Axioma Style Handbook

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1 Market-Based Style Factors

1.1 Exchange-Rate Sensitivity

This is a measure of a stock's response to fluctuations in the foreign exchange market. It is calculated by regressing 6 months of daily stock returns against the returns of a currency basket c_t, the market return $r_{M,t}$, and an intercept term. In some models the currency basket contains only one currency.

$$r_{i,t} = \beta_{i,0} c_t + \beta_{i,1} r_{M,t} + \beta_{i,2} + \epsilon_{i,t}.$$

c_t represents the return of the stock's local currency using the currency basket as numeraire, and $r_{M,t}$ is the return of the market to which the stock belongs. $\beta_{i,0}$ is taken as the raw exposure value.

1.2 Liquidity

The liquidity factor provides a measure of a stock's trading activity, or lack thereof. It is defined as the 20-day average daily volume (expressed in units currency, not shares traded), divided by the average 20-day market capitalization:

$$LIQ_i = \frac{\frac{1}{20}\sum_{j=1}^{20} tdv_{i,t-j}}{\frac{1}{20}\sum_{j=1}^{20} mc_{i,t-j}}$$

where $tdv_{i,j}$ is the total volume traded at time j.

1.3 Market Sensitivity

This is a measure of a stock's under or over performance relative to the broad market from historical data. It is calculated by regressing the time-series of an asset's return against the market return. Thus

$$r_{i,t} = \alpha_i + \beta_i r_{M,t} + \epsilon_{i,t},$$

where

$$r_{M,t} = r^T(t) h_{M,t}.$$

where h_M are the weights of the "market" portfolio at time t. The composition of the market portfolio depends on the model geography and is typically a proxy for the local benchmark index. The regression coefficient βi is simply the stock's *historical beta*, estimated using the Market Model. 6 months of daily returns are used for the regression. The beta is corrected for serial correlation and asynchronous trading via the Scholes-Williams formula with a lead/lag value of 1.

1.4 Medium-Term Momentum

Medium-Term Momentum gives a measure of a stock's past performance over the medium-term. It is defined as an asset's cumulative return over the last 250 trading days, excluding the last 20 trading days (approximately past year excluding past month):

$$MTM_i = \prod_{j=21}^{250} [1 + r_{i,t-j}] - 1.$$

1.5 Short-Term Momentum

Short-Term Momentum gives a measure of a stock's recent performance. It is defined as an asset's cumulative return over the last 20 trading days (approximately one month):

$$STM_i = \prod_{j=1}^{20} [1 + r_{i,t-j}] - 1.$$

1.6 Size

This differentiates between large and small stocks and is defined as the natural logarithm of the market capitalization, averaged over the last 20 trading days. Denote by $mc_{i,t}$ the market capitalization of asset i at time t. Market capitalization is computed as the product of the total shares outstanding and closing price.

$$SIZ_i = ln\left(\frac{1}{20}\sum_{j=1}^{20} mc_{i,t-j}\right)$$

1.7 Volatility

Volatility gives a measure of an asset's relative volatility over time according to its historical behavior. It is calculated as the square-root of the asset's absolute return averaged over the last 60-days, divided by the cross-sectional volatility of the market:

$$VOL_i = \sqrt{\frac{1}{60}\sum_{j=1}^{60} \frac{|r_{i,t-j}|}{csv_{t-j}}}$$

where

$$csv_t = \sqrt{\frac{1}{N}\sum_{i=1}^{N} (r_{i,t} - \bar{r}_t)^2}$$

is the cross-sectional standard deviation of returns at time t, measured only across the N assets in the model estimation universe.

2 Fundamental Style Factors

2.1 Value

Value gives a measure of how fairly a stock is priced within the market. It is calculated as the ratio of common equity to average 20-day market capitalization (i.e. Book-to-Price). The calculation

uses the common equity value reported on the most recent date from the last 2 years.

$$VAL_i = \frac{ce_i}{\sum_{j=1}^{20} mc_{i,t-j}}.$$

2.2 Leverage

Leverage provides a measure of a company's exposure to debt levels. It is calculated as total debt divided by average 20-day market capitalization. Total debt is the sum of long-term debt and current liabilities (short-term debt) taken on the most recent reporting date in the past 2 years.

$$LEV_i = \frac{debt_{LT} + debt_{ST}}{\sum_{j=1}^{20} mc_{i,t-j}}$$

2.3 Growth

Growth gives an indication of a company's rate of growth historically. The growth factor is calculated as the product of one minus the dividend pay-out rate and the one-year return on equity.

$$GRO_i = (1 - dpr_i) \cdot roe_i$$

The dividend pay-out rate, dpr_i, is calculated as the ratio of the annualized dividends per share and the annualized earnings per share:

$$dpr_i = \frac{dps_i}{eps_i}$$

The return on equity, roe_i , is calculated as the ratio of the annualized income over the last year and the common equity value of a year ago:

$$roe_i = \frac{inc_i}{ce_i}$$

3 Model-Specific Style Factors

3.1 B-Share Market (China)

This is a binary (0/1) indicator that identifies B-shares (as opposed to domestic A-shares) listed on the Shanghai and Shenzhen stock exchanges.

3.2 Mid-Market (Japan)

This identifies commonalities among mid-sized stocks in the Japanese market. First, the 100 largest and most liquid stocks quoted on Section 1 of the Tokyo Stock Exchange are identified. Using capitalization and trading activity screens, the next 400 stocks are selected and assigned unit exposure; all other stocks have zero exposure. Only common stocks of Japanese companies, except those that have recently listed or begun delisting procedures, are eligible.

3.3 Investment Trusts (United Kingdom)

This is a binary (0/1) indicator that identifies firms whose business is that of holding equity and other investments, such as investment trusts, venture capital trusts, and various other open-ended investment instruments.

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