What does the X-Ray Machine Reveal About Hedge Funds?

Insights into Hedge Fund Investment Behavior Through 13F Filings

A significant number of institutional investment managers report their US long positions on a quarterly basis to the SEC in form of 13F filings. We systematically collect the 13F position level information across a subset of these managers which belong to the Equity Hedge fund group and aggregate this information in a sample portfolio which tracks their collective holdings. The resulting sample portfolio is an effective tool, allowing us to learn more about Equity Hedge fund investment behavior and helping to capture their stock selection capabilities in an investable portfolio. Based on our analysis, we found that (1) hedge funds tend to overweight equities in the information technology, consumer discretionary and healthcare industry, (2) quarter-on-quarter turnover in Equity Hedge fund exposures is limited, and (3) a long-only sample portfolio based on 13F filings of Equity Hedge funds delivers a high correlation of 94.1% with Equity Hedge fund returns.

What are 13F Filings?

Institutional investment managers which exercise investment discretion over more than $100 million and conduct US interstate commerce must report relevant holdings on Form 13F to the SEC. This Form needs to be filed within no more than 45 days after the end of a calendar quarter, introducing a publication lag. The filings cover securities which trade on an exchange, certain options and warrants, or convertible debt securities.

How can Market Participants Benefit from this Information?

We believe such detailed information about holdings of hedge funds allows us to “X-Ray” their portfolios and learn more about the underlying drivers of returns. On an individual fund basis, this allows to evaluate the positioning of a specific hedge fund and understand how it corresponds to the funds objectives and investment style. Drifts in the investment style can be easily identified. On an aggregate basis, this information allows an evaluation of the consensus views on investment opportunities which find their expressions in the active exposures expressed in the filings. These views can lead to industry and style tilts as well as the stock selection component of exposures. The information captured in the 13F holdings can also be used to build portfolios which track the returns of hedge funds using a more transparent and cost-efficient approach, benefitting from the investment strategies of some of the most sophisticated investors in the markets. Finally, information in 13F filings can give indications about crowding; a topic we will investigate more deeply another time.

The observations are on the basis of assumptions used in the data analysis. If any assumptions used do not prove to be true, results may vary substantially. Past correlations are not indicative of future correlations, which may vary. Data from Nov-2009 to Feb-2018, time period due to data availability, Sources: GSAM, Axioma, HFR, SEC provided through Thomson Reuters.

The portfolio risk management process includes an effort to monitor and manage risk, but does not imply low risk. The observations are on the basis of assumptions used in the data analysis. If any assumptions used do not prove to be true, results may vary substantially.

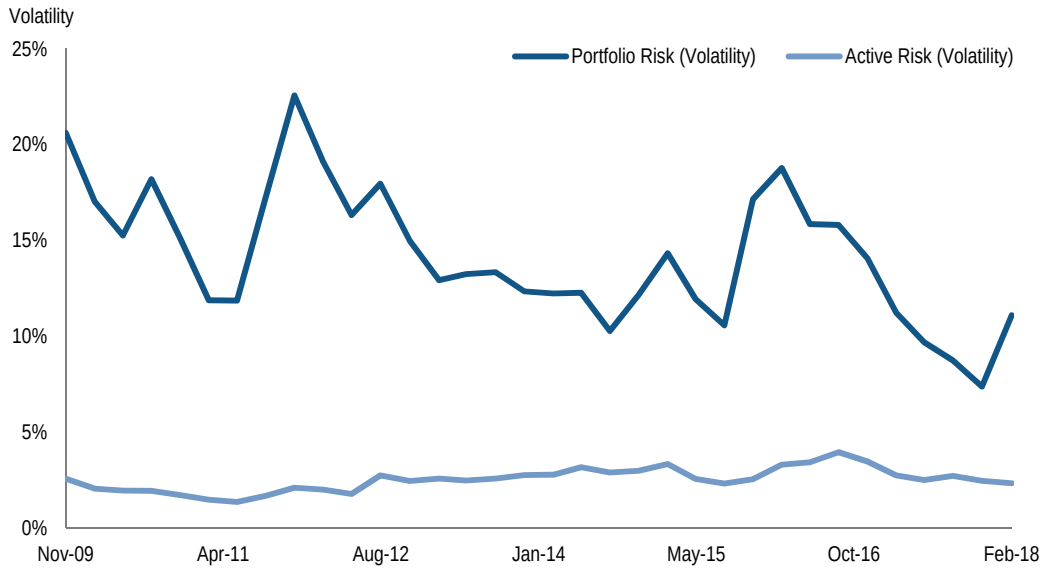
How can 13F Filings be used to Construct Investable Portfolios?

The proposed methodology uses an intuitive algorithm which identifies Equity Hedge funds and then maps the identified funds with their 13F filings. This methodology allows us to track an average of $203 billion in Equity Hedge fund assets with quarterly updated holdings. Accounting for the fact that we know the 13F positioning up to 45 days after quarter-end, we build a publication lag into the methodology. The positions of the respective funds are then used to calculate percentage weights which are averaged across all the identified hedge funds in the sample to construct the Full Hedge Fund Holdings Portfolio. For liquidity purposes we concentrate on the largest names held by Equity Hedge funds. The resulting portfolio represents the Sample 13F Portfolio and will be the subject of the following analyses.

Insights into the Investment Behavior of Hedge Funds

The investment behaviour of hedge funds can be characterized using a risk factor model. More specifically, the analysis in this section is based on the Axioma US Medium-Horizon risk factor model (compare Appendix A for details). Such risk factor models allow a decomposition of portfolio risks in various aspects and drivers. In our usage of the Axioma risk model, we first compute the overall Active Risk of the portfolio defined as the difference between portfolio weights and the index weights. Active Risk is put in context to the overall portfolio risk. We then decompose Active Risk into risk characteristics driven by Industry, Style (e.g., Size or Medium-Term Momentum), and Specific Risk. The Active Risk associated with Specific Risk is driven by investment decisions independent from Industries and Style Factors, capturing, amongst others, the stock selection skill implicit in a portfolio.

Exhibit 1: Dynamics of Equity Hedge Fund Risk Taking



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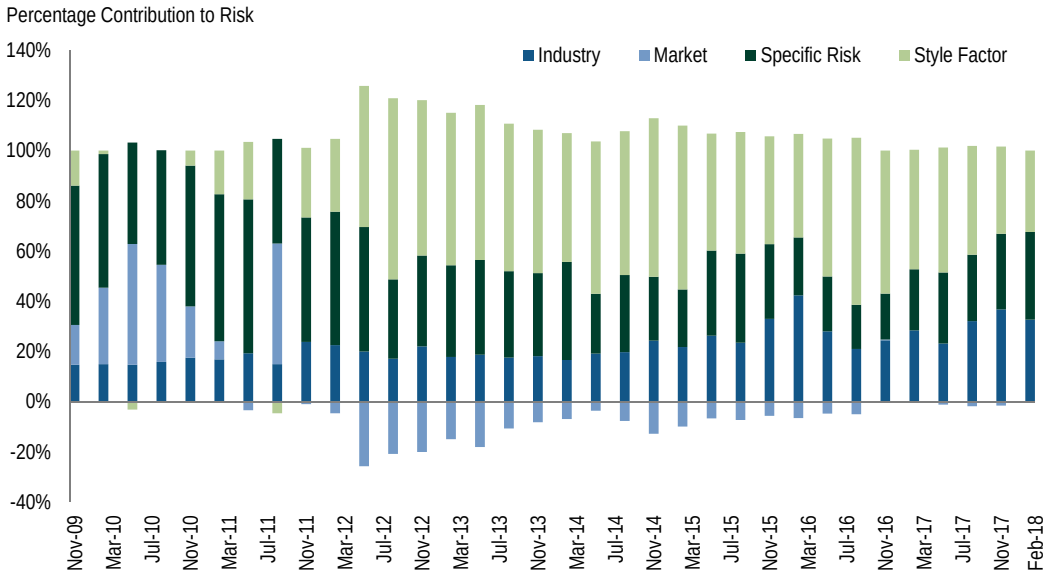
The first step is to understand the dynamics of overall Equity Hedge fund risk. Exhibit 1 illustrates how the overall portfolio risk changes over time with expected annualized volatility ranging between 7.4% and 22.6%, which is driven by the investment behavior of hedge funds as well as changes in the overall market volatility. The Active Risk[1] as measured versus the Russell 1000, however, is rather constant, ranging in a rather narrow band around an average expected annualized volatility of 2.5%. This makes the overall hedge fund portfolio rather exposed to directional equity benchmark risk but leaves a quite sizable Active Exposure where hedge fund managers deviate from equity benchmark driven returns.

Concentrating next on decomposing this Active Risk (compare Exhibit 2), the analysis indicates that on average the largest part is driven by Style Factors (41.3%), such as momentum or value, while Industry tilts drive 22.3% of overall Active Risk. The Specific Risk, which captures amongst other things the stock selection of hedge funds unrelated to Style and Industry positioning, takes up the second highest average portion of Active Risk (36.5%). The Specific Risk has decreased as a driver of total risk over the studied time period from 55.5% in the November 2009 filing to 35.0% in the February 2018 filing. However, compared to the lows of 17.6% of Specific Risk in August 2016, the February 2018 filing shows a significantly increased stock selection activity in hedge funds which evidences their perception of a larger opportunity set.

Exhibit 2: Decomposing Active Risk Over Time



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With a contribution of 85 bps to the average active volatility of 2.5%, the stock Specific Risk turns out to be an economically relevant aspect of hedge fund active returns.

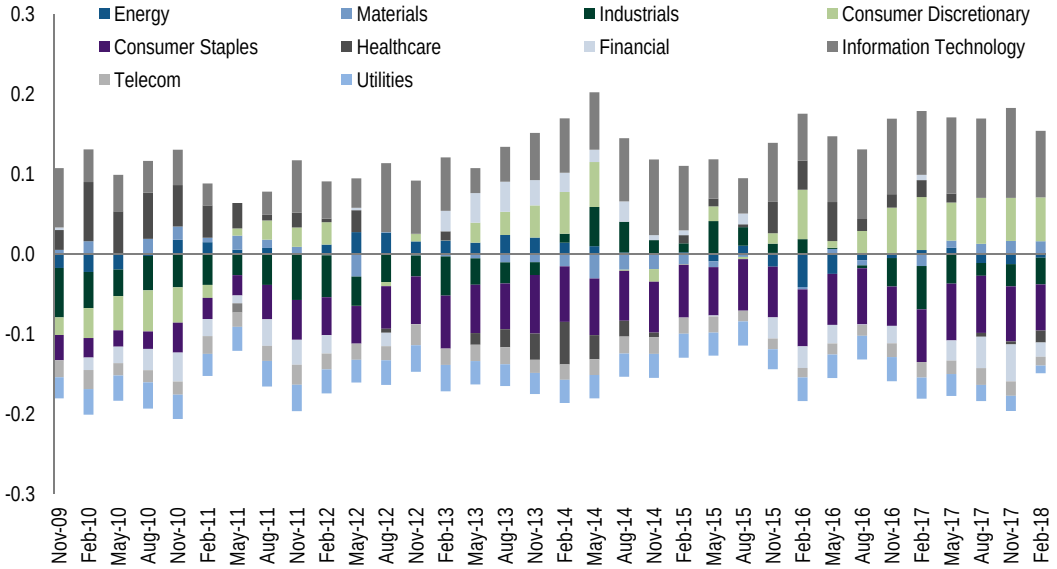
Facing this sizable Specific Risk component it becomes apparent how the 13F portfolio is an important building block in strategies attempting to track hedge funds, as liquid market and alternative risk premium factors cannot provide this aspect to hedge fund returns.

We now turn towards a more granular analysis of the drivers of Active Risk by analyzing Style Factor and Industry exposures in the Sample 13F Portfolio in more detail.

[1] Active Risk is measured versus the Russell 1000. The corresponding metrics are calculated by running the Axioma US Medium-Term equity factor risk model on a portfolio whose weights are determined by taking the Sample 13F Portfolio weights and subtracting the Russell 1000 index weights from them. The risk is represented in units of expected volatility.

Our analysis highlights how hedge funds are on average overweight in Information Technology, Consumer Discretionary and Healthcare when compared to the Russell 1000 benchmark allocation (compare Exhibit 3). Consequently, they tend to underweight on average Consumer Staples, Industrials, Telecom and Utilities. The gross active industry weights[2] are with an average of 38.5% impactful for the portfolios of hedge fund holdings, indicating that hedge funds take a considerable amount of Active Risk[3] in their positions. This gross active Industry weight fluctuates substantially between 26.5% and 51.3% of every USD invested in our sample suggesting that industry views of hedge funds may change noticeably over time.

Exhibit 3: Active Industry Weight Over Time



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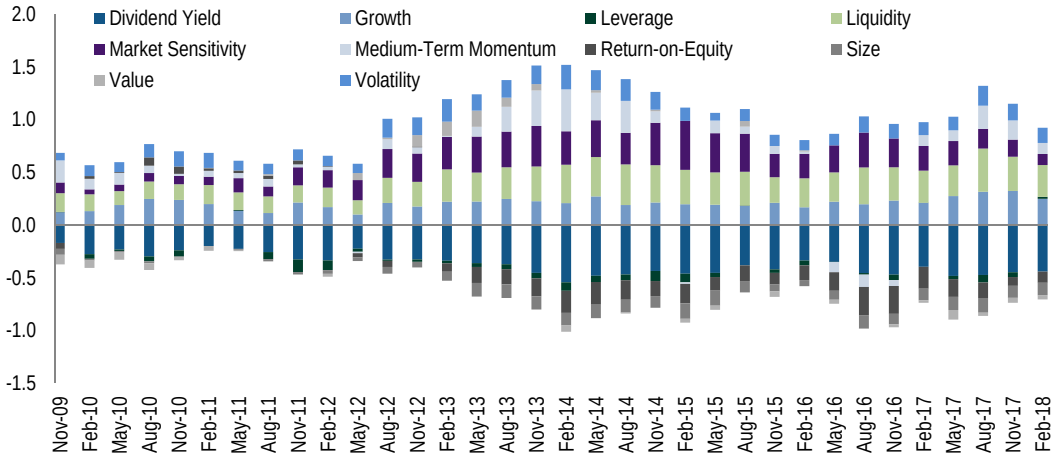
Deviations of active Axioma Style Factor[4] exposures from the Russell 1000 evidence how Equity Hedge fund managers modulate their investment approach over time (compare Exhibit 4). The gross active Style Factor exposure is the largest in February 2014, indicating how Equity Hedge funds saw ample opportunities in style tilts. In May 2011, the gross active style exposure reached a minimum over our studied time period. Hedge Funds have, on average, a positive exposure of 18.6% to the Market Sensitivity and 7.7% to the Volatility Style Factors which capture systematic and overall risk taking illustrating how hedge funds may concentrate in their investment behavior on equities carrying higher systematic and overall risk. The holdings also load positively on the Liquidity Style Factor illustrating that hedge funds may favour over the studied time period higher liquidity names. Interestingly, such investment behavior is inconsistent with the harvesting of the liquidity premium (compare, e.g., Amihud, 2002, as well as Pastor and Stambough, 2003) although the liquidity terms of investments into hedge funds would enable them to do so. Finally, the holdings load on average positively on the Momentum Style Factor, indicating that hedge funds tend to invest in equities with positive momentum, which is consistent with the findings by Carhart (1997) for mutual funds.

[2] Gross active industry weights are calculated as the sum of the absolute values of the active industry weights illustrated in Exhibit.

[3] Active Risk is measured versus the Russell 1000. The corresponding metrics are calculated by running the Axioma US Medium-Term equity factor risk model on a portfolio whose weights are determined by taking the Sample 13F Portfolio weights and subtracting the Russell 1000 index weights from them.

[4] Please refer to Appendix A for more detail on the Axioma US Medium Horizon risk model and how the used factors are defined.

Exhibit 4: Active Style Factor Exposure Over Time



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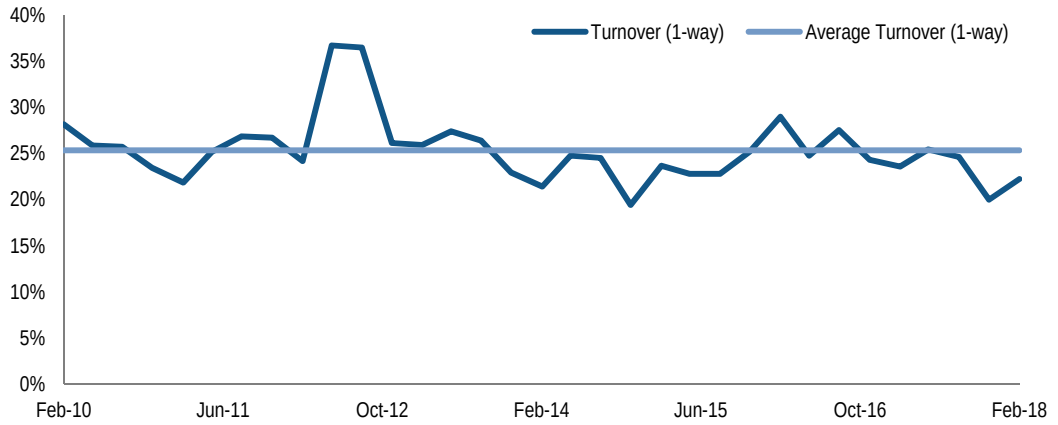
Overall, the results indicate that a large portion of Active Risk in Equity Hedge funds can be explained by Style Factors and Industries but a sizable Stock Selection component remains which needs to be considered in any attempt to analyze or track this class of investors. The Sample 13F Portfolio allows to capture the discussed Style, Industry and Stock Selection aspects making it uniquely suitable as a building block for hedge fund tracking.

How actively do Equity Hedge Funds change their Positioning?

In our opinion, the analyses of Industry and Style Factor exposures illustrate how – contrary to public opinion – Style Factor and Industry exposures move slowly over time and the percentage contributions to risk is consistent. This finding is underlined by a quarter-on-quarter average one-way turnover of 5.4% for Industry exposures and of 19.4% for risk factors.

Furthermore, the one-way turnover of the Sample 13F Portfolio is with an average of 25.3% quarter-on-quarter very modest, and can go as low as 19.4% of the portfolio (compare Exhibit 5).

Exhibit 5: Turnover of the Sample 13F Portfolio (One-Way)



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Is there an Interaction between Style or Industry Exposures and Returns?

Our analyses of 13F filings using data from November 2009 until February 2018 do not give any evidence for an ability of hedge funds to time their Industry or Style Factor exposures in a significant way[5]. Furthermore, there is little evidence for hedge funds adjusting their Industry and Axioma factor exposures as a result of strong Industry or Style Factor returns[6].

It is a curious observation that over our sample period Equity Hedge funds load positively on the Axioma Medium-Term momentum factor, while the Industry and Style exposures of the these funds do not change in a significant way in response to past Industry and factor returns. We conclude that the way Equity Hedge funds appear to get exposure to equities with positive momentum must be through the stock selection component within a Style or Industry exposure, rather than Style Factor or Industry tilts in response to the respective past returns.

How can 13F Filings be used in Hedge Fund Tracking?

Hedge fund tracking strategies generally aim at closely tracking the return profile of a broadly diversified portfolio of hedge funds by combining a set of liquid market factors and alternative risk premium strategies (compare, e.g., Hill et al., 2014, Hasanhodzic and Lo, 2007, or Bunn et al., 2018). This section concentrates on a discussion of the ability of the Sample 13F Portfolio to track Equity Hedge funds.

Exhibit 6: Comparing Performance of the HFRI Equity Hedge index and the Sample 13F Portfolio

	HFRI Equity Hedge	Sample 13F Portfolio
Annualized Total Return	5.4%	7.3%
Annualized Vol	6.9%	6.9%
Sharpe	0.74	1.01
Max Drawdown	-13.2%	-9.8%
Correlation	100.0%	94.1%
Tracking Error		2.4%

Source: GSAM, HFR. Data from Nov-2009 to Feb-2018. Sample 13F Portfolio scaled to match volatility of HFRI Equity Hedge over given time frame. Backtested performance shown is not actual performance and in no way should be construed as indicative of future results. Backtested performance results are created based on an analysis of past market data with the benefit of hindsight, do not reflect the performance of any GSAM product and are being shown for informational purposes only. Please see additional disclosures. Past performance does not guarantee future results, which may vary. Past correlations are not indicative of future correlations, which may vary.

An indication for the extent of the commonality of Equity Hedge funds and the Sample 13F Portfolio can be given by the correlation of their return time series. As summarized in Exhibit 6, the Sample 13F Portfolio shows a high correlation to Equity Hedge funds (proxied by the HFRI Equity Hedge index) of 94.1%, indicating a high degree of co-movement in the returns. While correlation is a measure that concentrates on the degree of commonality between two financial time series, tracking error provides complementing information by expressing the magnitude of how much two time series might deviate from each other. After scaling the long only Sample 13F Portfolio to the same volatility as the HFRI Equity Hedge index, we achieve a tracking error of only 2.4%, indicating that the two return series behave in a similar fashion and the degree of divergence is limited. The performance of the 13F Portfolio[7] is rather strong, achieving over our studied period a Sharpe ratio of 1.0 which compares favorably to the performance actually achieved by hedge funds (Sharpe ratio of 0.7).

[5] Regressing quarterly Axioma factor or industry returns on the changes to the corresponding exposures in the previous quarter gives R2 of 0.01 and 0.001, respectively, indicating that there is no strong link between changes to factor or industry exposures and subsequent returns.

[6] Regressing changes of quarterly Axioma factor or industry exposures on the corresponding previous quarter returns gives R2 of 0.002 and 0.020, respectively, indicating that there is no strong response of industry and factor exposures to past returns. Similar results are obtained when using factor and industry exposures rather than changes as dependent variables. Furthermore, using yearly rather than quarterly returns gives comparable results as well.

[7] Backtested performance takes a transaction cost of 5 bps into account.

Using 13F filings to track Equity Hedge funds poses two challenges linked to their regional restriction and lack of short positions coverage.

The missing presence of international equities in the 13F filings and the lack of equivalents for asset manager holdings outside the US are drawbacks preventing us from using this impactful source of information for hedge fund tracking in other regions. However, given hedge funds invest predominantly in the US (60.5% as of 28-Feb-18 according to a poll of major prime brokers), the impact of this limitation on our ability to track the broad universe of Equity Hedge funds is limited.

Furthermore, 13F filing information gives a good understanding of the US equity positioning of an investment manager on the long side only. While this is essentially covering all relevant information for mutual funds, it covers less of the total investment strategy scope of hedge funds mainly due to their usage of short positions. Considering the fact that most US Equity Hedge funds take their risk predominantly on the long side, 13F filings provide nevertheless a deep insight into their positioning, limiting the impact of this shortcoming of 13F filings on hedge fund tracking[8]. The strong tracking ability of our long only Sample 13F Portfolio provides supporting evidence.

Impact of Information Decay on Tracking[9]

The 45-day publication lag has actually only a limited impact on the ability to track the Equity Hedge fund universe. Correlations to the HFRI Equity Hedge index actually increase from 93.5% to 94.1% when introducing the actual publication lag, and tracking error reduces from 2.9% to 2.4% (number given for a strategy scaled to the same volatility as the hedge fund index).

We believe results are consistent with our earlier findings which showed that hedge funds adjust their portfolios on average in an incremental, measured way, leading to limited changes in Style Factor and Industry exposures quarter-on-quarter as well as a quarterly one-way turnover in the holdings of only 25.3%.

[8] Leverage figures of US based Equity Long/Short funds as provided by Morgan Stanley show a median total long exposure of 109% and a short exposure of 54% as per 16-Mar-2018.

[9] Numbers are backtested and cover the period 30-Jun-2010 to 28-Feb-2018.

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Conclusion

We believe the 13F filings many hedge funds have to submit to the SEC provide a useful tool to study their investment behavior. We analyze this information focusing on Style Factor and Industry exposures as well as changes thereof in Equity Hedge funds.

While active Industry exposures in Equity Hedge fund positions change over time, the analysis provides evidence for a propensity to invest in technology- and software-related companies. On the style side, hedge funds are found to have positive exposures to momentum as well as equities, which carry higher systematic and overall risk. The analysis can attest to a sizable stock selection component in hedge fund portfolios which is picked up by the Sample 13F Portfolio.

The 13F filings of Equity Hedge funds provide insights that improve our ability to track their returns. In addition to helping track Equity Hedge funds, this information is also relevant to track the hedge fund universe more broadly. The publication lag of the data does not result in a reduced tracking ability, which is a finding that is supported by the limited turnover we measure in the Sample 13F Portfolio. While coverage of 13F filings omits information on positioning in shorts and international equities, this information gap turns out to be less of a challenge in practice given that Equity Hedge funds invest predominantly in the US and have considerable long bias.

The insights provided by the 13F filings illustrate how the increasing amount of available information on how hedge funds invest allows us to continuously deepen our understanding of their investment behavior and eventually track them better.

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Appendix A: Overview of the Axioma US Medium-Horizon Equity Factor Risk Model

General model description

Model Aspect	Description
Asset Coverage	As of 2013, the models cover over 8700 securities (over 23,500 historically) listed on various US stock exchanges, including ADRs. The models also cover more than 250 ETFs and more than 300 EIF contracts.
Estimation Universe	Dynamic selection criteria are employed to identify stocks on NYSE and NASDAQ with sufficient size and market liquidity. Typically, only common stocks are eligible (ADRs and foreign issuers excluded) but a few exceptions may arise from time to time (e.g. REITs). Grandfathering logic is applied to ensure stability and robustness. Throughout the model history, the estimation universe amounts to roughly 3300 stocks on average.
Model History	Daily history from January 1982 onwards.
Forecast Horizon	3-6 months
Estimation Frequency	Factor exposures and covariances, asset specific risks estimated daily.

Style Factors

Style Factors	Description	Type
Liquidity	Ln 3 month average daily volume over market capitalization	Market Based-Factor
Market Sensitivity	1 year daily beta	Market Based-Factor
Volatility	6 month average of absolute returns over cross-sectional standard deviation, partially orthogonalized to Market Sensitivity	Market Based-Factor
Size	Natural logarithm of market capitalization	Market Based-Factor
Medium-Term Momentum	Cumulative return over past year excluding most recent month	Market Based-Factor
Value	Book-to-price, earnings-to-price, estimated earnings-to-price	Fundamental Factor
Leverage	Total debt (current and long-term liabilities) to total assets	Fundamental Factor
Growth	Sales growth, estimated sales growth, earnings growth, estimated earnings growth	Fundamental Factor
Return-on-Equity	Ratio of income to common equity over the previous year	Fundamental Factor
Dividend Yield	Ratio of paid dividends over the last year to market capitalization	Fundamental Factor

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