

FINE 452 Applied Quantitative Finance Assignment 1

What is momentum trading? How does it perform?

Momentum trading is a strategy predicated on past results predicting future ones. Relative winners of a previous time period are expected to be winners in the future as well. Empirically, momentum trading is a high-performance strategy. It was first discovered in 1993 and has maintained its effectiveness even as it has become well known amount investors and academics. Momentum has been found in all equity markets, including international, and across asset classes.

Why does momentum trading work? What are the risks?

There are multiple potential causes for momentum. The first being that high returns are due to the increased risk due to portfolio under-diversification, as winners generally move together. They make be the stock of a hot industry. The risk is that if there is a cooldown, a great deal of the momentum portfolio risks substantial losses. There are also behavioral explanations, regarding momentum as an overreaction or an under reaction to new information. One theory sees it as overreaction due to individual investors expectations that goods news, leading to a price increase, will be followed by more good news, and the buying is a bandwagon effect. The under reaction theory explains momentum as the lag it takes for investors to fully integrate news into the valuation of a stock, and momentum works because it is a delayed adjustment. In general, both these explanations contradict the efficient market hypothesis as they assume prices don't adjust to new information effectively, nor immediately.

In general, the largest risk of momentum is that the strategy assumes the past is a good indication for the future. This generally seems to work, except for exceptional times such as the 2008 financial crisis. Momentum, and in particular long-momentum strategies, are accordingly also sensitive to the economic cycle, providing better returns during boom markets and worse during busts. This means volatility is high.

What are the challenges of bringing momentum trading to mutual funds? Recommended solutions? Describe your "tweaks".

AQR is seeking to create a mutual fund with a momentum strategy so retail investors can have access to the superior returns offered by the momentum strategies. The first tweak is forced since mutual funds are not allowed to short stocks. As a result of the first modification on classic momentum strategies, previous winners will still be held, but losers will not be shorted. AQR's strategy ranks stocks based on the past year's returns up to the month before to determine the top 10% (winners), and holds them for the next month. This strategy calculates momentum every month, so the portfolio of winners changes every month. Another tweak to the strategy could be to recalculate momentum every quarter (every three months instead of

one). This strategy could be useful if the mutual fund is trying to reduce their transaction costs. We assumed no transaction costs for this case, so we decided to calculate momentum every month.

The next tweak in our strategy planning was related to the weightings of the stocks in the portfolio. The vanilla momentum strategy uses equal weights for all stocks in the portfolio. One possible tweak is to use value weighting, where the percentage of a stock in the portfolio depends on the market capitalization of the stock relative to all other stocks in the portfolio. This tweak also helps solve our next problem, liquidity. Historically, momentum strategies have been used by hedge funds for whom liquidity is not a critical issue. AQR believes mutual funds are an intriguing market due to the large pool of capital and the lack of availability of momentum mutual fund products for this new market. Mutual funds, as opposed to hedge funds, are available to a larger public, and allow the investor to purchase/sell their shares at any time based on the daily net asset value. This means that liquidity is a large issue, as investors can pull out their capital at any time during trading hours. Large cap stocks are historically more liquid, so our next tweak addresses this issue. Our next strategy ranks all stocks in descending order by market cap every month, and limits the investible universe to only the 1000 largest cap stocks.

Other challenges and considerations, as well as possible solutions are referenced in Table A.

Go or No Go? Support your answer by back-testing the performance of your own momentum strategy, tweaked to fit the needs of mutual fund products.

We back-tested the performance of our long only momentum strategy using four different combinations - equal weighting, value weighting, equal weighting using only 1000 large cap stocks and finally value weighting using only 1000 large cap stocks. We compared the performance of the long only momentum strategy against three other strategies namely, vanilla momentum(Mom), Index (benchmark) and shadow momentum (Shadow). The results of all 16 combinations of strategies and parameters can be seen in Figure 1 in the appendix.

While using our own value-weighted index (VWIndex which takes into account all the stocks) as our benchmark, we see that overall, the strategies using only 1000 large cap stocks have on average higher alpha and sharpe ratios. Based on the results of data from 2004 to 2008, we come to the conclusion that the best strategy is equally weighted long only strategy focusing on the 1000 large cap stocks. This strategy returns an annualized alpha of ~9% with a sharpe ratio of 0.51. This strategy also meets all the needs of a mutual fund product: since we use only the large cap stocks, liquidity should not be an issue and it is a long only strategy which can be offered as a mutual fund product.

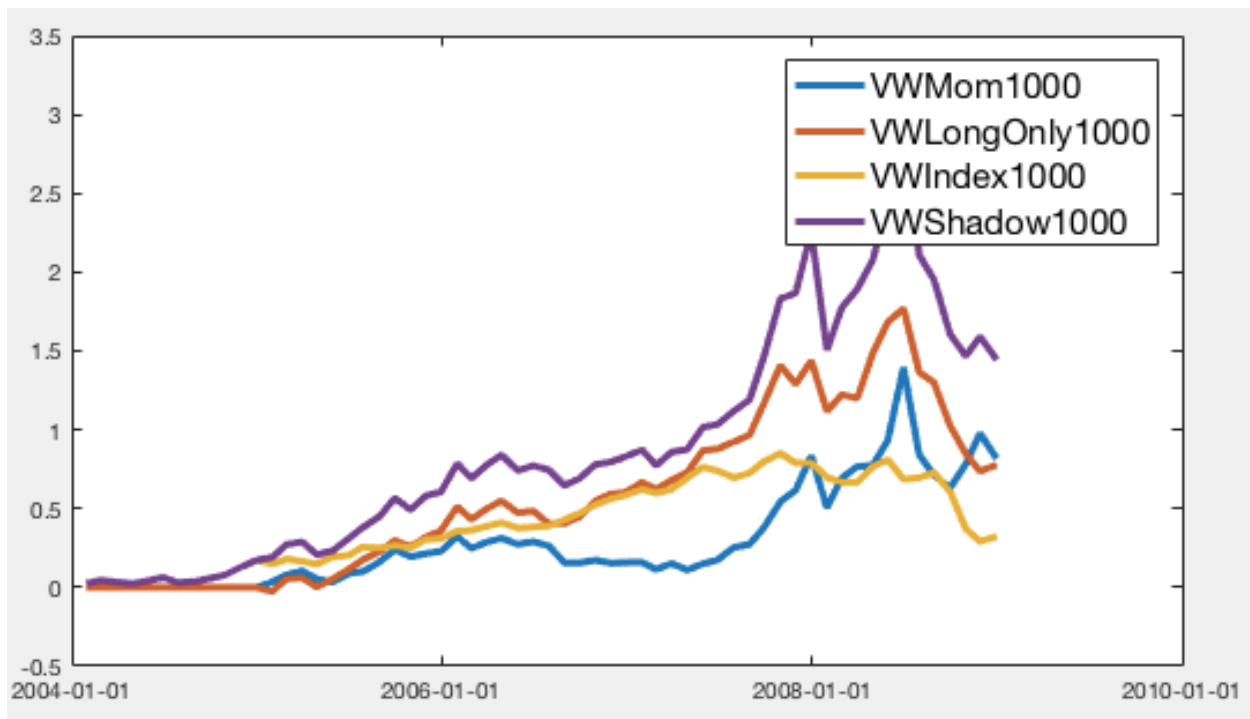
Our overall recommendation is that AQR should go ahead and offer the large cap long only momentum strategy as a mutual fund product.

APPENDIX

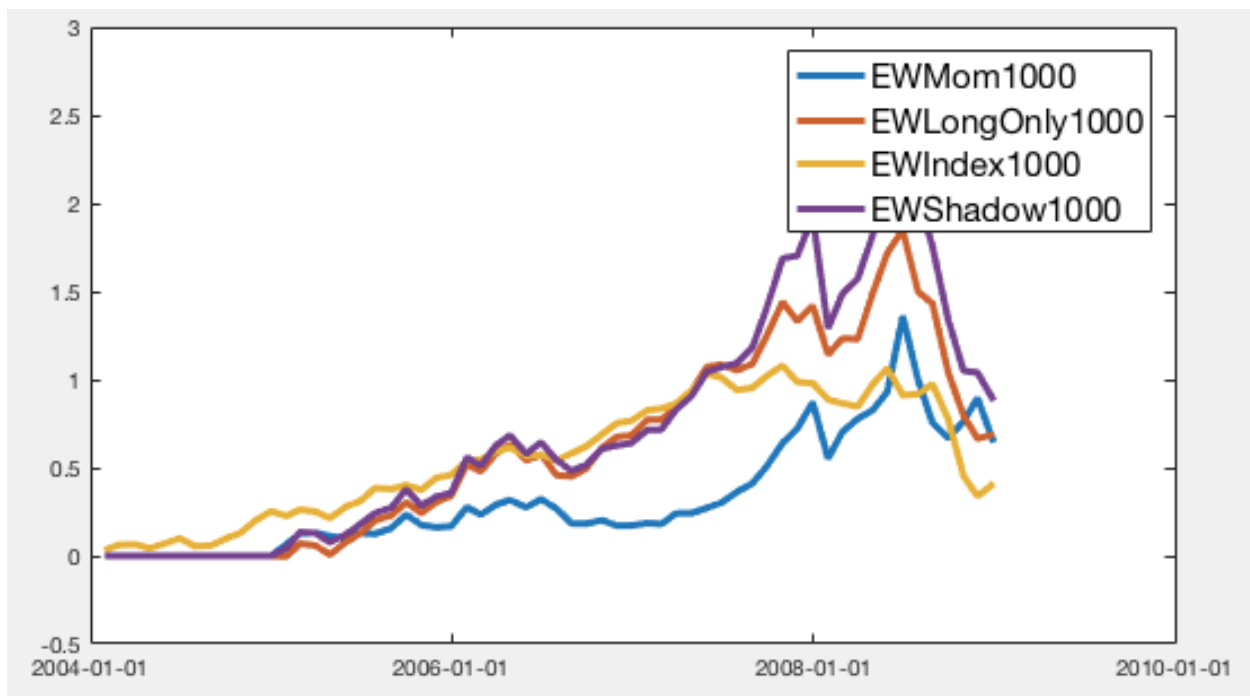
Figure 1

	1 alpha	2 arithMean	3 STD	4 sharpe
1 EWMom	0.1424	0.0172	0.0491	0.9614
2 EWLongOnly	-0.0562	6.7744e-04	0.0603	-0.1685
3 EWIndex	-0.0972	-0.0027	0.0523	-0.4209
4 EWShadow	-0.3496	-0.0238	0.1784	-0.5317
5 VWMom	-0.0040	0.0050	0.0725	0.0675
6 VWLongOnly	0.0595	0.0103	0.0523	0.4442
7 VWIndex	0	0.0054	0.0361	0.1678
8 VWShadow	0.1874	0.0210	0.1331	0.4518
9 EWMom1000	0.0887	0.0127	0.0686	0.4614
10 EWLongOnly1000	0.0922	0.0130	0.0641	0.5098
11 EWIndex1000	0.0164	0.0067	0.0436	0.2478
12 EWShadow1000	0.1386	0.0169	0.1556	0.2961
13 VWMom1000	0.0845	0.0124	0.0693	0.4394
14 VWLongOnly1000	0.0701	0.0112	0.0561	0.4687
15 VWIndex1000	-6.1799e...	0.0053	0.0348	0.1688
16 VWShadow1000	0.1194	0.0153	0.1244	0.3257

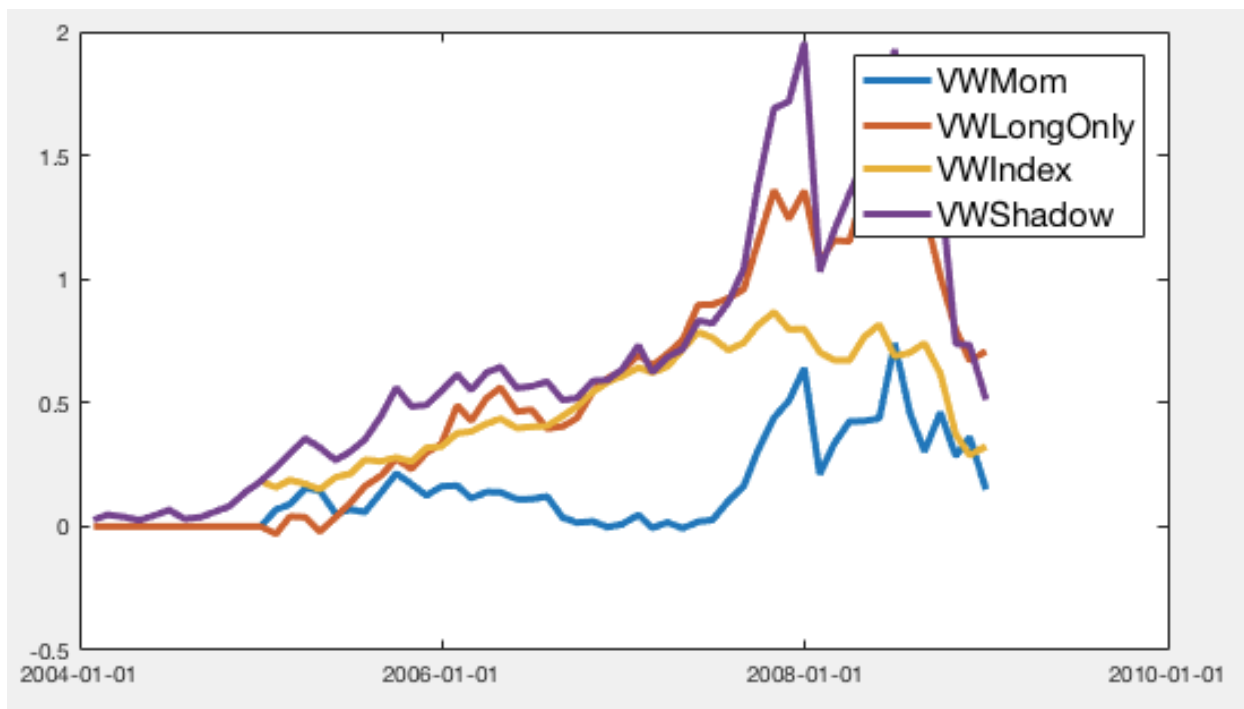
Figure 2



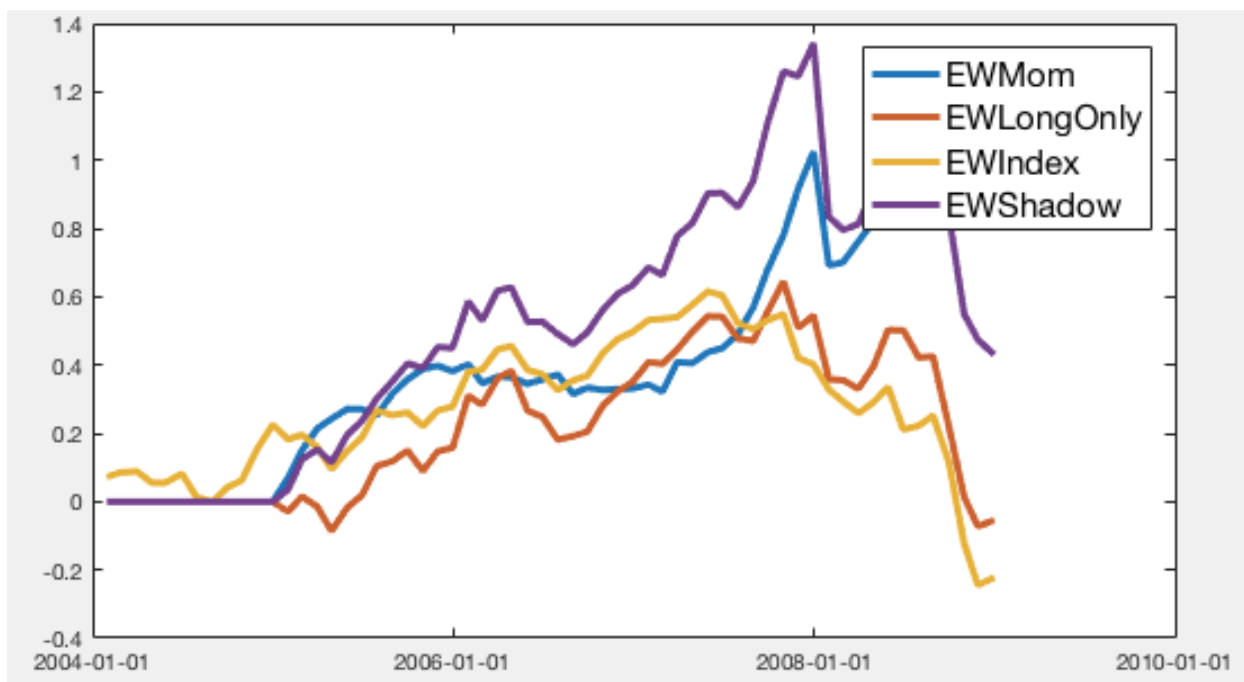
Cumulative Returns for Value-Weighted Strategies on 1000 Large Cap



Cumulative Returns for Equal Weighted Strategies on 1000 Large Cap Stocks



Cumulative Returns for Value Weighted Strategies



Cumulative Returns for Equal Weighted Strategies

Table A

Considerations		Potential Solutions
Liquidity	Momentum trading is a time-dependent strategy. That means it is important to be able to buy and sell the right stock at the right moment. Ensuring that the stock is available to buy and to sell is important.	Focus on 1000 large market cap stocks.
Transaction Costs	As every month there will be a rebalancing of the stock portfolio, transaction costs can add up when buying/selling shares. High trading costs reduce returns and the attractiveness of AQR's mutual fund.	For the case, we assume no transaction costs
Rebalancing	The index is rebalanced monthly.	To achieve the highest performance without taking trading costs into account, rebalancing as often as possible is best.
Tracking the index	This is the educational material we have released about our momentum mutual fund as a way to show investors the possible performance. This could be the kind of return they are expecting, at the least. But if we overperform this leads to tracking error.	The lack of momentum mutual funds products in the market indicates that investors could be satisfied with achieving the index, which already captures the benefits of momentum investing. We propose sticking with the index rather than exposing ourselves to tracking error.
Taxes	After-tax returns are important to investors. The fact that momentum sells losers and holds winners is quite tax efficient, but this depends on the amount of tracking errors we endure.	Momentum trading's inherent tax efficiency is attractive enough, and we think that investors primarily care about returns, so we will not incur high tracking errors in order to improve gains from taxes.