

Global Factor Data Documentation

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1 Overview

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

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

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

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

1.1 How To Run The Code

- Access the code for this data set at <https://github.com/bkelly-lab/GlobalFactor>.
- This data is produced using the SAS Studio on Wharton Research Data Services (WRDS). The following is how to successfully produce the data:
 - Log onto WRDS and open the SAS Studio available under “Programs”
 - Create a folder “Global Data” on the SAS Studio server and upload the SAS files
 - Open main.sas
 - Alter line 7 “libname scratch ... ” to run to your desired output folder
 - Run main.sas. This should run and output the entire code, which should take around 48 hours. This will produce many datasets, including the final dataset.
- Use the 'EOM' (end of month) variable as the date variable to join/merge datasets.

1.2 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.
- 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”

1.3 Terminology

- Annual data refers to accounting data from annual reports sourced from COMP.FUNDA and COMP.G.FUNDA.
- Quarterly data refers to accounting data from quarterly reports sourced from COMP.FUNDQ and COMP.G.FUNDQ.
- Final Dataset refers to “world_data.sas7bdat”, the output dataset
- Fiscal period refers to the relevant period over which income and expenses have accrued.
- Accounting variables refers to accounting items such as assets sales and net income.

- Market variables refers to market based items such as market equity and excess return.
- Characteristics refers to columns in the final dataset such as asset growth, book to market equity, and net income to book equity.

2 Factor Portfolio Construction

- For each characteristic, we build the 1-month holding period factor return within each country as follows.
- In each country and month, we sort stocks into characteristic terciles (top/middle/bottom third) with breakpoints based on non-micro stocks in that country. Specifically, we start with all non-micro stocks in a country (i.e., larger than NYSE 20th 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 80th percentile. This construction ensures that tiny stocks have tiny weights and any one mega stock does not dominate a portfolio, seeking to create tradable, yet balanced, portfolios.
- The factor is then defined as the high-tercile return minus the low-tercile return, corresponding to the excess return of a long-short zero-net-investment strategy. The factor is long (short) the tercile identified by the original paper to have the highest (lowest) expected return.
- For a factor return to be non-missing, we require that it has at least 5 stocks in each of the long and short legs. We also require a minimum of 60 valid monthly observations for each country-specific factor for inclusion in our sample.
- We update characteristics with the most recent accounting data (which could be either annual or quarterly) starting four months after the reporting period.

3 Identifier Variables

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

Table 1: Identifier Variables

Name	Description
size_grp	This groups each firm into one of five categories: Mega, Large, Small, Micro and Nano cap. The groups are non-overlapping and the breakpoints are based on the market equity of NYSE stocks. In particular, Mega caps are all stocks with market equity larger than the 80th percentile of NYSE stocks, Large caps are all remaining stocks larger than the 50th percentile, Small caps are larger than the 20th percentile, Micro caps are larger than the 1st percentile and Nano caps are the remaining stocks.
id	Dataset's unique firm identifier variable. It first identifies the source of the data 'crsp' or 'comp' and also a number as a firm identifier.
source	Identifies the source of the firm/date observation which is either CRSP or Compustat
obs_main	If there are more than one firm observations for one date, this identifies if the observation is considered as the 'main' observation. If available, CRSP observations are considered as the 'main' observation.
gvkey	Permanent six-digit unique firm identifier from Compustat
iid	Permanent two-digit addition to 'gvkey' that identifies specific issues of a firm from Compustat
primary_sec	Primary security as identified by Compustat. A 'gvkey' can have up to three different primary securities ('iid') at a given time (US, CA, and international).
permno	Permanent unique firm identifier from CRSP
permco	Permanent issue identifier from CRSP
excntry	Stock exchange country code from CRSP
curcd	ISO currency code
fx	Ratio of firm currency to USD at the date of observation
common	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_exchg	CRSP stock exchange code
crsp_sic	CRSP firm industry identifier (sic2)
date	Date of the observation
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 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, $MEAN_{12M}(X)$ is the mean of the past 12 months of variable X .

Table 2: Helper Functions

Function	Name	Description
Mean	$MEAN_{z(X)}$	$\frac{1}{z} \sum_{n=0}^{z-1} X_{t-n}$
Variance	$VARC_{z(X)}$	$\frac{1}{z-1} \sum_{n=0}^{z-1} (X_{t-n} - MEAN_{z(X_t)})^2$

Function	Name	Description
Covariance	COVAR _z (X, Y)	$\frac{1}{z-1} \sum_{n=0}^{z-1} (X_{t-n} - MEAN_z(X_t))(Y_{t-n} - MEAN_z(Y_t))$
Standard Deviation	SDEV _z (X)	$\sqrt{VARC_z(X)}$
Skewness	SKEW _z (X)	$\frac{1}{z \times SDEV_z(X)^3} \sum_{n=0}^{z-1} (X_{t-n} - MEAN_z(X_t))^3$
Standardized Unexpected Realization	SUR _z (X)	$\frac{X_t - (X_{t-3} + MEAN_z(X_{t-3} - X_{t-15})/4)}{SDEV_z(X_{t-3} - X_{t-15})}$
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 Variables		
Earnings Volatility	<i>_EVOL</i>	<i>ROEQ_BE_STD</i> × 2. If this is unavailable, we use <i>ROE_BE_STD</i> .
Rank of Variable	<i>_rVar</i>	Cross-sectional rank of Var within a country ¹
Z transformation	<i>ZV(rVar)</i>	$\frac{_rVAR - MEAN_t(_rVAR)}{SDEV_t(_rVAR)}$

5 Accounting Characteristics

5.1 Datasets

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

5.2 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.

¹*OACCRUALS_AT*, *BETABAB_1260d*, *DEBT_AT* and *_EVOL* are sorted in descending order. All other variables are sorted in ascending order.

- 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 cumulative value over the quarters with data available within a fiscal year.

5.3 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.

5.4 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 3: 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

Name	Abbreviation	Construction
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 unavailable, 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
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*. Either EQNETIS* or DBNETIS* are allowed to be 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

Name	Abbreviation	Construction
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	txdite*	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 unavailable, we use PSTK
Total Debt	debt*	We use DLTT+ DLC . Either DLTT or DLC are allowed to be 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
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	aliqu*	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

Name	Abbreviation	Construction
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Table 4: 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 - Percentage²		
Asset Growth 1yr	at_gr1	$\frac{AT^*_t}{AT^*_{t-12}} - 1$
Sales Growth 1yr	sale_gr1	$\frac{SALE^*_t}{SALE^*_{t-12}} - 1$
Current Asset Growth 1yr	ca_gr1	$\frac{CA^*_t}{CA^*_{t-12}} - 1$
Non-Current Asset Growth 1yr	nca_gr1	$\frac{NCA^*_t}{NCA^*_{t-12}} - 1$

²This refers to all variables with a suffix of “_gr1” or “_gr3”. The variables are percentage growth in the accounting variables before the suffix. The number in the suffix refers to either 1 or 3 year growth. For all variables, we only take the percentage growth if the denominator is above zero.

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

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

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

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

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

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

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

Name	Abbreviation	Construction
Accounts Payable Change 3yr	ap-gr3a	$\frac{AP_t - AP_{t-36}}{AT^*_t}$
Income Tax Payable Change 3yr	txp-gr3a	$\frac{TXP_t - TXP_{t-36}}{AT^*_t}$
Long-Term Debt Change 3yr	debtlt-gr3a	$\frac{DEBTLT_t - DEBTLT_{t-36}}{AT^*_t}$
Deferred Taxes and Investment Credit Change 3yr	txditc-gr3a	$\frac{TXDITC^*_t - TXDITC^*_{t-36}}{AT^*_t}$
Current Operating Assets Change 3yr	coa-gr3a	$\frac{COA^*_t - COA^*_{t-36}}{AT^*_t}$
Current Operating Liabilities Change 3yr	col-gr3a	$\frac{COL^*_t - COL^*_{t-36}}{AT^*_t}$
Current Operating Working Capital Change 3yr	cowc-gr3a	$\frac{COWC^*_t - COWC^*_{t-36}}{AT^*_t}$
Non-Current Operating Assets Change 3yr	ncoa-gr3a	$\frac{NCOA^*_t - NCOA^*_{t-36}}{AT^*_t}$
Net Non-Current Operating Assets Change 3yr	nncoa-gr3a	$\frac{NNCOA^*_t - NNCOA^*_{t-36}}{AT^*_t}$
Operating Assets Change 3yr	oa-gr3a	$\frac{OA^*_t - OA^*_{t-36}}{AT^*_t}$
Operating Liabilities Change 3yr	ol-gr3a	$\frac{OL^*_t - OL^*_{t-36}}{AT^*_t}$

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

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

Name	Abbreviation	Construction
Effective Tax Rate Change 3yr	tax_gr3a	$\frac{TAX_t - TAX_{t-36}}{AT_t}$
Dividend Payout Ratio Change 3yr	div_gr3a	$\frac{DIV^*_t - DIV^*_{t-36}}{AT_t}$
Equity Buyback Change 3yr	eqbb_gr3a	$\frac{EQBB^*_t - EQBB^*_{t-36}}{AT_t}$
Equity Issuance Change 3yr	eqis_gr3a	$\frac{EQIS^*_t - EQIS^*_{t-36}}{AT_t}$
Net Equity Payout Change 3yr	eqpo_gr3a	$\frac{EQPO^*_t - EQPO^*_{t-36}}{AT_t}$
Capital Expenditures Change 3yr	capx_gr3a	$\frac{CAPX_t - CAPX_{t-36}}{AT_t}$
Investment		
Capital Expenditures scaled by Assets	capx_at	$\frac{CAPX_t}{AT^*_t}$
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	$\frac{SPI_t + XIDO^*_t}{AT^*_t}$

Name	Abbreviation	Construction
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	$\frac{EBIT^*_t}{AT^*_t}$

Name	Abbreviation	Construction
Firm Income scaled by Assets	fi_at	$\frac{FI^*_t}{AT^*_t}$
Cash Based Operating Profitability scaled by Assets	cop_at	$\frac{COP^*_t}{AT^*_t}$
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	$\frac{EBITDA^*_t}{BEV^*_t}$
Operating Profit after Depreciation scaled by BEV	ebit_bev	$\frac{EBIT^*_t}{BEV^*_t}$
Firm Income scaled by BEV	fi_bev	$\frac{FI^*_t}{BEV^*_t}$

Name	Abbreviation	Construction
Cash Based Operating Profitability scaled by BEV	cop_bev	$\frac{COP^*_t}{BEV^*_t}$
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	$\frac{DSTNETIS^*_t}{AT^*_t}$

Name	Abbreviation	Construction
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	$\frac{OACC^*_t}{ NIX^*_t }$
Total Accruals	taccruals_at	$\frac{TACC^*_t}{AT^*_t}$
Percent Total Accruals	taccruals_ni	$\frac{TACC^*_t}{ NIX^*_t }$
Net Operating Asset to Total Assets	noa_at	$\frac{NOA^*_t}{AT^*_t}$
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	$\frac{CASH_t}{BEV^*_t}$

Name	Abbreviation	Construction
Preferred Stock scaled by BEV	pstk_bev	$\frac{PSTK_t^*}{BEV_t^*}$
Long-Term Debt scaled by BEV	debtlt_bev	$\frac{DEBTLT_t}{BEV_t^*}$
Short-Term Debt scaled by BEV	debtst_bev	$\frac{DEBTST_t}{BEV_t^*}$
Total Debt scaled by MEV	debt_mev	$\frac{DEBT_t^*}{MEV_t^*}$
Preferred Stock scaled by MEV	pstk_mev	$\frac{PSTK_t^*}{MEV_t^*}$
Long-Term Debt scaled by MEV	debtlt_mev	$\frac{DEBTLT_t}{MEV_t^*}$
Short-Term Debt scaled by MEV	debtst_mev	$\frac{DEBTST_t}{MEV_t^*}$
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	$\frac{EBITDA_t^*}{CL_t^*}$

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

Name	Abbreviation	Construction
Long-Term Debt to Book Equity	debtlt.be	$\frac{DEBTLT_t}{BE^*_t}$
Working Capital scaled by Assets	nwc.at	$\frac{NWC^*_t}{AT^*_t}$
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	$\frac{\frac{INV_t + INV_{t-12}}{2}}{COGS_t} \times 365$
Days Sales Outstanding	rec_days	$\frac{\frac{REC_t + REC_{t-12}}{2}}{SALE^*_t} \times 365$
Days Accounts Payable Outstanding	ap_days	$\frac{\frac{AP_t + AP_{t-12}}{2}}{COGS_t} \times 365$
Cash Conversion Cycle	cash_conversion	$INV_DAYSt + REC_DAYSt - AP_DAYSt$
Cash Ratio	cash.cl	$\frac{CASH_t}{CL^*_t}$
Quick Ratio	caliq.cl	$\frac{CALIQ^*_t}{CL^*_t}$

Name	Abbreviation	Construction
Current Ratio	ca.cl	$\frac{CA^*_t}{CL^*_t}$
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	$\frac{DVC_t}{NI^*_t}$

Name	Abbreviation	Construction
Sales scaled by Working Capital	sale_nwc	$\frac{SALE_t^*}{NWC_t^*}$
Effective Tax Rate	tax_pi	$\frac{TAX_t}{PI_t^*}$
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	$\frac{DIV^*_t}{ME_t}$

Name	Abbreviation	Construction
Equity Buyback scaled by ME	eqbb_me	$\frac{EQBB^*_t}{ME_t}$
Equity Issuance scaled by ME	eqis_me	$\frac{EQIS^*_t}{ME_t}$
Net Equity Payout scaled by ME	eqpo_me	$\frac{EQPO^*_t}{ME_t}$
Equity Net Payout scaled by ME	eqnpo_me	$\frac{EQNPO^*_t}{ME_t}$
Equity Net Issuance scaled by ME	eqnetis_me	$\frac{EQNETIS^*_t}{ME_t}$
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	$\frac{EBITDA^*_t}{MEV^*_t}$

Name	Abbreviation	Construction
Operating Profit after Depreciation scaled by MEV	ebit_mev	$\frac{EBIT^*_t}{MEV^*_t}$
Sales scaled by MEV	sale_mev	$\frac{SALE^*_t}{MEV^*_t}$
Operating Cash Flow scaled by MEV	ocf_mev	$\frac{OCF^*_t}{MEV^*_t}$
Free Cash Flow scaled by MEV	fcf_mev	$\frac{FCF^*_t}{MEV^*_t}$
Cash Based Operating Profitability scaled by MEV	cop_mev	$\frac{COP^*_t}{MEV^*_t}$
Financial Cash Flow Change scaled by MEV	fincf_mev	$\frac{FINCF^*_t}{MEV^*_t}$
New Variables not in HXZ		
Net Income to Sales Quarterly Volatility	niq_saleq_std	$SDEV_8Q \left(\frac{NI_QTR^*_t}{SALE_QTR^*_t} \right)$
Net Income scaled by Employees	ni_emp	$\frac{NI^*_t}{EMP_t}$
Sales scaled by Employees	sale_emp	$\frac{SALE^*_t}{EMP_t}$
Net Income scaled by Assets	ni_at	$\frac{NI^*_t}{AT^*_t}$
Operating Cash Flow scaled by Assets	ocf_at	$\frac{OCF^*_t}{AT^*_t}$

Name	Abbreviation	Construction
Operating Cash Flow to Assets 1 yr Change	ocf_at_chgl	$OCF_AT_t - OCF_AT_{t-12}$
Quarterly ROE Volatility	roeq_be_std	$SDEV_16Q \left(\frac{NI_QTR^*_t}{BE^*_t} \right)$
ROE Volatility	roe_be_std	$SDEV_60M \left(\frac{NI^*_t}{BE^*_t} \right)$
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 Change in Property, Plant and Equipment Less Inventories scaled by lagged Assets	ni_inc8q ppeinv_gr1a	Count number of earnings increases over past 8 quarters $\frac{PPEINV^*_t - PPEINV^*_{t-12}}{AT^*_{t-12}}$
Change in Long-Term NOA scaled by average Assets	lnoa_gr1a	$\frac{LNOA^*_t - LNOA^*_{t-12}}{AT^*_t - AT^*_{t-12}}$

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

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

Name	Abbreviation	Construction
Ball Operating Profit scaled by lagged Assets	op_atl1	$\frac{OP^*_t}{AT^*_{t-12}}$
Operating Profit scaled by lagged Book Equity	ope_bel1	$\frac{OPE^*_t}{BE^*_{t-12}}$
Gross Profit scaled by lagged Assets	gp_atl1	$\frac{GP^*_t}{AT^*_{t-12}}$
Cash Based Operating Profitability scaled by lagged Assets	cop_atl1	$\frac{COP^*_t}{AT^*_{t-12}}$
Book Leverage	at_be	$\frac{AT^*_t}{BE^*_t}$
Operating Cash Flow to Sales Quarterly Volatility	ocfq_saleq_std	$SDEV_16Q \left(\frac{OCF_QTR^*_t}{SALE_QTR^*_t} \right)$
Liquidity scaled by lagged Assets	aliq_at	$\frac{ALIQ^*_t}{AT^*_{t-12}}$
Liquidity scaled by lagged Market Assets	aliq_mat	$\frac{ALIQ^*_t}{MAT^*_{t-12}}$
Tangibility	tangibility	$\frac{CASH_t + 0.715 \times REC_t + 0.547 \times INV_t + 0.535 \times PPEG_t}{AT^*_t}$
Equity Duration Piotroski F-Score Ohlson O-Score Altman Z-Score Kaplan-Zingales Index Intrinsic ROE Sales scaled by Employees Growth 1 yr	eq_dur f_score o_score z_score kz_index intrinsic_value sale_emp_gr1	<p>Outlined in detail here Following Piotroski (2000) Following Ohlson (1980) Following Altman (1968) Following Kaplan and Zingales (1997) Following Frankel and Lee (1998)</p> $\frac{SALE_EMP_t}{SALE_EMP_{t-12}} - 1$

Name	Abbreviation	Construction
Employee Growth 1 yr	emp_gr1	$\frac{EMP_t - EMP_{t-12}}{0.5 \times EMP_t + 0.5 \times EMP_{t-12}}$
Earnings Variability	earnings_variability	$\frac{SDEV_{.60M} \left(\frac{NI^*_t}{AT^*_{t-12}} \right)}{SDEV_{.60M} \left(\frac{OCF^*_t}{AT^*_{t-12}} \right)}$
1 yr lagged Net Income to Assets	ni_ar1	$\frac{NI^*_{t-12}}{AT^*_{t-12}}$
Net Income Idiosyncratic Volatility	ni_livol	Outlined in detail here

6 Market Based Characteristics

6.1 Datasets

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

7 Market Based Characteristics

7.1 Datasets

- CRSP.MSF
- CRSP.DSF
- COMP.SECD

- COMP.G_SECD
- COMP.FUNDQ
- COMP.FUNDA
- COMP.SECM
- COMP.SECURITY
- COMP.G_SECURITY

7.2 Market Variables

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

Table 5: Market Variables

Name	Abbreviation	Construction
CRSP Variables³		
Share Adjustment Factor	adjfct*	We use CFACSHR
Shares	shares*	We use SHROUT/100
Price	prc*	We use PRC
Local Price	prc_local*	We use PRC*
Highest Daily Price/Ask	prc_high	We use ASKHI. If PRC* or AKSHI are negative, then PRC.HIGH is set to missing
Lowest Daily Price/Bid	prc_low	We use BIDLO. If PRC* or BIDLO are negative, then PRC.LOW is set to missing
Adjusted Proce	prc_adj*	We use PRC*×ADJFCT*
Market Equity	me*	We use PRC*×SHARES*
Company Market Equity	me_company*	We sum ME* grouped by PERMNO and date
Dollar Volume	dolvol*	We use VOL×PRC*
Return	RET*	We use RET
Local Return	ret_local*	We use RET
Excess Return	ret_exc*	We use (RET*-T30RET)/21. If T30RET is unavailable, we use RF. If the return is a daily return rather than a monthly return, the RET - T30RET is divided by 1 rather than 21.
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 ⁴
Local Price	prc_local*	We use PRCCD
Market Equity	me*	We use PRC*×SHARES*
Company Market Equity	me_company*	We use ME*
Dollar Volume	dolvol*	We use CSHTRD×PRC*
Return	RET*	We use RET.LOCAL*×FX
Cumulative Return - Local	ri_local*	We use PRC.LOCAL*×TRFD/AJEXDI

³lag is a lag function where lag(x) is the value of x from the previous time period

⁴FX scales the price to USD

Name	Abbreviation	Construction
Local Return	ret_local*	We use $RILOCAL^*/\text{lag}(RILOCAL^*) - 1$
Time Since Most Recent Return	ret_lag_dif*	We estimate the number of days since the previous return. If the returns are monthly rather than daily, then the time is in months
Cumulative Return	ri*	$RILOCAL^* \times FX^*$
Monthly Dividend	div_tot*	We use $DIV \times FX^*$. If DIV is missing, we set it to zero
Cash Dividend	div_cash*	We use $DIVD \times FX^*$. If DIVD is unavailable, we set it to zero
Special Cash Dividend	div_spc*	We use $DIVSP \times FX^*$. If DIVSP is unavailable, we set it to zero
Bid-Ask Average Dummy	bidask*	When $PRCSTD = 4$ then 1, otherwise 0
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*
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*	$SDEV_zD(MKTRF^*_t)$ ⁵

Table 6: Market Characteristics

Name	Abbreviation	Construction
Size Based 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	$\frac{\sum_{n=0}^5 DIV_TOT^*_{t-n} \times SHARES^*_{t-n}}{ME^*_t}$

⁵Must have enough non-missing values of stock to be estimated

Name	Abbreviation	Construction
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	divsp12m_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	$\log\left(\frac{RI^*_t}{RI^*_{t-6}}\right) - \log\left(\frac{ME^*_t}{ME^*_{t-6}}\right)$

Name	Abbreviation	Construction
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		
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	$\frac{RI^*_{t-1}}{RI^*_{t-12}} - 1$

Name	Abbreviation	Construction
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

Name	Abbreviation	Construction
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
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 ⁶	$\frac{1}{4}(O_SCORE_t^{r01} + RET_12.1_t^{r01} + GP_AT_t^{r01} + NIQ_AT_t^{r01})$
Management Based Mispricing	mispricing_mgmt	$\frac{1}{6}(CHCSHO_12M_t^{r01} + EQNPO_12M_t^{r01} + OACCRUALS_AT_t^{r01} + NOA_AT_t^{r01} + AT_GR1_t^{r01} + PPEINV_GR1_t^{r01})$
Residual Momentum - 6 Month	resff3_6.1	$-1 + \prod_{n=1}^6 1 + e_{t-n}$
Residual Momentum - 12 Month	resff3_12.1	$-1 + \prod_{n=1}^{12} 1 + e_{t-n}$
Daily Market Data⁷		
Let ϵ_t be defined as described here		
Return Volatility	rvol_zd	$SDEV_zD(RET_EXC^*_t)$
Maximum Return	rmax1_zd	$MAX1_zD(RET^*_t)$
Mean Maximum Return	rmax5_zd	$\frac{1}{5} \sum_{n=1}^5 X_n, \quad X_n \in MAX5_zD(RET^*)$

⁶A 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.

⁷Many of the variables in this section are estimated using rolling windows of data, and the variables are estimated using a variety of window lengths: 21, 126, 252 and 1260 days. In this section, I refer to the number of days as m as a proxy for any of the possible window lengths.

Name	Abbreviation	Construction
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	$MEAN_zD\left(\frac{ RET*_t }{DOLVOL*_t}\right) * 1000000$
CAPM Beta CAPM Idiosyncratic Vol. CAPM Skewness	beta_zd ivol_capm_zd iskew_capm_zd	Described in detail here Described in detail here Described in detail here
Coskewness	coskew_zd ⁸	$\frac{MEAN_zD(\epsilon_t \times MKTRF_DM_t^2)}{\sqrt{MEAN_zD(\epsilon_t^2) \times MEAN_zD(MKTRF_DM_t^2)}}$
Fama and French Idiosyncratic Vol. Fama and French Skewness Hou, Xue and Zhang Idiosyncratic Vol. Hou, Xue and Zhang Skewness Dimson Beta Downside Beta	ivol_ff3_zd iskew_ff3_zd ivol_hxz4_zd iskew_hxz4_zd beta_dimson_zd betadown_zd	Described in detail here Described in detail here Described in detail here Described in detail here Created as described in Dimson (1979) Described in detail here
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	$MEAN_zD\left(\frac{TVOL*_t}{SHARES*_t * 1000000}\right)$
Turnover Volatility	turnover_var_zd	$\frac{SDEV_zD\left(\frac{TVOL*_t}{SHARES*_t * 1000000}\right)}{TURNOVER_zD_t}$
Dollar Volume	dolvol_zd	$MEAN_zD(DOLVOL*_t)$
Dollar Volume Volatility	turnover_var_zd	$\frac{SDEV_zD(DOLVOL*_t)}{DOLSDEV_zD_t}$
Correlation to Market	corr_zd	The correlation between $RET_EXC*_3l = RET_EXC*_t + RET_EXC*_{t-1} + RET_EXC*_{t-2}$ and $MKT_EXC*_3l = MKTRF*_t + MKTRF*_{t-1} + MKTRF*_{t-2}$

⁸ $MKTRF_DM_t = MKTRF*_t - MEAN_zD(MKTRF*_t)$

Name	Abbreviation	Construction
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)
Quality Minus Junk		
Quality Minus Junk - Profit	qmj-prof	$ZV\left(ZV(GP_AT_t) + ZV(NI_BE_t) + ZV(NI_AT_t) + ZV(OCF_AT_t) + ZV(GP_SALE*_t) + ZV(OACCRUALS_AT_t)\right)$
Quality Minus Junk - Growth	qmj-growth	$ZV\left(ZV(GPOA_CH5_t) + ZV(ROE_CH5_t) + ZV(ROA_CH5_t) + ZV(CFOA_CH5_t) + ZV(GMAR_CH5_t)\right)$
Quality Minus Junk - Safety	qmj-safety	$ZV\left(ZV(BETABAB_1260d_t) + ZV(DEBT_AT_t) + ZV(O_SCORE_t) + ZV(Z_SCORE_t) + ZV(_EVOL_t)\right)$
Quality Minus Junk	qmj	$\frac{QMJ_PROF_t + QMJ_GROWTH_t + QMJ_SAFETY_t}{3}$

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:

$$_roe0 = \frac{NI*_t}{BE*_t-12}$$

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

$$_be0 = BE^*_t$$

– 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 ⁹

$$ed_constant = horizon + \frac{1 + r}{r}$$

$$ed_cw_w_t = \sum_{i=1}^{horizon} ed_cd_w_{i-1} + i \times \frac{_{-}cd_t}{(1 + r)^i}$$

$$ed_cd_t = \sum_{i=1}^{horizon} ed_cd_{i-1} + \frac{_{-}cd_t}{(1 + r)^i}$$

⁹ ed_cw_w , ed_cd and ed_err are equal to 0 at $i = 1$. ed_cw_w and ed_cd recursively build upon themselves over the length of the horizon, so $ed_cw_w_{i-1}$, for example, would be the previous iteration of ed_cw_w

- Characteristic:

$$eq_dur_t = \frac{ed_ed_w_t \times FX_t}{ME_COMPANY_t} + ed_constant \times \frac{ME_COMPANY_t - ed_cd_t \times FX_t}{ME_COMPANY_t}$$

- **Net Income Idiosyncratic Volatility**

- Define the following variable ¹⁰:

$$_ni_at_t = \frac{NI^*_t}{AT^*_t}$$

- 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):

$$RET_EXC^*_t = \beta_0 + \beta_1 MKTRF^*_t + \beta_2 SMB_HXZ^*_t + \beta_3 ROE^*_t + \beta_4 INV^*_t + \sigma_t$$

- Characteristics ¹¹:

- * $beta_zd_t = \beta_1$ from the CAPM model

- * $ivol_capm_zd_t = SDEV_zD(\epsilon_t)$

¹⁰If $AT^*_t \neq 0$, then $_ni_at_t$ is set to missing

¹¹ z indicates over how many days the model is run.

- * $ivol_ff3_zd_t = SDEV_zD(e_t)$
- * $ivol_hxx4_zd_t = SDEV_zD(\sigma_t)$
- * $iskew_capm_zd_t = SKEW_zD(\epsilon_t)$
- * $iskew_ff3_zd_t = SKEW_zD(e_t)$
- * $iskew_hxx4_zd_t = SKEW_zD(\sigma_t)$

- [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:

- * $betadown_zd = \beta_1$