# Accrual Strategy

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## Reported earnings equals operating cash flow plus accruals

- Under the accrual system, revenues and expenses are booked when they are earned and incurred, not necessarily when cash is received or paid.

- In an ideal world free of estimation (or moral) errors, net income, i.e. revenues minus expenses, will eventually be exactly the same as cash received minus cash paid.

- In the real world, reported net income is just an estimate because not all revenues and expenses are realized in cash at the time of reporting, and the unrealized portion is subject to estimation error and manipulation.

- Thus reported net income is commonly decomposed into a *factual* cash flow from operations component and an *estimated* accruals component:

     *Reported Earnings  =  Operating Cash Flow  +  Accruals*

- The cash flow component is hard to distort, which is why we prefer to relate cash flow instead of reported earnings to measures of the firm's capital base such as enterprise value.

- On the other hand, the accruals component is highly subjective, depending on provisions for reserves, different methods of inventory valuation, different methods of depreciating assets, and, in rare cases, wrongful acts such as capitalizing cash expenses or booking inventory as sales.

## The subjectivity of accruals can be exploited for profit

- Just as the ratios of earnings or cash flow to the firm's value is a good metric for trading stocks – particularly buying stocks – a ratio involving accruals may be a good metric for selling stocks.

- Such a ratio would work because of the subjective nature of accruals and our nature to manipulate when there is an opportunity to do so. When we see "subjective" or "human nature", we think "mean reversion".

- Note that even though they add up to reported earnings, the cash flow and accrual components are not necessarily inversely related to each other. A company could have high cash flow and high accruals or low cash flow and low accruals.

- There is a small body of academic literature that examines the relationship between accruals and future earnings and the extent to which information contained in accruals is reflected in stock prices (see for example, Richardson et al, Journal of Accounting and Economics 39 (2005), 437-485, and references therein).

- We study in this memo how suitable characterizations of the accrual component can help us sell short stocks.

## Accruals tend to mean revert over time

- The genesis of this research was an "earnings quality" (EQ) model that Starmine tried to sell to me a few months ago.

- The Starmine EQ model identifies companies whose past reported earnings are reliable and likely to persist in the future and those whose earnings are unreliable and unlikely to persist. The model uses the following four factors (effect on persistence of earnings explained in parentheses):

    1. Operating cash flow (higher cash flow means more persistent earnings)

    2. Accruals (higher accruals means less persistent earnings)

    3. Operating efficiency (higher earnings-to-assets ratio, in particular, higher sales-to-assets ratio, means more persistent earnings)

    4. Exclusions (more negative exclusions or "one-time charges" means less persistent earnings).

- A full explanation of the above factors and how they affect future stock returns can be found in Starmine's white paper on the EQ model (\\ns\stuff\michaeltan\StarMine_EQ_model_whitepaper.pdf)

- The basic idea is stock prices act as if investors extrapolate only on pro forma reported earnings and fail to include (in a statistical sense) the implications of the various components of earnings.

- **The really basic idea is that accruals tend to mean revert over time**. High accruals now embellish an earnings report only to disappear in a future earnings report, thereby inflating current earnings and deflating future earnings. Following earnings, the stock price gets inflated now and then deflated in the future. This is a statistical effect that can be exploited for profit.

## There are many definitions of accruals

- According to Starmine's white paper, the returns of the Starmine EQ model has a 0.4 correlation to a basic accruals model.   Therefore I set out a few months ago to learn about accruals, verify the idea and independently develop my own accruals model.

- I tested various models using different definitions of accruals such as:

  1. Pretax income minus operating income

  2. Reported earnings minus cash earnings (defined as pretax income minus change in capital expenditures plus depreciation)

  3. Reported earnings minus operating earnings (operating earnings defined as operating income minus depreciation)

  4. Change in net operating assets (net operating assets defined as current assets minus current liabilities plus PPE)

  5. Change in current assets minus change in current liabilities minus change in cash equivalents plus change in short term debt plus change in income tax payable (following definition in Sloan, The Accounting Review 71 (1996) pp 289-315).

- Some of the above models were naïve and borne of my ignorance of accounting while others were false starts.   I have tested both quarterly and annual versions of the models.  Definitions 4 and 5 worked the best.

## Sloan's definition of accruals

- For completeness, the exact definition of accruals used by Sloan (1996) is reproduced here:

$$\text{Accruals} = (\Delta CA - \Delta Cash) - (\Delta CL - \Delta STD - \Delta TP) - \text{Dep} \qquad (1)$$

where
$\Delta CA$ = change in current assets (Compustat item 4),
$\Delta Cash$ = change in cash/cash equivalents (Compustat item 1),
$\Delta CL$ = change in current liabilities (Compustat item 5),
$\Delta STD$ = change in debt included in current liabilities (Compustat item 34),
$\Delta TP$ = change in income taxes payable (Compustat item 71), and
$\text{Dep}$ = depreciation and amortization expense (Compustat item 14).

- Financial companies (defined as those with SIC codes between 6000 and 7000 inclusive) are excluded from all accruals strategies tested in this memo.

# Short only strategy is profitable 9 out of the last 10 years

- Using the Sloan definition of accruals (definition number 5) and shorting the top 5% by ratio of annual accruals to total assets starting from a universe composed of stocks from the top 70th to 90th percentiles by market cap, we get the following performance:

| Short top 5% by accruals/assets (Sloan 1996 definition); mkt cap [70,90], monthly rebal, no TC, lag 2 months, no beta adjustment | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
| | | | | | | | |
| min | -27.12 | -42.87 | -40.37 | -40.02 | -41.38 | -34.18 | -18.04 |
| max | 28.24 | 40.29 | 48.38 | 62.81 | 60.38 | 69.63 | 97.83 |
| std | 9.16 | 15.53 | 17.64 | 20.22 | 22.45 | 23.68 | 23.7 |
| r/r | 0.09 | 0.3 | 0.63 | 0.98 | 1.29 | 3.59 | 7.06 |
| %pos | 0.55 | 0.57 | 0.65 | 0.65 | 0.68 | 0.76 | 0.85 |
| %neg | 0.44 | 0.43 | 0.35 | 0.35 | 0.32 | 0.24 | 0.15 |
| avg+ | 7.07 | 13.49 | 14.86 | 18.47 | 20.81 | 27.02 | 34.2 |
| avg- | -6.95 | -11.69 | -14.44 | -15.26 | -17.57 | -13.92 | -8.46 |
| avg | 0.85 | 2.67 | 4.56 | 6.6 | 8.38 | 17.34 | 27.88 |
| | | | | | | | |
| Annual: | | | | | | | |
| | | | | | | | |
| 1996 | 2.57 | | | | | | |
| 1997 | 10.5 | | | | | | |
| 1998 | 10.54 | | | | | | |
| 1999 | 3.74 | | | | | | |
| 2000 | 15.38 | | | | | | |
| 2001 | 19.01 | | | | | | |
| 2002 | 32.51 | | | | | | |
| 2003 | -35.91 | | | | | | |
| 2004 | 7.63 | | | | | | |
| 2005 | 32.21 | | | | | | |
| | | | | | | | |
| AvgRoR | 10.07 | | | | | | |
| R/R | 0.32 | | | | | | |
| skew | 0.04 | | | | | | |
| STD | 31.59 | | | | | | |
| | | | | | | | |
| 5 worst drawdowns: | | | | | | | |
| | DD | Begin | End | Dur(M) | Recovery | | |
| | | | | | | | |
| 1 | -52.91 | 19980731 | 20000929 | 38 | 13 | | |
| 2 | -43.35 | 20030228 | 20031231 | 15 | 0 | | |
| 3 | -30.07 | 19970331 | 19980529 | 21 | 14 | | |
| 4 | -23.08 | 20010831 | 20020531 | 13 | 10 | | |
| 5 | -22.5 | 20010228 | 20010731 | 8 | 4 | | |
| | | | | | | | |
| | | | | | | | |
| Avg DD: | -34.38 | | | | | MT | 2/15/2006 17:25 |

The portfolio is rebalanced once a month and no transaction costs are charged. The accounting data is lagged two months to ensure that trading was done using data that were actually available.

All financial companies (defined as those with SIC codes between 6000 and 7000) are excluded from the screen.

## High accruals also imply high beta

- There is a positive relationship between accruals and beta which is statistically significant. That is, a company that has higher accruals is also likely a company whose price has a higher beta to the market.

- Each point in the graph below represents a stock on a particular month-end date between Jan 1, 1997 and Oct 15, 2005. The straight line through the scatter plot is the linear fit. The 95% confidence bounds on the regression coefficients are shown to the right of the figure.

Accruals-to-assets ratio vs beta (raw, 1-year window)

$A = 0.013*\beta - 0.049$
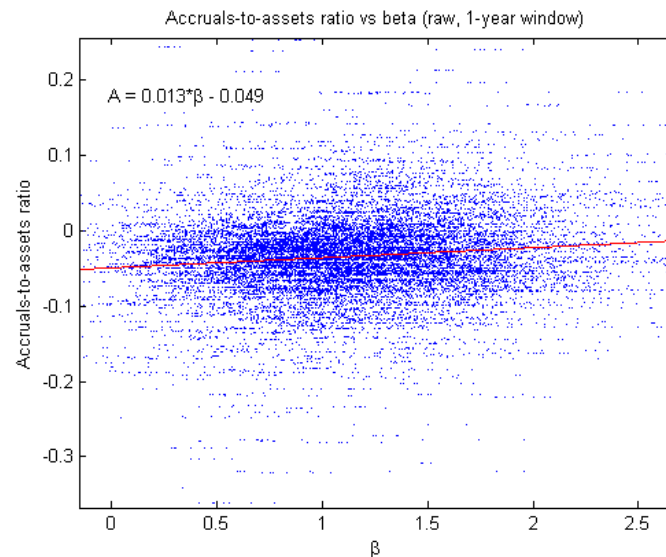
$Coeff1 \in [0.0113, 0.0156]$

$Coeff0 \in [-0.05158770127053, -0.04633563580660]$

- Therefore, if we short a stock with high accruals, then we are also shorting a high beta stock. This is why the strategy shown on the previous page had its biggest drawdown during the internet bubble period.

# Simple reranking procedure to remove a factor bias from a portfolio

- It is clear that a dollar neutral portfolio which is long the low accruals stocks and short the high accruals stocks will have a negative beta. This portfolio can lose a lot of money in a sustained run-up in the market.

- If we divide the universe into 10 deciles by beta and rank the stocks in *each decile* by accruals-to-total assets ratio, then the assigned ranks will no longer have a bias to beta in the sense that a portfolio long the bottom 5% (say) and short the top 5% using the new ranks will have (approximately) zero beta by construction.

- The reranking procedure is depicted schematically below:
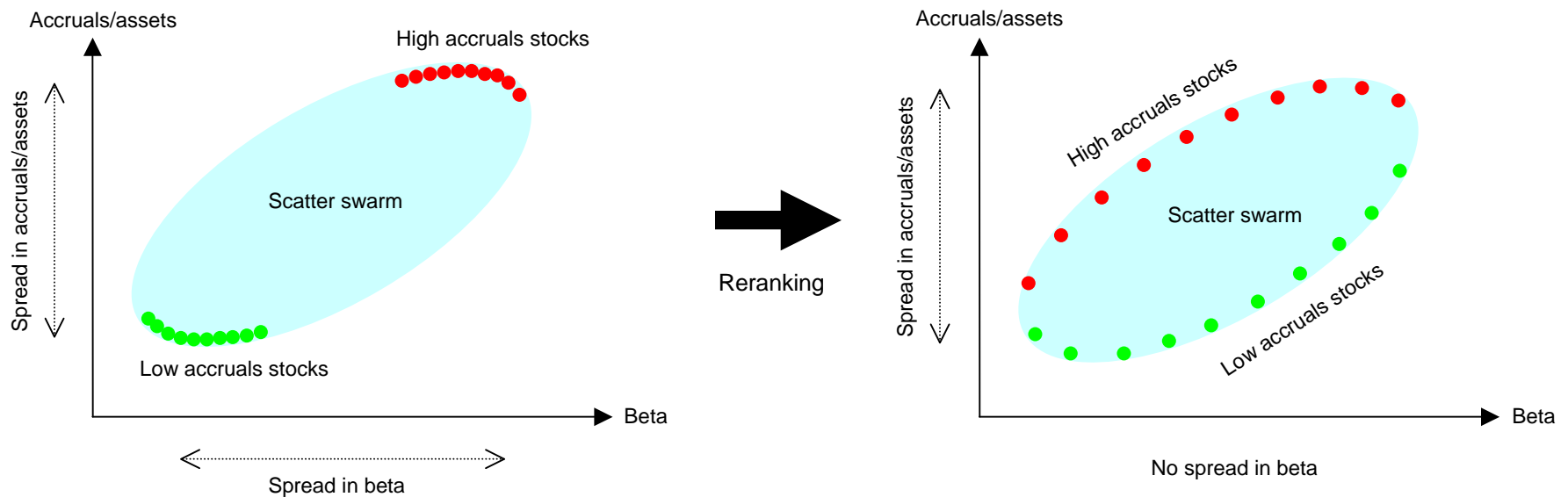


*Spread in accruals/assets ratio as well as spread in beta*

*Spread in accruals/assets ratio but no spread in beta*

S

# Reranking to neutralize beta reduces drawdowns dramatically

- If we apply the reranking procedure just described to the raw accruals-to-assets ratios, we reduce almost every major drawdown by 10% or more.

**Short top 5% by accruals/assets (Sloan 1996 definition); mkt cap [70,90], monthly rebal, no TC, lag 2 months, beta adjustment over 10 deciles**

| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
|---|---|---|---|---|---|---|---|
| min | -20.02 | -32.97 | -34.85 | -39.79 | -41.1 | -37.6 | -25.77 |
| max | 26.45 | 36.22 | 45.01 | 43.95 | 52.13 | 66.56 | 86.04 |
| std | 7.39 | 12.99 | 15.54 | 18.64 | 21.38 | 24.43 | 23.47 |
| r/r | 0.11 | 0.33 | 0.71 | 1.09 | 1.42 | 3.73 | 7.64 |
| %pos | 0.53 | 0.55 | 0.68 | 0.64 | 0.7 | 0.76 | 0.89 |
| %neg | 0.46 | 0.45 | 0.32 | 0.36 | 0.3 | 0.24 | 0.11 |
| avg+ | 6.08 | 11.94 | 12.76 | 17.79 | 19.56 | 29.01 | 34.94 |
| avg- | -5.42 | -9.23 | -13.36 | -12.75 | -17.01 | -15.07 | -10.59 |
| avg | 0.78 | 2.47 | 4.53 | 6.76 | 8.76 | 18.58 | 29.88 |

| Annual: | |
|---|---|
| 1996 | -0.45 |
| 1997 | 12.43 |
| 1998 | 22.61 |
| 1999 | 4.1 |
| 2000 | 7.89 |
| 2001 | 22.54 |
| 2002 | 32.92 |
| 2003 | -36.11 |
| 2004 | 2.34 |
| 2005 | 21.72 |

| | |
|---|---|
| AvgRoR | 9.23 |
| R/R | 0.36 |
| skew | 0.31 |
| STD | 25.48 |

5 worst drawdowns:

| | DD | Begin | End | Dur(M) | Recovery |
|---|---|---|---|---|---|
| 1 | -42.93 | 20030228 | 20031231 | 15 | 0 |
| 2 | -37.18 | 19990930 | 20000929 | 18 | 13 |
| 3 | -26.36 | 19970331 | 19980529 | 21 | 14 |
| 4 | -17.34 | 20010831 | 20020430 | 12 | 9 |
| 5 | -16.54 | 19980731 | 19981231 | 8 | 3 |

| Avg DD: | -28.07 | | | | | MT | 2/15/2006 17:32 |
|---|---|---|---|---|---|---|---|

The only drawdown that is not reduced is the one occurring in 2003. I have not been able to find any statistical method to significantly reduce this drawdown.

# Reranking by momentum reduces the maximum drawdowns even more

- Clearly the reranking procedure can be used to neutralize the portfolio's exposure to factors other than beta, such as momentum.

- If we apply the reranking procedure to the raw accruals-to-assets ratios using the past one month return as a measure of momentum, then we reduce the largest drawdown during 2003 by 15%.

**Short top 5% by accruals/assets (Sloan 1996 definition); mkt cap [70,90], monthly rebal, no TC, lag 2 months, momentum (=lagging 1-month return) adjustment over deciles 3 to 7**

| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
|---|---|---|---|---|---|---|---|
| min | -21.38 | -27.46 | -31.28 | -30.42 | -36.29 | -23.49 | -21.63 |
| max | 23.33 | 36.58 | 47.33 | 54.48 | 53.58 | 72.37 | 100.82 |
| std | 7.51 | 13.1 | 16.29 | 18.1 | 20.2 | 26.45 | 33.53 |
| r/r | 0.12 | 0.35 | 0.86 | 1.54 | 2.16 | 4.7 | 7.12 |
| %pos | 0.54 | 0.58 | 0.64 | 0.74 | 0.76 | 0.73 | 0.81 |
| %neg | 0.45 | 0.42 | 0.36 | 0.26 | 0.24 | 0.27 | 0.19 |
| avg+ | 6.23 | 11.53 | 15.06 | 17.55 | 21.71 | 38.22 | 50.74 |
| avg- | -5.54 | -9.69 | -10.88 | -14.4 | -15.54 | -9.61 | -8.17 |
| avg | 0.9 | 2.67 | 5.72 | 9.32 | 12.6 | 25.39 | 39.8 |

Annual:

| | |
|---|---|
| 1997 | -5.49 |
| 1998 | 15.04 |
| 1999 | 41.41 |
| 2000 | 11.74 |
| 2001 | 12.3 |
| 2002 | 29.76 |
| 2003 | -32.14 |
| 2004 | 13.51 |
| 2005 | 8.51 |

| | |
|---|---|
| AvgRoR | 10.71 |
| R/R | 0.41 |
| skew | 0.29 |
| STD | 25.89 |

5 worst drawdowns:

| | DD | Begin | End | Dur(M) | Recovery |
|---|---|---|---|---|---|
| 1 | -36.81 | 20020830 | 20031231 | 24 | 0 |
| 2 | -31.28 | 19970228 | 19980529 | 22 | 14 |
| 3 | -27.46 | 20010831 | 20020628 | 15 | 11 |
| 4 | -24.59 | 19980731 | 19990730 | 18 | 12 |
| 5 | -23.25 | 20001031 | 20010731 | 13 | 12 |

| | | | | | |
|---|---|---|---|---|---|
| Avg DD: | -28.68 | | | MT | 2/17/2006 16:40 |

In this strategy, the past one month returns of the stocks are divided into deciles and the top and bottom 3 deciles are *discarded*. The remaining deciles are reranked according to the procedure described.



Accruals strategy neutral to 1-mth momentum, mkt cap [70,90]
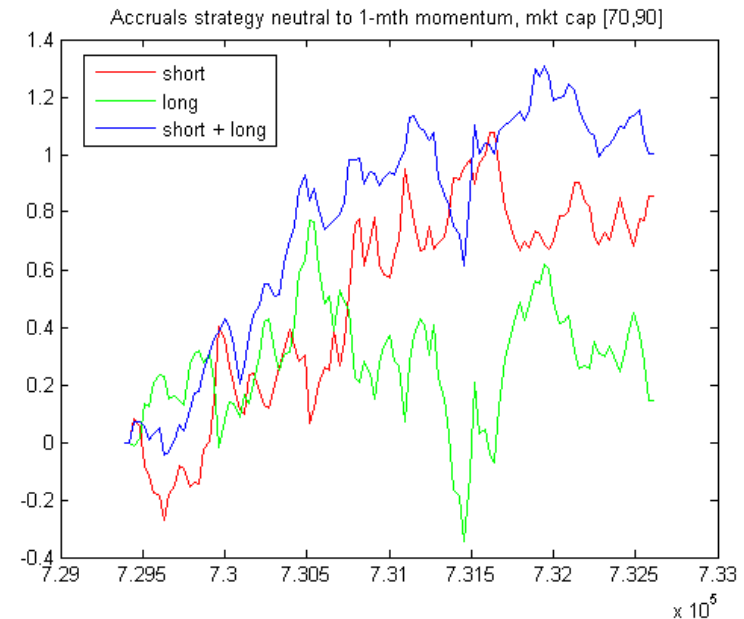
# Accruals is a pure short factor

- The accruals models tested do not work on the long side but may work as long/short combination.

**Long bottom 5% by accruals/assets (Sloan 1996 definition); mkt cap [70,90], monthly rebal, no TC, lag 2 months, beta adjustment over 10 deciles (simulated using Fsim_AccrualsBetaAdj4.m)**

| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
|---|---|---|---|---|---|---|---|
| min | -25.74 | -32.91 | -40.8 | -52.95 | -50.66 | -53.35 | -66.49 |
| max | 23.1 | 27.92 | 45.43 | 53.34 | 59.49 | 50.8 | 60.8 |
| std | 8.2 | 14.28 | 17.97 | 21.71 | 25.02 | 23.97 | 26.47 |
| r/r | 0.02 | 0.07 | 0.12 | 0.12 | 0.18 | 0.89 | 0.91 |
| %pos | 0.5 | 0.51 | 0.5 | 0.46 | 0.43 | 0.55 | 0.63 |
| %neg | 0.5 | 0.49 | 0.5 | 0.54 | 0.57 | 0.45 | 0.37 |
| avg+ | 6.68 | 11.75 | 15.38 | 19.68 | 24.98 | 21.82 | 19.66 |
| avg- | -6.37 | -11.24 | -13.66 | -15.36 | -16.18 | -16.93 | -22.45 |
| avg | 0.15 | 0.59 | 0.86 | 0.89 | 1.34 | 4.33 | 4.02 |

| Annual: | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1997 | 18.06 | | | | | | |
| 1998 | -2.49 | | | | | | |
| 1999 | 22.13 | | | | | | |
| 2000 | -21.09 | | | | | | |
| 2001 | -0.58 | | | | | | |
| 2002 | -19.17 | | | | | | |
| 2003 | 54.55 | | | | | | |
| 2004 | -22.48 | | | | | | |
| 2005 | -12.79 | | | | | | |
| AvgRoR | 1.83 | | | | | | |
| R/R | 0.06 | | | | | | |
| skew | -0.12 | | | | | | |
| STD | 28.28 | | | | | | |

**5 worst drawdowns:**

| | DD | Begin | End | Dur(M) | Recovery | | |
|---|---|---|---|---|---|---|---|
| 1 | -82.15 | 20000131 | 20020731 | 44 | 0 | | |
| 2 | -38.84 | 19980331 | 19991029 | 28 | 23 | | |
| 3 | -13.44 | 19970829 | 19980130 | 8 | 4 | | |
| 4 | -4.08 | 19970131 | 19970228 | 2 | 1 | | |
| 5 | -3.57 | 19991130 | 19991231 | 2 | 1 | | |
| Avg DD: | -28.42 | | | | | MT | 3/8/2006 14:50 |

# Accruals may work in a long/short combination

- Adding the long side reduces somewhat the drawdowns of the short-only strategy.

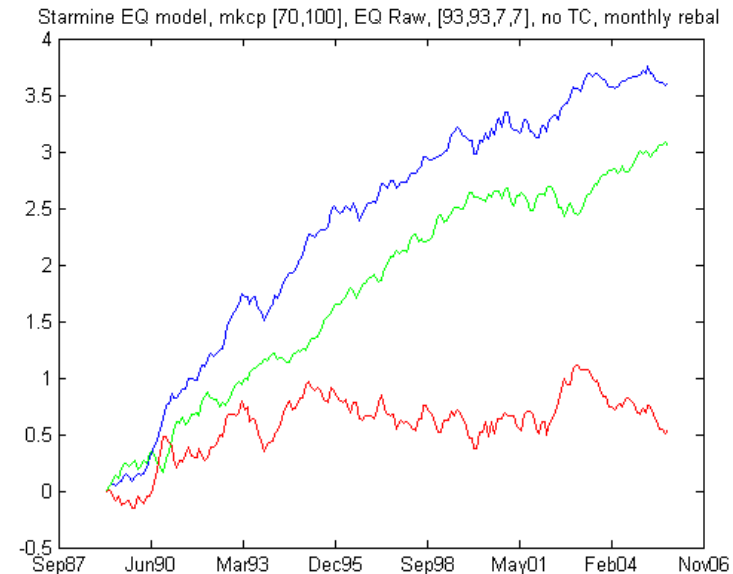| Short top 5% and long bottom 5% by accruals/assets (Sloan 1996 definition); mkt cap [70,90], monthly rebal, no TC, lag 2 months, beta adjustment over 10 deciles (simulated using Fsim_AccrualsBetaAdj4.m) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
| | | | | | | | |
| min | -9.72 | -13.28 | -21.65 | -22.03 | -25.8 | -19.08 | -8 |
| max | 13.55 | 17.14 | 31.54 | 30.9 | 41.03 | 57.14 | 56.54 |
| std | 3.95 | 6.84 | 9.95 | 12.67 | 15.1 | 18.89 | 14.04 |
| r/r | 0.15 | 0.43 | 0.81 | 1.22 | 1.59 | 3.88 | 8.89 |
| %pos | 0.54 | 0.6 | 0.59 | 0.67 | 0.68 | 0.7 | 0.9 |
| %neg | 0.45 | 0.4 | 0.41 | 0.33 | 0.32 | 0.3 | 0.1 |
| avg+ | 3.29 | 6.2 | 9.85 | 12.38 | 15.68 | 24.61 | 23.53 |
| avg- | -2.63 | -5.11 | -6.15 | -9.49 | -11.73 | -7.07 | -3.74 |
| avg | 0.61 | 1.7 | 3.29 | 5.16 | 6.94 | 14.95 | 20.8 |
| | | | | | | | |
| Annual: | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 1997 | 13.22 | | | | | | |
| 1998 | 14.15 | | | | | | |
| 1999 | 32.94 | | | | | | |
| 2000 | -24.12 | | | | | | |
| 2001 | 11.39 | | | | | | |
| 2002 | 17.19 | | | | | | |
| 2003 | 15.73 | | | | | | |
| 2004 | -19.02 | | | | | | |
| 2005 | 2.48 | | | | | | |
| | | | | | | | |
| AvgRoR | 7.24 | | | | | | |
| R/R | 0.53 | | | | | | |
| skew | 0.2 | | | | | | |
| STD | 13.61 | | | | | | |
| | | | | | | | |
| 5 worst drawdowns: | | | | | | | |
| | DD | Begin | End | Dur(M) | Recovery | | |
| | | | | | | | |
| 1 | -30.03 | 19991029 | 20030131 | 57 | 38 | | |
| 2 | -23.24 | 20031231 | 20050630 | 27 | 0 | | |
| 3 | -10.43 | 19980930 | 19981231 | 5 | 3 | | |
| 4 | -3.83 | 20031031 | 20031128 | 2 | 1 | | |
| 5 | -3.72 | 19970331 | 19970630 | 5 | 3 | | |
| | | | | | | | |
| | | | | | | | |
| Avg DD: | -14.25 | | | | | MT | 3/8/2006 14:36 |

# Starmine's EQ model works marginally on the short side

- Starmine provided a historical data package which can be used to backtest their EQ model. The simulation below uses Starmine's EQ rankings but our own CRSP prices for calculating returns.

- The Starmine EQ model works only marginally on the short side, despite having accruals as a primary component.

This strategy buys stocks with Starmine EQ raw percentile ranks equal to or above 93 and shorts stocks with ranks equal to or below 7.  Note: "raw" ranks refer to ranks that are not neutralized with respect to beta.

**Starmine EQ model, both long and short, mkt cap [70,100], monthly rebal**
**no TC, use EQ raw scores, no leverage (1x1), [93,93,7,7]**

| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
|---|---|---|---|---|---|---|---|
| min | -12.97 | -21.1 | -23.77 | -18.56 | -22.44 | -10.43 | 6.79 |
| max | 14.63 | 32.19 | 46.55 | 65.6 | 70.43 | 105.85 | 160.81 |
| std | 4.94 | 8.93 | 13.7 | 17.2 | 19.66 | 27.25 | 34.34 |
| r/r | 0.36 | 1.05 | 1.96 | 2.93 | 4 | 8.16 | 11.87 |
| %pos | 0.63 | 0.75 | 0.78 | 0.82 | 0.87 | 0.97 | 1 |
| %neg | 0.36 | 0.25 | 0.22 | 0.18 | 0.13 | 0.03 | 0 |
| avg+ | 4.56 | 9.19 | 16.31 | 22.26 | 27.02 | 47.21 | 67.94 |
| avg- | -3.04 | -6.06 | -7.82 | -7.68 | -5.36 | -6.24 | |
| avg | 1.78 | 5.4 | 10.96 | 16.78 | 22.71 | 45.39 | 67.94 |

Annual:

| | |
|---|---|
| 1989 | 11.92 |
| 1990 | 64.83 |
| 1991 | 35.04 |
| 1992 | 47.85 |
| 1993 | 2.33 |
| 1994 | 46.97 |
| 1995 | 39.47 |
| 1996 | 6.47 |
| 1997 | 17.87 |
| 1998 | 22.15 |
| 1999 | 15.39 |
| 2000 | 25.19 |
| 2001 | -22.44 |
| 2002 | 43.56 |
| 2003 | 6.41 |
| 2004 | 5.28 |
| 2005 | -8.7 |

| | |
|---|---|
| AvgRoR | 21.58 |
| R/R | 1.26 |
| skew | 0.01 |
| STD | 17.08 |

5 worst drawdowns:

| | DD | Begin | End | Dur(M) | Recovery |
|---|---|---|---|---|---|
| 1 | -23.77 | 19990731 | 20000831 | 19 | 12 |
| 2 | -23.57 | 19930228 | 19940331 | 19 | 9 |
| 3 | -22.68 | 20001231 | 20020731 | 28 | 13 |
| 4 | -16.56 | 20050331 | 20050831 | 8 | 0 |
| 5 | -14.74 | 19960630 | 19961031 | 6 | 4 |

| Avg DD: | -20.26 | | | | MT | 3/14/2006 15:17 |
|---|---|---|---|---|---|---|



Starmine EQ model, mkcp [70,100], EQ Raw, [93,93,7,7], no TC, monthly rebal

# Starmine's EQ model works marginally on the short side

- Starmine's EQ model's short side performance has very high drawdowns.

**Starmine EQRaw model, short only, mkt cap [70,100], monthly rebal**
**no TC, use EQ raw scores, no leverage (1x1), [93,93,7,7], last mktcaplo=1B, mktcaphi=3600B**

| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
|---|---|---|---|---|---|---|---|
| min | -14.03 | -28.6 | -39.5 | -38.18 | -38.08 | -47.99 | -48.53 |
| max | 14.87 | 41.27 | 52.85 | 59.47 | 63.71 | 56.53 | 87.67 |
| std | 6.49 | 11.97 | 17.49 | 20.58 | 23.23 | 25.48 | 31.03 |
| r/r | 0.04 | 0.13 | 0.28 | 0.49 | 0.69 | 1.71 | 2.88 |
| %pos | 0.43 | 0.5 | 0.53 | 0.5 | 0.51 | 0.62 | 0.66 |
| %neg | 0.46 | 0.5 | 0.47 | 0.5 | 0.49 | 0.38 | 0.34 |
| avg+ | 6.09 | 10.5 | 14.91 | 19.39 | 23.07 | 25.38 | 31.42 |
| avg- | -5.16 | -8.86 | -12.66 | -12.57 | -14.58 | -17.98 | -17.01 |
| avg | 0.27 | 0.87 | 1.98 | 3.33 | 4.65 | 8.87 | 14.88 |

Annual:

| | | |
|---|---|---|
| 1989 | -15.31 | |
| 1990 | 57.44 | |
| 1991 | -9.34 | |
| 1992 | 33.37 | |
| 1993 | -22.96 | |
| 1994 | 39.67 | |
| 1995 | 0.4 | |
| 1996 | -16.93 | |
| 1997 | -6.47 | |
| 1998 | -8.15 | |
| 1999 | -5.58 | |
| 2000 | 22.95 | |
| 2001 | -17.96 | |
| 2002 | 57.83 | |
| 2003 | -26.06 | |
| 2004 | -15.55 | |
| 2005 | -12.94 | |

| | |
|---|---|
| AvgRoR | 3.27 |
| R/R | 0.15 |
| skew | 0.2 |
| STD | 22.42 |

5 worst drawdowns:

| | DD | Begin | End | Dur(M) | Recovery |
|---|---|---|---|---|---|
| 1 | -61.45 | 20030228 | 20050831 | 44 | 0 |
| 2 | -60.1 | 19950228 | 20020831 | 131 | 46 |
| 3 | -45.13 | 19930228 | 19940630 | 24 | 13 |
| 4 | -27.09 | 19901130 | 19920531 | 27 | 22 |
| 5 | -16.48 | 19890331 | 19900630 | 22 | 12 |

| | | | | | |
|---|---|---|---|---|---|
| Avg DD: | -42.05 | | | MT | 3/14/2006 15:21 |

**Starmine EQRaw model, long only, mkt cap [70,100], monthly rebal**
**no TC, use EQ raw scores, no leverage (1x1), [93,93,7,7], last mktcaplo=1B, mktcaphi=3**

| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
|---|---|---|---|---|---|---|---|
| min | -12.97 | -20.02 | -25.18 | -23.49 | -21.42 | -23.13 | -16.57 |
| max | 12.63 | 29.02 | 43.58 | 44.94 | 52.39 | 66.91 | 100.2 |
| std | 4.5 | 8.26 | 10.65 | 12.42 | 14.57 | 20.46 | 27.34 |
| r/r | 0.34 | 0.95 | 2.07 | 3.25 | 4.29 | 8.74 | 11.64 |
| %pos | 0.66 | 0.71 | 0.8 | 0.87 | 0.87 | 0.9 | 0.95 |
| %neg | 0.32 | 0.29 | 0.2 | 0.13 | 0.13 | 0.1 | 0.05 |
| avg+ | 4 | 8.6 | 12.8 | 16.61 | 21.91 | 41.4 | 56.71 |
| avg- | -3.54 | -5.22 | -6.68 | -8.58 | -8.2 | -9.17 | -9.82 |
| avg | 1.51 | 4.53 | 8.98 | 13.45 | 18.06 | 36.51 | 53.05 |

Annual:

| | | |
|---|---|---|
| 1989 | 27.23 | |
| 1990 | 7.39 | |
| 1991 | 44.38 | |
| 1992 | 14.47 | |
| 1993 | 25.3 | |
| 1994 | 7.3 | |
| 1995 | 39.06 | |
| 1996 | 23.4 | |
| 1997 | 24.34 | |
| 1998 | 30.29 | |
| 1999 | 20.97 | |
| 2000 | 2.25 | |
| 2001 | -4.49 | |
| 2002 | -14.27 | |
| 2003 | 32.47 | |
| 2004 | 20.83 | |
| 2005 | 4.23 | |

| | |
|---|---|
| AvgRoR | 18.31 |
| R/R | 1.18 |
| skew | -0.35 |
| STD | 15.55 |

5 worst drawdowns:

| | DD | Begin | End | Dur(M) | Recovery |
|---|---|---|---|---|---|
| 1 | -26.06 | 20020430 | 20030731 | 22 | 16 |
| 2 | -20.78 | 20010131 | 20020331 | 21 | 10 |
| 3 | -19.29 | 19900630 | 19901231 | 9 | 4 |
| 4 | -12.22 | 19920229 | 19921031 | 12 | 7 |
| 5 | -8.77 | 19960531 | 19960831 | 5 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| Avg DD: | -17.43 | | | MT | 3/14/2006 15:26 |

# The beta-adjusted Starmine EQ model is not profitable on the short side

| Starmine EQ model, long + short, mkt cap [70,100], monthly rebal | | | | | | |
|---|---|---|---|---|---|---|
| no TC, beta adj, no leverage (1x1), [93,93,7,7], last mktcaplo=1B, mktcaphi=3.6B | | | | | | |
| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
| | | | | | | | |
| min | -10.76 | -13.86 | -14.34 | -20.36 | -15.09 | -18.97 | -22.75 |
| max | 12.59 | 24.9 | 44.34 | 50.9 | 53.74 | 76.4 | 107.64 |
| std | 3.91 | 7.07 | 10.34 | 12.88 | 15.84 | 24.84 | 32.4 |
| r/r | 0.31 | 0.89 | 1.76 | 2.64 | 3.38 | 6.08 | 8.6 |
| %pos | 0.63 | 0.7 | 0.77 | 0.79 | 0.83 | 0.85 | 0.87 |
| %neg | 0.36 | 0.3 | 0.23 | 0.21 | 0.17 | 0.15 | 0.13 |
| avg+ | 3.38 | 7.16 | 11.2 | 15.71 | 19.82 | 37.83 | 55 |
| avg- | -2.59 | -4.45 | -5.13 | -4.64 | -5.79 | -7.72 | -8.88 |
| avg | 1.2 | 3.62 | 7.41 | 11.34 | 15.46 | 30.84 | 46.43 |

| Annual: | |
|---|---|
| 1989 | 13.64 |
| 1990 | 50.16 |
| 1991 | 20.2 |
| 1992 | 33.64 |
| 1993 | 4.83 |
| 1994 | 31.25 |
| 1995 | 35.22 |
| 1996 | 17.13 |
| 1997 | 4.77 |
| 1998 | 21.26 |
| 1999 | 7.47 |
| 2000 | 15.68 |
| 2001 | 13.74 |
| 2002 | -6.84 |
| 2003 | -5.89 |
| 2004 | 5.57 |
| 2005 | -18.09 |
| | |
| AvgRoR | 14.62 |
| R/R | 1.08 |
| skew | 0.06 |
| STD | 13.55 |

| 5 worst drawdowns: | | | | | |
|---|---|---|---|---|---|
| | DD | Begin | End | Dur(M) | Recovery |
| | | | | | |
| 1 | -30.23 | 20020131 | 20050831 | 63 | 0 |
| 2 | -16.8 | 19981231 | 19990930 | 13 | 9 |
| 3 | -13.8 | 20010228 | 20011130 | 14 | 10 |
| 4 | -12.36 | 19910831 | 19911130 | 5 | 3 |
| 5 | -9.82 | 19991231 | 20000229 | 3 | 3 |

| Avg DD: | -16.6 | | | MT | 3/14/2006 16:26 |
|---|---|---|---|---|---|

- Starmine also provides a beta-neutral version of the EQ model which is backtested here.

- This version lost money on the short side.



Starmine EQ model, mkcp [70,100], beta adj, [93,93,7,7], no TC, monthly rebal

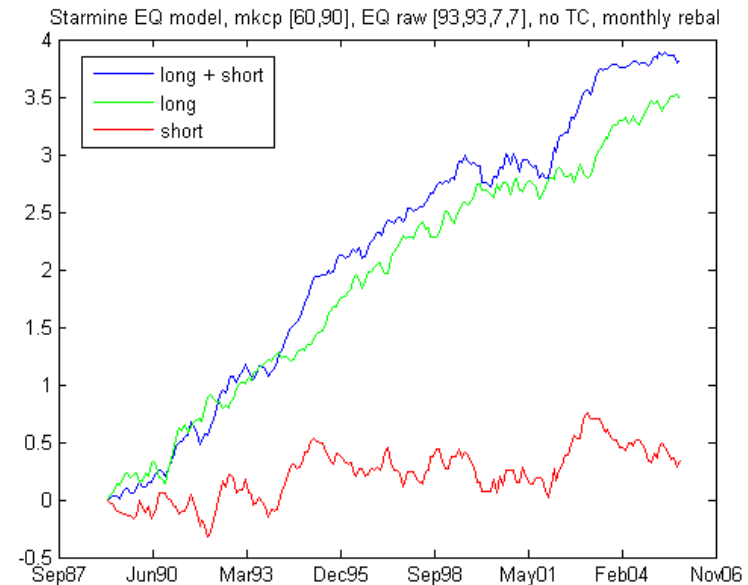Legend: long + short, long, short
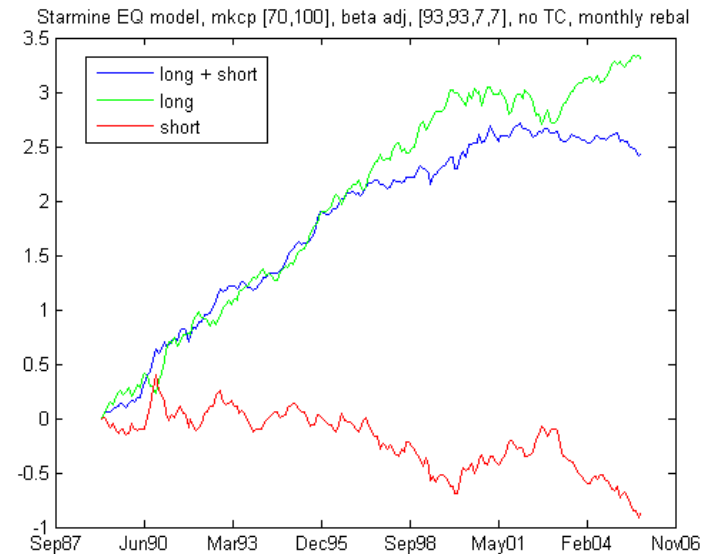
# Starmine EQ model has higher returns for smaller market cap stocks

- As expected, the Starmine EQ long/short model has higher returns if we limit trading to only smaller market cap stocks.

| Starmine EQ model, long+short, mkt cap [60,90], monthly rebal | | | | | | | |
|---|---|---|---|---|---|---|---|
| no TC, use EQ raw scores, no leverage (1x1), [97,93,3,7], last mktcaplo=600M, mktcaphi=4.9B | | | | | | | |
| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
| | | | | | | | |
| min | -13.68 | -19.11 | -23.43 | -28.29 | -20.41 | -11.75 | 3.08 |
| max | 13.86 | 26.42 | 39.25 | 51.79 | 73.18 | 101.78 | 129.92 |
| std | 4.82 | 8.72 | 13.06 | 16.32 | 18.8 | 24.83 | 27.92 |
| r/r | 0.4 | 1.15 | 2.21 | 3.29 | 4.44 | 9.83 | 16.32 |
| %pos | 0.63 | 0.74 | 0.85 | 0.9 | 0.91 | 0.95 | 1 |
| %neg | 0.35 | 0.26 | 0.15 | 0.1 | 0.09 | 0.05 | 0 |
| avg+ | 4.68 | 9.51 | 15.31 | 21.15 | 27.13 | 52.51 | 75.94 |
| avg- | -3.01 | -4.61 | -7.57 | -9.74 | -8.61 | -7.1 | |
| avg | 1.92 | 5.79 | 11.77 | 17.92 | 24.08 | 49.8 | 75.94 |
| | | | | | | | |
| Annual: | | | | | | | |
| | | | | | | | |
| 1989 | 9.4 | | | | | | |
| 1990 | 24.7 | | | | | | |
| 1991 | 23.18 | | | | | | |
| 1992 | 51.49 | | | | | | |
| 1993 | 5.05 | | | | | | |
| 1994 | 62.45 | | | | | | |
| 1995 | 35.78 | | | | | | |
| 1996 | 20.09 | | | | | | |
| 1997 | 20.71 | | | | | | |
| 1998 | 24.29 | | | | | | |
| 1999 | 12.7 | | | | | | |
| 2000 | 10.57 | | | | | | |
| 2001 | -20.18 | | | | | | |
| 2002 | 73.18 | | | | | | |
| 2003 | 24.87 | | | | | | |
| 2004 | 0.69 | | | | | | |
| 2005 | 3.92 | | | | | | |
| | | | | | | | |
| AvgRoR | 22.97 | | | | | | |
| R/R | 1.38 | | | | | | |
| skew | -0.05 | | | | | | |
| STD | 16.64 | | | | | | |

| 5 worst drawdowns: | | | | | |
|---|---|---|---|---|---|
| | DD | Begin | End | Dur(M) | Recovery |
| | | | | | |
| 1 | -28.29 | 19990731 | 20000831 | 19 | 7 |
| 2 | -20.53 | 20000930 | 20020131 | 24 | 4 |
| 3 | -19.11 | 19910731 | 19920229 | 11 | 7 |
| 4 | -13.11 | 19930228 | 19931231 | 15 | 12 |
| 5 | -9.17 | 20050331 | 20050831 | 8 | 0 |
| | | | | | |
| Avg DD: | -18.04 | | | MT | 3/14/2006 18:46 |



Starmine EQ model, mkcp [60,90], EQ raw [93,93,7,7], no TC, monthly rebal

- long + short
- long
- short

# Starmine EQ model works marginally on the short side for smaller market caps

- The Starmine EQ model still underperforms a basic accruals model on the short side.

**Starmine EQ model, short only, mkt cap [60,90], monthly rebal**
**no TC, use EQ raw scores, no leverage (1x1), [97,93,3,7], last mktcaplo=600M, mktcaphi=4.9B**

| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
|---|---|---|---|---|---|---|---|
| min | -13.35 | -27.62 | -37.59 | -37.02 | -34.88 | -39.45 | -38.18 |
| max | 14.99 | 33.75 | 50.87 | 54.13 | 67.16 | 60.22 | 82.98 |
| std | 6.44 | 11.65 | 16.55 | 19.4 | 22.26 | 23.26 | 25.71 |
| r/r | 0.03 | 0.09 | 0.21 | 0.36 | 0.48 | 1.44 | 3.08 |
| %pos | 0.42 | 0.48 | 0.46 | 0.47 | 0.48 | 0.56 | 0.67 |
| %neg | 0.48 | 0.51 | 0.54 | 0.53 | 0.52 | 0.44 | 0.33 |
| avg+ | 6.17 | 10.49 | 15.7 | 18.81 | 21.48 | 23.86 | 27.35 |
| avg- | -4.99 | -8.71 | -10.69 | -12.32 | -14.22 | -14.52 | -15.65 |
| avg | 0.19 | 0.59 | 1.42 | 2.35 | 3.06 | 6.85 | 13.19 |

Annual:

| | |
|---|---|
| 1989 | -14.12 |
| 1990 | 13.79 |
| 1991 | -21.29 |
| 1992 | 30.35 |
| 1993 | -18.93 |
| 1994 | 51.13 |
| 1995 | -5.11 |
| 1996 | -7.99 |
| 1997 | -3.18 |
| 1998 | 2.29 |
| 1999 | -11.48 |
| 2000 | 10.23 |
| 2001 | -23.98 |
| 2002 | 67.16 |
| 2003 | -16.56 |
| 2004 | -20.1 |
| 2005 | 3.05 |

| | |
|---|---|
| AvgRoR | 2.11 |
| R/R | 0.1 |
| skew | 0.23 |
| STD | 22.26 |

5 worst drawdowns:

| | DD | Begin | End | Dur(M) | Recovery |
|---|---|---|---|---|---|
| 1 | -52.21 | 19950228 | 20020831 | 131 | 13 |
| 2 | -47.39 | 20030228 | 20050831 | 44 | 0 |
| 3 | -38.74 | 19901031 | 19920531 | 28 | 7 |
| 4 | -37.66 | 19920930 | 19940531 | 29 | 12 |
| 5 | -16.63 | 19900131 | 19900731 | 9 | 4 |

| Avg DD: | -38.52 | | | | MT | 3/14/2006 18:39 |
|---|---|---|---|---|---|---|


**Starmine EQ model, long only, mkt cap [60,90], monthly rebal**
**no TC, use EQ raw scores, no leverage (1x1), [97,93,3,7], last mktcaplo=600M, mktcaphi=4.9B**

| | 1M | 3M | 6M | 9M | 12M | 24M | 36M |
|---|---|---|---|---|---|---|---|
| min | -10.92 | -16.3 | -11.92 | -14.39 | -13.44 | -2.46 | 10.16 |
| max | 12.77 | 30.99 | 46.37 | 48.59 | 57.1 | 74.98 | 108.37 |
| std | 4.82 | 8.69 | 10.75 | 12 | 13.91 | 16.94 | 21.12 |
| r/r | 0.36 | 1.04 | 2.36 | 3.89 | 5.24 | 12.42 | 17.83 |
| %pos | 0.65 | 0.7 | 0.83 | 0.93 | 0.94 | 0.99 | 1 |
| %neg | 0.33 | 0.3 | 0.17 | 0.07 | 0.06 | 0.01 | 0 |
| avg+ | 4.57 | 9.73 | 13.5 | 17.07 | 22.63 | 43.46 | 62.75 |
| avg- | -3.74 | -5.15 | -4.99 | -5.04 | -4.79 | -1.24 | |
| avg | 1.72 | 5.2 | 10.36 | 15.57 | 21.03 | 42.95 | 62.75 |

Annual:

| | |
|---|---|
| 1989 | 23.51 |
| 1990 | 10.91 |
| 1991 | 44.47 |
| 1992 | 21.14 |
| 1993 | 23.99 |
| 1994 | 11.32 |
| 1995 | 40.89 |
| 1996 | 28.08 |
| 1997 | 23.89 |
| 1998 | 22 |
| 1999 | 24.18 |
| 2000 | 0.33 |
| 2001 | 3.8 |
| 2002 | 6.03 |
| 2003 | 41.43 |
| 2004 | 20.79 |
| 2005 | 0.87 |

| | |
|---|---|
| AvgRoR | 20.86 |
| R/R | 1.25 |
| skew | -0.24 |
| STD | 16.66 |

5 worst drawdowns:

| | DD | Begin | End | Dur(M) | Recovery |
|---|---|---|---|---|---|
| 1 | -19.97 | 19900630 | 19901130 | 8 | 3 |
| 2 | -17.89 | 20010131 | 20020228 | 19 | 9 |
| 3 | -14.08 | 20020430 | 20021031 | 9 | 3 |
| 4 | -12.34 | 19980430 | 19981130 | 11 | 7 |
| 5 | -12.27 | 19960531 | 19960831 | 5 | 3 |

| Avg DD: | -15.31 | | | | MT | 3/14/2006 18:45 |
|---|---|---|---|---|---|---|

## Other factors in Starmine EQ model skewed performance back to long side

- It is documented in the academic literature that excess returns can be achieved by shorting high accruals stocks. My own research also indicates that this is the case (at least in the last 10 years).

- My conjecture is that while Starmine realized that accruals work on the short side, they added cash flow, operating efficiency and exclusions factors to improve the consistency of the model returns. This diminished the power of accruals to select good short candidates.

- Starmine also uses a "beta adjustment" procedure to neutralize the portfolio's beta (which I reverse engineered). Without this adjustment, the short side returns of the EQ model are positive but extremely volatile. The long/short combination returns are much higher without beta adjustment (see figures below).

- Basically, beta adjustment smoothes the returns further but killed the return on the short side (and reduced it by a lot on the long side as well).
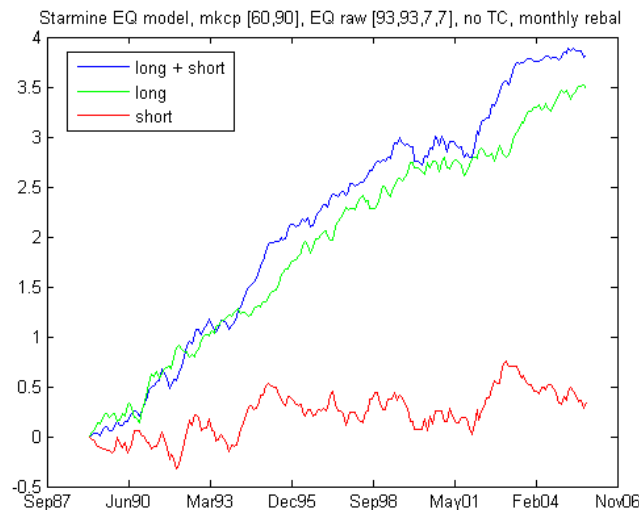


*Portfolio beta not neutralized*
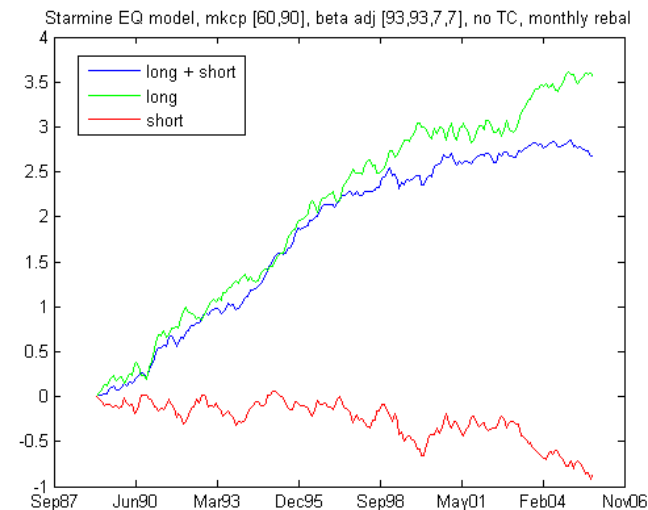
*Portfolio beta neutralized*

# Interest earned on short rebate will increase accruals model's return

- The various simulations of the short only accruals model show annual returns between 5% and 10%. They do not reflect the additional return from interest earned on the short rebate, which will increase the expect return of the model going forward by another 4%.

- The expected performance of the short only accruals and Starmine EQ models and their implementation costs are:

| | Short only accruals model [95,5] | | | Starmine EQ model long/short [93,7], top 30% by market cap | |
|---|---|---|---|---|---|
| | without adjustment | with beta adjustment | with momentum adjustment | without adjustment | with beta adjustment |
| Expected Gross Return (excluding short rebate) | 5% | 9% | 11% | 22% | 14% |
| Std Dev Gross Return | 30% | 24% | 29% | 17% | 14% |
| Average holding period | 5.7 months | 2.1 months | 2.1 months | 1.9 months | 1.8 months |
| Average # stocks in portfolio | 55 | 55 | 29** | 67 | 67 |
| Estimated annual portfolio trading cost assuming 0.5% transaction cost per trade | 1.0% | 2.8% | 2.8% | 3.2% | 3.3% |
| Expected Net Return | 4% | 6% | 8% | 19% | 11% |
| Sharpe Ratio | 0.1 | 0.3 | 0.3 | 1.1 | 0.8 |

** There are fewer stocks in this portfolio because the top and bottom 3 deciles by momentum are discarded.

- Note that all accruals strategies tested have very low Sharpe ratios between 0.1 and 0.3. These ratios increase to about 0.5 if we add back the short rebate interest. This is as much as we can expect from a naked directional strategy!

- I propose to start with a maximum of $1M per side allocation to the Starmine EQ model and maximum $1M allocation to the short only accruals model with momentum adjustment. My usual slow-ramp-up-to-forestall-any-surprises philosophy applies.