AXIOMA AXWW5.1-MH & SH MODEL FACT SHEET

Equity Factor Risk Models

April 2025

CONTENTS

MODEL OVERVIEW

Asset Coverage

As of 2025, the model covers roughly 56,000 securities (over 102,000 historically), primarily from the following 48 markets:

Argentina	Denmark	Ireland	New Zealand	Spain
Australia	Egypt	Israel	Norway	Sweden
Austria	Finland	Italy	Pakistan	Switzerland
Belgium	France	Japan	Peru	Taiwan
Brazil	Germany	Korea	Philippines	Thailand
Canada	Greece	Luxembourg	Poland	Turkey
Chile	Hong Kong	Malaysia	Portugal	UK
China	Hungary	Mexico	Russia	USA
Colombia	India	Morocco	Singapore	
Czech Rep.	Indonesia	Netherlands	South Africa	

In addition, the following 46 emerging markets are included; the first group was included in 2003, the second in 2009 and the third in 2015:

Bahrain	Cyprus	Kuwait	Oman	Slovenia
Botswana	Estonia	Latvia	Qatar	Sri Lanka
Bulgaria	Iceland	Lithuania	Romania	UAE
Croatia	Jordan	Mauritius	Slovakia	Venezuela
Bangladesh	Kazakhstan	Namibia	Tunisia	Zambia
Ecuador	Kenya	Nigeria	Ukraine	
Ghana	Lebanon	Saudi Arabia	Vietnam	
Jamaica	Malta	Serbia	Trinidad & Tobago	
Ivory Coast	Macedonia	Montenegro	Tanzania	Zimbabwe
Bosnia & Herzegovina	Malawi	Palestinian Territory	Uganda	

Estimation Universe

Includes assets with sufficient size and liquidity, using selection criteria similar to those employed by major index providers. More granular, localized rules are also applied on a per-market basis to filter certain exchanges, asset types, etc. Grandfathering logic is applied to ensure stability and robustness. In early 2025, the estimation universe comprised around 13,900 securities on average.

Model Variants (4)

Medium-horizon (MH) and short-horizon (SH),

	fundamental and statistical methodologies available. Using Axioma Portfolio®, the fundamental factor models can be re-based into country- or industry-focused versions, for risk decomposition or performance attribution tailored to a specific investment process
Model History	Daily history from January 1997 onwards.
Forecast Horizon	MH model: 3-6 months. SH model: 1-2 months.
Estimation Freq.	Factor exposures, covariances, and asset specific risks estimated daily.

FUNDAMENTAL FACTOR MODEL

Style Factors	AXWW5.1-MH (18)	AXWW5.1-SH (20)
Market-Based Factors		
Liquidity	Ratio of ln of 6 months of average daily volume to market capitalization, inverse of 6 month Amihud illiquidity ratio and percent of non-missing returns to trading days over 6 months	Ratio of ln of 3 months of average daily volume to market capitalization, inverse of 3 month Amihud illiquidity ratio and percent of non-missing returns to trading days over 3 months
Market Sensitivity	2 year weekly beta to the Global market	1 year weekly beta to the Global market
Exchange Rate Sensitivity	2 year weekly beta to returns of currency basket containing USD, EUR, GBP, JPY, CNY	1 year weekly beta to returns of currency basket containing USD, EUR, GBP, JPY, CNY
Residual Volatility	Square root of 6 month average of absolute returns over cross-sectional standard deviation, fully orthogonalized to Market Sensitivity and Downside Risk	Square root of 3 month average of absolute returns over cross-sectional standard deviation, fully orthogonalized to Market Sensitivity and Downside Risk
Non-linear Residual Structure (US)	Non-linear combination of factor exposures over a 3 year window for US region updated annually	Non-linear combination of factor exposures over a 3 year window for US region updated quarterly
Non-linear Residual Structure (DMxUS)	Non-linear combination of factor exposures over a 3 year window for DMxUS region updated annually	Non-linear combination of factor exposures over a 3 year window for DMxUS region updated quarterly
Non-linear Residual Structure (EM)	Non-linear combination of factor exposures over a 3 year window for EM region updated annually	Non-linear combination of factor exposures over a 3 year window for EM region updated quarterly
Opinion Divergence	N/A	Two month standardised unexplained volume

Short-Term Momentum	N/A	Cumulative return over past month
Downside Risk	Semi-variance of six months of daily returns below the minimum market return over the past year, and max 1 day return over the last month	Semi-variance of three months of daily returns below the minimum market return over the past year and max 1 day return over the last month
Short Interest	Short interest, short interest ratio and short interest utilisation	
Size	Natural logarithm of market capitalization	
Medium-Term Momentum	Cumulative return over past year excluding most recent month	

Fundamental Factors

Value	Book-to-price
Earnings Yield	Earnings-to-price, and estimated earnings-to-price
Leverage	Total debt (current and long-term liabilities) to total assets and total debt to equity
Profit Growth	Earnings growth and change in cash flow to assets
Profit Quality	Return on equity, return on assets, cash flow to assets, sales to assets, sales to enterprise value, gross profits to assets and operating accruals
Dividend Yield	Ratio of sum of the dividends paid (excluding non-recurring, special dividends) over the most recent year to average market capitalization
Investment	Sales growth, change in inventory to assets and change in operating assets to assets

Industry Factors (74)

GICS®2023-based industry classification with 0/1 assignments. Assets with no official GICS® are given industry membership based on internal research and are explicitly labeled as such in product deliverables.

Global Market Factor

Regression intercept term; all assets have unit exposure. Allows the model to better distinguish between country and industry risk contribution effects.

Country Factors

0/1 assignments based on an asset's country of quotation, business activities or domicile. In most cases this is equivalent to the market where an asset trades; the issuer's home country is used for foreign listings, depository receipts, and similar instruments.

Currency Factors

0/1 assignments to the primary currency of an asset's country.

Local Factors

Meant to capture strong residual structure in certain markets not captured by others factors. The model currently has one such factor: Domestic China.

Returns Model

Models local asset excess returns using five sets of factors: a global market factor, countries, industries, styles, and local factors. Currency factors are only introduced in the risk estimation stage.

Returns History	MH model: 4 years of daily returns for factor correlations, 2 years of daily returns for factor volatilities. SH model: 4 years of daily returns for factor correlations, 2 years of daily returns for factor volatilities.
Estimation	Robust linear regression using Huber weight function and square-root market capitalization weights. Style, industry and country factors are included in the regression. Local factors are estimated via an auxiliary regression on the residuals. The capitalization-weighted industry and country factor returns are each constrained to sum to zero. Currency factor returns are computed directly from exchange rates against USD.
Numeraire Currency	Currency risk is expressed from a U.S. Dollar (USD) perspective, but advanced features in Axioma Portfolio enable users to dynamically re-base the model into various other currencies.

STATISTICAL FACTOR MODEL

Factor Structure	40 statistical factors.
Currency Factors	0/1 assignments to the primary currency of an asset's country.
Estimation	2-Pass Asymptotic Principal Components factor analysis with residual variance weighted returns. One year of daily local excess returns are used. Currency factor returns are taken from the same currency risk model used by the fundamental factor model.
Returns History	One year of daily asset returns are used to estimate statistical factor exposures. Four years of statistical factor returns are used to estimate statistical factor covariances.
Numeraire Currency	Currency risk is expressed from a U.S. Dollar (USD) perspective, but advanced features in Axioma Portfolio enable users to dynamically re-base the model into various other currencies.

MODEL PARAMETERS

FACTOR VOLATILITIES / COVARIANCES

Estimation	Covariance of exponentially-weighted daily factor returns.
Half-life Parameters	MH model: 125 days for variances, 250 days for correlations. SH model: 60 days for variances, 125 days for correlations.
Autocorrelation	Newey-West adjustment accounting for 3 days of autocorrelation (a fixed lag of 1 day is used for statistical factors).
Returns Asynchronicity	*Returns-timing* technique is applied to the factor estimation process to compensate for non-synchronous trading between world stock markets.
Adjustments	Measurements of realized cross-sectional volatility (CSV) are used to adjust market factor volatility to better capture market volatility expectation. Other factor covariances are then adjusted, based on their betas to the market factor.

SPECIFIC RISKS

Estimation	Variance of exponentially-weighted daily specific returns
History	MH model: 500 days. SH model: 500 days.
Half-life Parameter	MH model: 125 days. SH model: 60 days.
Autocorrelation	Newey-West adjustment accounting for 1 day of autocorrelation.
Other Adjustments	Measurements of realised specific cross-sectional volatility (CSV) across sectors are used to adjust asset specific volatilities. Issuer Specific Covariance (ISC) captures covariances between security lines of the same issuer, using a cointegration model of price behavior. Applies only to portfolios containing two or more securities from the same issuer.

CURRENCY RISK

Miscellaneous	Currency risks in all models are taken from the Axioma Global Currency Risk Model, ensuring that all regional/global risk models share consistent estimates of currency risks and covariances.
Estimation	Principal components analysis using 1 year of exchange rate returns and 12 statistical factors, estimated from a pool of core currencies: USD, EUR, GBP, JPY, CHF, CAD, AUD, NZD, NOK, SEK, DKK, BRL, MXN, SGD, KRW, ZAR and PLN.

DATA DELIVERABLES

Availability	Updated daily and downloadable via SFTP and HTTPS.
Historical Coverage	Daily history from Jan. 1997 onwards.
Data Format	Delimited text file (“flat files”) or proprietary database format for seamless integration into Axioma Portfolio and Backtester feature in Axioma Portfolio Optimizer.
Benchmarks	Global and regional benchmarks are available in a format compatible with Axioma software products.
Exchange Traded Funds (ETFs)	Broad coverage of ETFs and index-linked ETFs. ETF coverage for the model is determined by the model’s full coverage of the underlying constituents in order to ensure consistency in the instrument’s risk and exposure measures.
Equity Index Futures (EIFs)	Broad coverage of EIF contracts with daily history as far back as January 2008. Risk characteristics for EIFs are inherited from underlying indices, or ETF proxies when indices are unavailable.
Pure Factor Portfolios (PFPs)	Factor Mimicking Portfolios for all factors for both MH and SH Fund models (daily update).
Statistical Model Factor Returns (PRET)	250 days of Statistical factor returns history (daily update).

Asset Identifiers	Axioma ID, 7-digit SEDOL, 9-digit CUSIP, ISIN, local ticker, and security name.
Market & Fundamental Data	Asset-level data including: • Price and market capitalization • 1-, 5-, 20-, and 60-day returns • 5- and 20-day average daily volume • 20- and 60-day median daily volume • Historical and predicted beta • 1-year earnings growth, 1-year income growth • Debt-to-equity, dividend yield, EBITDA • Price-to-book, price-to-earnings, price-to-sales Some items of asset data may not be available in delimited text file format. Sample flat files are available upon request.

APPENDICES

AXWW5.1 INDUSTRY FACTORS VS. GICS®2023

	GICS® 2023 Industry Groups (25)		Axioma Industry Factors (74)
1010	Energy	101010	Energy Equipment & Services
		101020	Oil, Gas & Consumable Fuels
1510	Materials	151010	Chemicals
		151020	Construction Materials
		151030	Containers & Packaging
		151040	Metals & Mining
		151050	Paper & Forest Products
2010	Capital Goods	201010	Aerospace & Defense
		201020	Building Products
		201030	Construction & Engineering
		201040	Electrical Equipment
		201050	Industrial Conglomerates
		201060	Machinery
		201070	Trading Companies & Distributors
2020	Commercial & Professional Services	202010	Commercial Services & Supplies
		202020	Professional Services
2030	Transportation	203010	Air Freight & Logistics
		203020	Passenger Airlines
		203030	Marine Transportation
		203040	Ground Transportation
		203050	Transportation Infrastructure
2510	Automobiles & Components	251010	Automobile Components
		251020	Automobiles
2520	Consumer Durables & Apparel	252010	Household Durables
		252020	Leisure Products
		252030	Textiles Apparel & Luxury Goods
2530	Consumer Services	253010	Hotels Restaurants & Leisure
		253020	Diversified Consumer Services
2550	Consumer Discretionary Distribution & Retail	255010	Distributors
		255030	Broadline Retail
		255040	Specialty Retail
3010	Consumer Staples Distribution & Retail	301010	Consumer Staples Distribution & Retail
3020	Food, Beverage & Tobacco	302010	Beverages
		302020	Food Products
		302030	Tobacco
3030	Household & Personal Products	303010	Household Products
		303020	Personal Care Products
3510	Health Care Equipment & Services	351010	Health Care Equipment & Supplies
		351020	Health Care Providers & Services

		351030	Health Care Technology
3520	Pharmaceuticals, Biotechnology & Life Sciences	352010	Biotechnology
		352020	Pharmaceuticals
		352030	Life Sciences Tools & Services
4010	Banks	401010	Banks
4020	Financial Services	402010	Financial Services
		402020	Consumer Finance
		402030	Capital Markets
		402040	Mortgage Real Estate Investment Trusts (REITs)
4030	Insurance	403010	Insurance
4510	Software & Services	451010	IT Services
		451030	Software
4520	Technology Hardware & Equipment	452010	Communications Equipment
		452020	Technology Hardware, Storage & Peripherals
		452030	Electronic Equipment, Instruments & Components
4530	Semiconductors & Semiconductor Equipment	453010	Semiconductors & Semiconductor Equipment
5010	Telecommunication Services	501010	Diversified Telecommunication Services
		501020	Wireless Telecommunication Services
5020	Media & Entertainment	502010	Media
		502020	Entertainment
		502030	Interactive Media & Services
5510	Utilities	551010	Electric Utilities
		551020	Gas Utilities
		551030	Multi-Utilities
		551040	Water Utilities
		551050	Independent Power & Renewable Electricity Producers
6010	Equity Real Estate Investment Trusts (REITs)	601010	Diversified REITs
		601025	Industrial REITs
		601030	Hotel & Resort REITs
		601040	Office REITs
		601050	Health Care REITs
		601060	Residential REITs
		601070	Retail REITs
		601080	Specialized REITs
6020	Real Estate Management & Development	602010	Real Estate Management & Development

AXWW5.1-MH RESULTS OVERVIEW

Model Fit and Factor Performance

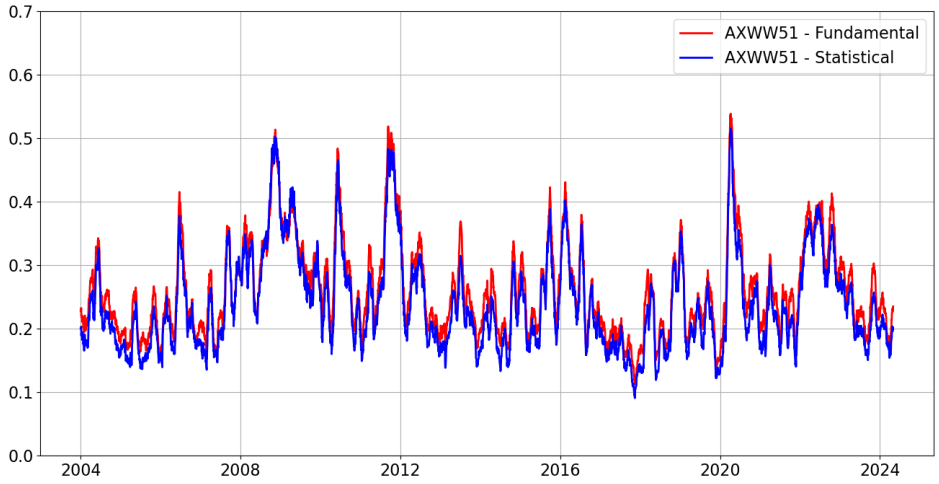

Figure 1: Average 1-month adjusted R-squared for the model estimation universe, 2004-2024.

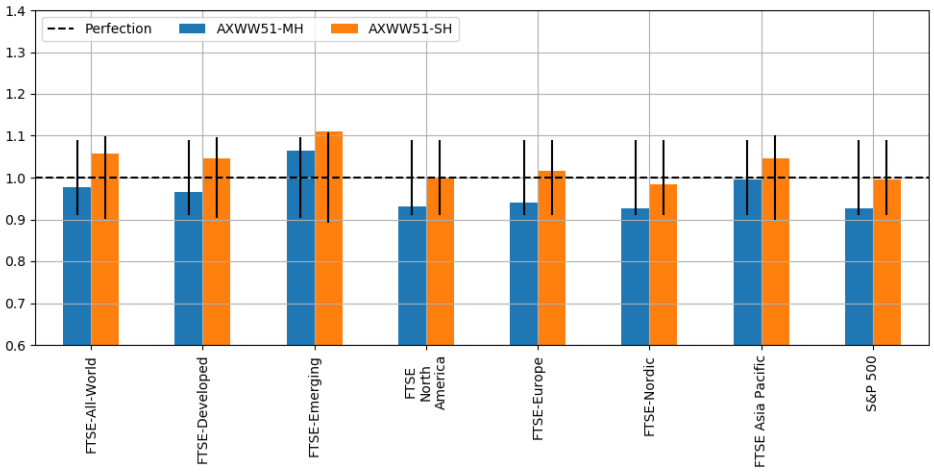

Figure 2: Monthly total risk bias statistics for selected benchmark portfolios, 2004-2024. The vertical lines represent the bounds of the 95% confidence interval. Bias statistics beyond these lines are significantly different from 1.00.[1]

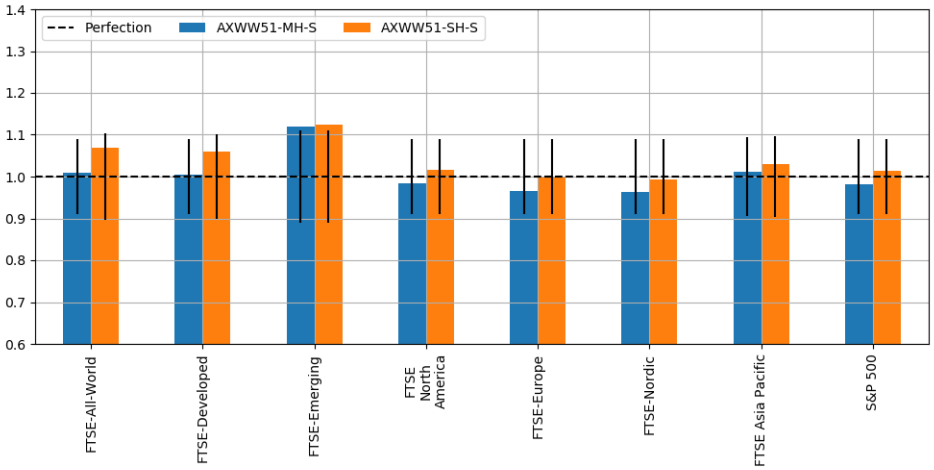

Figure 3: Monthly total risk bias statistics for selected benchmark portfolios, 2004-2024. The horizontal lines represent the bounds of the 95% confidence interval. Bias statistics beyond these lines are significantly different from 1.00.[1]

[1]S&P INDICES are registered trademarks of Standard & Poor's Financial Services LLC.

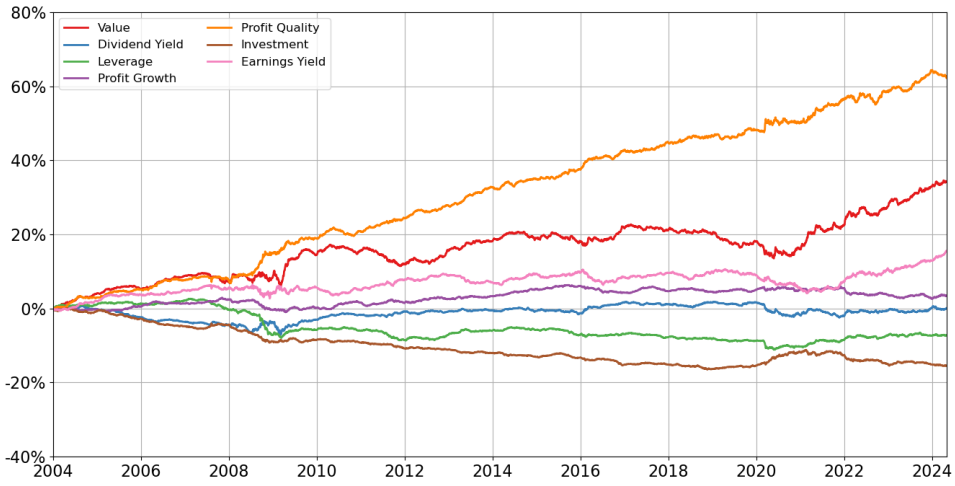

Figure 4: Cumulative return to each of the AXWW5.1-MH Fundamental Style factors, 2004-2024.

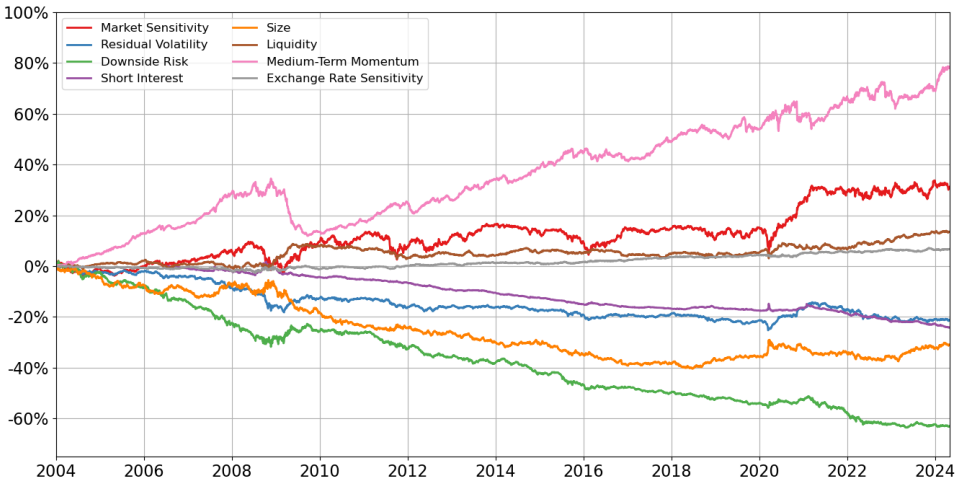

Figure 5: Cumulative return to some of the AXWW5.1-MH Market based Style factors, 2004-2024.

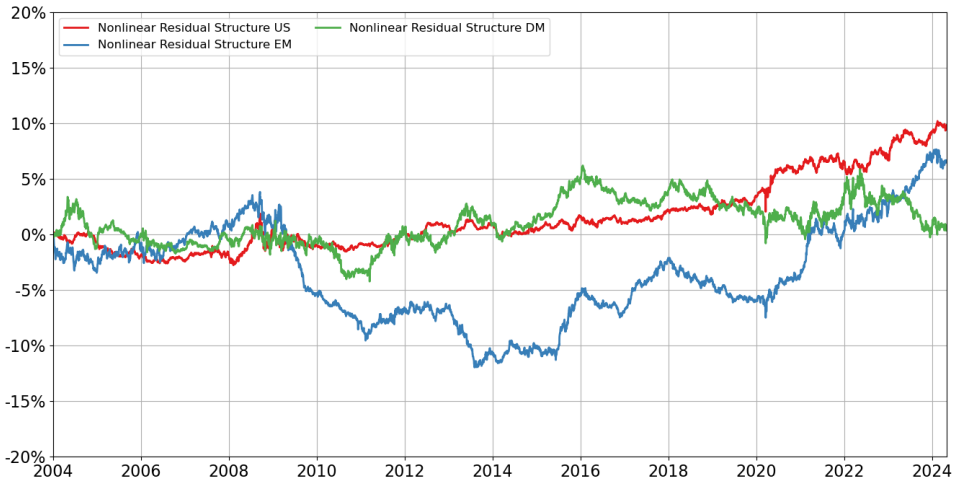

Figure 6: Cumulative return to some of the AXWW5.1-MH Market based Style factors, 2004-2024.

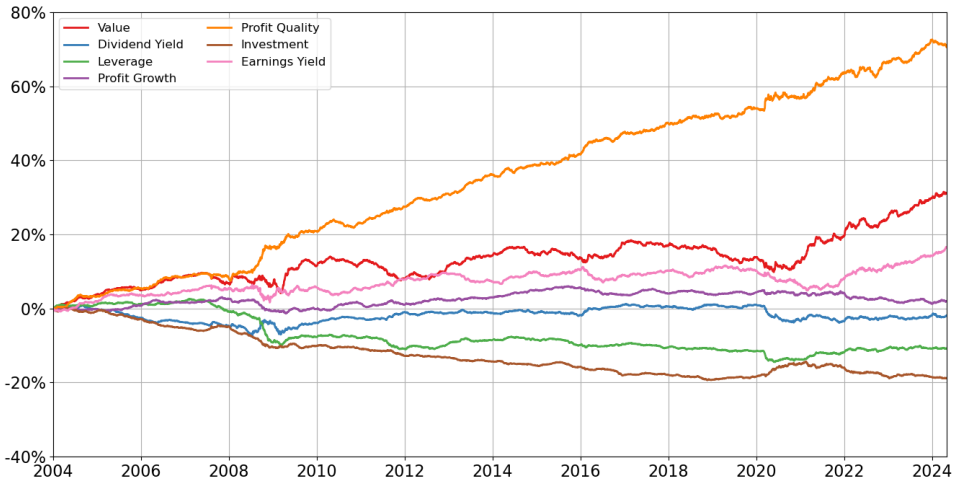

Figure 7: Cumulative return to each of the AXWW5.1-SH Fundamental Style factors, 2004-2024.

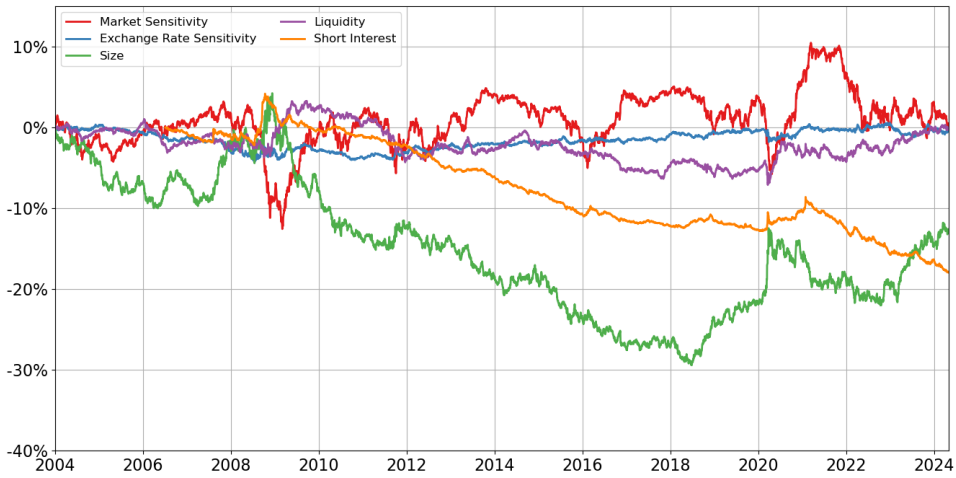

Figure 8: Cumulative return to some of the AXWW5.1-SH Market based Style factors, 2004-2024.

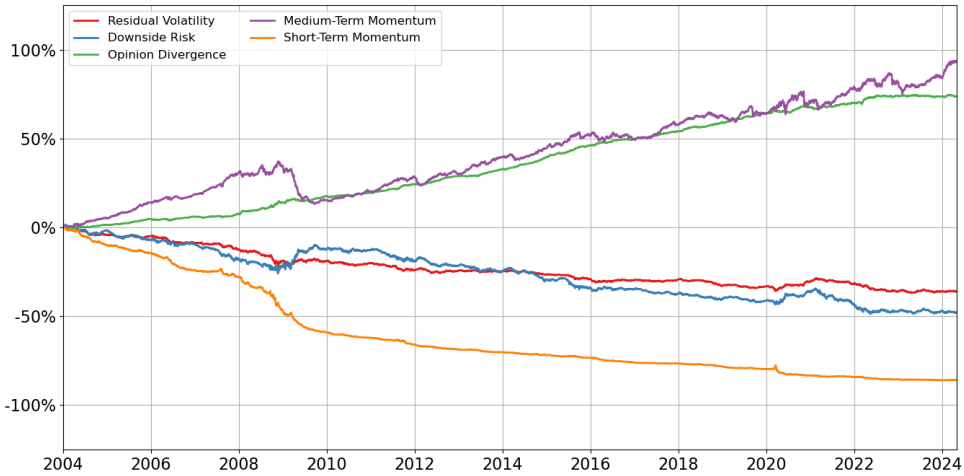

Figure 9: Cumulative return to some of the AXWW5.1-SH Market based Style factors, 2004-2024.

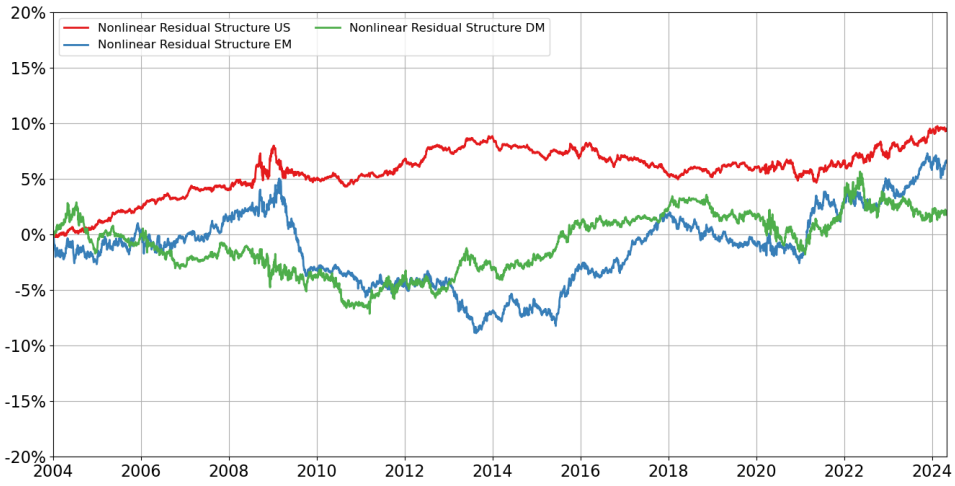

Figure 10: Cumulative return to some of the AXWW5.1-SH Market based Style factors, 2004-2024.

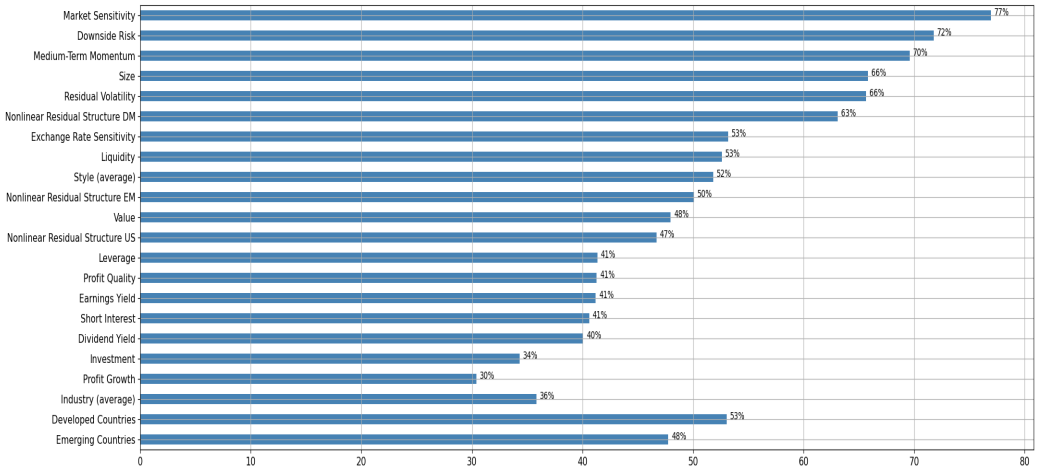

Figure 11: AXWW5.1-MH factors' frequency of statistical significance, 2004-2024. Market Sensitivity, for example, is statistically significant 77% of the time.

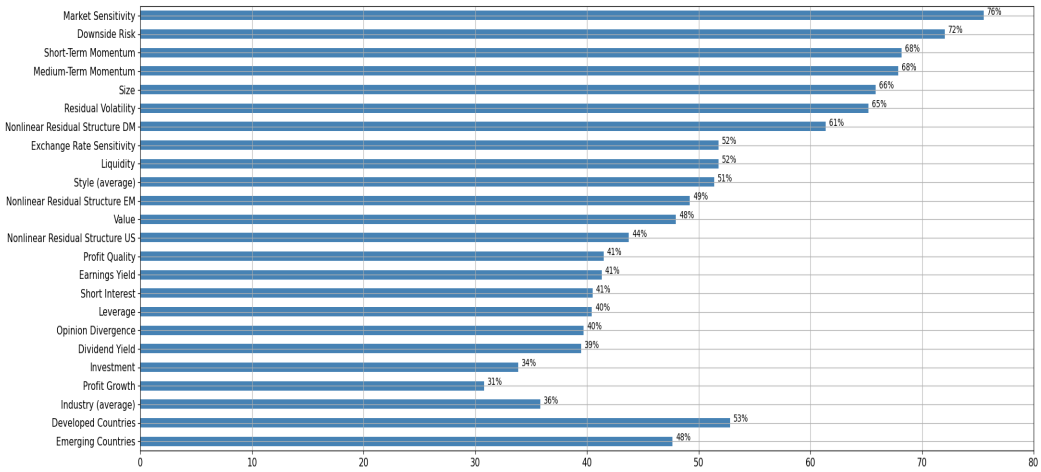

Figure 12: AXWW5.1-SH factors' frequency of statistical significance, 2004-2024. Market Sensitivity, for example, is statistically significant 77% of the time.