While we achieved this result of significantly higher returns, we must acknowledge we are subject to more volatility which reflects into less stability for our strategy.

By plotting a table with average annualized returns and Sharpe Ratios, we arrive at the conclusion that, despite the MVE portfolios having a lower annualized return compared to the 60/40 benchmark portfolio, the Sharpe Ratios are surprisingly better than the benchmark's. The long only MVE has an annualized SR of +1.02 while the long short MVE has +1.07, while the benchmark's SR is +0.74.

	Strategy Version	mean-variance efficient portfolios	60/40 portfolio
Average Annualized Return	Long only	0.0402	0.0741
	Long short	0.0449	
Annualized Sharpe Ratios	Long only	1.0245	0.7416
	Long short	1.0686	

Figure: Performance measures table for the portfolios over the full period

To conclude, our Mean-Variance efficient portfolios outperform the 60/40 benchmark in terms of risk-adjusted returns, posing as a better alternative for forming a diversified portfolio. While this strategy seems to work in a diversified portfolio and is worthy of recommendation, one must consider taccruals\_at as a standalone investment a poor performing alternative. Regarding the sample period, it was cut short from 20 to approximately 15 years in order to be able to fulfil the overlapping requisites to build our mean-variance optimal diversified portfolios. While a shorter time span, it is still long enough to include several economic cycles and help eliminate survivorship bias (being fundamental since we believe high levels of taccruals\_at negatively impact the lifespan of a company).

## Bibliography

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