

# Global Factor Data Documentation

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## 1 Overview

- This documentation describes the Global Factor Data, and the associated code for constructing the data, based on Jensen, Kelly, and Pedersen (2021). The citation for use of this data and code is:

Jensen, T.I., B. Kelly, and L.H. Pedersen (2021). “Is There a Replication Crisis in Finance?” Working Paper Yale University and Copenhagen Business School.

- The Global Factor Data includes 406 characteristics and their associated factor portfolios. This is a superset of the 153 factors analyzed in Jensen, Kelly, and Pedersen (2021).
- This documentation is grouped into eight main sections: Identifier Variables, Industry Identifiers, Helper Functions, Accounting Characteristics, Market Based Characteristics, Detailed Characteristic Construction, FX Conversion Rate Construction and Factor Details and Citations.
  - Identifier Variables include firm identifying information, date, etc...
  - Each of the Characteristics sections includes at least three subsections: Datasets, Variables, and Characteristics.
  - Datasets refers to which datasets the items in variables are drawn from. For example, 'COMP.FUNDA' suggests we use variables from the FUNDA dataset provided by Compustat.
  - Variables refers to a table containing information about the variables drawn from the datasets previously identified. These tables include the name, abbreviation used throughout the section, and the construction of the variables. These variables are constructed in a way to maximize coverage and are not directly included in the final dataset.

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- Characteristics refers to a table of constructed characteristics made of the previously describes variables. These tables include the name, the abbreviation used in the published dataset, and the construction. These characteristics are in the final dataset.

## 1.1 How To Run the Code

- Access the code for this data set at <https://github.com/bkelly-lab/GlobalFactor>.
- This data is produced using the SAS Studio on Wharton Research Data Services (WRDS) servers. The github README file contains instruction on how to generate the data.
- Use the 'EOM' (end of month) variable as the date variable to join/merge datasets.

## 1.2 How To Use the Data

- The *id* column is the unique security  $\times$  source<sup>1</sup> identifier.
- The *eom* column shows the end of month, where the data is valid. In other words, it shows the information available by the end of a given month. As an example, the *me* value for a stocks with *eom*=20191231, will be the last available market equity before or at December 31st 2019. When creating portfolio, characteristics should therefore be lagged relative to returns to avoid lookahead bias.
- The *excntry* column, identifies the country of the exchange where the security is traded.
- Suggested screens:
  - To obtain one observation per security  $\times$  month, use *obs\_main*=1.
  - To obtain one observation per firm  $\times$  month, use *primary\_sec*=1.
  - To include only common stocks, use *common*=1.
  - To include only main exchanges, use *exch\_main*=1.

## 1.3 Versions, Bug Fixes, and Comments

- We will update the code and data regularly as CRSP and Compustat updates become available. We will also release periodic updates with bug fixes. Changes from periodic updates will be noted in the changelog: <https://github.com/bkelly-lab/GlobalFactor/blob/master/CHANGELOG.md>.
- The code and data has been carefully vetted, but may contain bugs and certainly has room for improvement. We welcome any and all feedback regarding bugs or suggestions for improvements and extensions.
- Send correspondence to [bryan.kelly@yale.edu](mailto:bryan.kelly@yale.edu) with subject “Global Factor Data”

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<sup>1</sup>CRSP or Compustat.

## 1.4 Terminology

- Annual data refers to accounting data from annual reports sourced from COMP.FUNDA and COMP.G.FUNDA.
- Quarterly data refers to accounting data from quarterly reports sourced from COMP.FUNDQ and COMP.G.FUNDQ.
- Final Dataset refers to “world\_data.sas7bdat”, the output dataset
- Fiscal period refers to the relevant period over which income and expenses have accrued.
- Accounting variables refers to accounting items such as assets, sales and net income.
- Market variables refers to market based items such as market equity and excess return.
- Characteristics refers to columns in the final dataset such as asset growth, book to market equity, and net income to book equity.

## 2 Factor Portfolio Construction

- For each characteristic, we build the 1-month holding period factor return within each country as follows.
- In each country and month, we sort stocks into characteristic terciles (top/middle/bottom third) with breakpoints based on non-micro stocks in that country. Specifically, we start with all non-micro stocks in a country (i.e., larger than NYSE 20<sup>th</sup> percentile) and sort them into three groups of equal numbers of stocks based on the characteristic, say book-to-market. Then we distribute the micro-cap stocks into the three groups based on the same characteristic breakpoints. This process ensures that the non-micro stocks are distributed equally among across portfolios, creating more tradable portfolios.
- For each tercile, we compute its “capped value weight” return, meaning that we weight stocks by their market equity, winsorized at the NYSE 80<sup>th</sup> percentile. This construction ensures that tiny stocks have tiny weights and any one mega stock does not dominate a portfolio, seeking to create tradable, yet balanced, portfolios.
- The factor is then defined as the high-tercile return minus the low-tercile return, corresponding to the excess return of a long-short zero-net-investment strategy. The factor is long (short) the tercile identified by the original paper to have the highest (lowest) expected return.
- For a factor return to be non-missing, we require that it has at least 5 stocks in each of the long and short legs. We also require a minimum of 60 valid monthly observations for each country-specific factor for inclusion in our sample.

- We update characteristics with the most recent accounting data (which could be either annual or quarterly) starting four months after the reporting period.

### 3 Identifier Variables

This section covers all of the variables that give firm/date level identifiers and information. If a variable starts with 'comp' or 'crsp', then the following variable name is drawn from the specified dataset. For example, 'crsp\_shrcd' is the 'shrcd' variable from CRSP.

Table 1: Identifier Variables

Name	Description
size_grp	This groups each firm into one of five categories: Mega, Large, Small, Micro and Nano cap. The groups are non-overlapping and the breakpoints are based on the market equity of NYSE stocks. In particular, Mega caps are all stocks with market equity larger than the 80th percentile of NYSE stocks, Large caps are all remaining stocks larger than the 50th percentile, Small caps are larger than the 20th percentile, Micro caps are larger than the 1st percentile and Nano caps are the remaining stocks.
id	Dataset's unique firm identifier variable. It first identifies the source of the data 'crsp' or 'comp' and also a number as a firm identifier.
source	Identifies the source of the firm/date observation which is either CRSP or Compustat
obs_main	If there are more than one firm observations for one date, this identifies if the observation is considered as the 'main' observation. If available, CRSP observations are considered as the 'main' observation.
exch_main	Indicator for main exchanges. If CRSP is the source, main exchanges are those with <i>crsp_exchcd</i> 1, 2 and 3. If Compustat is the source, main exchanges are all <i>comp_exchg</i> except 0, 1, 2, 3, 4, 13, 15, 16, 17, 18, 19, 20, 21, 127, 150, 157, 229, 263, 269, 281, 283, 290, 320, 326, 341, 342, 347, 348, 349, 352.
gvkey	Permanent six-digit unique firm identifier from Compustat
iid	Permanent two-digit addition to 'gvkey' that identifies specific issues of a firm from Compustat
primary_sec	Primary security as identified by Compustat. A 'gvkey' can have up to three different primary securities ('iid') at a given time (US, CA, and international).
permno	Permanent unique firm identifier from CRSP
permco	Permanent issue identifier from CRSP
excntry	The country of the exchange where the security is traded. Usually expressed as an ISO currency code with the exception of <i>mul</i> which indicates a multi country exchange <sup>2</sup>
curcd	Currency of <i>prc_local</i> and the currency used to calculate <i>ret_local</i> .
fx	Ratio of <i>curcd</i> to USD at the date of observation
common	Indicator for common stocks. If CRSP is the source, common is one if the SHRCd variable is 10, 11 or 12. If Compustat is the source, common is one if TPCI is '0'
comp_tpci	Compustat issue type identifier
crsp_shrcd	CRSP share code
comp_exchg	Compustat stock exchange code
crsp_exchd	CRSP stock exchange code
date	Date of the last observation during the month.
eom	The last day of the month in which the observation is made
adjfct	Share adjustment factor, using 'cfacshr' if the source is CRSP or 'ajexdi' if the source is Compustat

### 4 Industry Identification

This section describes the industry identifiers. First we construct separate identifiers for CRSP and Compustat. Based on these datasets, we create one SIC, NAICS and GICS code for each firm based on Compustat data if available and otherwise CRSP. GVKEY is the

<sup>2</sup>Typically over the counter exchanges.

company identifier for COMPUSTAT. PERMNO is the security identifier for CRSP. While we would prefer to use PERMCO, which is company level, different firms with different industry identifications can be listed under the same PERMCO. CRSP identifiers are available on a daily basis. For Compustat, we extract SIC and NAICS codes from annual accounting reports. Historical GICS codes are only available in Compustat. The Fama-French industry identifier is mapped from SIC codes using documentation provided by Ken French. We allow for using either 38 or 49 industry portfolio definitions, as defined [here](#) and [here](#), respectively. By default, we use the 49 portfolio definition, but that can be adjusted in 'main.sas'.

## 4.1 Datasets

- CRSP.DSENNAMES
- COMP.FUNDA
- COMP.G\_FUNDA
- COMP.CO\_HGIC
- COMP.G\_CO\_HGIC

Table 2: Identifier Variables

Name	Description
sic	Firm SIC industry. We use Compustat data if available and otherwise use CRSP data.
naics	Firm NAICS industry. We use Compustat data if available and otherwise use CRSP data.
gics	Firm GICS industry. We use historical data from Compustat.
ff49	Classification of stocks into 49 industry groups based SIC codes and the methodology in <a href="#">Fama and French (1997)</a> with the addition of a software industry.

## 5 Helper Functions

This section describes functions that we use to create variables. Many of the functions are used for variables with quarterly, monthly and daily frequencies, and these are specified by “\_zQ”, “\_zM” and “\_zD” respectively, where “z” is the number of quarters, months or days that the function is referencing. For example, COVAR\_12M(X, Y) is the covariance of variables X and Y over the past 12 months.

Table 3: Helper Functions

Function	Name	Description
Mean	$\bar{X}_z$	$\frac{1}{z} \sum_{n=0}^{z-1} X_{t-n}$

Function	Name	Description
Variance	$\text{VARC}_z(X)$	$\frac{1}{z-1} \sum_{n=0}^{z-1} (X_{t-n} - \overline{X}_{tz})^2$
Covariance	$\text{COVAR}_z(X, Y)$	$\frac{1}{z-1} \sum_{n=0}^{z-1} (X_{t-n} - \overline{X}_{tz})(Y_{t-n} - \overline{Y}_{tz})$
Standard Deviation	$\sigma_z(X)$	$\sqrt{\text{VARC}_z(X)}$
Skewness	$\text{SKEW}_z(X)$	$\frac{1}{z \times \sigma_z(X)^3} \sum_{n=0}^{z-1} (X_{t-n} - \overline{X}_{tz})^3$
Standardized Unexpected Realization	$\text{SUR}_z(X)$	$\frac{X_t - (X_{t-3} + (\overline{X}_{t-3} - \overline{X}_{t-15})_z/4)}{\sigma_z(X_{t-3} - X_{t-15})}$
Change to Expectations	$\text{CHG\_TO\_EXP}(X)$	$\frac{X_t}{(X_{t-12} + X_{t-24})/2}$
Maximum	$\text{MAXn}_z(X)$	The maximum n values of given input.
Quality Minus Junk Variables		
Earnings Volatility	$\_EVOL$	$ROEQ\_BE\_STD \times 2$ . If this is unavailable, we use $ROE\_BE\_STD$ .
Rank of Variable	$\_rVar$	Cross-sectional rank of Var within a country <sup>3</sup>
Z transformation	$ZV(rVar)$	$\frac{\_rVAR - \_rVAR_z}{\_t(\_rVAR)}$

## 6 Accounting Characteristics

### 6.1 Datasets

- COMP.FUNDA
- COMP.FUNDQ
- COMP.G.FUNDA
- COMP.G.FUNDQ

<sup>3</sup> $OACCRUALS\_AT$ ,  $BETABAB\_1260d$ ,  $DEBT\_AT$  and  $\_EVOL$  are sorted in descending order. All other variables are sorted in ascending order.

## 6.2 General Information

- We create characteristics for annual and quarterly accounting data separately. We then take the most recent characteristics value from each dataset to create the final dataset.
- We assume that accounting variables are publically available 4 months after the end of the accounting period .
- In describing accounting variables, we use the Compustat item names from the annual dataset. The equivalent item name in the quarterly dataset can be found by adding a ‘q’ or ‘y’ to the end of the annual item name. Specifically, ‘q’ indicates a value calculated over one quarter while ‘y’ refers to the cummulative value over the quarters with data available within a fiscal year.

## 6.3 Annualized Accounting Variables from Quarterly Data

- The value of a balance sheet item such as asset or book equity has the same meaning in the annual and the quarterly data. It is the value by the end of a fiscal period.
- The value of an income or cash flow statement item is different. In the annual data, it is calculated over one year. However, in the quarterly data, it is calculated over one quarter. To make quarterly income and cash flows items comparable to the corresponding annual item, we take the sum of the item over the last four quarters.

## 6.4 Accounting Variables

The abbreviation is used to refer to the accounting variable. A suffix of ‘\*’ indicates that we have altered the original Compustat item to increase the coverage or to create a variable that is a part of creating a characteristic in the final dataset. The characteristic name will reflect the accounting name except the ‘\*’ suffix. As an example, ‘gp\_at’ is gross profit scaled by assets. In general, we will refer to Compustat variables using capital letters.

Table 4: Accounting Variables

Name	Abbreviation	Construction
<b>Income Statement</b>		
Sales	sale*	We prefer <a href="#">SALE</a> . If this is unavailable, we use <a href="#">REVT</a>
Cost of Goods Sold	cogs	Compustat item <a href="#">COGS</a>
Gross Profit	gp*	We prefer to use <a href="#">GP</a> . If this is unavailable we use sale*- <a href="#">COGS</a>
Selling, General and Administrative Expenses	xsga	Compustat item <a href="#">XSGA</a>
Advertising Expenses	xad	Compustat item <a href="#">XAD</a> . Note that this is not available in Compustat Global
Research and Development Expenses	xrd	Compustat item <a href="#">XRD</a> . Note that this is not available in Compustat Global
Staff Expenses	xlr	Compustat item <a href="#">XLR</a>
Special Items	spi	Compustat item <a href="#">SPI</a>
Operating Expenses	opex*	We prefer to use <a href="#">XOPR</a> . If this is unavailable, we use <a href="#">COGS+XSGA</a>
Operating Income Before Depreciation	ebitda*	We prefer to use <a href="#">EBITDA</a> . If this is unavailable, we use <a href="#">OIBDP</a> . If this is unavailable, we use SALE*-OPEX*. If this is unavailable, we use GP*- <a href="#">XSGA</a>
Depreciation and Amortization	dp	Compustat Item <a href="#">DP</a>

Name	Abbreviation	Construction
Operating Income After Depreciation	ebit*	We prefer to use <a href="#">EBIT</a> . If this is unavailable, we use <a href="#">OIADP</a> .
Interest Expenses	int	If this is unavailable, we use <a href="#">EBITDA*-DP</a> Compustat item <a href="#">XINT</a>
Operating Profit ala Ball et al (2015)	op*	We use <a href="#">EBITDA* + XRD</a> . If <a href="#">XRD</a> is unavailable, we set it to zero
Operating Profit to Equity	ope*	We use <a href="#">EBITDA*-XINT</a> . Note that we target the same variable as the numerator of the profitability characteristic used to create the Robust-minus weak factor in the fama-French 5 factor model (Fama and French, 2015)
Earnings before Tax and Extraordinary Items	pi*	We prefer to use <a href="#">PI</a> . If this is unavailable we use <a href="#">EBIT*-XINT+SPI+NOPI</a> where we set <a href="#">SPI</a> and <a href="#">NOPI</a> to zero if missing
Income Tax	tax	Compustat item <a href="#">TXT</a>
Extraordinary Items and Discontinued Operations	xido*	We prefer to use <a href="#">XIDO</a> . If this is unavailable, we use <a href="#">XI+DO</a> where we set <a href="#">DO</a> to zero if missing. The reason why we set missing <a href="#">DO</a> to zero is because it is not available in <a href="#">COMP.G.FUNDQ</a>
Net Income	ni*	We prefer to use <a href="#">IB</a> . If this is unavailable, we use <a href="#">NI-XIDO*</a> . If this is unavailable, we prefer <a href="#">PI*-TXT-MII</a> . If <a href="#">MII</a> is unavailable, it is set to zero
Net Income Including Extraordinary Items	nix*	We prefer <a href="#">NI</a> . If this is not available, we prefer <a href="#">NI*+XIDO*</a> . If <a href="#">XIDO*</a> is unavailable, we set it to zero. If that is unavailable, we prefer <a href="#">NI*+XI+DO</a>
Firm Income	fi*	We use <a href="#">NIX*+XINT</a>
Dividends for Common Shareholds	dvc	Compustat Item <a href="#">DVC</a>
Total Dividends	div*	We prefer <a href="#">DVT</a> . If this is not available, we use <a href="#">DV</a>
Income Before Extraordinary Items	ni_qtr*	We use <a href="#">IBQ</a>
Net Sales	sale_qtr*	We use <a href="#">SALEQ</a>
<b>Cash Flow Statement</b>		
Capital Expenditures	capx	Compustat item <a href="#">CAPX</a>
Capital Expenditures to Sales	capex_sale*	We use <a href="#">CAPX / SALE*</a>
Free Cash Flow	fcf*	We use <a href="#">OCF*-CAPX</a> . Note that the free cash flow is computed before financing activities and sale of assets is taken into account
Equity Buyback	eqbb*	We use <a href="#">PRSTKC+PURTSHR</a> . Equity Buyback is mainly <a href="#">PRSTKC</a> in NA and <a href="#">PURTSHR</a> in GLOBAL. Either of <a href="#">PRSTKC</a> or <a href="#">PURTSHR</a> are allowed to be missing
Equity Issuance	eqis*	Compustat item <a href="#">SSTK</a>
Equity Net Issuance	eqnetis*	We use <a href="#">EQIS*-EQBB*</a> . Either <a href="#">EQIS*</a> or <a href="#">EQBB*</a> are allowed to be missing
Net Equity Payout	eqpo*	We use <a href="#">DIV*+EQBB*</a>
Equity Net Payout	eqnpo*	We use <a href="#">DIV*-EQNETIS*</a>
Net Long-Term Debt Issuance	dltnetis*	We prefer to use <a href="#">DLTIS-DLTR</a> where we only require that one of the items are non-missing. If this is unavailable, we use <a href="#">LTDCH</a> . If this is unavailable we use the yearly change in long-term book debt <a href="#">DLTT</a>
Net Short-Term Debt Issuance	dstnetis*	We prefer <a href="#">DLCCH</a> . If this is unavailable, we use the yearly change in short-term book debt <a href="#">DLC</a>
Net Debt Issuance	dbnetis*	We use <a href="#">DLTNETIS*+DSTNETIS*</a> and only require one of the items to be non-missing
Net Issuance	netis*	We use <a href="#">EQNETIS*+DBNETIS*</a> . Either <a href="#">EQNETIS*</a> or <a href="#">DBNETIS*</a> are allowed to be missing
Financial Cash Flow	fincf*	We prefer <a href="#">FINCF</a> . If this is unavailable, we use <a href="#">NETIS*-DV+FIAO+TXBCOF</a> . If <a href="#">FIAO</a> or <a href="#">TXBCOF</a> is missing, it is set to zero
<b>Balance Sheet - Assets</b>		
Total Assets	at*	We prefer to use <a href="#">AT</a> . If this is unavailable, then we use <a href="#">SEQ* + DLTT + LCT + LO + TXDITC</a> . If <a href="#">LCT</a> , <a href="#">LO</a> , or <a href="#">TXDITC</a> are missing, then they are set to zero
Current Assets	ca*	We prefer <a href="#">ACT</a> . If this is unavailable, we use <a href="#">RECT+INVT+CHE+ACO</a>
Account Receivables	rec	Compustat item <a href="#">RECT</a>
Cash and Short-Term Investment	cash	Compustat item <a href="#">CHE</a>
Inventory	inv	Compustat item <a href="#">INVT</a>
Non-Current Assets	nca*	We use <a href="#">AT* - CA*</a>
Intangible Assets	intan	Compustat item <a href="#">INTAN</a>
Investment and Advances	ivao	Compustat item <a href="#">IVAO</a>



Name	Abbreviation	Construction
Property, Plans and Equipment Gross	ppeg	Compustat item <a href="#">PPEGT</a>
Property, Plans and Equipment Net	ppen	Compustat item <a href="#">PPENT</a>
<b>Balance Sheet - Liabilities</b>		
Total Liabilities	lt	Compustat item <a href="#">LT</a>
Current Liabilities	cl*	We prefer <a href="#">LCT</a> . If this is unavailable, we use <a href="#">AP</a> + <a href="#">DLC</a> + <a href="#">TXP</a> + <a href="#">LCO</a>
Accounts Payable	ap	Compustat item <a href="#">AP</a>
Short-Term Debt	debtst	Compustat item <a href="#">DLC</a>
Income Tax Payable	txp	Compustat item <a href="#">TXP</a>
Non-Current Liabilities	ncl*	We use <a href="#">LT-CL</a> *
Long-Term Debt	debtlt	Compustat item <a href="#">DLTT</a>
Deferred Taxes and Investment Credit	txdite*	We prefer to use <a href="#">TXDITC</a> . If this is unavailable, we use <a href="#">TXDB</a> + <a href="#">ITCB</a>
<b>Balance Sheet - Financing</b>		
Preferred Stock	pstk*	We prefer to use <a href="#">PSTKRV</a> . If this is unavailable, we use <a href="#">PSTKL</a> . If this is unavailable, we use <a href="#">PSTK</a>
Total Debt	debt*	We use <a href="#">DLTT</a> + <a href="#">DLC</a> . Either DLTT or DLC are allowed to be missing
Net Debt	netdebt*	We use DEBT* - <a href="#">CHE</a> where we set CHE to zero if missing
Shareholders Equity	seq*	We prefer to use <a href="#">SEQ</a> . If this is unavailable, we use <a href="#">CEQ</a> + PSTK* where we set PSTK* to zero if missing. If this is unavailable, we use <a href="#">AT</a> - <a href="#">LT</a>
Book Equity	be*	We use SEQ* + TXDITC* - PSTK* where we set TXDITC* and PSTK* to zero if missing
Book Enterprise Value	bev*	We prefer to use <a href="#">ICAPT</a> + <a href="#">DLC</a> - <a href="#">CHE</a> where DLC and CHE are set to zero if missing. If this is unavailable, we use SEQ* + NETDEBT* + <a href="#">MIB</a> where we set MIB to zero if missing. In the global data <a href="#">ICAPT</a> is reduced by Treasury stock
<b>Balance Sheet - Summary</b>		
Net Working Capital	nwc*	We use CA* - CL*
Current Operating Assets	coa*	We use CA* - <a href="#">CHE</a>
Current Operating Liabilities	col*	We use CL* - <a href="#">DLC</a> . If DLC is missing, it is set to zero
Current Operating Working Capital	cowc*	We use COA* - COL*
Non-Current Operating Assets	ncoa*	We use AT* - CA* - <a href="#">IVAO</a>
Non-Current Operating Liabilities	ncol*	We use <a href="#">LT-CL</a> * - <a href="#">DLTT</a>
Net Non-Current Operating Assets	nncoa*	We use NCOA* - NCOL*
Financial Assets	fna*	We use <a href="#">IVST</a> + <a href="#">IVAO</a> . If either is missing, they are set to zero
Financial Liabilities	fnl*	We use DEBT* + PSTK*. If PSTK* is missing, it is set to zero
Net Financial Assets	nfna*	We use FNA* - FNL*
Operating Assets	oa*	We use COA* + NCOA*
Operating Liabilities	ol*	We use COL* + NCOL*
Net Operating Assets	noa*	We use OA* - OL*
Long-Term NOA	lnoa*	<a href="#">PPENT</a> + <a href="#">INTAN</a> + <a href="#">AO</a> - <a href="#">LO</a> + <a href="#">DP</a>
Liquid Current Assets	caliq*	We prefer to use CA* - <a href="#">INVT</a> . If this is unavailable, we use <a href="#">CHE</a> + <a href="#">RECT</a>
Property Plant and Equipment Less Inventories	ppeinv*	<a href="#">PPEGT</a> + <a href="#">INVT</a>
Ortiz-Molina and Phillips Liquidity	aliqu*	<a href="#">CHE</a> + 0.75 × COA* + 0.5(AT* - CA* - <a href="#">INTAN</a> ). If INTAN is missing, we set it to zero
<b>Market Based</b>		
Market Equity	me	We use the market equity for the stock we deem to the primary security of the firm. Importantly, we do not align the market value with the end of the fiscal period. Instead, we update the market value on a monthly basis and align it with the most recently available accounting characteristic
Market Enterprise Value	mev*	We use ME_COMPANY + NETDEBT* × FX*
Market Assets	mat*	We use AT* × FX + BE* × FX + ME_COMPANY
<b>Accruals</b>		
Operating Accruals	oacc*	We prefer NI* - <a href="#">OANCF</a> . If that is unavailable, we use the yearly change in COWC* + the yearly change in NCOA*
Total Accruals	tacc*	We use OACC* + the yearly change in NFNA*
Operating Cash Flow	ocf*	We prefer to use <a href="#">OANCF</a> . If this is unavailable, we use NI* - OACC*. If this is unavailable, we use NI* + <a href="#">DP</a> - <a href="#">WCAPT</a> . If WCAPT is missing, we use 0.
Quarterly Operating Cash Flow	ocf_qtr*	We use <a href="#">OANCFQ</a> . If this is unavailable, then we use <a href="#">IBQ</a> + <a href="#">DPQ</a> - <a href="#">WCAPTQ</a> . If WCAPTQ is unavailable, we set it to

Name	Abbreviation	Construction
Cash Based Operating Profitability	cop*	We prefer EBITDA*+XRD-OACC*. If XRD is unavailable, we set it to zero
<b>Other</b>		
Employees in Thousands	emp	Compustat item EMP

Table 5: Accounting Characteristics

Name	Abbreviation	Construction
<b>Accounting Based Size Measures</b>		
Assets	assets	$AT^*_t$
Sales	sales	$SALE^*_t$
Book Equity	book_equity	$BE^*_t$
Net Income	net_income	$NI^*_t$
Enterprise Value	enterprise_value	$MEV^*_t$
<b>Growth - Percentage<sup>4</sup></b>		
Asset Growth 1yr	at_gr1	$\frac{AT^*_t}{AT^*_{t-12}} - 1$
Sales Growth 1yr	sale_gr1	$\frac{SALE^*_t}{SALE^*_{t-12}} - 1$
Current Asset Growth 1yr	ca_gr1	$\frac{CA^*_t}{CA^*_{t-12}} - 1$
Non-Current Asset Growth 1yr	nca_gr1	$\frac{NCA^*_t}{NCA^*_{t-12}} - 1$

<sup>4</sup>This refers to all variables with a suffix of “\_gr1” or “\_gr3”. The variables are percentage growth in the accounting variables before the suffix. The number in the suffix refers to either 1 or 3 year growth. For all variables, we only take the percentage growth if the denominator is above zero.

Name	Abbreviation	Construction
Total Liabilities Growth 1yr	lt_gr1	$\frac{LT_t}{LT_{t-12}} - 1$
Current Liabilities Growth 1yr	cl_gr1	$\frac{CL^*_t}{CL^*_{t-12}} - 1$
Non-Current Liabilities Growth 1yr	ncl_gr1	$\frac{NCL^*_t}{NCL^*_{t-12}} - 1$
Book Equity Growth 1yr	be_gr1	$\frac{BE^*_t}{BE^*_{t-12}} - 1$
Preferred Stock Growth 1yr	pstk_gr1	$\frac{PSTK^*_t}{PSTK^*_{t-12}} - 1$
Total Debt Growth 1yr	debt_gr1	$\frac{DEBT^*_t}{DEBT^*_{t-12}} - 1$
Cost of Goods Sold Growth 1yr	cogs_gr1	$\frac{COGS_t}{COGS_{t-12}} - 1$
Selling, General, and Administrative Expenses Growth 1yr	sga_gr1	$\frac{XSGA_t}{XSGA_{t-12}} - 1$
Operating Expenses Growth 1yr	opex_gr1	$\frac{OPEX^*_t}{OPEX^*_{t-12}} - 1$
Asset Growth 3yr	at_gr3	$\frac{AT^*_t}{AT^*_{t-36}} - 1$
Sales Growth 3yr	sale_gr3	$\frac{SALE^*_t}{SALE^*_{t-36}} - 1$

Name	Abbreviation	Construction
Current Asset Growth 3yr	ca_gr3	$\frac{CA^*_t}{CA^*_{t-36}} - 1$
Non-Current Asset Growth 3yr	nca_gr3	$\frac{NCA^*_t}{NCA^*_{t-36}} - 1$
Total Liabilities Growth 3yr	lt_gr3	$\frac{LT_t}{LT_{t-36}} - 1$
Current Liabilities Growth 3yr	cl_gr3	$\frac{CL^*_t}{CL^*_{t-36}} - 1$
Non-Current Liabilities Growth 3yr	ncl_gr3	$\frac{NCL^*_t}{NCL^*_{t-36}} - 1$
Book Equity Growth 3yr	be_gr3	$\frac{BE^*_t}{BE^*_{t-36}} - 1$
Preferred Stock Growth 3yr	pstk_gr3	$\frac{PSTK^*_t}{PSTK^*_{t-36}} - 1$
Total Debt Growth 3yr	debt_gr3	$\frac{DEBT^*_t}{DEBT^*_{t-36}} - 1$
Cost of Goods Sold Growth 3yr	cogs_gr3	$\frac{COGS_t}{COGS_{t-36}} - 1$
Selling, General, and Administrative Expenses Growth 3yr	sga_gr3	$\frac{XSGA_t}{XSGA_{t-36}} - 1$
Operating Expenses Growth 3yr	opex_gr3	$\frac{OPEX^*_t}{OPEX^*_{t-36}} - 1$
Growth - Changed Scaled by Total Assets		

Name	Abbreviation	Construction
Gross Profit Change 1yr	gp_gr1a	$\frac{GP^*_t - GP^*_{t-12}}{AT^*_t}$
Operating Cash Flow Change 1yr	ocf_gr1a	$\frac{OCF^*_t - OCF^*_{t-12}}{AT^*_t}$
Cash and Short-Term Investments Change 1yr	cash_gr1a	$\frac{CASH_t - CASH_{t-12}}{AT^*_t}$
Inventory Change 1yr	inv_gr1a	$\frac{INV_t - INV_{t-12}}{AT^*_t}$
Receivables Change 1yr	rec_gr1a	$\frac{REC_t - REC_{t-12}}{AT^*_t}$
Property, Plans and Equipment Gross Change 1yr	ppeg_gr1a	$\frac{PPEG_t - PPEG_{t-12}}{AT^*_t}$
Investment and Advances Change 1yr	lti_gr1a	$\frac{LTI_t - LTI_{t-12}}{AT^*_t}$
Intangible Assets Change 1yr	intan_gr1a	$\frac{INTAN_t - INTAN_{t-12}}{AT^*_t}$
Short-Term Debt Change 1yr	debtst_gr1a	$\frac{DEBTST_t - DEBTST_{t-12}}{AT^*_t}$
Accounts Payable Change 1yr	ap_gr1a	$\frac{AP_t - AP_{t-12}}{AT^*_t}$
Income Tax Payable Change 1yr	txp_gr1a	$\frac{TXP_t - TXP_{t-12}}{AT^*_t}$

Name	Abbreviation	Construction
Long-Term Debt Change 1yr	debtlt_gr1a	$\frac{DEBTLT_t - DEBTLT_{t-12}}{AT^*_t}$
Deferred Taxes and Investment Credit Change 1yr	txditc_gr1a	$\frac{TXDITC^*_t - TXDITC^*_{t-12}}{AT^*_t}$
Current Operating Assets Change 1yr	coa_gr1a	$\frac{COA^*_t - COA^*_{t-12}}{AT^*_t}$
Current Operating Liabilities Change 1yr	col_gr1a	$\frac{COL^*_t - COL^*_{t-12}}{AT^*_t}$
Current Operating Working Capital Change 1yr	cowc_gr1a	$\frac{COWC^*_t - COWC^*_{t-12}}{AT^*_t}$
Non-Current Operating Assets Change 1yr	ncoa_gr1a	$\frac{NCOA^*_t - NCOA^*_{t-12}}{AT^*_t}$
Non-Current Operating Liabilities Change 1yr	ncol_gr1a	$\frac{NCOL^*_t - NCOL^*_{t-12}}{AT^*_t}$
Net Non-Current Operating Assets Change 1yr	nncoa_gr1a	$\frac{NNCOA^*_t - NNCOA^*_{t-12}}{AT^*_t}$
Operating Assets Change 1yr	oa_gr1a	$\frac{OA^*_t - OA^*_{t-12}}{AT^*_t}$
Operating Liabilities Change 1yr	ol_gr1a	$\frac{OL^*_t - OL^*_{t-12}}{AT^*_t}$
Net Operating Assets Change 1yr	noa_gr1a	$\frac{NOA^*_t - NOA^*_{t-12}}{AT^*_t}$

Name	Abbreviation	Construction
Financial Assets Change 1yr	fna_gr1a	$\frac{FNA^*_t - FNA^*_{t-12}}{AT^*_t}$
Financial Liabilities Change 1yr	fnl_gr1a	$\frac{FNL^*_t - FNL^*_{t-12}}{AT^*_t}$
Net Financial Assets Change 1yr	nfna_gr1a	$\frac{NFNA^*_t - NFNA^*_{t-12}}{AT^*_t}$
Operating Profit before Depreciation Change 1yr	ebitda_gr1a	$\frac{EBITDA^*_t - EBITDA^*_{t-12}}{AT^*_t}$
Operating Profit after Depreciation Change 1yr	ebit_gr1a	$\frac{EBIT^*_t - EBIT^*_{t-12}}{AT^*_t}$
Operating Earnings to Equity Change 1yr	ope_gr1a	$\frac{OPE^*_t - OPE^*_{t-12}}{AT^*_t}$
Net Income Change 1yr	ni_gr1a	$\frac{NI^*_t - NI^*_{t-12}}{AT^*_t}$
Depreciation and Amortization Change 1yr	dp_gr1a	$\frac{DP_t - DP_{t-12}}{AT^*_t}$
Free Cash Flow Change 1yr	fcf_gr1a	$\frac{FCF^*_t - FCF^*_{t-12}}{AT^*_t}$
Net Working Capital Change 1yr	nwc_gr1a	$\frac{NWC^*_t - NWC^*_{t-12}}{AT^*_t}$
Net Income Including Extraordinary Items Change 1yr	nix_gr1a	$\frac{NIX^*_t - NIX^*_{t-12}}{AT^*_t}$

Name	Abbreviation	Construction
Equity Net Issuance Change 1yr	eqnetis_gr1a	$\frac{EQNETIS^*_t - EQNETIS^*_{t-12}}{AT^*_t}$
Net Long-Term Debt Issuance Change 1yr	dltnetis_gr1a	$\frac{DLTNETIS^*_t - DLTNETIS^*_{t-12}}{AT^*_t}$
Net Short-Term Debt Issuance Change 1yr	dstnetis_gr1a	$\frac{DSTNETIS^*_t - DSTNETIS^*_{t-12}}{AT^*_t}$
Net Debt Issuance Change 1yr	dbnetis_gr1a	$\frac{DBNETIS^*_t - DBNETIS^*_{t-12}}{AT^*_t}$
Net Issuance Change 1yr	netis_gr1a	$\frac{NETIS^*_t - NETIS^*_{t-12}}{AT^*_t}$
Financial Cash Flow Change 1yr	fincf_gr1a	$\frac{FINCF^*_t - FINCF^*_{t-12}}{AT^*_t}$
Equity Net Payout Change 1yr	eqnpo_gr1a	$\frac{EQNPO^*_t - EQNPO^*_{t-12}}{AT^*_t}$
Effective Tax Rate Change 1yr	tax_gr1a	$\frac{TAX_t - TAX_{t-12}}{AT^*_t}$
Dividend Payout Ratio Change 1yr	div_gr1a	$\frac{DIV^*_t - DIV^*_{t-12}}{AT^*_t}$
Equity Buyback Change 1yr	eqbb_gr1a	$\frac{EQBB^*_t - EQBB^*_{t-12}}{AT^*_t}$
Equity Issuance Change 1yr	eqis_gr1a	$\frac{EQIS^*_t - EQIS^*_{t-12}}{AT^*_t}$



Name	Abbreviation	Construction
Net Equity Payout Change 1yr	eqpo_gr1a	$\frac{EQPO^*_t - EQPO^*_{t-12}}{AT^*_t}$
Capital Expenditures Change 1yr	capx_gr1a	$\frac{CAPX_t - CAPX_{t-12}}{AT^*_t}$
Gross Profit Change 3yr	gp_gr3a	$\frac{GP^*_t - GP^*_{t-36}}{AT^*_t}$
Operating Cash Flow Change 3yr	ocf_gr3a	$\frac{OCF^*_t - OCF^*_{t-36}}{AT^*_t}$
Cash and Short-Term Investments Change 3yr	cash_gr3a	$\frac{CASH_t - CASH_{t-36}}{AT^*_t}$
Inventory Change 3yr	inv_gr3a	$\frac{INV_t - INV_{t-36}}{AT^*_t}$
Receivables Change 3yr	rec_gr3a	$\frac{REC_t - REC_{t-36}}{AT^*_t}$
Property, Plans and Equipment Gross Change 3yr	ppeg_gr3a	$\frac{PPEG_t - PPEG_{t-36}}{AT^*_t}$
Investment and Advances Change 3yr	lti_gr3a	$\frac{LTI_t - LTI_{t-36}}{AT^*_t}$
Intangible Assets Change 3yr	intan_gr3a	$\frac{INTAN_t - INTAN_{t-36}}{AT^*_t}$
Short-Term Debt Change 3yr	debst_gr3a	$\frac{DEBST_t - DEBST_{t-36}}{AT^*_t}$

Name	Abbreviation	Construction
Accounts Payable Change 3yr	ap_gr3a	$\frac{AP_t - AP_{t-36}}{AT^*_t}$
Income Tax Payable Change 3yr	txp_gr3a	$\frac{TXP_t - TXP_{t-36}}{AT^*_t}$
Long-Term Debt Change 3yr	debtlt_gr3a	$\frac{DEBTLT_t - DEBTLT_{t-36}}{AT^*_t}$
Deferred Taxes and Investment Credit Change 3yr	txditc_gr3a	$\frac{TXDITC^*_t - TXDITC^*_{t-36}}{AT^*_t}$
Current Operating Assets Change 3yr	coa_gr3a	$\frac{COA^*_t - COA^*_{t-36}}{AT^*_t}$
Current Operating Liabilities Change 3yr	col_gr3a	$\frac{COL^*_t - COL^*_{t-36}}{AT^*_t}$
Current Operating Working Capital Change 3yr	cowc_gr3a	$\frac{COWC^*_t - COWC^*_{t-36}}{AT^*_t}$
Non-Current Operating Assets Change 3yr	ncoa_gr3a	$\frac{NCOA^*_t - NCOA^*_{t-36}}{AT^*_t}$
Net Non-Current Operating Assets Change 3yr	nncoa_gr3a	$\frac{NNCOA^*_t - NNCOA^*_{t-36}}{AT^*_t}$
Operating Assets Change 3yr	oa_gr3a	$\frac{OA^*_t - OA^*_{t-36}}{AT^*_t}$
Operating Liabilities Change 3yr	ol_gr3a	$\frac{OL^*_t - OL^*_{t-36}}{AT^*_t}$

Name	Abbreviation	Construction
Net Operating Assets Change 3yr	noa_gr3a	$\frac{NOA^*_t - NOA^*_{t-36}}{AT^*_t}$
Financial Assets Change 3yr	fna_gr3a	$\frac{FNA^*_t - FNA^*_{t-36}}{AT^*_t}$
Financial Liabilities Change 3yr	fnl_gr3a	$\frac{FNL^*_t - FNL^*_{t-36}}{AT^*_t}$
Net Financial Assets Change 3yr	nfna_gr3a	$\frac{NFNA^*_t - NFNA^*_{t-36}}{AT^*_t}$
Operating Profit before Depreciation Change 3yr	ebitda_gr3a	$\frac{EBITDA^*_t - EBITDA^*_{t-36}}{AT^*_t}$
Operating Profit after Depreciation Change 3yr	ebit_gr3a	$\frac{EBIT^*_t - EBIT^*_{t-36}}{AT^*_t}$
Operating Earnings to Equity Change 3yr	ope_gr3a	$\frac{OPE^*_t - OPE^*_{t-36}}{AT^*_t}$
Net Income Change 3yr	ni_gr3a	$\frac{NI^*_t - NI^*_{t-36}}{AT^*_t}$
Depreciation and Amortization Change 3yr	dp_gr3a	$\frac{DP_t - DP_{t-36}}{AT^*_t}$
Free Cash Flow Change 3yr	fcf_gr3a	$\frac{FCF^*_t - FCF^*_{t-36}}{AT^*_t}$
Net Working Capital Change 3yr	nwc_gr3a	$\frac{NWC^*_t - NWC^*_{t-36}}{AT^*_t}$

Name	Abbreviation	Construction
Inventory Change 1yr	inv_gr3a	$\frac{INV_t - INV_{t-36}}{AT^*_t}$
Non-Current Operating Liabilities Change 3yr	ncol_gr3a	$\frac{NCOL^*_t - NCOL^*_{t-36}}{AT^*_t}$
Net Income Including Extraordinary Items Change 3yr	nix_gr3a	$\frac{NIX^*_t - NIX^*_{t-36}}{AT^*_t}$
Equity Net Issuance Change 3yr	eqnetis_gr3a	$\frac{EQNETIS^*_t - EQNETIS^*_{t-36}}{AT^*_t}$
Net Long-Term Debt Issuance Change 3yr	dltnetis_gr3a	$\frac{DLTNETIS^*_t - DLTNETIS^*_{t-36}}{AT^*_t}$
Net Short-Term Debt Issuance Change 3yr	dstnetis_gr3a	$\frac{DSTNETIS^*_t - DSTNETIS^*_{t-36}}{AT^*_t}$
Net Debt Issuance Change 3yr	dbnetis_gr3a	$\frac{DBNETIS^*_t - DBNETIS^*_{t-36}}{AT^*_t}$
Net Issuance Change 3yr	netis_gr3a	$\frac{NETIS^*_t - NETIS^*_{t-36}}{AT^*_t}$
Financial Cash Flow Change 3yr	fincf_gr3a	$\frac{FINCF^*_t - FINCF^*_{t-36}}{AT^*_t}$
Net Working Capital Change 3yr	nwc_gr3a	$\frac{NWC^*_t - NWC^*_{t-36}}{AT^*_t}$
Equity Net Payout Change 3yr	eqnpo_gr3a	$\frac{EQNPO^*_t - EQNPO^*_{t-36}}{AT_t}$

Name	Abbreviation	Construction
Effective Tax Rate Change 3yr	tax_gr3a	$\frac{TAX_t - TAX_{t-36}}{AT_t}$
Dividend Payout Ratio Change 3yr	div_gr3a	$\frac{DIV^*_t - DIV^*_{t-36}}{AT_t}$
Equity Buyback Change 3yr	eqbb_gr3a	$\frac{EQBB^*_t - EQBB^*_{t-36}}{AT_t}$
Equity Issuance Change 3yr	eqis_gr3a	$\frac{EQIS^*_t - EQIS^*_{t-36}}{AT_t}$
Net Equity Payout Change 3yr	eqpo_gr3a	$\frac{EQPO^*_t - EQPO^*_{t-36}}{AT_t}$
Capital Expenditures Change 3yr	capx_gr3a	$\frac{CAPX_t - CAPX_{t-36}}{AT_t}$
<b>Investment</b>		
Capital Expenditures scaled by Assets	capx_at	$\frac{CAPX_t}{AT^*_t}$
R&D scaled by Assets	rd_at	$\frac{XRD_t}{AT^*_t}$
<b>Non-Recurring Items</b>		
Special Items scaled by Assets	spi_at	$\frac{SPI_t}{AT^*_t}$
Extraordinary Items and Discontinued Operations scaled by Assets	xido_at	$\frac{XIDO^*_t}{AT^*_t}$
Non-Recurring Items scaled by Assets	nri_at	$\frac{SPI_t + XIDO^*_t}{AT^*_t}$

Name	Abbreviation	Construction
<b>Profit Margins</b>		
Gross Profit Margin	gp_sale	$\frac{GP^*_t}{SALE^*_t}$
Operating Profit Margin before Depreciation	ebitda_sale	$\frac{EBITDA^*_t}{SALE^*_t}$
Operating Profit Margin after Depreciation	ebit_sale	$\frac{EBIT^*_t}{SALE^*_t}$
Pretax Profit Margin	pi_sale	$\frac{PI^*_t}{SALE^*_t}$
Net Profit Margin before XI	ni_sale	$\frac{NI^*_t}{SALE^*_t}$
Net Profit Margin	nix_sale	$\frac{NIX^*_t}{SALE^*_t}$
Free Cash Flow Margin	fcf_sale	$\frac{FCF^*_t}{SALE^*_t}$
Operating Cash Flow Margin	ocf_sale	$\frac{OCF^*_t}{SALE^*_t}$
<b>Return on Assets</b>		
Gross Profit scaled by Assets	gp_at	$\frac{GP^*_t}{AT^*_t}$
Operating Profit before Depreciation scaled by Assets	ebitda_at	$\frac{EBITDA^*_t}{AT^*_t}$
Operating Profit after Depreciation scaled by Assets	ebit_at	$\frac{EBIT^*_t}{AT^*_t}$

Name	Abbreviation	Construction
Firm Income scaled by Assets	fi_at	$\frac{FI^*_t}{AT^*_t}$
Cash Based Operating Profitability scaled by Assets	cop_at	$\frac{COP^*_t}{AT^*_t}$
<b>Return on Book Equity</b>		
Operating Profit to Equity scaled by BE	ope_be	$\frac{OPE^*_t}{BE^*_t}$
Net Income scaled by BE	ni_be	$\frac{NI^*_t}{BE^*_t}$
Net Income Including Extraordinary Items scaled by BE	nix_be	$\frac{NIX^*_t}{BE^*_t}$
Operating Cash Flow scaled by BE	ocf_be	$\frac{OCF^*_t}{BE^*_t}$
Free Cash Flow scaled by BE	fcf_be	$\frac{FCF^*_t}{BE^*_t}$
<b>Return on Invested Capital</b>		
Gross Profit scaled by BEV	gp_bev	$\frac{GP^*_t}{BEV^*_t}$
Operating Profit before Depreciation scaled by BEV	ebitda_bev	$\frac{EBITDA^*_t}{BEV^*_t}$
Operating Profit after Depreciation scaled by BEV	ebit_bev	$\frac{EBIT^*_t}{BEV^*_t}$
Firm Income scaled by BEV	fi_bev	$\frac{FI^*_t}{BEV^*_t}$

Name	Abbreviation	Construction
Cash Based Operating Profitability scaled by BEV	cop_bev	$\frac{COP^*_t}{BEV^*_t}$
<b>Return on Physical Capital</b>		
Gross Profit scaled by PPEN	gp_ppen	$\frac{GP^*_t}{PPEN_t}$
Operating Profit before Depreciation scaled by PPEN	ebitda_ppen	$\frac{EBITDA^*_t}{PPEN_t}$
Free Cash Flow scaled by PPEN	fcf_ppen	$\frac{FCF^*_t}{PPEN_t}$
<b>Issuance</b>		
Financial Cash Flow scaled by Assets	fincf_at	$\frac{FINCF^*_t}{AT^*_t}$
Net Issuance scaled by Assets	netis_at	$\frac{NETIS^*_t}{AT^*_t}$
Equity Net Issuance scaled by Assets	eqnetis_at	$\frac{EQNETIS^*_t}{AT^*_t}$
Equity Issuance scaled by Assets	eqis_at	$\frac{EQIS^*_t}{AT^*_t}$
Net Debt Issuance scaled by Assets	dbnetis_at	$\frac{DBNETIS^*_t}{AT^*_t}$
Net Long-Term Debt Issuance scaled by Assets	dltnetis_at	$\frac{DLTNETIS^*_t}{AT^*_t}$
Net Short-Term Debt Issuance scaled by Assets	dstnetis_at	$\frac{DSTNETIS^*_t}{AT^*_t}$



Name	Abbreviation	Construction
<b>Equity Payout</b>		
Equity Net Payout scaled by Assets	eqnpo_at	$\frac{EQNPO^*_t}{AT^*_t}$
Net Equity Payout scaled by Assets	eqbb_at	$\frac{EQBB^*_t}{AT^*_t}$
Total Dividends scaled by Assets	div_at	$\frac{DIV^*_t}{AT^*_t}$
<b>Accruals</b>		
Operating Accruals	oaccruals_at	$\frac{OACC^*_t}{AT^*_t}$
Percent Operating Accruals	oaccruals_ni	$\frac{OACC^*_t}{ NIX^*_t }$
Total Accruals	taccruals_at	$\frac{TACC^*_t}{AT^*_t}$
Percent Total Accruals	taccruals_ni	$\frac{TACC^*_t}{ NIX^*_t }$
Net Operating Asset to Total Assets	noa_at	$\frac{NOA^*_t}{AT^*_t}$
<b>Capitalization/Leverage Ratios</b>		
Common Equity scaled by BEV	be_bev	$\frac{BE^*_t}{BEV^*_t}$
Total Debt scaled by BEV	debt_bev	$\frac{DEBT^*_t}{BEV^*_t}$
Cash and Short-Term Investments scaled by BEV	cash_bev	$\frac{CASH_t}{BEV^*_t}$

Name	Abbreviation	Construction
Preferred Stock scaled by BEV	pstk_bev	$\frac{PSTK^*_t}{BEV^*_t}$
Long-Term Debt scaled by BEV	debtlt_bev	$\frac{DEBTLT_t}{BEV^*_t}$
Short-Term Debt scaled by BEV	debtst_bev	$\frac{DEBTST_t}{BEV^*_t}$
Total Debt scaled by MEV	debt_mev	$\frac{DEBT^*_t}{MEV^*_t}$
Preferred Stock scaled by MEV	pstk_mev	$\frac{PSTK^*_t}{MEV^*_t}$
Long-Term Debt scaled by MEV	debtlt_mev	$\frac{DEBTLT_t}{MEV^*_t}$
Short-Term Debt scaled by MEV	debtst_mev	$\frac{DEBTST_t}{MEV^*_t}$
<b>Financial Soundness Ratios</b>		
Interest scaled by Total Debt	int_debt	$\frac{INT_t}{DEBT^*_t}$
Interest scaled by Long-Term Debt	int_debtlt	$\frac{INT_t}{DEBTLT_t}$
Operating Profit before Depreciation scaled by Total Debt	ebitda_debt	$\frac{EBITDA^*_t}{DEBT^*_t}$
Profit before D&A scaled by Current Liabilities	profit_cl	$\frac{EBITDA^*_t}{CL^*_t}$

Name	Abbreviation	Construction
Operating Cash Flow scaled by Current Liabilities	ocf_cl	$\frac{OCF^*_t}{CL^*_t}$
Operating Cash Flow scaled by Total Debt	ocf_debt	$\frac{OCF^*_t}{DEBT^*_t}$
Cash Balance scaled by Total Liabilities	cash_lt	$\frac{CASH_t}{LT_t}$
Inventory scaled by Current Assets	inv_act	$\frac{INV_t}{ACT_t}$
Receivables scaled by Current Assets	rec_act	$\frac{REC_t}{ACT_t}$
Short-Term Debt scaled by Total Debt	debtst_debt	$\frac{DEBTST_t}{DEBT^*_t}$
Current Liabilities scaled by Total Liabilities	cl_lt	$\frac{CL^*_t}{LT_t}$
Long-Term Debt scaled by Total Debt	debtlt_debt	$\frac{DEBTLT_t}{DEBT^*_t}$
Operating Leverage	opex_at	$\frac{OPEX^*_t}{AT^*_t}$
Free Cash Flow scaled by Operating Cash Flow	fcf_ocf	$\frac{FCF^*_t}{OCF^*_t}$
Total Liabilities scaled by Total Tangible Assets	lt_ppen	$\frac{LT_t}{PPEN_t}$

Name	Abbreviation	Construction
Long-Term Debt to Book Equity	debtlt.be	$\frac{DEBTLT_t}{BE^*_t}$
Working Capital scaled by Assets	nwc.at	$\frac{NWC^*_t}{AT^*_t}$
<b>Solvency Ratios</b>		
Debt-to-Assets	debt.at	$\frac{DEBT^*_t}{AT^*_t}$
Debt to Shareholders' Equity Ratio	debt.be	$\frac{DEBT^*_t}{BE^*_t}$
Interest Coverage Ratio	ebit.int	$\frac{EBIT^*_t}{INT_t}$
<b>Liquidity Ratios</b>		
Days Inventory Outstanding	inv_days	$\frac{\frac{INV_t + INV_{t-12}}{2}}{COGS_t} \times 365$
Days Sales Outstanding	rec_days	$\frac{\frac{REC_t + REC_{t-12}}{2}}{SALE^*_t} \times 365$
Days Accounts Payable Outstanding	ap_days	$\frac{\frac{AP_t + AP_{t-12}}{2}}{COGS_t} \times 365$
Cash Conversion Cycle	cash_conversion	$INV\_DAYSt + REC\_DAYSt - AP\_DAYSt$
Cash Ratio	cash.cl	$\frac{CASH_t}{CL^*_t}$
Quick Ratio	caliq.cl	$\frac{CALIQ^*_t}{CL^*_t}$

Name	Abbreviation	Construction
Current Ratio	ca.cl	$\frac{CA^*_t}{CL^*_t}$
<b>Activity/Efficiency Ratios</b>		
Inventory Turnover	inv_turnover	$\frac{COGS_t}{(INV_t + INV_{t-12})/2}$
Asset Turnover	at_turnover	$\frac{SALE^*_t}{(AT^*_t + AT^*_{t-12})/2}$
Receivables Turnover	rec_turnover	$\frac{SALE^*_t}{(REC_t + REC_{t-12})/2}$
Account Payables Turnover	ap_turnover	$\frac{COGS_t + INV_t - INV_{t-12}}{(AP_t + AP_{t-12})/2}$
<b>Miscellaneous</b>		
Advertising scaled by Sales	adv.sale	$\frac{XAD_t}{SALE^*_t}$
Labor Expense scaled by Sales	staff.sale	$\frac{XLR_t}{SALE^*_t}$
Sales scaled by BEV	sale.bev	$\frac{SALE^*_t}{BEV^*_t}$
R&D scaled by Sales	rd.sale	$\frac{XRD_t}{SALE^*_t}$
Sales scaled by Total Stockholders' Equity	sale.be	$\frac{SALE^*_t}{BE^*_t}$
Dividend Payout Ratio	div.ni	$\frac{DVC_t}{NI^*_t}$

Name	Abbreviation	Construction
Sales scaled by Working Capital	sale_nwc	$\frac{SALE^*_t}{NWC^*_t}$
Effective Tax Rate	tax_pi	$\frac{TAX_t}{PI^*_t}$
<b>Balance Sheet Fundamental to Market Equity</b>		
Book Equity scaled by Market Equity	be_me	$\frac{BE^*_t}{ME_t}$
Total Assets scaled by Market Equity	at_me	$\frac{AT^*_t}{ME_t}$
Cash and Short-Term Investments scaled by Market Equity	cash_me	$\frac{CASH_t}{ME_t}$
<b>Income Fundamentals to Market Equity</b>		
Gross Profit scaled by ME	gp_me	$\frac{GP^*_t}{ME_t}$
Operating Profit before Depreciation scaled by ME	ebitda_me	$\frac{EBITDA^*_t}{ME_t}$
Operating Profit after Depreciation scaled by ME	ebit_me	$\frac{EBIT^*_t}{ME_t}$
Operating Earnings to Equity scaled by ME	ope_me	$\frac{OPE^*_t}{ME_t}$
Net Income scaled by ME	ni_me	$\frac{NI^*_t}{ME_t}$
Sales scaled by ME	sale_me	$\frac{SALE^*_t}{ME_t}$

Name	Abbreviation	Construction
Operating Cash Flow scaled by ME	ocf_me	$\frac{OCF^*_t}{ME_t}$
Free Cash Flow scaled by ME	fcf_me	$\frac{FCF^*_t}{ME_t}$
Net Income Including Extraordinary Items scaled by ME	nix_me	$\frac{NIX^*_t}{ME_t}$
Cash Based Operating Profitability scaled by ME	cop_me	$\frac{COP^*_t}{ME_t}$
R&D scaled by ME	rd_me	$\frac{XRD_t}{ME_t}$
<b>Balance Sheet Fundamentals to Market Enterprise Value</b>		
Book Equity scaled by MEV	be_mev	$\frac{BE^*_t}{MEV^*_t}$
Total Assets scaled by MEV	at_mev	$\frac{AT^*_t}{MEV^*_t}$
Cash and Short-Term Investments scaled by MEV	cash_mev	$\frac{CASH_t}{MEV^*_t}$
Book Enterprise Value scaled by MEV	bev_mev	$\frac{BEV^*_t}{MEV^*_t}$
Property, Plans and Equipment Net scaled by MEV	ppen_mev	$\frac{PPEN_t}{MEV^*_t}$
<b>Equity Payout/Issuance to Market Equity</b>		
Total Dividends scaled by ME	div_me	$\frac{DIV^*_t}{ME_t}$

Name	Abbreviation	Construction
Equity Buyback scaled by ME	eqbb_me	$\frac{EQBB^*_t}{ME_t}$
Equity Issuance scaled by ME	eqis_me	$\frac{EQIS^*_t}{ME_t}$
Net Equity Payout scaled by ME	eqpo_me	$\frac{EQPO^*_t}{ME_t}$
Equity Net Payout scaled by ME	eqnpo_me	$\frac{EQNPO^*_t}{ME_t}$
Equity Net Issuance scaled by ME	eqnetis_me	$\frac{EQNETIS^*_t}{ME_t}$
<b>Debt Issuance to Market Enterprise Value</b>		
Net Long-Term Debt Issuance scaled by MEV	dltnetis_mev	$\frac{DLTNETIS^*_t}{MEV^*_t}$
Net Short-Term Debt Issuance scaled by MEV	dstnetis_mev	$\frac{DSTNETIS^*_t}{MEV^*_t}$
Net Debt Issuance scaled by MEV	dbnetis_mev	$\frac{DBNETIS^*_t}{MEV^*_t}$
<b>Firm Payout/Issuance to Market Enterprise Value</b>		
Net Issuance scaled by MEV	netis_mev	$\frac{NETIS^*_t}{MEV^*_t}$
<b>Income Fundamentals to Market Enterprise Value</b>		
Gross Profit scaled by MEV	gp_mev	$\frac{GP^*_t}{MEV^*_t}$
Operating Profit before Depreciation scaled by MEV	ebitda_mev	$\frac{EBITDA^*_t}{MEV^*_t}$



Name	Abbreviation	Construction
Operating Profit after Depreciation scaled by MEV	ebit_mev	$\frac{EBIT^*_t}{MEV^*_t}$
Sales scaled by MEV	sale_mev	$\frac{SALE^*_t}{MEV^*_t}$
Operating Cash Flow scaled by MEV	ocf_mev	$\frac{OCF^*_t}{MEV^*_t}$
Free Cash Flow scaled by MEV	fcf_mev	$\frac{FCF^*_t}{MEV^*_t}$
Cash Based Operating Profitability scaled by MEV	cop_mev	$\frac{COP^*_t}{MEV^*_t}$
Financial Cash Flow Change scaled by MEV	fincf_mev	$\frac{FINCF^*_t}{MEV^*_t}$
<b>New Variables not in HXZ</b>		
Net Income to Sales Quarterly Volatility	niq_saleq_std	$\sigma_{8Q} \left( \frac{NI\_QTR^*_t}{SALE\_QTR^*_t} \right)$
Net Income scaled by Employees	ni_emp	$\frac{NI^*_t}{EMP_t}$
Sales scaled by Employees	sale_emp	$\frac{SALE^*_t}{EMP_t}$
Net Income scaled by Assets	ni_at	$\frac{NI^*_t}{AT^*_t}$
Operating Cash Flow scaled by Assets	ocf_at	$\frac{OCF^*_t}{AT^*_t}$

Name	Abbreviation	Construction
Operating Cash Flow to Assets 1 yr Change	ocf_at_chgl	$OCF\_AT_t - OCF\_AT_{t-12}$
Quarterly ROE Volatility	roeq_be_std	$\sigma_{16Q} \left( \frac{NI\_QTR^*_t}{BE^*_t} \right)$
ROE Volatility	roe_be_std	$\sigma_{60M} \left( \frac{NI^*_t}{BE^*_t} \right)$
Gross Product to Assets 5 yr Change	gpoa_ch5	$\frac{GP^*_t}{AT^*_t} - \frac{GP^*_{t-60}}{AT^*_{t-60}}$
ROE 5 yr Change	roe_ch5	$\frac{NI^*_t}{BE^*_t} - \frac{NI^*_{t-60}}{BE^*_{t-60}}$
ROA 5 yr Change	roa_ch5	$\frac{NI^*_t}{AT^*_t} - \frac{NI^*_{t-60}}{AT^*_{t-60}}$
Operating Cash Flow to Assets 5 yr Change	cfoa_ch5	$\frac{OCF^*_t}{AT^*_t} - \frac{OCF^*_{t-60}}{AT^*_{t-60}}$
Gross Product to Sales 5 yr Change	gmar_ch5	$\frac{GP^*_t}{SALE^*_t} - \frac{GP^*_{t-60}}{SALE^*_{t-60}}$
<b>New Variables from HXZ</b>		
Cash and Short Term Investments scaled by Assets	cash_at	$\frac{CASH_t}{AT^*_t}$
Number of Consecutive Earnings Increases Change in Property, Plant and Equipment Less Inventories scaled by lagged Assets	ni_inc8q ppeinv_gr1a	Count number of earnings increases over past 8 quarters  $\frac{PPEINV^*_t - PPEINV^*_{t-12}}{AT^*_{t-12}}$
Change in Long-Term NOA scaled by average Assets	lnoa_gr1a	$\frac{LNOA^*_t - LNOA^*_{t-12}}{AT^*_t - AT^*_{t-12}}$

Name	Abbreviation	Construction
CAPX 1 year growth	capx_gr1	$\frac{CAPX_t}{CAPX_{t-12}} - 1$
CAPX 2 year growth	capx_gr2	$\frac{CAPX_t}{CAPX_{t-24}} - 1$
CAPX 3 year growth	capx_gr3	$\frac{CAPX_t}{CAPX_{t-36}} - 1$
Change in Short-Term Investments scaled by Assets	sti_gr1a	$\frac{IVST_t - IVST_{t-12}}{AT^*_t}$
Quarterly Income scaled by BE	niq_be	$\frac{NI\_QTR^*_t}{BE^*_{t-3}}$
Change in Quarterly Income scaled by BE	niq_be_chg1	$NIQ\_BE_t - NIQ\_BE_{t-12}$
Quarterly Income scaled by AT	niq_at	$\frac{NI\_QTR^*_t}{AT^*_{t-3}}$
Change in Quarterly Income scaled by AT	niq_at_chg1	$NIQ\_AT_t - NIQ\_AT_{t-12}$
Quarterly Sales Growth	saleq_gr1	$\frac{SALE\_QTR^*_t}{SALE\_QTR^*_{t-12}} - 1$
R&D Capital-to-Assets	rd5_at	$\frac{\sum_{n=0}^4 (1 - .2 \times n)(XRD_{t-12*n})}{AT^*_t}$
Age Change Sales minus Change Inventory	age dsale_dinv	Age of the firms in months  $CHG\_TO\_EXP(SALE^*_t) - CHG\_TO\_EXP(INV_t)$

Name	Abbreviation	Construction
Change Sales minus Change Receivables	dsale_drec	$CHG\_TO\_EXP(SALE^*_t) - CHG\_TO\_EXP(REC_t)$
Change Gross Profit minus Change Sales	dgp_dsale	$CHG\_TO\_EXP(GP^*_t) - CHG\_TO\_EXP(SALE^*_t)$
Change Sales minus Change SG&A	dsale_dsga	$CHG\_TO\_EXP(SALE^*_t) - CHG\_TO\_EXP(XSGA_t)$
Earnings Surprise	saleq_su	$SUR(SALE\_QTR^*)$
Revenue Surprise	niq_su	$SUR(NI\_QTR^*)$
Total Debt scaled by ME	debt_me	$\frac{DEBT^*_t}{ME_t}$
Net Debt scaled by ME	netdebt_me	$\frac{NETDEBT^*_t}{ME_t}$
Abnormal Corporate Investment	capex_abn	$\frac{CAPX\_SALE^*_t}{(CAPX\_SALE^*_{t-12} + CAPX\_SALE^*_{t-24} + CAPX\_SALE^*_{t-36})/3} - 1$
Inventory Change 1 yr	inv_gr1	$\frac{INV_t}{INV_{t-12}} - 1$
Book Equity Change 1 yr scaled by Assets	be_gr1a	$\frac{BE^*_t - BE^*_{t-12}}{AT^*_t}$
Ball Operating Profit to Assets	op_at	$\frac{OP^*_t}{AT^*_t}$
Earnings before Tax and Extraordinary Items to Net Income Including Extraordinary Items	pi_nix	$\frac{PI^*_t}{NIX^*_t}$

Name	Abbreviation	Construction
Ball Operating Profit scaled by lagged Assets	op_atl1	$\frac{OP^*_t}{AT^*_{t-12}}$
Operating Profit scaled by lagged Book Equity	ope_bel1	$\frac{OPE^*_t}{BE^*_{t-12}}$
Gross Profit scaled by lagged Assets	gp_atl1	$\frac{GP^*_t}{AT^*_{t-12}}$
Cash Based Operating Profitability scaled by lagged Assets	cop_atl1	$\frac{COP^*_t}{AT^*_{t-12}}$
Book Leverage	at_be	$\frac{AT^*_t}{BE^*_t}$
Operating Cash Flow to Sales Quarterly Volatility	ocfq_saleq_std	$\sigma_{16Q} \left( \frac{OCF\_QTR^*_t}{SALE\_QTR^*_t} \right)$
Liquidity scaled by lagged Assets	aliq_at	$\frac{ALIQ^*_t}{AT^*_{t-12}}$
Liquidity scaled by lagged Market Assets	aliq_mat	$\frac{ALIQ^*_t}{MAT^*_{t-12}}$
Tangibility	tangibility	$\frac{CASH_t + 0.715 \times REC_t + 0.547 \times INV_t + 0.535 \times PPEG_t}{AT^*_t}$
Equity Duration Piotroski F-Score Ohlson O-Score Altman Z-Score Kaplan-Zingales Index Intrinsic ROE Sales scaled by Employees Growth 1 yr	eq_dur f_score o_score z_score kz_index intrinsic_value sale_emp_gr1	<p>Outlined in detail <a href="#">here</a>            Outlined in detail <a href="#">here</a>            Outlined in detail <a href="#">here</a>            Outlined in detail <a href="#">here</a>            Outlined in detail <a href="#">here</a>            Outlined in detail <a href="#">here</a></p> $\frac{SALE\_EMP_t}{SALE\_EMP_{t-12}} - 1$

Name	Abbreviation	Construction
Employee Growth 1 yr	emp-gr1	$\frac{EMP_t - EMP_{t-12}}{0.5 \times EMP_t + 0.5 \times EMP_{t-12}}$
Earnings Variability	earnings_variability	$\frac{\sigma_{60M}(NI^*_t/AT^*_{t-12})}{\sigma_{60M}(OCF^*_t/AT^*_{t-12})}$
1 yr lagged Net Income to Assets	ni_ar1	$\frac{NI^*_{t-12}}{AT^*_{t-12}}$
Net Income Idiosyncratic Volatility	ni_ivol	Outlined in detail <a href="#">here</a>

## 7 Market Based Characteristics

### 7.1 Datasets

- CRSP.MSF
- CRSP.DSF
- COMP.SECD
- COMP.G\_SECD
- COMP.FUNDQ
- COMP.FUNDA
- COMP.SECM
- COMP.SECURITY
- COMP.G\_SECURITY

## 8 Market Based Characteristics

### 8.1 Datasets

- CRSP.MSF
- CRSP.DSF
- COMP.SECD
- COMP.G\_SECD

- COMP.FUNDQ
- COMP.FUNDA
- COMP.SECM
- COMP.SECURITY
- COMP.G\_SECURITY

## 8.2 Market Variables

The abbreviation is used to refer to the accounting variable. A suffix of '\*' indicates that we have altered the original Compustat item to increase the coverage. The characteristic name will reflect the accounting name except the '\*' suffix. As an example, 'gp\_at' is gross profit scaled by assets. In general, we will refer to Compustat variables using capital letters. We use the CRSP Market Variable values if they are available, and if they are not, we use the Compustat Market Variables.

Table 6: Market Variables

Name	Abbreviation	Construction
<b>CRSP Variables<sup>5</sup></b>		
Share Adjustment Factor	adjfct*	We use CFACSHR
Shares	shares*	We use SHROUT/1000 so shares outstanding are in millions.
Price	prc*	We use  PRC
Local Price	prc.local*	We use PRC*
Highest Daily Price/Ask	prc_high	We use ASKHI. If PRC* or AKSHI are negative, then PRC_HIGH is set to missing
Lowest Daily Price/Bid	prc_low	We use BIDLO. If PRC* or BIDLO are negative, then PRC_LOW is set to missing
Adjusted Proce	prc_adj*	We use PRC*×ADJFCT*
Market Equity	me*	We use PRC*×SHARES* so market equity is quoted in million USD.
Company Market Equity	me_company*	We sum ME* grouped by PERMNO and date
Dollar Volume	dolvol*	We use VOL×PRC*
Return	RET*	We use RET
Local Return	ret.local*	We use RET
Excess Return	ret_exc*	We use (RET*-T30RET)/21. If T30RET is unavailable, we use RF. If the return is a daily return rather than a monthly return, the RET - T30RET is divided by 1 rather than 21.
Excess Return t+1	ret_exc_lead1m*	Excess return (ret_exc*) in month t+1
Time Since Most Recent Return	ret_lag_dif*	We automatically set this to 1
Cumulative Return	ri*	This is the cumulative return estimated from RET*
Monthly Dividend	div_tot*	We use (RET - RETX)×lag(PRC*)×(CFACSHR/lag(CFACSHR))
<b>Compustat Variables</b>		
Share Adjustment Factor	adjfct*	We use AJEXDI
Shares	shares*	We use CSHOC/1000000
Price	prc*	We use PRC_LOCAL*×FX <sup>6</sup>
Local Price	prc.local*	We use PRCCD
Market Equity	me*	We use PRC*×SHARES*
Company Market Equity	me_company*	We use ME*
Dollar Volume	dolvol*	We use CSHTRD×PRC*
Return	RET*	We use RET_LOCAL*×FX

<sup>5</sup>lag is a lag function where lag(x) is the value of x from the previous time period

<sup>6</sup>FX scales the price to USD

Name	Abbreviation	Construction
Excess Return	ret_exc*	We use $(RET^* - T30RET)/21$ . If T30RET is unavailable, we use RF. If the return is a daily return rather than a monthly return, the RET - T30RET is divided by 1 rather than 21.
Excess Return t+1	ret_exc_lead1m*	Excess return (ret_exc*) in month t+1
Cumulative Return - Local	ri_local*	We use $PRC\_LOCAL^* \times TRFD/AJEXDI$
Local Return	ret_local*	We use $RILOCAL^*/\log(RILOCAL^*) - 1$
Time Since Most Recent Return	ret_lag_dif*	We estimate the number of days since the previous return. If the returns are monthly rather than daily, then the time is in months
Cumulative Return	ri*	$RILOCAL^* \times FX^*$
Monthly Dividend	div_tot*	We use $DIV \times FX^*$ . If DIV is missing, we set it to zero
Cash Dividend	div_cash*	We use $DIVD \times FX^*$ . If DIVD is unavailable, we set it to zero
Special Cash Dividend	div_spc*	We use $DIVSP \times FX^*$ . If DIVSP is unavailable, we set it to zero
Bid-Ask Average Dummy	bidask*	When $PRCSTD = 4$ then 1, otherwise 0
<b>Asset Pricing Factors</b>		
Excess Market Return	mktrf*	Country specific market return
High Minus Low	hml*	Country specific factor following Fama and French (1993) and using breakpoints from non-micro cap stocks within the country
Small Minus Big ala Fama-French	smb_ff*	Average of small portfolios minus average of large portfolios from hml*
Return on Equity	roe*	Country specific factor following Hou, Xue and Zhang (2015) and using breakpoints from non-micro cap stocks within the country. We use double sorts on return on equity and size rather than triple sorts with investment, due to the limited number of stocks in some international markets.
Investment	inv*	Country specific factor following Hou, Xue and Zhang (2015) and using breakpoints from non-micro cap stocks within the country. We use double sorts on investment and size rather than triple sorts with return on equity, due to the limited number of stocks in some international markets
Small Minus Big ala Hou et al	smb_hxz*	Average of small portfolios minus average of large portfolios from roe* and inv*
Market Volatility for Each Stock	_mktvol_zd*	$\sigma_{zD}(MKTRF^*_t)$ <sup>7</sup>

Table 7: Market Characteristics

Name	Abbreviation	Construction
<b>Size Based Measures</b>		
Market Equity	market_equity	$ME^*_t$
<b>Total Dividend Paid to Market Equity</b>		
Dividend to Price - 1 Month	div1m_me	$\frac{DIV\_TOT^*_t \times SHARES^*_t}{ME^*_t}$
Dividend to Price - 3 Months	div3m_me	$\frac{\sum_{n=0}^2 DIV\_TOT^*_{t-n} \times SHARES^*_{t-n}}{ME^*_t}$

<sup>7</sup>Must have enough non-missing values of stock to be estimated



Name	Abbreviation	Construction
Dividend to Price - 6 Months	div6m_me	$\frac{\sum_{n=0}^5 DIV\_TOT^*_{t-n} \times SHARES^*_{t-n}}{ME^*_t}$
Dividend to Price - 12 Months	div12m_me	$\frac{\sum_{n=0}^{11} DIV\_TOT^*_{t-n} \times SHARES^*_{t-n}}{ME^*_t}$
<b>Special Dividend Paid to Market Equity</b>		
Special Dividend to Price - 1 Month	divspc1m_me	$\frac{DIV\_SPC^*_t \times SHARES^*_t}{ME^*_t}$
Special Dividend to Price - 12 Month	divsp12m_me	$\frac{\sum_{n=0}^{11} DIV\_SPC^*_{t-n} \times SHARES^*_{t-n}}{ME^*_t}$
<b>Change in Shares Outstanding</b>		
Change in Shares - 1 Month	chcsho.1m	$\frac{SHARES^*_t \times ADJFCT^*_t}{SHARES^*_{t-1} \times ADJFCT^*_{t-1}} - 1$
Change in Shares - 3 Month	chcsho.3m	$\frac{SHARES^*_t \times ADJFCT^*_t}{SHARES^*_{t-3} \times ADJFCT^*_{t-3}} - 1$
Change in Shares - 6 Month	chcsho.6m	$\frac{SHARES^*_t \times ADJFCT^*_t}{SHARES^*_{t-6} \times ADJFCT^*_{t-6}} - 1$
Change in Shares - 12 Month	chcsho.12m	$\frac{SHARES^*_t \times ADJFCT^*_t}{SHARES^*_{t-12} \times ADJFCT^*_{t-12}} - 1$
<b>Net Equity Payout</b>		
Net Equity Payout - 1 Month	eqnpo.1m	$\log\left(\frac{RI^*_t}{RI^*_{t-1}}\right) - \log\left(\frac{ME^*_t}{ME^*_{t-1}}\right)$
Net Equity Payout - 3 Month	eqnpo.3m	$\log\left(\frac{RI^*_t}{RI^*_{t-3}}\right) - \log\left(\frac{ME^*_t}{ME^*_{t-3}}\right)$

Name	Abbreviation	Construction
Net Equity Payout - 6 Month	eqnpo_6m	$\log\left(\frac{RI^*_t}{RI^*_{t-6}}\right) - \log\left(\frac{ME^*_t}{ME^*_{t-6}}\right)$
Net Equity Payout - 12 Month	eqnpo_12m	$\log\left(\frac{RI^*_t}{RI^*_{t-12}}\right) - \log\left(\frac{ME^*_t}{ME^*_{t-12}}\right)$
<b>Momentum/Reversal</b>		
Short Term Reversal	ret_1.0	$\frac{RI^*_t}{RI^*_{t-1}} - 1$
Momentum 0-2 Months	ret_2.0	$\frac{RI^*_t}{RI^*_{t-2}} - 1$
Momentum 0-3 Months	ret_3.0	$\frac{RI^*_t}{RI^*_{t-3}} - 1$
Momentum 1-3 Months	ret_3.1	$\frac{RI^*_{t-1}}{RI^*_{t-3}} - 1$
Momentum 0-6 Months	ret_6.0	$\frac{RI^*_t}{RI^*_{t-6}} - 1$
Momentum 1-6 Months	ret_6.1	$\frac{RI^*_{t-1}}{RI^*_{t-6}} - 1$
Momentum 0-9 Months	ret_9.0	$\frac{RI^*_t}{RI^*_{t-9}} - 1$
Momentum 1-9 Months	ret_9.1	$\frac{RI^*_{t-1}}{RI^*_{t-9}} - 1$
Momentum 0-12 Months	ret_12.0	$\frac{RI^*_t}{RI^*_{t-12}} - 1$

Name	Abbreviation	Construction
Momentum 1-12 Months	ret_12_1	$\frac{RI^*_{t-1}}{RI^*_{t-12}} - 1$
Momentum 7-12 Months	ret_12_7	$\frac{RI^*_{t-7}}{RI^*_{t-12}} - 1$
Momentum 1-18 Months	ret_18_1	$\frac{RI^*_{t-1}}{RI^*_{t-18}} - 1$
Momentum 1-24 Months	ret_24_1	$\frac{RI^*_{t-1}}{RI^*_{t-24}} - 1$
Momentum 12-24 Months	ret_24_12	$\frac{RI^*_{t-12}}{RI^*_{t-24}} - 1$
Momentum 1-36 Months	ret_36_1	$\frac{RI^*_{t-1}}{RI^*_{t-36}} - 1$
Momentum 12-36 Months	ret_36_12	$\frac{RI^*_{t-12}}{RI^*_{t-36}} - 1$
Momentum 1-48 Months	ret_48_1	$\frac{RI^*_{t-1}}{RI^*_{t-48}} - 1$
Momentum 12-48 Months	ret_48_12	$\frac{RI^*_{t-12}}{RI^*_{t-48}} - 1$
Momentum 1-60 Months	ret_60_1	$\frac{RI^*_{t-1}}{RI^*_{t-60}} - 1$
Momentum 12-60 Months	ret_60_12	$\frac{RI^*_{t-12}}{RI^*_{t-60}} - 1$

Name	Abbreviation	Construction
Momentum 36-60 Months	ret_60_36	$\frac{RI^*_{t-36}}{RI^*_{t-60}} - 1$
<b>Seasonality</b>		
1 Year Annual Seasonality	seas_1_1an	Return in month t-12
2 - 5 Year Annual Seasonality	seas_2_5an	Average return over annual lags from year t-2 to t-5
6 - 10 Year Annual Seasonality	seas_6_10an	Average return over annual lags from year t-6 to t-10
11 - 15 Year Annual Seasonality	seas_11_15an	Average return over annual lags from year t-11 to t-15
16 - 20 Year Annual Seasonality	seas_16_20an	Average return over annual lags from year t-16 to t-20)
1 Year Non-Annual Seasonality	seas_1_1na	Average return from month t-1 to t-11
2 - 5 Year Non-Annual Seasonality	seas_2_5na	Average return over non-annual lags from year t-2 to t-5
6 - 10 Year Non-Annual Seasonality	seas_6_10na	Average return over non-annual lags from year t-6 to t-10
11 - 15 Year Non-Annual Seasonality	seas_11_15na	Average return over non-annual lags from year t-11 to t-15
16 - 20 Year Non-Annual Seasonality	seas_16_20na	Average return over non-annual lags from year t-16 to t-20
<b>Combined Accounting and Market Based Characteristics</b>		
Let $e_t$ be defined as described <a href="#">here</a>		
60 Month CAPM Beta	beta_60m	$\frac{COVAR\_60M(RET^*_t, MKTRF^*_t)}{VARC\_60M(MKTRF^*_t)}$
Performance Based Mispricing	mispricing_perf <sup>8</sup>	$\frac{1}{4}(O\_SCORE_t^{r01} + RET\_12\_1_t^{r01} + GP\_AT_t^{r01} + NIQ\_AT_t^{r01})$
Management Based Mispricing	mispricing_mgmt	$\frac{1}{6}(CHCSHO\_12M_t^{r01} + EQNPO\_12M_t^{r01} + OACCRUALS\_AT_t^{r01} + NOA\_AT_t^{r01} + AT\_GR1_t^{r01} + PPEINV\_GR1A_t^{r01})$
Residual Momentum - 6 Month	resff3_6_1	$-1 + \prod_{n=1}^6 1 + e_{t-n}$
Residual Momentum - 12 Month	resff3_12_1	$-1 + \prod_{n=1}^{12} 1 + e_{t-n}$
<b>Daily Market Data<sup>9</sup></b>		
Let $e_t$ be defined as described <a href="#">here</a>		
Return Volatility	rvol_zd	$\sigma_{zD}(RET\_EXC^*_t)$

<sup>8</sup>A rank characteristic has the value of that characteristics rank with respect to other companies' same characteristic of the same month and country scaled [0, 1]. This is identified with a "r01" superscript.

<sup>9</sup>Many of the variables in this section are estimated using rolling windows of data, and the variables are estimated using a variety of window lengths: 21, 126, 252 and 1260 days. In this section, I refer to the number of days as m as a proxy for any of the possible window lengths.

Name	Abbreviation	Construction
Maximum Return	rmax1_zd	$MAX1\_zD(RET^*_t)$
Mean Maximum Return	rmax5_zd	$\frac{1}{5} \sum_{n=1}^5 X_n, \quad X_n \in MAX5\_zD(RET^*)$
Return Skewness	rskew_zd	$SKEW\_zD(RET\_EXC^*_t)$
Price-to-High	prc_highprc_zd	$\frac{PRC\_ADJ^*_t}{MAX1\_zD(PRC\_ADJ^*_t)}$
Amihud (2002) Measure	ami_zd	$\left( \frac{ RET^*_t }{DOLVOL^*_t} \right)_{zD} * 1000000$
CAPM Beta CAPM Idiosyncratic Vol. CAPM Skewness	beta_zd ivol_capm_zd iskew_capm_zd	Described in detail <a href="#">here</a> Described in detail <a href="#">here</a> Described in detail <a href="#">here</a>
Coskewness	coskew_zd <sup>10</sup>	$\frac{\overline{(\epsilon_t \times MKTRF\_DM_t^2)_{zD}}}{\sqrt{\overline{(\epsilon_t^2)_{zD}} \times \overline{(MKTRF\_DM_t^2)_{zD}}}}$
Fama and French Idiosyncratic Vol. Fama and French Skewness Hou, Xue and Zhang Idiosyncratic Vol. Hou, Xue and Zhang Skewness Dimson Beta Downside Beta	ivol_ff3_zd iskew_ff3_zd ivol_hxz4_zd iskew_hxz4_zd beta_dimson_zd betadown_zd	Described in detail <a href="#">here</a> Described in detail <a href="#">here</a> Described in detail <a href="#">here</a> Described in detail <a href="#">here</a> Created as described in Dimson (1979) Described in detail <a href="#">here</a>
Zero Trades	zero_trades_zd	Number of days with zero trades over period. In case of equal number of zero trading days, turnover_zd will decide on the rank following Liu (2006)
Turnover	turnover_zd	$\left( \frac{TVOL^*_t}{SHARES^*_t * 1000000} \right)_{zD}$
Turnover Volatility	turnover_var_zd	$\frac{\sigma_{zD}((TVOL^*_t / SHARES^*_t) * 1000000)}{TURNOVER\_zDt}$

<sup>10</sup>  $MKTRF\_DM_t = MKTRF^*_t - \overline{MKTRF^*}_{tzD}$

Name	Abbreviation	Construction
Dollar Volume	dolvol_zd	$\overline{DOLVOL^*_{t_zD}}$
Dollar Volume Volatility	dolvol_var_zd	$\frac{\sigma_{zD}(DOLVOL^*_t)}{DOLVOL_{zD_t}}$
Correlation to Market	corr_zd	The correlation between $RET\_EXC^*_{3l} = RET\_EXC^*_t + RET\_EXC^*_{t-1} + RET\_EXC^*_{t-2}$ and $MKT\_EXC_{3l} = MKTRF^*_t + MKTRF^*_{t-1} + MKTRF^*_{t-2}$
Betting Against Beta	betabab_1260d	$\frac{CORR\_1260d_t \times RVOL\_252d_t}{\_MKTVOL\_252d^*_t}$
Max Return to Volatility	rmax5_rvol_21d	$\frac{RMAX5\_21d_t}{RVOL\_252d_t}$
21 Day Bid-Ask High-Low	bidaskhl_21d	High-low bid ask estimator created using code from Corwin and Schultz (2012)
<b>Quality Minus Junk</b>		
Quality Minus Junk - Profit	qmj-prof	$ZV\left(ZV(GP\_AT_t) + ZV(NI\_BE_t) + ZV(NI\_AT_t) + ZV(OCF\_AT_t) + ZV(GP\_SALE^*_t) + ZV(OACCRUALS\_AT_t)\right)$
Quality Minus Junk - Growth	qmj-growth	$ZV\left(ZV(GPOA\_CH5_t) + ZV(ROE\_CH5_t) + ZV(ROA\_CH5_t) + ZV(CFOA\_CH5_t) + ZV(GMAR\_CH5_t)\right)$
Quality Minus Junk - Safety	qmj_safety	$ZV\left(ZV(BETABAB\_1260d_t) + ZV(DEBT\_AT_t) + ZV(O\_SCORE_t) + ZV(Z\_SCORE_t) + ZV(\_EVOL_t)\right)$
Quality Minus Junk	qmj	$\frac{QMJ\_PROF_t + QMJ\_GROWTH_t + QMJ\_SAFETY_t}{3}$

## 9 Detailed Characteristic Construction

This section includes detailed descriptions how we built characteristics that don't easily fit into the Accounting Characteristics or Market Characteristics tables.

- [Equity Duration](#)

- Define the following variables:

- \* horizon: number of months used to estimate helper variables

- \*  $r$ : constant used as assumed discount rate
  - \*  $roe\_mean$ : constant used as the average ROE value
  - \*  $roe\_ar1$ : constant used as the expected growth rate of ROE
  - \*  $g\_mean$ : constant used as the average sales growth rate
  - \*  $g\_ar1$ : constant used as the expected growth rate of sales
- Create initial variables:

$$\begin{aligned} \_roe0 &= \frac{NI_t^*}{BE_{t-12}^*} \\ \_g0 &= \frac{SALE_t^*}{SALE_{t-12}^*} - 1 \\ \_be0 &= BE_t^* \end{aligned}$$

- \* If the number of non-missing observations is less than or equal to 12 or the variables' respective denominators are less than or equal to 1  $\_roe0_t$  and  $\_g0_t$  are set to missing.
- Forecast cash distributions

$$\begin{aligned} roe\_c &= roe\_mean \times (1 - roe\_ar1) \\ g\_c &= g\_mean \times (1 - g\_ar1) \\ \_roe_t &= \sum_{i=1}^{horizon} roe\_c + roe\_ar1 \times \_roe_{t-i} \\ \_g_t &= \sum_{i=1}^{horizon} g\_c + g\_ar1 \times \_g_{t-i} \\ \_be_t &= \sum_{i=1}^{horizon} \_be_{t-i} \times (1 + \_g_t) \\ \_cd_t &= \sum_{i=1}^{horizon} \_be_t \times (\_roe_t - \_g_t) \end{aligned}$$

- Create duration helper variables <sup>11</sup>

$$\begin{aligned} ed\_constant &= horizon + \frac{1+r}{r} \\ ed\_cw\_w_t &= \sum_{i=1}^{horizon} ed\_cd\_w_{i-1} + i \times \frac{\_cd_t}{(1+r)^i} \\ ed\_cd_t &= \sum_{i=1}^{horizon} ed\_cd_{i-1} + \frac{\_cd_t}{(1+r)^i} \end{aligned}$$

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<sup>11</sup> $ed\_cw\_w$ ,  $ed\_cd$  and  $ed\_err$  are equal to 0 at  $i = 1$ .  $ed\_cw\_w$  and  $ed\_cd$  recursively build upon themselves over the length of the horizon, so  $ed\_cw\_w_{i-1}$ , for example, would be the previous iteration of  $ed\_cw\_w$

- Characteristic:

$$eq\_dur_t = \frac{ed\_ed\_wt \times FX_t}{ME\_COMPANY_t} + ed\_constant \times \frac{ME\_COMPANY_t - ed\_cd_t \times FX_t}{ME\_COMPANY_t}$$

- Piotroski F-Score

- Create helper variables:

$$\begin{aligned} \_f\_roa_t &= \frac{NI^*_t}{AT^*_{t-12}} \\ \_f\_croa_t &= \frac{OCF^*_t}{AT^*_{t-12}} \\ \_f\_droa_t &= \_f\_roa_t - \_f\_roa_{t-12} \\ \_f\_acc_t &= \_f\_croa_t - \_f\_roa_t \\ \_f\_lev &= \frac{DLTT_t}{AT^*_t} - \frac{DLTT_{t-12}}{AT^*_{t-12}} \\ \_f\_liq_t &= \frac{CA^*_t}{CL^*_t} - \frac{CA^*_{t-12}}{CL^*_{t-12}} \\ \_f\_eqis_t &= EQIS^*_t \\ \_f\_gm_t &= \frac{GP^*_t}{SALE^*_t} - \frac{GP^*_{t-12}}{SALE^*_{t-12}} \\ \_f\_aturn_t &= \frac{SALE^*_t}{AT^*_{t-12}} - \frac{SALE^*_{t-12}}{AT^*_{t-24}} \end{aligned}$$

- \* For all variables except  $\_f\_acc$ ,  $\_f\_aturn$ ,  $\_f\_eqis$ , if the count of available observations is less than or equal to 12, then the variable is set to missing. If  $\_f\_aturn$  has less than or equal to 24 non-missing observations, it is set to missing. If a variable has  $AT^*_t$  or  $AT^*_{t-12}$  as an input and  $AT^*_t \leq 0$  or  $AT^*_{t-12} \leq 0$ , then it is set to missing. If  $CL^*_t \leq 0$  or  $CL^*_{t-12} \leq 0$  then  $\_f\_liq_t$  is set to missing. If  $SALE^*_t \leq 0$  or  $SALE^*_{t-12} \leq 0$  then  $\_f\_gm_t$  is set to missing.

- Characteristic<sup>12</sup>

$$\begin{aligned} f\_score_t &= \_f\_roa_{>0,t} + \_f\_croa_{>0,t} + \_f\_droa_{>0,t} + \_f\_acc_{>0,t} + \\ &\quad \_f\_lev_{<0,t} + \_f\_liq_{>0,t} + \_f\_eqis_{=0,t} + \_f\_gm_{>0,t} + \_f\_aturn_{>0,t} \end{aligned}$$

- Ohlson O-Score

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<sup>12</sup>A subscript of  $> 0$ , ex:  $VAR_{t>0,t}$ , is a dummy for if the variable is greater than zero, and it is defined similarly for  $VAR_{t<0,t}$  or any other specification. Otherwise, not included as an input. Also, if any variables other than  $\_f\_eqis_t$  are missing, then  $f\_score_t$  is set to missing.



- Create helper variables:

$$\_o\_lat_t = AT^*_{t-1}$$

$$\_o\_lev_t = \frac{DEBT^*_t}{AT^*_t}$$

$$\_o\_wc_t = \frac{CA^*_t - CL^*_t}{AT^*_t}$$

$$\_o\_roe_t = \frac{NIX^*_t}{AT^*_t}$$

$$\_o\_cacr_t = \frac{CL^*_t}{CA^*_t}$$

$$\_o\_ffo_t = \frac{PI^*_t + DP_t}{LT_t}$$

$$\_o\_neg\_eq_t = 1 \text{ if } LT_t > AT^*_t, \text{ otherwise } 0$$

$$\_o\_neg\_earn_t = 1 \text{ if } NIX^*_t < 0 \text{ and } NIX^*_{t-12} < 0$$

$$\_o\_nich_t = \frac{NIX^*_t - NIX^*_{t-12}}{|NIX^*_t| + |NIX^*_{t-12}|}$$

- \* If  $AT^*_t \leq 0$ , then  $\_o\_lat_t$ ,  $\_o\_lev_t$ ,  $\_o\_wc_t$ , and  $\_o\_roe_t$  are set to missing. If  $CA^*_t \leq 0$  then  $\_o\_cacr_t$  is set to missing. If  $LT_t \leq 0$  then  $\_o\_ffo_t$  is set to missing. If  $LT_t$  or  $AT^*_t$  are missing, then  $\_o\_neg\_eq_t$  is set to missing. If there are less than or equal to 12 observations or either of  $NIX^*_t$  and  $NIX^*_{t-12}$  are missing, then  $\_o\_nich_t$  and  $\_o\_neg\_earn_t$  are set to missing.

- Characteristic:

$$\begin{aligned} o\_score_t = & -1.37 - 0.407 \times \_o\_lat_t + 6.03 \times \_o\_lev_t + 1.43 \times \_o\_wc_t + \\ & 0.076 \times \_o\_cacr_t - 1.72 \times \_o\_neg\_eq_t - 2.37 \times \_o\_roe_t - \\ & 1.83 \times \_o\_ffo_t + 0.285 \times \_o\_neg\_earn_t - 0.52 \times \_o\_nich_t \end{aligned}$$

- [Altman Z-Score](#)

- Create helper variables:

$$\_z\_wc_t = \frac{CA^*_t - CL^*_t}{AT^*_t}$$

$$\_z\_re_t = \frac{RE_t}{AT^*_t}$$

$$\_z\_eb_t = \frac{EBITDA^*_t}{AT^*_t}$$

$$\_z\_sa_t = \frac{SALE^*_t}{AT^*_t}$$

$$\_z\_me_t = \frac{ME\_FISCAL_t}{LT_t}$$

- \* If  $AT_t^* \leq 0$  then any variable including  $AT_t^*$ , then it is set to missing. If  $LT_t \leq 0$ , then  $z\_me_t$  is set to missing.

– Characteristic:

$$z\_score_t = 1.2 \times z\_wc_t + 1.4 \times z\_re_t + 3.3 \times z\_eb_t + 0.6 \times z\_me_t + 1.0 \times z\_sa_t$$

- [Kaplan-Zingales Index](#)

– Create helper variables:

$$\begin{aligned} \_kz\_cf_t &= \frac{NI_t^* + DP_t}{PPENT_{t-12}} \\ \_kz\_qt &= \frac{AT_t^* + ME\_FISCAL_t - BE_t^*}{AT_t^*} \\ \_kz\_db_t &= \frac{DEBT_t^*}{DEBT_t^* + SEQ_t^*} \\ \_kz\_dv_t &= \frac{DIV_t^*}{PPENT_{t-12}} \\ \_kz\_cs_t &= \frac{CHE_t}{PPENT_{t-12}} \end{aligned}$$

- \* If the number of non-missing observations is less than or equal to 12, then  $\_kz\_cf_t$ ,  $\_kz\_dv_t$  and  $\_kz\_cs_t$  are set to zero. If  $PPENT_{t-12} \leq 0$  then  $\_kz\_cf_t$ ,  $\_kz\_dv_t$  and  $\_kz\_cs_t$  are set to missing. If  $AT_t^* \leq 0$  then  $\_kz\_qt$  is set to missing. If  $(DEBT_t^* + SEQ_t^*) = 0$  then  $\_kz\_db_t$  is set to missing.

– Characteristic:

$$kz\_index = -1.002 \times \_kz\_cf_t + 0.283 \times \_kz\_qt + 3.139 \times \_kz\_db_t - 39.368 \times \_kz\_dv_t - 1.315 \times \_kz\_cs_t$$

- [Intrinsic ROE from Frankel and Lee](#)

– Define  $r$  as a constant assumed discount rate

– Create helper variables:

$$\begin{aligned} \_iv\_po_t &= \frac{DIV_t^*}{NIX_t^*} \\ \_iv\_roe_t &= \frac{NIX_t^*}{(BE_t^* + BE_{t-12}^*)/2} \\ \_iv\_be1_t &= (1 + (1 - \_iv\_po_t) \times \_iv\_roe_t) \times BE_t^* \end{aligned}$$

- \* If  $NIX_t^* \leq 0$  then

$$\_iv\_po_t = \frac{DIV_t^*}{AT_t^* \times 0.06}$$

- \* If the number of non-missing observations is less than or equal to 12 or  $(BE_t^* + BE_{t-12}^*) \leq 0$  then  $\_iv\_roe_t$  is set to missing.

– Characteristics:

$$intrinsic\_value_t = BE^*_t + \frac{iv\_roe_t - r}{1 + r} \times BE^*_t + \frac{iv\_roe_t - r}{(1 + r) \times r} \times iv\_bel_t$$

\* If  $intrinsic\_value_t \leq 0$  then it is set to missing.

- **Net Income Idiosyncratic Volatility**

– Define the following variable <sup>13</sup>:

\*

$$_ni\_at_t = \frac{NI^*_t}{AT^*_t}$$

– A rolling regression of the following form is run for each company, with the time series split up into n groups:

\*

$$_ni\_at_t = \beta_0 + \beta_1\_ni\_at_{t-12} + u_t$$

where  $edf_t$  = the error degrees of freedom of regression and  $rmse_t$  = root mean square error of the regression.

– Characteristic:

$$ni\_ivol_t = \sqrt{\frac{rmse_t^2 \times edf_t}{edf_t + 1}}$$

- **Beta, Idiosyncratic Volatility and Skewness of Asset Pricing Factor Regressions**

– This section describes the construction of  $\beta_{zd}$  for the CAPM model, and the idiosyncratic volatility and skewness characteristics, which are estimated using three different factor models:

\* CAPM (capm):

$$RET\_EXC^*_t = \beta_0 + \beta_1 MKTRF^*_t + \epsilon_t$$

\* Fama-French 3 Factor Model (ff3):

$$RET\_EXC^*_t = \beta_0 + \beta_1 MKTRF^*_t + \beta_2 HML^*_t + \beta_3 SMB\_FF^*_t + e_t$$

\* Hou, Xue and Zhang 4 Factor Model (hxz4):

$$RET\_EXC^*_t = \beta_0 + \beta_1 MKTRF^*_t + \beta_2 SMB\_HXZ^*_t + \beta_3 ROE^*_t + \beta_4 INV^*_t + \mu_t$$

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<sup>13</sup>If  $AT^*_t \neq 0$ , then  $_ni\_at_t$  is set to missing

- Characteristics <sup>14</sup>:

$$\begin{aligned}
beta\_zd &= \beta_1 \text{ from the CAPM model} \\
ivol\_capm\_zd_t &= \sigma_{zD}(\epsilon_t) \\
ivol\_ff3\_zd_t &= \sigma_{zD}(e_t) \\
ivol\_hxx4\_zd_t &= \sigma_{zD}(\mu_t) \\
iskew\_capm\_zd_t &= SKEW\_zD(\epsilon_t) \\
iskew\_ff3\_zd_t &= SKEW\_zD(e_t) \\
iskew\_hxx4\_zd_t &= SKEW\_zD(\sigma_t)
\end{aligned}$$

- **Downside Beta**

- Define the following regression model run over z days:

$$RET\_EXC^*_t = \beta_0 + \beta_1 MKTRF^*_t + \epsilon_t$$

However, we restrict the data to when  $MKTRF^*$  is negative.

- Characteristic:

$$* \text{ betadown\_zd} = \beta_1$$

## 10 FX Conversion Rate Construction

This section outlines how we create a daily dataset, beginning 01/01/1950 to now, of X currency - USD exchange rate using COMPUSTAT. This is run in the macro *compustat\_fx()* in the *project\_macros.sas* file.

- We use COMP.EXRT\_DLY, which has daily conversion rates from GBP to other currencies 'X'.
- Every day available, we estimate the exchange rate  $fx_t$  as

$$fx_t = \frac{USD_{GBP,t}}{X_{GBP,t}}$$

where  $X_{GBP,t}$  is the exchange rate of GBP to currency X on day  $t$ .

- In case there are gaps in information, we assume the exchange rate of the last observation until a new observation is available.
- $fx\_t$  is quoted as  $\frac{X_t}{USD_t}$ , so to go from X to USD, do  $X_t \times fx_t$

## 11 Factor Details and Citations

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<sup>14</sup> $z$  indicates over how many days the model is run.

Table 8: Factor and Cluster Details

Description	Variable Name	Citation	Orig. Sample	Sign	Orig. Signif.
<b><u>Accruals</u></b>					
Change in current operating working capital	cowc_gr1a	Richardson, Sloan, Soliman, and Tuna (2005)	1962-2001	-1	1
Operating accruals	oaccruals_at	Sloan (1996)	1962-1991	-1	1
Percent operating accruals	oaccruals_ni	Hafzalla, Lundholm, and Matthew Van Winkle (2011)	1989-2008	-1	1
Total accruals	taccruals_at	Richardson et al. (2005)	1962-2001	-1	1
Percent total accruals	taccruals_ni	Hafzalla et al. (2011)	1989-2008	-1	1
<b><u>Debt Issuance</u></b>					
Abnormal corporate investment	capex_abn	Titman, Wei, and Xie (2004)	1973-1996	-1	1
Growth in book debt (3 years)	debt_gr3	Lyandres, Sun, and Zhang (2008)	1970-2005	-1	1
Change in financial liabilities	fnl_gr1a	Richardson et al. (2005)	1962-2001	-1	1
Change in noncurrent operating liabilities	ncol_gr1a	Richardson et al. (2005)	1962-2001	-1	0
Change in net financial assets	nfna_gr1a	Richardson et al. (2005)	1962-2001	1	1
Net operating assets	noa_at	Hirshleifer, Hou, Teoh, and Zhang (2004)	1964-2002	-1	1
<b><u>Investment</u></b>					
Liquidity of book assets	aliqu_at	Ortiz-Molina and Phillips (2014)	1984-2006	-1	0
Asset Growth	at_gr1	Cooper, Gulen, and Schill (2008)	1968-2003	-1	1
Change in common equity	be_gr1a	Richardson et al. (2005)	1962-2001	-1	1
CAPEX growth (1 year)	capx_gr1	Xie (2001)	1971-1992	-1	0
CAPEX growth (2 years)	capx_gr2	Anderson and Garcia-Feijoo (2006)	1976-1998	-1	1
CAPEX growth (3 years)	capx_gr3	Anderson and Garcia-Feijoo (2006)	1976-1998	-1	1
Change in current operating assets	coa_gr1a	Richardson et al. (2005)	1962-2001	-1	1
Change in current operating liabilities	col_gr1a	Richardson et al. (2005)	1962-2001	-1	1
Hiring rate	emp_gr1	Belo, Lin, and Bazdresch (2014)	1965-2010	-1	1
Inventory growth	inv_gr1	Belo and Lin (2012)	1965-2009	-1	1
Inventory change	inv_gr1a	J. K. Thomas and Zhang (2002)	1970-1997	-1	1
Change in long-term net operating assets	lnoa_gr1a	Fairfield, Whisenant, and Yohn (2003)	1964-1993	-1	1
Mispricing factor: Management	mispricing_mgmt	Stambaugh and Yuan (2017)	1967-2013	1	1
Change in noncurrent operating assets	ncoa_gr1a	Richardson et al. (2005)	1962-2001	-1	1
Change in net noncurrent operating assets	nncoa_gr1a	Richardson et al. (2005)	1962-2001	-1	1
Change in net operating assets	noa_gr1a	Hirshleifer et al. (2004)	1964-2002	-1	1
Change PPE and Inventory	ppeinv_gr1a	Lyandres et al. (2008)	1970-2005	-1	1
Long-term reversal	ret_60_12	De Bondt and Thaler (1985)	1926-1982	-1	1
Sales Growth (1 year)	sale_gr1	Lakonishok, Shleifer, and Vishny (1994)	1968-1989	-1	1
Sales Growth (3 years)	sale_gr3	Lakonishok et al. (1994)	1968-1989	-1	1
Sales growth (1 quarter)	saleq_gr1		1967-2016	-1	0
Years 2-5 lagged returns, nonannual	seas_2_5na	Heston and Sadka (2008)	1965-2002	-1	1
<b><u>Leverage</u></b>					

Firm age	age	Jiang, Lee, and Zhang (2005)	1965-2001	-1	1
Liquidity of market assets	aliq_mat	Ortiz-Molina and Phillips (2014)	1984-2006	-1	0
Book leverage	at_be	Fama and French (1992)	1963-1990	-1	0
The high-low bid-ask spread	bidaskhl_21d	Corwin and Schultz (2012)	1927-2006	1	1
Cash-to-assets	cash_at	Palazzo (2012)	1972-2009	1	0
Net debt-to-price	netdebt_me	Penman, Richardson, and Tuna (2007)	1962-2001	-1	1
Earnings volatility	ni_ivol	Francis, LaFond, Olsson, and Schipper (2004)	1975-2001	1	0
R&D-to-sales	rd_sale	Chan, Lakonishok, and Sougiannis (2001)	1975-1995	1	0
R&D capital-to-book assets	rd5_at	Li (2011)	1952-2004	1	0
Asset tangibility	tangibility	Hahn and Lee (2009)	1973-2001	1	0
Altman Z-score	z_score	Dichev (1998)	1981-1995	1	1

#### Low Risk

Market Beta	beta_60m	Fama and MacBeth (1973)	1935-1968	-1	1
Dimson beta	beta_dimson_21d	Dimson (1979)	1955-1974	-1	0
Frazzini-Pedersen market beta	betabab_1260d	Frazzini and Pedersen (2014)	1926-2012	-1	1
Downside beta	betadown_252d	Ang, Chen, and Xing (2006)	1963-2001	-1	1
Net stock issues	chcsho_12m	Pontiff and Woodgate (2008)	1970-2003	-1	1
Earnings variability	earnings_variability	Francis et al. (2004)	1975-2001	-1	0
Net equity issuance	eqnetis_at	Bradshaw, Richardson, and Sloan (2006)	1971-2000	-1	1
Free cash flow-to-price	fcf_me	Lakonishok et al. (1994)	1963-1990	1	1
Idiosyncratic volatility from the CAPM (21 days)	ivol_capm_21d		1967-2016	-1	0
Idiosyncratic volatility from the CAPM (252 days)	ivol_capm_252d	Ali, Hwang, and Trombley (2003)	1976-1997	-1	1
Idiosyncratic volatility from the Fama-French 3-factor model	ivol_ff3_21d	Ang, Hodrick, Xing, and Zhang (2006)	1963-2000	-1	1
Idiosyncratic volatility from the q-factor model	ivol_hxz4_21d		1967-2016	-1	0
Net total issuance	netis_at	Bradshaw et al. (2006)	1971-2000	-1	1
Cash flow volatility	ocfq_saleq_std	Huang (2009)	1980-2004	-1	1
Maximum daily return	rmax1_21d	Bali, Cakici, and Whitelaw (2011)	1962-2005	-1	1
Highest 5 days of return	rmax5_21d	Bali, Brown, and Tang (2017)	1993-2012	-1	1
Return volatility	rvol_21d	Ang, Hodrick, et al. (2006)	1963-2000	-1	1
Share turnover	turnover_126d	Datar, Naik, and Radcliffe (1998)	1963-1991	-1	1
Number of zero trades with turnover as tiebreaker (6 months)	zero_trades_126d	Liu (2006)	1963-2003	1	1
Number of zero trades with turnover as tiebreaker (1 month)	zero_trades_21d	Liu (2006)	1963-2003	1	0
Number of zero trades with turnover as tiebreaker (12 months)	zero_trades_252d	Liu (2006)	1963-2003	1	1

#### Momentum

Current price to high price over last year	prc_highprc_252d	George and Hwang (2004)	1963-2001	1	1
Residual momentum t-12 to t-1	resff3_12_1	Blitz, Huij, and Martens (2011)	1930-2009	1	1
Residual momentum t-6 to t-1	resff3_6_1	Blitz et al. (2011)	1930-2009	1	1
Price momentum t-12 to t-1	ret_12_1	Fama and French (1996)	1963-1993	1	1
Price momentum t-3 to t-1	ret_3_1	Jegadeesh and Titman (1993)	1965-1989	1	1
Price momentum t-6 to t-1	ret_6_1	Jegadeesh and Titman (1993)	1965-1989	1	1

Price momentum t-9 to t-1	ret_9.1	Jegadeesh and Titman (1993)	1965-1989	1	1
Year 1-lagged return, nonannual	seas_1_1na	Heston and Sadka (2008)	1965-2002	1	1
<b>Profit Growth</b>					
Change sales minus change Inventory	dsale_dinv	Abarbanell and Bushee (1998)	1974-1988	1	1
Change sales minus change receivables	dsale_drec	Abarbanell and Bushee (1998)	1974-1988	-1	0
Change sales minus change SG&A	dsale_dsga	Abarbanell and Bushee (1998)	1974-1988	1	0
Change in quarterly return on assets	niq_at_chg1		1972-2016	1	0
Change in quarterly return on equity	niq_be_chg1		1967-2016	1	0
Standardized earnings surprise	niq_su	Foster, Olsen, and Shevlin (1984)	1974-1981	1	1
Change in operating cash flow to assets	ocf_at_chg1	Bouchaud, Krueger, Landier, and Thesmar (2019)	1990-2015	1	1
Quality minus Junk: Safety	qmj_safety	C. S. Asness, Frazzini, and Pedersen (2019)	1957-2016	1	1
Price momentum t-12 to t-7	ret_12.7	Novy-Marx (2012)	1925-2010	1	1
Labor force efficiency	sale_emp_gr1	Abarbanell and Bushee (1998)	1974-1988	1	0
Standardized Revenue surprise	saleq_su	Jegadeesh and Livnat (2006)	1987-2003	1	1
Year 1-lagged return, annual	seas_1_1an	Heston and Sadka (2008)	1965-2002	1	1
Change in short-term investments	sti_gr1a	Richardson et al. (2005)	1962-2001	1	0
<b>Profitability</b>					
Coefficient of variation for dollar trading volume	dolvol_var_126d	Chordia, Subrahmanyam, and Anshuman (2001)	1966-1995	-1	1
Return on net operating assets	ebit_bev	Soliman (2008)	1984-2002	1	1
Profit margin	ebit_sale	Soliman (2008)	1984-2002	1	1
Pitroski F-score	f_score	Piotroski (2000)	1976-1996	1	1
Intrinsic value-to-market	intrinsic_value	Frankel and Lee (1998)	1975-1993	1	0
Return on equity	ni_be	Haugen and Baker (1996)	1979-1993	1	1
Quarterly return on equity	niq_be	Hou, Xue, and Zhang (2015)	1972-2012	1	1
Ohlson O-score	o_score	Dichev (1998)	1981-1995	-1	1
Operating cash flow to assets	ocf_at	Bouchaud et al. (2019)	1990-2015	1	1
Operating profits-to-book equity	ope_be	Fama and French (2015)	1963-2013	1	1
Operating profits-to-lagged book equity	ope_bel1		1967-2016	1	0
Coefficient of variation for share turnover	turnover_var_126d	Chordia et al. (2001)	1966-1995	-1	1
<b>Quality</b>					
Capital turnover	at_turnover	Haugen and Baker (1996)	1979-1993	1	0
Cash-based operating profits-to-book assets	cop_at		1967-2016	1	0
Cash-based operating profits-to-lagged book assets	cop_atl1	Ball, Gerakos, Linnainmaa, and Nikolaev (2016)	1963-2014	1	1
Change gross margin minus change sales	dgp_dsale	Abarbanell and Bushee (1998)	1974-1988	1	0
Gross profits-to-assets	gp_at	Novy-Marx (2013)	1963-2010	1	1
Gross profits-to-lagged assets	gp_atl1		1967-2016	1	0
Mispricing factor: Performance	mispricing_perf	Stambaugh and Yuan (2017)	1967-2013	1	1
Number of consecutive quarters with earnings increases	ni_inc8q	Barth, Elliott, and Finn (1999)	1982-1992	1	0

Quarterly return on assets	niq_at	Balakrishnan, Bartov, and Faurel (2010)	1976-2005	1	1
Operating profits-to-book assets	op_at		1963-2013	1	1
Operating profits-to-lagged book assets	op_atl1	Ball et al. (2016)	1963-2014	1	1
Operating leverage	opex_at	Novy-Marx (2011)	1963-2008	1	1
Quality minus Junk: Composite	qmj	C. S. Asness et al. (2019)	1957-2016	1	1
Quality minus Junk: Growth	qmj_growth	C. S. Asness et al. (2019)	1957-2016	1	1
Quality minus Junk: Profitability	qmj_prof	C. S. Asness et al. (2019)	1957-2016	1	1
Assets turnover	sale_bev	Soliman (2008)	1984-2002	1	1
Tax expense surprise	tax_gr1a	J. Thomas and Zhang (2011)	1977-2006	1	1
<b>Seasonality</b>					
Market correlation	corr_1260d	C. Asness, Frazzini, Gormsen, and Pedersen (2020)	1925-2015	-1	1
Coskewness	coskew_21d	Harvey and Siddique (2000)	1963-1993	-1	1
Net debt issuance	dbnetis_at	Bradshaw et al. (2006)	1971-2000	-1	1
Kaplan-Zingales index	kz_index	Lamont, Polk, and Saaá-Requejo (2001)	1968-1995	1	1
Change in long-term investments	lti_gr1a	Richardson et al. (2005)	1962-2001	-1	1
Earnings persistence	ni_ar1	Francis et al. (2004)	1975-2001	1	0
Taxable income-to-book income	pi_nix	Lev and Nissim (2004)	1973-2000	1	1
Years 11-15 lagged returns, annual	seas_11_15an	Heston and Sadka (2008)	1965-2002	1	1
Years 11-15 lagged returns, nonannual	seas_11_15na	Heston and Sadka (2008)	1965-2002	-1	0
Years 16-20 lagged returns, annual	seas_16_20an	Heston and Sadka (2008)	1965-2002	1	1
Years 16-20 lagged returns, nonannual	seas_16_20na	Heston and Sadka (2008)	1965-2002	-1	1
Years 2-5 lagged returns, annual	seas_2_5an	Heston and Sadka (2008)	1965-2002	1	1
Years 6-10 lagged returns, annual	seas_6_10an	Heston and Sadka (2008)	1965-2002	1	1
Years 6-10 lagged returns, nonannual	seas_6_10na	Heston and Sadka (2008)	1965-2002	-1	1
<b>Size</b>					
Amihud Measure	ami_126d	Amihud (2002)	1964-1997	1	1
Dollar trading volume	dolvol_126d	Brennan, Chordia, and Subrahmanyam (1998)	1966-1995	-1	1
Market Equity	market_equity	Banz (1981)	1926-1975	-1	1
Price per share	prc	Miller and Scholes (1982)	1940-1978	-1	1
R&D-to-market	rd_me	Chan et al. (2001)	1975-1995	1	1
<b>Skewness</b>					
Idiosyncratic skewness from the CAPM	iskew_capm_21d		1967-2016	-1	0
Idiosyncratic skewness from the Fama-French 3-factor model	iskew_ff3_21d	Bali, Engle, and Murray (2016)	1925-2021	-1	1
Idiosyncratic skewness from the q-factor model	iskew_hxz4_21d		1967-2016	-1	0
Short-term reversal	ret_1_0	Jegadeesh (1990)	1929-1982	-1	1
Highest 5 days of return scaled by volatility	rmax5_rvol_21d	C. Asness et al. (2020)	1925-2015	-1	1
Total skewness	rskew_21d	Bali et al. (2016)	1925-2021	-1	1

#### Value



Assets-to-market	at_me	Fama and French (1992)	1963-1990	1	0
Book-to-market equity	be_me	Rosenberg, Reid, and Lanstein (1985)	1973-1984	1	1
Book-to-market enterprise value	bev_mev	Penman et al. (2007)	1962-2001	1	1
Debt-to-market	debt_me	Bhandari (1988)	1948-1979	1	1
Dividend yield	div12m_me	Litzenberger and Ramaswamy (1979)	1940-1980	1	1
Ebitda-to-market enterprise value	ebitda_mev	Loughran and Wellman (2011)	1963-2009	1	1
Equity duration	eq_dur	Dechow, Sloan, and Soliman (2004)	1962-1998	-1	1
Equity net payout	eqnpo_12m	Daniel and Titman (2006)	1968-2003	1	1
Net payout yield	eqnpo_me	Boudoukh, Michaely, Richardson, and Roberts (2007)	1984-2003	1	1
Payout yield	eqpo_me	Boudoukh et al. (2007)	1984-2003	1	1
Earnings-to-price	ni_me	Basu (1983)	1963-1979	1	1
Operating cash flow-to-market	ocf_me	Desai, Rajgopal, and Venkatachalam (2004)	1973-1997	1	1
Sales-to-market	sale_me	Barbee Jr, Mukherji, and Raines (1996)	1979-1991	1	1

#### Other Factors

Assets	assets
Sales	sales
Book Equity	book_equity
Net Income	net_income
Enterprise Value	enterprise_value
Current Asset Growth 1yr	ca_gr1
Non-Current Asset Growth 1yr	nca_gr1
Total Liabilities Growth 1yr	lt_gr1
Current Liabilities Growth 1yr	cl_gr1
Non-Current Liabilities Growth 1yr	ncl_gr1
Preferred Stock Growth 1 yr	pstk_gr1
Total Debt Growth 1yr	debt_gr1
Cost of Goods Sold Growth 1yr	cogs_gr1
Selling, General, and Administrative Expenses Growth 1yr	sga_gr1
Operating Expenses Growth 1yr	opex_gr1
Asset Growth 3yr	at_gr3
Current Asset Growth 3yr	ca_gr3
Non-Current Asset Growth 3yr	nca_gr3
Total Liabilities Growth 3yr	lt_gr3
Current Liabilities Growth 3yr	cl_gr3
Non-Current Liabilities Growth 3yr	ncl_gr3
Book Equity Growth 3yr	be_gr3
Preferred Stock Growth 3yr	pstk_gr3
Cost of Goods Sold Growth 3yr	cogs_gr3
Selling, General, and Administrative Expenses Growth 3yr	sga_gr3
Operating Expenses Growth 3yr	opex_gr3
Gross Profit Change 1yr	gp_gr1a
Operating Cash Flow Change 1yr	ocf_gr1a
Cash and Short-Term Investments Change 1yr	cash_gr1a
Receivables Change 1yr	rec_gr1a

Property, Plans and Equipment Gross Change 1yr	ppeg_gr1a
Intangible Assets Change 1yr	intan_gr1a
Short-Term Debt Change 1yr	debtst_gr1a
Accounts Payable Change 1yr	ap_gr1a
Income Tax Payable Change 1yr	txp_gr1a
Long-Term Debt Change 1yr	debtlt_gr1a
Deferred Taxes and Investment Credit Change 1yr	txditc_gr1a
Non-Current Operating Liabilities Change 1yr	ncol_gr1a
Operating Assets Change 1yr	oa_gr1a
Operating Liabilities Change 1yr	ol_gr1a
Financial Assets Change 1yr	fna_gr1a
Operating Profit before Deprecia- tion Change 1yr	ebitda_gr1a
Operating Profit after Depreciation Change 1yr	ebit_gr1a
Operating Earnings to Equity Change 1yr	ope_gr1a
Net Income Change 1yr	ni_gr1a
Depreciation and Amortization Change 1yr	dp_gr1a
Free Cash Flow Change 1yr	fcf_gr1a
Net Working Capital Change 1yr	nwc_gr1a
Net Income Including Extraordi- nary Items Change 1yr	nix_gr1a
Equity Net Issuance Change 1yr	eqnetis_gr1a
Net Long-Term Debt Issuance Change 1yr	dltnetis_gr1a
Net Short-Term Debt Issuance Change 1yr	dstnetis_gr1a
Net Debt Issuance Change 1yr	dbnetis_gr1a
Net Issuance Change 1yr	netis_gr1a
Financial Cash Flow Change 1yr	fincf_gr1a
Equity Net Payout Change 1yr	eqnpo_gr1a
Dividend Payout Ratio Change 1yr	div_gr1a
Equity Buyback Change 1yr	eqbb_gr1a
Equity Issuance Change 1yr	eqis_gr1a
Net Equity Payout Change 1yr	eqpo_gr1a
Capital Expenditures Change 1yr	capx_gr1a
Gross Profit Change 3yr	gp_gr3a
Operating Cash Flow Change 3yr	ocf_gr3a
Cash and Short-Term Investments Change 3yr	cash_gr3a
Inventory Change 3yr	inv_gr3a
Receivables Change 3yr	rec_gr3a
Property, Plans and Equipment Gross Change 3yr	ppeg_gr3a
Investment and Advances Change 3yr	lti_gr3a
Intangible Assets Change 3yr	intan_gr3a
Short-Term Debt Change 3yr	debtst_gr3a
Accounts Payable Change 3yr	ap_gr3a

Income Tax Payable Change 3yr	txp_gr3a
Long-Term Debt Change 3yr	debtlt_gr3a
Deferred Taxes and Investment Credit Change 3yr	txditc_gr3a
Current Operating Assets Change 3yr	coa_gr3a
Current Operating Liabilities Change 3yr	col_gr3a
Current Operating Working Capital Change 3yr	cowc_gr3a
Non-Current Operating Assets Change 3yr	ncoa_gr3a
Net Non-Current Operating Assets Change 3yr	nncoa_gr3a
Operating Assets Change 3yr	oa_gr3a
Operating Liabilities Change 3yr	ol_gr3a
Net Operating Assets Change 3yr	noa_gr3a
Financial Assets Change 3yr	fna_gr3a
Financial Liabilities Change 3yr	fnl_gr3a
Net Financial Assets Change 3yr	nfna_gr3a
Operating Profit before Depreciation Change 3yr	ebitda_gr3a
Operating Profit after Depreciation Change 3yr	ebit_gr3a
Operating Earnings to Equity Change 3yr	ope_gr3a
Net Income Change 3yr	ni_gr3a
Depreciation and Amortization Change 3yr	dp_gr3a
Free Cash Flow Change 3yr	fcf_gr3a
Net Working Capital Change 3yr	nwc_gr3a
Inventory Change 1yr	inv_gr3a
Non-Current Operating Liabilities Change 3yr	ncol_gr3a
Net Income Including Extraordinary Items Change 3yr	nix_gr3a
Equity Net Issuance Change 3yr	eqnetis_gr3a
Net Long-Term Debt Issuance Change 3yr	dltnetis_gr3a
Net Short-Term Debt Issuance Change 3yr	dstnetis_gr3a
Net Debt Issuance Change 3yr	dbnetis_gr3a
Net Issuance Change 3yr	netis_gr3a
Financial Cash Flow Change 3yr	fincf_gr3a
Net Working Capital Change 3yr	nwc_gr3a
Equity Net Payout Change 3yr	eqnpo_gr3a
Effective Tax Rate Change 3yr	tax_gr3a
Dividend Payout Ratio Change 3yr	div_gr3a
Equity Buyback Change 3yr	eqbb_gr3a
Equity Issuance Change 3yr	eqis_gr3a
Net Equity Payout Change 3yr	eqpo_gr3a
Capital Expenditures Change 3yr	capx_gr3a
Capital Expenditures scaled by Assets	capx_at

R&D scaled by Assets	rd_at
Special Items scaled by Assets	spi_at
Extraordinary Items and Discontinued Operations scaled by Assets	xido_at
Non-Recurring Items scaled by Assets	nri_at
Gross Profit Margin	gp_sale
Operating Profit Margin before Depreciation	ebitda_sale
Pretax Profit Margin	pi_sale
Net Profit Margin before XI	ni_sale
Net Profit Margin	nix_sale
Free Cash Flow Margin	fcf_sale
Operating Cash Flow Margin	ocf_sale
Operating Profit before Depreciation scaled by Assets	ebitda_at
Operating Profit after Depreciation scaled by Assets	ebit_at
Firm Income scaled by Assets	fi_at
Net Income Including Extraordinary Items scaled by BE	nix_be
Operating Cash Flow scaled by BE	ocf_be
Free Cash Flow scaled by BE	fcf_be
Gross Profit scaled by BEV	gp_bev
Operating Profit before Depreciation scaled by BEV	ebitda_bev
Firm Income scaled by BEV	fi_bev
Cash Based Operating Profitability scaled by BEV	cop_bev
Gross Profit scaled by PPEN	gp_ppen
Operating Profit before Depreciation scaled by PPEN	ebitda_ppen
Free Cash Flow scaled by PPEN	fcf_ppen
Financial Cash Flow scaled by Assets	fincf_at
Equity Issuance scaled by Assets	eqis_at
Net Long-Term Debt Issuance scaled by Assets	dltnetis_at
Net Short-Term Debt Issuance scaled by Assets	dstnetis_at
Equity Net Payout scaled by Assets	eqnpo_at
Net Equity Payout scaled by Assets	eqbb_at
Total Dividends scaled by Assets	div_at
Common Equity scaled by BEV	be_bev
Total Debt scaled by BEV	debt_bev
Cash and Short-Term Investments scaled by BEV	cash_bev
Preferred Stock scaled by BEV	pstk_bev
Long-Term Debt scaled by BEV	debtlt_bev
Short-Term Debt scaled by BEV	debtst_bev
Total Debt scaled by MEV	debt_mev
Preferred Stock scaled by MEV	pstk_mev
Long-Term Debt scaled by MEV	debtlt_mev
Short-Term Debt scaled by MEV	debtst_mev

Interest scaled by Total Debt	int_debt
Interest scaled by Long-Term Debt	int_debtl
Operating Profit before Depreciation scaled by Total Debt	ebitda_debt
Profit before D&A scaled by Current Liabilities	profit_cl
Operating Cash Flow scaled by Current Liabilities	ocf_cl
Operating Cash Flow scaled by Total Debt	ocf_debt
Cash Balance scaled by Total Liabilities	cash_lt
Inventory scaled by Current Assets	inv_act
Receivables scaled by Current Assets	rec_act
Short-Term Debt scaled by Total Debt	debtst_debt
Current Liabilities scaled by Total Liabilities	cl_lt
Long-Term Debt scaled by Total Debt	debtlt_debt
Free Cash Flow scaled by Operating Cash Flow	fcf_ocf
Total Liabilities scaled by Total Tangible Assets	lt_ppen
Long-Term Debt to Book Equity	debtlt_be
Working Capital scaled by Assets	nwc_at
Debt-to-Assets	debt_at
Debt to Shareholders' Equity Ratio	debt_be
Interest Coverage Ratio	ebit_int
Days Inventory Outstanding	inv_days
Days Sales Outstanding	rec_days
Days Accounts Payable Outstanding	ap_days
Cash Conversion Cycle	cash_conversion
Cash Ratio	cash_cl
Quick Ratio	caliq_cl
Current Ratio	ca_cl
Inventory Turnover	inv_turnover
Receivables Turnover	rec_turnover
Account Payables Turnover	ap_turnover
Advertising scaled by Sales	adv_sale
Labor Expense scaled by Sales	staff_sale
Sales scaled by Total Stockholders' Equity	sale_be
Dividend Payout Ratio	div_ni
Sales scaled by Working Capital	sale_nwc
Effective Tax Rate	tax_pi
Cash and Short-Term Investments scaled by Market Equity	cash_me
Gross Profit scaled by ME	gp_me
Operating Profit before Depreciation scaled by ME	ebitda_me

Operating Profit after Depreciation scaled by ME	ebit_me
Operating Earnings to Equity scaled by ME	ope_me
Net Income Including Extraordinary Items scaled by ME	nix_me
Cash Based Operating Profitability scaled by ME	cop_me
Book Equity scaled by MEV	be_mev
Total Assets scaled by MEV	at_mev
Cash and Short-Term Investments scaled by MEV	cash_mev
Property, Plans and Equipment Net scaled by MEV	ppen_mev
Total Dividends scaled by ME	div_me
Equity Buyback scaled by ME	eqbb_me
Equity Issuance scaled by ME	eqis_me
Equity Net Issuance scaled by ME	eqnetis_me
Net Long-Term Debt Issuance scaled by MEV	
Net Short-Term Debt Issuance scaled by MEV	dstnetis_mev
Net Debt Issuance scaled by MEV	dbnetis_mev
Net Issuance scaled by MEV	netis_mev
Gross Profit scaled by MEV	gp_mev
Operating Profit after Depreciation scaled by MEV	ebit_mev
Sales scaled by MEV	sale_mev
Operating Cash Flow scaled by MEV	ocf_mev
Free Cash Flow scaled by MEV	fcf_mev
Cash Based Operating Profitability scaled by MEV	cop_mev
Financial Cash Flow Change scaled by MEV	fincf_mev
Net Income to Sales Quarterly Volatility	niq_saleq_std
Net Income scaled by Employees	ni_emp
Sales scaled by Employees	sale_emp
Net Income scaled by Assets	ni_at
Quarterly ROE Volatility	roeq_be_std
ROE Volatility	roe_be_std
Gross Product to Assets 5 yr Change	gpoa_ch5
ROE 5 yr Change	roe_ch5
ROA 5 yr Change	roa_ch5
Operating Cash Flow to Assets 5 yr Change	cfoa_ch5
Gross Product to Sales 5 yr Change	gmar_ch5
Dividend to Price - 1 Month	div1m_me
Dividend to Price - 3 Months	div3m_me
Dividend to Price - 6 Months	div6m_me
Special Dividend to Price - 1 Month	

Special Dividend to Price - 12 Month	divsp12m_me
Change in Shares - 1 Month	chcsho_1m
Change in Shares - 3 Month	chcsho_3m
Change in Shares - 6 Month	chcsho_6m
Net Equity Payout - 1 Month	eqnpo_1m
Net Equity Payout - 3 Month	eqnpo_3m
Net Equity Payout - 6 Month	eqnpo_6m
Momentum 0-2 Months	ret_2.0
Momentum 0-3 Months	ret_3.0
Momentum 0-6 Months	ret_6.0
Momentum 0-9 Months	ret_9.0
Momentum 0-12 Months	ret_12.0
Momentum 1-18 Months	ret_18.1
Momentum 1-24 Months	ret_24.1
Momentum 12-24 Months	ret_24.12
Momentum 1-36 Months	ret_36.1
Momentum 12-36 Months	ret_36.12
Momentum 1-48 Months	ret_48.1
Momentum 12-48 Months	ret_48.12
Momentum 1-60 Months	ret_60.1
Momentum 36-60 Months	ret_60.36

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*Note:* This table shows cluster names as underlined section headings and, for each cluster, a description of the factors included, the variable name used in the code, the original reference, the sample period used in the original reference, the sign of the factor (“1” means “long”, “-1” means “short”), and whether the original reference found the factor to be significant (“1” means “yes”, “0” means “no”). For example, the first value factor “at\_me” goes long stocks with high values of assets-to-market and shorts those with low values (and would be done the reverse if the sign was “-1” instead of “1”).

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