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 (2022). The citation for use of this data and code is:

```
@article{JensenKellyPedersen2022,
   author = {Jensen, Theis Ingerslev and Kelly, Bryan T and Pedersen, Lasse Heje},
   journal = {Journal of Finance, Forthcoming},
   title = {Is There A Replication Crisis In Finance?},
   year = {2022}
}
```

- 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.
  - 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/ReplicationCrisis.
- 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 × source[1] 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. Therefore, when predicting the return column `ret`, characteristics should be lagged by one month (as `ret` shows the return in the current month identified by `eom`). Alternatively, you can predict next month's returns, stored in `ret_exc_lead1m`, without lagging the characteristics.
- The `excntry` column, identifies the country of the exchange where the security is traded.
- Suggested screens:
  - To restrict the sample to one observation per security × month, use `obs_main=1`.
  - To restrict the sample to common stocks, use `common=1`.
  - To restrict the sample to prominent exchanges, use `exch_main=1`.
  - To restrict the sample to primary listing × month, use `primary_sec=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. Our GitHub repository: https://github.com/bkelly-lab/ReplicationCrisis/blob/master/GlobalFactors/CHANGELOG.md tracks the evolution in the code used to generate the data. Furthermore, Table 1 gives an overview of the most important changes.
- 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 with subject "Global Factor Data"

[1] CRSP or Compustat.

Table 1: Log of Important Code and Methodology

Date	**Changes**
03-03-2023	• Added 'me' (market equity) and 'ret' (total return) and removed 'source_crsp' from daily return files.
02-08-2022	• Fixed error in the construction of intrinsic_value. Previously, we failed to scale intrinsic_value by market equity as done in Frankel and Lee (1998). We call the new characteristic ival_me and keep intrinsic_value in the data set. The alpha of the new factor based on ival_me is significantly different from zero, while the factor based on intrinsic_value is insignificant.
11-16-2021	• Changed return cutoffs to depend on all stocks, instead of only stocks from CRSP. • Changed the 'source' (character) column to 'source_crsp' (integer), source_crsp is 1 if CRSP is the return data source. • Changed the 'id' column from character to integer. For stocks from CRSP, the id is just their permno. For stocks from Compustat, the first digit is 1 if the stock is traded on a US exchange, 2 if it's traded on a Canadian exchange, and 3 otherwise. The next two digits are the IID from Compustat, and the remaining six digits are the gvkey. • Adapted the primary_sec column such that all observations from CRSP have primary_sec=1. • Changed the treatment of zero return. Previously, we treated a zero return as a missing observation. Now, we have removed this screen, such that a zero return is treated like any other return. • Changed the creation of characteristics based on daily stock market data. Previously, we winsorized daily returns, market equity, and dollar volume, before creating characteristics based on daily stock market data. Now, we have removed this winsorization, and daily characteristics are based on the raw data. • Added the option to create daily factor return in the portfolios.R code. • Added the option to create industry returns in the portfolios.R code.
08-27-2021	• Fixed a bug regarding how daily delisting returns from CRSP are incorporated. • Added indfmt='FS' to the international accounting data.

Date	Changes
06-14-2021	• We changed the winsorization scheme. First, we removed the 0.01%/99.9% winsorization of market equity in all countries. Second, we removed the winsorization of returns from the CRSP database. For Compustat returns, we set returns above (below) the 99.9% (0.01%) of CRSP returns in the same month, to that level. In other words, we base our winsorization of Compustat data on CRSP data from the same month.
02-19-2021	• Previously we did not exclude securities that are only traded over the counter. In the new version of the data set, we include an indicator column "exch_main" to exclude non-standard exchanges. In the US, the main exchanges are AMEX, NASDAQ, and NYSE. Outside of the US, we exclude over the counter exchanges, stock connect exchanges in China, and cross-country exchanges such as BATS Chi-X Europe. The documentation includes a full list of the excluded exchanges. • Included SIC, NAICS, and GICS industry codes.
02-15-2021	• Removed a bug that caused ivol_ff3_21d, iskew_ff3_21d, ivol_hxz4_21d, and iskew_hxz4_21d to require 17 (ff3) and 18 (hxz) observations for a valid estimate. Consistent with our original intent, we now require at least 15 observations for a valid estimate.
02-01-2021	• Fixed a small bug in the bidask_hl() macro. • Lowered the requirement for the number of stocks needed when creating asset pricing factors (FF and HXZ). We previously required at least 5 stocks in a sub-portfolio (e.g., small stocks with high BM) for the observation to be valid. This led to missing observations in the 1950s for small stocks with low BM. We lowered this requirement to 3 stocks. Furthermore, when creating asset pricing factors, we changed the breakpoints to be based on NYSE stocks in the US instead of non-microcap stocks. Outside of the US, breakpoints are still based on non-microcap stocks.

Date	Changes
01-25-2021	• Changed residual momentum characteristics (resff3_12_1 & resff3_6_1) to be scaled with the standard deviation of residuals consistent with Blitz, Huij, and Mertens (2011). • Fixed error in creating qmj_prof. The issue was that the oaccruals_at used the value instead of the z-score of ranks. This effectively meant that accruals didn't impact the profitability score. • Fixed error for annual seasonality characteristics (factor names starting with seas_ and ending with _an). There was a bug in the screening procedure which meant that the characteristic for one stock could use information from an unrelated stock. • Rounding issues when converting a .csv file to an excel file, caused the zero_trades_* variables to not have any decimals which made the turnover tie-breaker ineffective. • Standardized unexpected earnings (niq_su) and sales (saleq_su) is computed as the actual value minus the expected value (standardized by the standard deviation of this change). Before, the expected value was computed as the mean yearly change over the last 8 quarters added to the last quarterly value. Now the expected value is the same mean yearly change, but added to the quarterly value 4 quarters ago consistent with Jegadeesh and Livnat (2006).

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 that reveals a characteristic about the security, For example 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^{th} 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^{th} 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 end of the fiscal period.
- To compute a cluster (theme) return, we first sign factors according to the original reference, then we equal-weight the returns of factors within a specific cluster. The signing convention and cluster allocation follows Jensen et al. (2022) and we show it in table 9.

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 2: 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 by the end of each month. In particular, Mega caps are stocks with a market cap above the 80th percentile of NYSE stocks, large caps are all remaining stocks above the 50th percentile, small caps are above the 20th percentile, micro caps above the 1st percentile and nano caps are the remaining stocks.

Name	Description
id	We generate a unique number for each security in our data set. For securities from CRSP, the id is just the corresponding `permno`. For stocks from Compustat, the first digits is 1 if the stocks is traded on a US exchange, 2 if it's traded on a Canadian exchange, and 3 otherwise. The next six digits are the `gvkey` and the last two are the `iid`.[2]
source_crsp	Identifies the source of the return data. A 1 (0), indicates that the source is CRSP (Compustat).
obs_main	For US stocks, we often have two observations for each security-month pair. One from Compustat, and one from CRSP. In cases with duplicates, the observation from CRSP has `obs_main=1`, and the observation from Compustat has `obs_main=0`. 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 ordinary exchanges. If CRSP is the source, main exchanges are those with *crsp_exchcd* 1, 2 and 3. If Compustat is the source, main exchanges are all `comp_exchg` 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 security 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). All observations from CRSP has `primary_sec=1`.
permco	Permanent unique firm identifier from CRSP
permno	Permanent security 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 *mul* which indicates a multi country exchange[3]
curcd	Currency of *prc_local* and the currency used to calculated *ret_local*.
fx	Ratio of *curcd* 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 return 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 contruct 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 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'.

[2] In Compustat, a security is identified by gvkey and iid. To map our id to Compustat, add 'C' or 'W' to the iid if the first digit is 2 or 3 respectively.

[3] Typically over the counter exchanges.

4.1 Datasets

- CRSP.DSENAMES
- COMP.FUNDA
- COMP.G_FUNDA
- COMP.CO_HGIC
- COMP.G_CO_HGIC

Table 3: 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 Fama and French (1997) 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 4: Helper Functions

Function	Name	Description
Mean	$\overline{X}_z$	$\frac{1}{z}\sum_{n=0}^{z-1} X_{t-n}$
Variance	VARC_z(X)	$\frac{1}{z-1}\sum_{n=0}^{z-1}(X_{t-n} - \overline{X_t}_z)^2$
Covariance	COVAR_z(X, Y)	$\frac{1}{z-1}\sum_{n=0}^{z-1}(X_{t-n} - \overline{X_t}_z)(Y_{t-n} - \overline{Y_t}_z)$
Standard Deviation	$\sigma_z(X)$	$\sqrt{VARC\_z(X)}$
Skewness	SKEW_z(X)	$\frac{1}{z\times\sigma_z(X)^3}\sum_{n=0}^{z-1}(X_{t-n} - \overline{X_t}_z)^3$
Standardized Unexpected Realization	SUR_z(X)	$\frac{X_t - (X_{t-3} + \overline{(X_{t-3}-X_{t-15})}_z/4)}{\sigma_z(X_{t-3}-X_{t-15})}$
Change to Expectations	CHG_TO_EXP(X)	$\frac{X_t}{(X_{t-12}+X_{t-24})/2}$
Maximum	MAXn_z(X)	The maximum n values of given input.
Quality Minus Junk Helpers		
Earnings Volatility	$\_EVOL$	$ROEQ\_BE\_STD \times 2$. If this is unavailable, we use ROE_BE_STD.

Function	Name	Description
Rank of Variable	$\_rVar$	Cross-sectional rank of Var within a country[4]
Z transformation	$ZV(rVar)$	$\frac{\_rVAR - \overline{\_rVAR}_z}{\_t(\_rVAR)}$

6 Accounting Characteristics

6.1 Datasets

- COMP.FUNDA
- COMP.FUNDQ
- COMP.G_FUNDA
- COMP.G_FUNDQ

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.

[4] $OACCRUALS\_AT$, $BETABAB\_1260d$, $DEBT\_AT$ and $\_EVOL$ are sorted in descending order. All other variables are sorted in ascending order.

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 5: Accounting Variables

Name	Abbreviation	Construction
Income Statement		
Sales	sale*	We prefer SALE. If this is unavailable, we use REVT
Cost of Goods Sold	cogs	Compustat item COGS
Gross Profit	gp*	We prefer to use GP. If this is unavailable we use sale*-COGS
Selling, General and Administrative Expenses	xsga	Compustat item XSGA
Advertising Expenses	xad	Compustat item XAD. Note that this is not available in Compustat Global
Research and Development Expenses	xrd	Compustat item XRD. Note that this is not available in Compustat Global
Staff Expenses	xlr	Compustat item XLR
Special Items	spi	Compustat item SPI
Operating Expenses	opex*	We prefer to use XOPR. If this is unavailable, we use COGS+XSGA
Operating Income Before Depreciation	ebitda*	We prefer to use EBITDA. If this is unavailable, we use OIBDP. If this is unavailable, we use SALE*-OPEX*. If this is unavailable, we use GP*-XSGA
Depreciation and Amortization	dp	Compustat Item DP
Operating Income After Depreciation	ebit*	We prefer to use EBIT. If this is unavailable, we use OIADP. If this is unavailable, we use EBITDA*-DP
Interest Expenses	int	Compustat item XINT
Operating Profit ala Ball et al (2015)	op*	We use EBITDA* + XRD. If XRD is unavailable, we set it to zero
Operating Profit to Equity	ope*	We use EBITDA*-XINT. 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 PI. If this is unavailable we use EBIT*-XINT+SPI+NOPI where we set SPI and NOPI to zero if missing
Income Tax	tax	Compustat item TXT
Extraordinary Items and Discontinued Operations	xido*	We prefer to use XIDO. If this is unavailable, we use XI+DO where we set DO to zero if missing. The reason why we set missing DO to zero is because it is not available in COMP.G_FUNDQ
Net Income	ni*	We prefer to use IB. If this is unavailable, we use NI-XIDO*. If this is unavailable, we prefer PI*-TXT-MII. If MII is unavailble, it is set to zero
Net Income Including Extraordinary Items	nix*	We prefer NI. If this is not available, we prefer NI*+XIDO*. If XIDO* is unavailable, we set it to zero. If that is unavailable, we prefer NI*+XI+DO
Firm Income	fi*	We use NIX*+XINT
Dividends for Common Shareholds	dvc	Compustat Item DVC
Total Dividends	div*	We prefer DVT. If this is not available, we use DV
Income Before Extraordinary Items	ni_qtr*	We use IBQ
Net Sales	sale_qtr*	We use SALEQ
Cash Flow Statement		
Capital Expenditures	capx	Compustat item CAPX
Capital Expenditures to Sales	capex_sale*	We use CAPX / SALE*
Free Cash Flow	fcf*	We use OCF*-CAPX. Note that the free cash flow is computed before financing activities and sale of assets is taken into account

Name	Abbreviation	Construction
Equity Buyback	eqbb*	We use PRSTKC+PURTSHR Equity Buyback is mainly PRSTKC in NA and PURTSHR in GLOBAL. Either of PRSTKC or PURTSHR are allowed to be missing
Equity Issuance	eqis*	Compustat item SSTK
Equity Net Issuance	eqnetis*	We use EQIS*-EQBB*. Either EQIS* or EQBB* are allowed to be missing
Net Equity Payout	eqpo*	We use DIV*+EQBB*
Equity Net Payout	eqnpo*	We use DIV*-EQNETIS*
Net Long-Term Debt Issuance	dltnetis*	We prefer to use DLTIS-DLTR where we only require that one of the items are non-missing. If this is unavailable, we use LTDCH. If this is unavailable we use the yearly change in long-term book debt DLTT
Net Short-Term Debt Issuance	dstnetis*	We prefer DLCCH. If this is unavailable, we use the yearly change in short-term book debt DLC
Net Debt Issuance	dbnetis*	We use DLTNETIS*+DSTNETIS* and only require one of the items to be non-missing
Net Issuance	netis*	We use EQNETIS*+DBNETIS* and require that both EQNETIS* and DBNETIS* are non-missing
Financial Cash Flow	fincf*	We prefer FINCF. If this is unavailable, we use NETIS*-DV+FIAO+TXBCOF. If FIAO or TXBCOF is missing, it is set to zero
Balance Sheet - Assets		
Total Assets	at*	We prefer to use AT. If this is unavailable, then we use SEQ* + DLTT + LCT + LO + TXDITC. If LCT, LO, or TXDITC are missing, then they are set to zero
Current Assets	ca*	We prefer ACT. If this is unavailable, we use RECT+INVT+CHE+ACO
Account Receivables	rec	Compustat item RECT
Cash and Short-Term Investment	cash	Compustat item CHE
Inventory	inv	Compustat item INVT
Non-Current Assets	nca*	We use AT* - CA*
Intangible Assets	intan	Compustat item INTAN
Investment and Advances	ivao	Compustat item IVAO
Property, Plans and Equipment Gross	ppeg	Compustat item PPEGT
Property, Plans and Equipment Net	ppen	Compustat item PPENT
Balance Sheet - Liabilities		
Total Liabilities	lt	Compustat item LT
Current Liabilities	cl*	We prefer LCT. If this is unavailable, we use AP+ DLC+ TXP+ LCO
Accounts Payable	ap	Compustat item AP
Short-Term Debt	debtst	Compustat item DLC
Income Tax Payable	txp	Compustat item TXP
Non-Current Liabilities	ncl*	We use LT-CL*
Long-Term Debt	debtlt	Compustat item DLTT
Deferred Taxes and Investment Credit	txditc*	We prefer to use TXDITC. If this is unavailable, we use TXDB+ ITCB
Balance Sheet - Financing		
Preferred Stock	pstk*	We prefer to use PSTKRV. If this is unavailable, we use PSTKL. If this is unavilable, we use PSTK
Total Debt	debt*	We use DLTT+ DLC. Either DLTT or DLC are allowed to me missing
Net Debt	netdebt*	We use DEBT*- CHE where we set CHE to zero if missing
Shareholders Equity	seq*	We prefer to use SEQ. If this is unavailable, we use CEQ+PSTK* where we set PSTK* to zero if missing. If this is unavailable, we use AT- LT
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 ICAPT+DLC-CHE where DLC and CHE are set to zero if missing. If this is unavailable, we use SEQ*+NETDEBT*+ MIB where we set MIB to zero if missing. In the global data ICAPT is reduced by Treasury stock
Balance Sheet - Summary		
Net Working Capital	nwc*	We use CA*-CL*
Current Operating Assets	coa*	We use CA*- CHE
Current Operating Liabilities	col*	We use CL*- DLC. 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*- IVAO

Name	Abbreviation	Construction
Non-Current Operating Liabilities	ncol*	We use LT-CL*- DLTT
Net Non-Current Operating Assets	nncoa*	We use NCOA*-NCOL*
Financial Assets	fna*	We use IVST+ IVAO. 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*	PPENT + INTAN + AO - LO + DP
Liquid Current Assets	caliq*	We prefer to use CA* - INVT. If this is unavailable, we use CHE + RECT
Property Plant and Equipment Less Inventories	ppeinv*	PPEGT + INVT
Ortiz-Molina and Phillips Liquidity	aliq*	CHE + 0.75× COA* + 0.5(AT* - CA* - INTAN). If INTAN is missing, we set it to zero
Market Based		
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
Accruals		
Operating Accruals	oacc*	We prefer NI*-OANCF. If that is unavailable, we use the yearly change in COWC*+the yearly change in NNCOA*
Total Accruals	tacc*	We use OACC* + the yearly change in NFNA*
Operating Cash Flow	ocf*	We prefer to use OANCF. If this is unavailable, we use NI*-OACC*. If this is unavailable, we use NI* + DP - WCAPT. If WCAPT is missing, we use 0.
Quarterly Operating Cash Flow	ocf_qtr*	We use OANCFQ. If this is unavailable, then we use IBQ + DPQ - WCAPTQ. If WCAPTQ is unavailable, we set it to
Cash Based Operating Profitability	cop*	We prefer EBITDA*+XRD-OACC*. If XRD is unavailable, we set it to zero
Other		
Employees in Thousands	emp	Compustat item EMP

Table 6: Accounting Characteristics

Name	Abbreviation	Construction
Accounting Based Size Measures		
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
Growth - Percentage[5]		
Asset Growth 1yr	at_gr1	$\frac{AT^*_t}{AT^*_{t-12}} - 1$

[5]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
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	$\frac{NCA^*_t}{NCA^*_{t-12}} - 1$
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	$\frac{SALE^*_t}{SALE^*_{t-36}} - 1$
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		
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	$\frac{REC_t - REC_{t-12}}{AT^*_t}$

Name	Abbreviation	Construction
Property, Plans and Equiptment 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	$\frac{TXP_t - TXP_{t-12}}{AT^*_t}$
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	$\frac{NOA^*_t - NOA^*_{t-12}}{AT^*_t}$
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	$\frac{NIX^*_t - NIX^*_{t-12}}{AT^*_t}$
Equity Net Issuance Change 1yr	eqnetis_gr1a	$\frac{EQNETIS^*_t - EQNETIS^*_{t-12}}{AT^*_t}$

Name	Abbreviation	Construction
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	$\frac{EQIS^*_t - EQIS^*_{t-12}}{AT^*_t}$
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	$\frac{DEBTST_t - DEBTST_{t-36}}{AT^*_t}$
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	$\frac{OA^*_t - OA^*_{t-36}}{AT^*_t}$

Name	Abbreviation	Construction
Operating Liabilities Change 3yr	ol_gr3a	$\frac{OL^*_t - OL^*_{t-36}}{AT^*_t}$
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	$\frac{NWC^*_t - NWC^*_{t-36}}{AT^*_t}$
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	$\frac{EQNPO^*_t - EQNPO^*_{t-36}}{AT\_t}$
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	$\frac{CAPX_t - CAPX_{t-36}}{AT\_t}$
Investment		
Capital Expenditures scaled by Assets	capx_at	$\frac{CAPX_t}{AT^*_t}$

Name	Abbreviation	Construction
R&D scaled by Assets	rd_at	$\frac{XRD_t}{AT^*_t}$
Non-Recurring Items		
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	$\frac{SPI_t+XIDO^*_t}{AT^*_t}$
Profit Margins		
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	$\frac{OCF^*_t}{SALE^*_t}$
Return on Assets		
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	$\frac{EBIT^*_t}{AT^*_t}$
Firm Income scaled by Assets	fi_at	$\frac{FI^*_t}{AT^*_t}$
Cash Based Operating Profitability scaled by Assets	cop_at	$\frac{COP^*_t}{AT^*_t}$
Return on Book Equity		
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	$\frac{FCF^*_t}{BE^*_t}$
Return on Invested Capital		
Gross Profit scaled by BEV	gp_bev	$\frac{GP^*_t}{BEV^*_t}$
Operating Profit before Depreciation scaled by BEV	ebitda_bev	$\frac{EBITDA^*_t}{BEV^*_t}$

Name	Abbreviation	Construction
Operating Profit after Depreciation scaled by BEV	ebit_bev	$\frac{EBIT^*_t}{BEV^*_t}$
Firm Income scaled by BEV	fi_bev	$\frac{FI^*_t}{BEV^*_t}$
Cash Based Operating Profitability scaled by BEV	cop_bev	$\frac{COP^*_t}{BEV^*_t}$
Return on Physical Capital		
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	$\frac{FCF^*_t}{PPEN_t}$
Issuance		
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	$\frac{DSTNETIS^*_t}{AT^*_t}$
Equity Payout		
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	$\frac{DIV^*_t}{AT^*_t}$
Accruals		
Operating Accruals	oaccruals_at	$\frac{OACC^*_t}{AT^*_t}$
Percent Operating Accruals	oaccruals_ni	$\frac{OACC^*_t}{\lvert NIX^*_t\rvert}$
Total Accruals	taccruals_at	$\frac{TACC^*_t}{AT^*_t}$
Percent Total Accruals	taccruals_ni	$\frac{TACC^*_t}{\lvert NIX^*_t\rvert}$
Net Operating Asset to Total Assets	noa_at	$\frac{NOA^*_t}{AT^*_t}$
Capitalization/Leverage Ratios		
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	$\frac{CASH_t}{BEV^*_t}$
Preferred Stock scaled by BEV	pstk_bev	$\frac{PSTK^*_t}{BEV^*_t}$

Name	Abbreviation	Construction
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	$\frac{DEBTST_t}{MEV^*_t}$
Financial Soundness Ratios		
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	$\frac{EBITDA^*_t}{CL^*_t}$
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	$\frac{LT_t}{PPEN_t}$
Long-Term Debt to Book Equity	debtlt_be	$\frac{DEBTLT_t}{BE^*_t}$
Working Capital scaled by Assets	nwc_at	$\frac{NWC^*_t}{AT^*_t}$
Solvency Ratios		
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	$\frac{EBIT^*_t}{INT_t}$
Liquidity Ratios		
Days Inventory Outstanding	inv_days	$\frac{\frac{INV_t+INV_{t-12}}{2}}{COGS_t} \times 365$

Name	Abbreviation	Construction
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	$INV\_DAYS_t + REC\_DAYS_t - AP\_DAYS_t$
Cash Ratio	cash_cl	$\frac{CASH_t}{CL^*_t}$
Quick Ratio	caliq_cl	$\frac{CALIQ^*_t}{CL^*_t}$
Current Ratio	ca_cl	$\frac{CA^*_t}{CL^*_t}$
Activity/Efficiency Ratios		
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	$\frac{COGS_t+INV_t-INV_{t-12}}{(AP_t+AP_{t-12})/2}$
Miscellaneous		
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	$\frac{DVC_t}{NI^*_t}$
Sales scaled by Working Capital	sale_nwc	$\frac{SALE^*_t}{NWC^*_t}$
Effective Tax Rate	tax_pi	$\frac{TAX_t}{PI^*_t}$
Balance Sheet Fundamental to Market Equity		
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	$\frac{CASH_t}{ME_t}$
Income Fundamentals to Market Equity		
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	$\frac{XRD_t}{ME_t}$
Balance Sheet Fundamentals to Market Enterprise Value		
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	$\frac{PPEN_t}{MEV^*_t}$
Equity Payout/Issuance to Market Equity		
Total Dividends scaled by ME	div_me	$\frac{DIV^*_t}{ME_t}$
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	$\frac{EQNETIS^*_t}{ME_t}$
Debt Issuance to Market Enterprise Value		
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	$\frac{DBNETIS^*_t}{MEV^*_t}$
Firm Payout/Issuance to Market Enterprise Value		
Net Issuance scaled by MEV	netis_mev	$\frac{NETIS^*_t}{MEV^*_t}$
Income Fundamentals to Market Enterprise Value		
Gross Profit scaled by MEV	gp_mev	$\frac{GP^*_t}{MEV^*_t}$
Operating Profit before Depreciation scaled by MEV	ebitda_mev	$\frac{EBITDA^*_t}{MEV^*_t}$
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	$\frac{OCF^*_t}{MEV^*_t}$

Name	Abbreviation	Construction
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	$\frac{FINCF^*_t}{MEV^*_t}$
New Variables not in HXZ		
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	$\frac{OCF^*_t}{AT^*_t}$
Operating Cash Flow to Assets 1 yr Change	ocf_at_chg1	$OCF\_AT_t - OCF\_AT_{t-12}$
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	$\frac{GP^*_t}{SALE^*_t} - \frac{GP^*_{t-60}}{SALE^*_{t-60}}$
New Variables from HXZ		
Cash and Short Term Investments scaled by Assets	cash_at	$\frac{CASH_t}{AT^*_t}$
Number of Consecutive Earnings Increases	ni_inc8q	Count number of earnings increases over past 8 quarters
Change in Property, Plant and Equipment Less Inventories scaled by lagged Assets	ppeinv_gr1a	$\frac{PPEINV^*_t - PPEINV^*_{t-12}}{AT^*_{t-12}}$
Change in Long-Term NOA scaled by average Assets	lnoa_gr1a	$\frac{LNOA^*_t - LNOA^*_{t-12}}{AT^*_t - AT^*_{t-12}}$
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	$NIQ\_AT_t - NIQ\_AT_{t-12}$

Name	Abbreviation	Construction
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	age	Age of the firms in months
Change Sales minus Change Inventory	dsale_dinv	$CHG\_TO\_EXP(SALE^*_t) - CHG\_TO\_EXP(INV_t)$
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 Surprrise	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	$\frac{PI^*_t}{NIX^*_t}$
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	eq_dur	Outlined in detail here
Piotroski F-Score	f_score	Outlined in detail here
Ohlson O-Score	o_score	Outlined in detail here

Name	Abbreviation	Construction
Altman Z-Score	z_score	Outlined in detail here
Kaplan-Zingales Index	kz_index	Outlined in detail here
Intrinsic Value	intrinsic_value	Outlined in detail here
Intrinsic value-to-market	ival_me	$\frac{INTRINSIC\_VALUE^*_t}{ME_t}$
Sales scaled by Employees Growth 1 yr	sale_emp_gr1	$\frac{SALE\_EMP_t}{SALE\_EMP_{t-12}} - 1$
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	$\frac{\sigma_{60M}\left(NI^*_t / AT^*_{t-12}\right)}{\sigma_{60M}\left(OCF^*_t / AT^*_{t-12}\right)}$
1 yr lagged Net Income to Assets	ni_ar1	$\frac{cov((NI^*/AT^*)_t, (NI^*/AT^*)_{t-12})}{var((NI^*/AT^*)_{t-12})}$
Net Income Idiosyncratic Volatility	ni_ivol	Outlined in detail here

7 Market Based Characteristics

Datasets

- CRSP.MSF
- CRSP.DSF
- COMP.SECD
- COMP.G_SECD
- COMP.SECM
- COMP.SECURITY
- COMP.G_SECURITY

Market Variables

A suffix of '*' indicates that we have altered or renamed the original item.

Table 7: Market Variables

Name	Abbreviation	Construction
CRSP Variables[6]		

[6] lag is a lag function where lag(x) is the value of x from the previous time period

Name	Abbreviation	Construction
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	prc_high	We use ASKHI. If PRC* or AKSHI are negative, then PRC_HIGH is set to missing
Lowest Daily Price	prc_low	We use BIDLO. If PRC* or BIDLO are negative, then PRC_LOW is set to missing
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 PERMCO and date
Trading Volume	tvol*	We use VOL
Dollar Volume	dolvol*	We use TVOL*×PRC*
Return	RET*	We use RET. In case of delisting, we calculate as (1+RET)*(1+DLRET)-1
Local Return	ret_local*	We use RET. In case of delisting, we calculate as (1+RET)*(1+DLRET)-1
Excess Return	ret_exc*	We use RET*-T30RET/21. If T30RET is unavailable, we use RF. If the return is a monthly return rather than a daily return, the 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))
Compustat Variables		
Share Adjustment Factor	adjfct*	We use AJEXDI
Shares	shares*	We use CSHOC/1000000
Price	prc*	We use PRC_LOCAL*×FX
Local Price	prc_local*	We use PRCCD
Market Equity	me*	We use PRC*×SHARES*
Company Market Equity	me_company*	We use ME*
Trading Volume	tvol*	We use CSHTRD
Dollar Volume	dolvol*	We use TVOL*×PRC*
Cumulative Return - Local	ri_local*	We use PRC_LOCAL*× TRFD/AJEXDI
Local Return	ret_local*	We use RI_LOCAL*/lag(RI_LOCAL*) - 1. In case of delisting, we calculate as (RI_LOCAL*/lag(RI_LOCAL*) * (1+dlret[7]) - 1)
Cumulative Return	ri*	RI_LOCAL* × FX*
Return	RET*	We use RI*/lag(RI*) - 1. In case of delisting, we calculate as (RI*/lag(RI*) * (1+dlret) -1)
Excess Return	ret_exc*	We use RET*-T30RET/21. If T30RET is unavailable, we use RF. If the return is a monthly return rather than a daily return, the 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 estimate the number of days since the previous return. If the returns are monthly rather than daily, then the time is in months
Monthly Dividend	div_tot*	We use DIV × FX*. If DIV is missing, we set it to zero
Cash Dividend	div_cash*	We use DIVD × FX*. If DIVD is unavailable, we set it to zero
Special Cash Dividend	div_spc*	We use DIVSP × FX*. If DIVSP is unavailable, we set it to zero
Bid-Ask Average Dummy	bidask*	When PRCSTD = 4 then 1, otherwise 0
Asset Pricing Factors		
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*

[7] dlret is set to -0.3 when dlsrni is '02' or '03' and set to 0 otherwise

Name	Abbreviation	Construction
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*	$\sigma_{zD}(MKTRF^*_t)$ [8]

Table 8: Market Characteristics

Name	Abbreviation	Construction
Market Based Size Measures		
Market Equity	market_equity	ME^*_t
Total Dividend Paid to Market Equity		
Dividend to Price - 1 Month	div1m_me	$\frac{DIV\_TOT^*_t \times SHARES^*_t}{ME^*_t}$
Dividend to Price - 3 Months	div3m_me	$\frac{\sum_{n=0}^{2} DIV\_TOT^*_{t-n} \times SHARES^*_{t-n}}{ME^*_t}$
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	$\frac{\sum_{n=0}^{11} DIV\_TOT^*_{t-n} \times SHARES^*_{t-n}}{ME^*_t}$
Special Dividend Paid to Market Equity		
Special Dividend to Price - 1 Month	divspc1m_me	$\frac{DIV\_SPC^*_t \times SHARES^*_t}{ME^*_t}$
Special Dividend to Price - 12 Month	divspc12m_me	$\frac{\sum_{n=0}^{11} DIV\_SPC^*_{t-n} \times SHARES^*_{t-n}}{ME^*_t}$
Change in Shares Outstanding		
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	$\frac{SHARES^*_t \times ADJFCT^*_t}{SHARES^*_{t-12} \times ADJFCT^*_{t-12}} - 1$
Net Equity Payout		
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	$log\left(\frac{RI^*_t}{RI^*_{t-3}}\right) - log\left(\frac{ME^*_t}{ME^*_{t-3}}\right)$
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	$log\left(\frac{RI^*_t}{RI^*_{t-12}}\right) - log\left(\frac{ME^*_t}{ME^*_{t-12}}\right)$
Momentum/Reversal		

[8] Must have enough non-missing values of stock to be estimated

Name	Abbreviation	Construction
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	$\frac{RI^*_t}{RI^*_{t-12}} - 1$
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	$\frac{RI^*_{t-12}}{RI^*_{t-60}} - 1$
Momentum 36-60 Months	ret_60_36	$\frac{RI^*_{t-36}}{RI^*_{t-60}} - 1$
Seasonality		
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

Name	Abbreviation	Construction
Combined Accounting and Market Based Characteristics		
Let e_t be defined as described here		
60 Month CAPM Beta	beta_60m	$\frac{COVAR\_60M(RET^*_t, MKTRF^*_t)}{VARC\_60M(MKTRF^*_t)}$
Performance Based Mispricing	mispricing_perf[9]	$\frac{1}{4}(O\_SCORE^{r01}_t + RET\_12\_1^{r01}_t + GP\_AT^{r01}_t + NIQ\_AT^{r01}_t)$
Management Based Mispricing	mispricing_mgmt	$\frac{1}{6}(CHCSHO\_12M^{r01}_t + EQNPO\_12M^{r01}_t + OACCRUALS\_AT^{r01}_t + NOA\_AT^{r01}_t + AT\_GR1^{r01}_t + PPEINV\_GR1A^{r01}_t)$
Residual Momentum - 6 Month	resff3_6_1	$-1 + \prod_{n=1}^{6} 1 + e_{t-n}$
Residual Momentum - 12 Month	resff3_12_1	$-1 + \prod_{n=1}^{12} 1 + e_{t-n}$
Daily Market Data[10]		
Let ϵ_t be defined as described here		
Return Volatility	rvol_zd	$\sigma_{zD}(RET\_EXC^*_t)$
Maximum Return	rmax1_zd	$MAX1\_zD(RET^*_t)$
Mean Maximum Return	rmax5_zd	$\frac{1}{5}\sum_{n=1}^{5} X_n, \;\; X_n \in MAX5\_zD(RET^*)$
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	$\left(\frac{\lvert RET^*_t \rvert}{DOLVOL^*_t}\right)_{zD} * 1000000$
CAPM Beta	beta_zd	Described in detail here
CAPM Idiosyncratic Vol.	ivol_capm_zd	Described in detail here
CAPM Skewness	iskew_capm_zd	Described in detail here
Coskewness	coskew_zd[11]	$\frac{\overline{(\epsilon_t \times MKTRF\_DM^2_t)}_{zD}}{\sqrt{\overline{(\epsilon^2_t)}_{zD} \times \overline{(MKTRF\_DM^2_t)}_{zD}}}$
Fama and French Idiosyncratic Vol.	ivol_ff3_zd	Described in detail here
Fama and French Skewness	iskew_ff3_zd	Described in detail here
Hou, Xue and Zhang Idiosyncratic Vol.	ivol_hxz4_zd	Described in detail here
Hou, Xue and Zhang Skewness	iskew_hxz4_zd	Described in detail here
Dimson Beta	beta_dimson_zd	Created as described in Dimson (1979)
Downside Beta	betadown_zd	Described in detail here

[9] 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.

[10] 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.

[11] $MKTRF\_DM_t = MKTRF^*_t - \overline{MKTRF^*}_{tzD}$

Name	Abbreviation	Construction
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	$\overline{\left(\frac{TVOL^*_t}{SHARES^*_t * 1000000}\right)}_{zD}$
Turnover Volatility	turnover_var_zd	$\frac{\sigma_{zD}\left((TVOL^*_t / SHARES^*_t) * 1000000\right)}{TURNOVER\_zD_t}$
Dollar Volume	dolvol_zd	$\overline{DOLVOL^*}_{tzD}$
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)
21 Day Return Volatility High-Low	rvolhl_21d	High-low return volatility estimator created using code from Corwin and Schultz (2012)
Quality Minus Junk		
Quality Minus Junk - Profit	qmj_prof	$ZV\Big(ZV(GP\_AT_t) + ZV(NI\_BE_t) + ZV(NI\_AT_t) + ZV(OCF\_AT_t) + ZV(GP\_SALE^*_t) + ZV(OACCRUALS\_AT_t)\Big)$
Quality Minus Junk - Growth	qmj_growth	$ZV\Big(ZV(GPOA\_CH5_t) + ZV(ROE\_CH5_t) + ZV(ROA\_CH5_t) + ZV(CFOA\_CH5_t) + ZV(GMAR\_CH5_t)\Big)$
Quality Minus Junk - Safety	qmj_safety	$ZV\Big(ZV(BETABAB\_1260d_t) + ZV(DEBT\_AT_t) + ZV(O\_SCORE_t) + ZV(Z\_SCORE_t) + ZV(\_EVOL_t)\Big)$
Quality Minus Junk	qmj	$\frac{QMJ\_PROF_t + QMJ\_GROWTH_t + QMJ\_SAFETY_t}{3}$

8 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:

$$\_roe0 = \frac{NI^*_t}{BE^*_{t-12}}$$
$$\_g0 = \frac{SALE^*_t}{SALE^*_{t-12}} - 1$$
$$\_be0 = BE^*_t$$

* 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

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

– Create duration helper variables [12]

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

– Characteristic:

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

[12] ed_cw_w, ed_cd and ed_err are equal to 0 at i = 1. ed_cw_w and ed_cd recusrively build upon themselves over the length of the horiozon, so $ed\_cw\_w_{i-1}$, for example, would be the previous iteration of ed_cw_w

- 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[13]

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

- Ohlson O-Score

[13] 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:

$$
\begin{aligned}
\_o\_lat_t &= AT^*{}_{t-1} \\
\_o\_lev_t &= \frac{DEBT^*{}_t}{AT^*{}_t} \\
\_o\_wc_t &= \frac{CA^*{}_t - CL^*{}_t}{AT^*{}_t} \\
\_o\_roe_t &= \frac{NIX^*{}_t}{AT^*{}_t} \\
\_o\_cacl_t &= \frac{CL^*{}_t}{CA^*{}_t} \\
\_o\_ffo_t &= \frac{PI^*{}_t + DP_t}{LT_t} \\
\_o\_neg\_eq_t &= 1 \text{ if } LT_t > AT^*{}_t, \text{ otherwise } 0 \\
\_o\_neg\_earn &= 1 \text{ if } NIX^*{}_t < 0 \text{ and } NIX^*{}_{t-12} < 0 \\
\_o\_nich_t &= \frac{NIX^*{}_t - NIX^*{}_{t-12}}{|NIX^*{}_t| + |NIX^*{}_{t-12}|}
\end{aligned}
$$

  * 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 $\_o\_cacl_t$ 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:

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

- Altman Z-Score

– Create helper variables:

$$
\begin{aligned}
\_z\_wc_t &= \frac{CA^*{}_t - CL^*{}_t}{AT^*{}_t} \\
\_z\_re_t &= \frac{RE_t}{AT^*{}_t} \\
\_z\_eb_t &= \frac{EBITDA^*{}_t}{AT^*{}_t} \\
\_z\_sa_t &= \frac{SALE^*{}_t}{AT^*{}_t} \\
\_z\_me_t &= \frac{ME\_FISCAL_t}{LT_t}
\end{aligned}
$$

* 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:

$$\begin{aligned}
_kz_cf_t &= \frac{NI^*_t + DP_t}{PPENT_{t-12}} \\
_kz_q_t &= \frac{AT^*_t + ME_FISCAL_t - BE^*_t}{AT^*_t} \\
_kz_db_t &= \frac{DEBT^*_t}{DEBT^*_t + SEQ^*_t} \\
_kz_dv_t &= \frac{DIV^*_t}{PPENT_{t-12}} \\
_kz_cs_t &= \frac{CHE_t}{PPENT_{t-12}}
\end{aligned}$$

* 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 $\_kz\_q_t$ is set to missing. If $(DEBT^*_t + SEQ^*_t) = 0$ then $\_kz\_db_t$ is set to missing.

– Characteristic:

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

- Intrinsic Value 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:

$$intrinsic\_value_t = BE^*{}_t + \frac{\_iv\_roe_t - r}{1+r} \times BE^*{}_t + \frac{\_iv\_roe_t - r}{(1+r) \times r} \times \_iv\_be1_t$$

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

- Net Income Idiosyncratic Volatility
  - Define the following variable [14]:

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

  - 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):

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

[14] If $AT^*{}_t \leq 0$, then $\_ni\_at_t$ is set to missing

– Characteristics [15]:

$$\begin{aligned} beta\_zd &= \beta_1 \text{ from the CAPM model} \\ ivol\_capm\_zd_t &= \sigma_{zD}(\epsilon_t) \\ ivol\_ff3\_zd_t &= \sigma_{zD}(e_t) \\ ivol\_hxz4\_zd_t &= \sigma_{zD}(\mu_t) \\ iskew\_capm\_zd_t &= SKEW\_zD(\epsilon_t) \\ iskew\_ff3\_zd_t &= SKEW\_zD(e_t) \\ iskew\_hxz4\_zd_t &= SKEW\_zD(\sigma_t) \end{aligned}$$

- 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:
    * $betadown\_zd = \beta_1$

9 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 $X_t \times fx_t$

[15] z indicates over how many days the model is run.

10 Factor Details and Citations

Table 9: Factor and Cluster Details

Description	Variable Name	Citation	Orig. Sample	Sign	Orig. Signif.
		Accruals			
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
Years 16-20 lagged returns, nonannual	seas_16_20na	Heston and Sadka (2008)	1965-2002	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
		Debt Issuance			
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
Earnings persistence	ni_ar1	Francis, LaFond, Olsson, and Schipper (2004)	1975-2001	1	0
Net operating assets	noa_at	Hirshleifer, Hou, Teoh, and Zhang (2004)	1964-2002	-1	1
		Investment			
Liquidity of book assets	aliq_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
		Low Leverage			
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 et al. (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
Earnings variability	earnings_variability	Francis et al. (2004)	1975-2001	-1	0
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
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
Years 6-10 lagged returns, nonannual	seas_6_10na	Heston and Sadka (2008)	1965-2002	-1	1
Share turnover	turnover_126d	Datar, Naik, and Radcliffe (1998)	1963-1991	-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 (6 months)	zero_trades_126d	Liu (2006)	1963-2003	1	1
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-6 to t-1	resff3_6_1	Blitz, Huij, and Martens (2011)	1930-2009	1	1
Residual momentum t-12 to t-1	resff3_12_1	Blitz et al. (2011)	1930-2009	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
Price momentum t-12 to t-1	ret_12_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
		Profit Growth			
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
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
Tax expense surprise	tax_gr1a	J. Thomas and Zhang (2011)	1977-2006	1	1
		Profitability			
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
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
		Quality			
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, Frazzini, and Pedersen (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
Quality minus Junk: Safety	qmj_safety	C. S. Asness et al. (2019)	1957-2016	1	1
Assets turnover	sale_bev	Soliman (2008)	1984-2002	1	1
		Seasonality			
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, Richardson, and Sloan (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
Taxable income-to-book income	pi_nix	Lev and Nissim (2004)	1973-2000	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 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
Change in short-term investments	sti_gr1a	Richardson et al. (2005)	1962-2001	1	0
		Size			
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
		Short-Term Reversal			
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
Net stock issues	chcsho_12m	Pontiff and Woodgate (2008)	1970-2003	-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
Net equity issuance	eqnetis_at	Bradshaw et al. (2006)	1971-2000	-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
Free cash flow-to-price	fcf_me	Lakonishok et al. (1994)	1963-1990	1	1
Intrinsic value-to-market	ival_me	Frankel and Lee (1998)	1975-1993	1	0
Net total issuance	netis_at	Bradshaw et al. (2006)	1971-2000	-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
Book Equity Growth 1yr	be_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 Depreciation 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 Extraordinary 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 extraordinary income	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_debtlt
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

Intrinsic Value	intrinsic_value
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	divspc1m_me	
Special Dividend to Price - 12 Month	divspc12m_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	
Market beta (21 days)	beta_21d	
Market beta (252 days)	beta_252d	
Return volatility (252 days)	rvol_252d	
Idiosyncratic volatility from the CAPM (60 months)	ivol_capm_60m	
The high-low return volatility	rvolhl_21d	Corwin and Schultz (2012)

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").

11 Miscellaneous

Table 10: Country Code Key and MSCI Categorization

Country	EXCNTRY-Country Code	MSCI Categorization
Argentina	ARG	standalone
Australia	AUS	developed
Austria	AUT	developed
Bahrain	BHR	frontier
Bangladesh	BGD	frontier
Belgium	BEL	developed
Bermuda	BMU	not rated
Botswana	BWA	standalone
Brazil	BRA	emerging
Bulgaria	BGR	standalone
Canada	CAN	developed
Chile	CHL	emerging
China	CHN	emerging
Colombia	COL	emerging
Croatia	HRV	frontier
Cyprus	CYP	not rated
Czech Republic	CZE	emerging
Denmark	DNK	developed
Ecuador	ECU	not rated
Egypt	EGY	emerging
Estonia	EST	frontier
Finland	FIN	developed
France	FRA	developed
Germany	DEU	developed
Ghana	GHA	not rated
Greece	GRC	emerging
Guernsey	GGY	not rated
Hong Kong	HKG	developed
Hungary	HUN	emerging
Iceland	ISL	frontier
India	IND	emerging
Indonesia	IDN	emerging
Iran, Islamic Republic of	IRN	not rated
Ireland	IRL	developed
Israel	ISR	developed
Italy	ITA	developed
Jamaica	JAM	standalone
Japan	JPN	developed
Jordan	JOR	frontier
Kazakhstan	KAZ	frontier
Kenya	KEN	frontier
Korea, Republic of	KOR	emerging
Kuwait	KWT	emerging
Latvia	LVA	frontier
Lebanon	LBN	standalone

Country	EXCNTRY-Country Code	MSCI Categorization
Lithuania	LTU	frontier
Luxembourg	LUX	not rated
Malawi	MWI	not rated
Malaysia	MYS	emerging
Malta	MLT	standalone
Mauritius	MUS	frontier
Mexico	MEX	emerging
Morocco	MAR	frontier
Namibia	NAM	not rated
Netherlands	NLD	developed
New Zealand	NZL	developed
Nigeria	NGA	standalone
Norway	NOR	developed
Oman	OMN	frontier
Pakistan	PAK	frontier
Palestinian Territory, Occupied	PSE	standalone
Peru	PER	emerging
Philippines	PHL	emerging
Poland	POL	emerging
Portugal	PRT	developed
Qatar	QAT	emerging
Romania	ROU	frontier
Russian Federation	RUS	not rated
Saudi Arabia	SAU	emerging
Senegal	SEN	frontier
Serbia	SRB	frontier
Singapore	SGP	developed
Slovakia	SVK	not rated
Slovenia	SVN	frontier
South Africa	ZAF	emerging
Spain	ESP	developed
Sri Lanka	LKA	frontier
Sweden	SWE	developed
Switzerland	CHE	developed
Taiwan, Province of China	TWN	emerging
Tanzania, United Republic of	TZA	not rated
Thailand	THA	emerging
Trinidad and Tobago	TTO	standalone
Tunisia	TUN	frontier
Turkey	TUR	emerging
Uganda	UGA	not rated
Ukraine	UKR	standalone
United Arab Emirates	ARE	emerging
United Kingdom	GBR	developed
United States	USA	developed
Uruguay	URY	not rated
Venezuela, Bolivarian Republic of	VEN	not rated
Viet Nam	VNM	frontier
Zambia	ZMB	not rated

Country	EXCNTRY-Country Code	MSCI Categorization
Zimbabwe	ZWE	standalone

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