The Characteristics that Provide Independent Information about Average U.S. Monthly Stock Returns

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We take up Cochrane's (2011) challenge to identify the firm characteristics that provide independent information about average U.S. monthly stock returns by simultaneously including 94 characteristics in Fama-MacBeth regressions that avoid overweighting microcaps and adjust for data-snooping bias. We find that while 12 characteristics are reliably independent determinants in non-microcap stocks from 1980 to 2014 as a whole, return predictability sharply fell in 2003 such that just two characteristics have been independent determinants since then. Outside of microcaps, the hedge returns to exploiting characteristics-based predictability also have been insignificantly different from zero since 2003. (*JEL* G12, G14)

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In his 2011 American Finance Association Presidential address, John H. Cochrane (2011, 1,060) challenges researchers to identify the firm characteristics that provide *independent* information about average U.S. stock returns. Cochrane issues his challenge because of the "veritable zoo" of hundreds of characteristics that have been presented as statistically significant predictors of the cross-section of returns in the anomalies literature since 1970 (Green, Hand, and Zhang 2013; Hou, Xue, and Zhang 2016). The goal of our

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determinants be the same across firm size and over time, we provide additional evidence beyond that of Harvey, Liu, and Zhu (2016) and McLean and Pontiff (2016) that the inferences that have been made from hundreds of return anomaly studies warrant substantial skepticism. At the same time, we also surface new facts and puzzles to be digested, the most prominent of which is the strong, sudden, and seemingly permanent decline in the characteristics-based predictability of returns in 2003, especially among non-microcap stocks. Our results suggest that future empirical models of average returns may benefit from weighting post-2003 data more strongly than pre-2003 data, as well as from conditioning the return generating process on firm size and from using as controls the characteristics that we identify (pre- versus post-2003) as being independent.

Appendix

Acronym	Author(s)	Date, Journal	Definition of the characteristic-based anomaly variable
absacc	Bandyopadhyay, Huang, and Wirjanto	2010, WP	Absolute value of *acc*
acc	Sloan	1996, TAR	Annual income before extraordinary items (*ib*) minus operating cash flows (*oancf*) divided by average total assets (*at*); if *oancf* is missing then set to change in *act* - change in *che* - change in *lct* + change in *dlc* + change in *txp-dp*
aeavol	Lerman, Livnat, and Mendenhall	2008, WP	Average daily trading volume (*vol*) for 3 days around earnings announcement minus average daily volume for 1-month ending 2 weeks before earnings announcement divided by 1-month average daily volume. Earnings announcement day from Compustat quarterly (*rdq*)
age	Jiang, Lee, and Zhang	2005, RAS	Number of years since first Compustat coverage
agr	Cooper, Gulen, and Schill	2008, JF	Annual percent change in total assets (*at*)
baspread	Amihud and Mendelson	1989, JF	Monthly average of daily bid-ask spread divided by average of daily spread
beta	Fama and MacBeth	1973, JPE	Estimated market beta from weekly returns and equal weighted market returns for 3 years ending month t-1 with at least 52 weeks of returns
betasq	Fama and MacBeth	1973, JPE	Market beta squared
bm	Rosenberg, Reid, and Lanstein	1985, JPM	Book value of equity (*ceq*) divided by end of fiscal year-end market capitalization
bm_ia	Asness, Porter, and Stevens	2000, WP	Industry adjusted book-to-market ratio
cash	Palazzo	2012, JFE	Cash and cash equivalents divided by average total assets
cashdebt	Ou and Penman	1989, JAE	Earnings before depreciation and extraordinary items (*ib+dp*) divided by avg. total liabilities (*lt*)
cashpr	Chandrashekar and Rao	2009, WP	Fiscal year-end market capitalization plus long-term debt (*dltt*) minus total assets (*at*) divided by cash and equivalents (*che*)
cfp	Desai, Rajgopal, and Venkatachalam	2004, TAR	Operating cash flows divided by fiscal-year-end market capitalization

(*continued*)

Acronym	Author(s)	Date, Journal	Definition of the characteristic-based anomaly variable
cfp_ia	Asness, Porter and Stevens	2000, WP	Industry adjusted *cfp*
chatoia	Soliman	2008, TAR	2-digit SIC - fiscal-year mean-adjusted change in sales (*sale*) divided by average total assets (*at*)
chcsho	Pontiff and Woodgate	2008, JF	Annual percent change in shares outstanding (*csho*)
chempia	Asness, Porter, and Stevens	1994, WP	Industry-adjusted change in number of employees
chfeps	Hawkins, Chamberlin, and Daniel	1984, FAJ	Mean analyst forecast in month prior to fiscal period end date from I/B/E/S summary file minus same mean forecast for prior fiscal period using annual earnings forecasts
chinv	Thomas and Zhang	2002, RAS	Change in inventory (*inv*) scaled by average total assets (*at*)
chmom	Gettleman and Marks	2006, WP	Cumulative returns from months *t*-6 to *t*-1 minus months *t*-12 to *t*-7
chnanalyst	Scherbina	2008 RF	Change in *nanalyst* from month *t*-3 to month *t*
chpmia	Soliman	2008, TAR	2-digit SIC - fiscal-year mean adjusted change in income before extraordinary items (*ib*) divided by sales (*sale*)
chtx	Thomas and Zhang	2011, JAR	Percent change in total taxes (*txtq*) from quarter*t*-4 to *t*
cinvest	Titman, Wei, and Xie	2004, JFQA	Change over one quarter in net PP&E (*ppentq*) divided by sales (*saleq*) - average of this variable for prior 3 quarters; if *saleq* = 0, then scale by 0.01
convind	Valta	2016, JFQA	An indicator equal to 1 if company has convertible debt obligations
currat	Ou and Penman	1989, JAE	Current assets / current liabilities
depr	Holthausen and Larcker	1992, JAE	Depreciation divided by PP&E
disp	Diether, Malloy, and Scherbina	2002, JF	Standard deviation of analyst forecasts in month prior to fiscal period end date divided by the absolute value of the mean forecast; if *meanest* = 0, then scalar set to 1. Forecast data from I/B/E/S summary files
divi	Michaely, Thaler, and Womack	1995, JF	An indicator variable equal to 1 if company pays dividends but did not in prior year
divo	Michaely, Thaler, and Womack	1995, JF	An indicator variable equal to 1 if company does not pay dividend but did in prior year
dolvol	Chordia, Subrahmanyam, and Anshuman	2001, JFE	Natural log of trading volume times price per share from month *t*-2
dy	Litzenberger and Ramaswamy	1982, JF	Total dividends (*dvt*) divided by market capitalization at fiscal year-end
ear	Kishore et al.	2008, WP	Sum of daily returns in three days around earnings announcement. Earnings announcement from Compustat quarterly file (*rdq*)
egr	Richardson et al.	2005, JAE	Annual percent change in book value of equity (*ceq*)
ep	Basu	1977, JF	Annual income before extraordinary items (*ib*) divided by end of fiscal year market cap
fgr5yr	Bauman and Dowen	1988, FAJ	Most recently available analyst forecasted 5-year growth
gma	Novy-Marx	2013, JFE	Revenues (*revt*) minus cost of goods sold (*cogs*) divided by lagged total assets (at)
grCAPX	Anderson and Garcia-Feijoo	2006, JF	Percent change in capital expenditures from year*t*-2 to year *t*
grltnoa	Fairfield, Whisenant, and Yohn	2003, TAR	Growth in long-term net operating assets
herf	Hou and Robinson	2006, JF	2-digit SIC - fiscal-year sales concentration (sum of squared percent of sales in industry for each company).

(*continued*)

Acronym	Author(s)	Date, Journal	Definition of the characteristic-based anomaly variable
hire	Bazdresch, Belo, and Lin	2014, JPE	Percent change in number of employees (*emp*)
idiovol	Ali, Hwang, and Trombley	2003, JFE	Standard deviation of residuals of weekly returns on weekly equal weighted market returns for 3 years prior to month end
ill	Amihud	2002, JFM	Average of daily (absolute return / dollar volume).
indmom	Moskowitz and Grinblatt	1999, JF	Equal weighted average industry 12-month returns
invest	Chen and Zhang	2010, JF	Annual change in gross property, plant, and equipment (*ppegt*) + annual change in inventories (*invt*) all scaled by lagged total assets (*at*)
IPO	Loughran and Ritter	1995, JF	An indicator variable equal to 1 if first year available on CRSP monthly stock file
lev	Bhandari	1988, JF	Total liabilities (lt) divided by fiscal year-end market capitalization
lgr	Richardson et al.	2005, JAE	Annual percent change in total liabilities (*lt*)
maxret	Bali, Cakici, and Whitelaw	2011, JFE	Maximum daily return from returns during calendar month$t$-1
mom12m	Jegadeesh	1990, JF	11-month cumulative returns ending one month before month end
mom1m	Jegadeesh and Titman	1993, JF	1-month cumulative return
mom36m	Jegadeesh and Titman	1993, JF	Cumulative returns from months$t$-36 to t-13
mom6m	Jegadeesh and Titman	1993, JF	5-month cumulative returns ending one month before month end
ms	Mohanram	2005, RAS	Sum of 8 indicator variables for fundamental performance
mve	Banz	1981, JFE	Natural log of market capitalization at end of month t-1
mve_ia	Asness, Porter, and Stevens	2000, WP	2-digit SIC industry-adjusted fiscal year-end market capitalization
nanalyst	Elgers, Lo, and Pfeiffer	2001, TAR	Number of analyst forecasts from most recently available I/B/E/S summary files in month prior to month of portfolio formation. *nanalyst* set to zero if not covered in I/B/E/S summary file
nincr	Barth, Elliott, and Finn	1999, JAR	Number of consecutive quarters (up to eight quarters) with an increase in earnings (*ibq*) over same quarter in the prior year
operprof	Fama and French	2015, JFE	Revenue minus cost of goods sold - SG&A expense - interest expense divided by lagged common shareholders' equity
orgcap	Eisfeldt and Papanikolaou	2013, JF	Capitalized SG&A expenses
pchcapx_ia	Abarbanell and Bushee	1998, TAR	2-digit SIC - fiscal-year mean-adjusted percent change in capital expenditures (*capx*)
pchcurrat	Ou and Penman	1989, JAE	Percent change in *currat.*
pchdepr	Holthausen and Larcker	1992, JAE	Percent change in *depr*
pchgm_pchsale	Abarbanell and Bushee	1998, TAR	Percent change in gross margin (*sale-cogs*) minus percent change in sales (*sale*)
pchquick	Ou and Penman	1989, JAE	Percent change in *quick*
pchsale_pchinvt	Abarbanell and Bushee	1998, TAR	Annual percent change in sales (*sale*) minus annual percent change in inventory (*invt*).
pchsale_pchrect	Abarbanell and Bushee	1998, TAR	Annual percent change in sales (*sale*) minus annual percent change in receivables (*rect*)
pchsale_pchxsga	Abarbanell and Bushee	1998, TAR	Annual percent change in sales (*sale*) minus annual percent change in SG&A (*xsga*)
pchsaleinv	Ou and Penman	1989, JAE	Percent change in *saleinv*
pctacc	Hafzalla, Lundholm, and Van Winkle	2011, TAR	Same as *acc* except that the numerator is divided by the absolute value of *ib*; if *ib* = 0 then *ib* set to 0.01 for denominator

(*continued*)

Acronym	Author(s)	Date, Journal	Definition of the characteristic-based anomaly variable
pricedelay	Hou & Moskowitz	2005, RFS	The proportion of variation in weekly returns for 36 months ending in month*t* explained by 4 lags of weekly market returns incremental to contemporaneous market return
ps	Piotroski	2000, JAR	Sum of 9 indicator variables to form fundamental health score
quick	Ou and Penman	1989, JAE	(current assets - inventory) / current liabilities
rd	Eberhart, Maxwell, and Siddique	2004, JF	An indicator variable equal to 1 if R&D expense as a percentage of total assets has an increase greater than 5%.
rd_mve	Guo, Lev, and Shi	2006, JBFA	R&D expense divided by end-of-fiscal-year market capitalization
rd_sale	Guo, Lev, and Shi	2006, JBFA	R&D expense divided by sales (*xrd*/*sale*)
realestate	Tuzel	2010, RFS	Buildings and capitalized leases divided by gross PP&E
retvol	Ang et al.	2006, JF	Standard deviation of daily returns from month *t*-1
roaq	Balakrishnan, Bartov, and Faurel	2010, JAE	Income before extraordinary items (*ibq*) divided by one quarter lagged total assets (*atq*)
roavol	Francis et al.	2004, TAR	Standard deviation for 16 quarters of income before extraordinary items (*ibq*) divided by average total assets (*atq*)
roeq	Hou, Xue, and Zhang	2015 RFS	Earnings before extraordinary items divided by lagged common shareholders' equity
roic	Brown and Rowe	2007, WP	Annual earnings before interest and taxes (*ebit*) minus nonoperating income (*nopi*) divided by non-cash enterprise value (*ceq+lt-che*)
rsup	Kama	2009, JBFA	Sales from quarter t minus sales from quarter *t*-4 (*saleq*) divided by fiscal-quarter-end market capitalization (*cshoq* * *prccq*)
salecash	Ou and Penman	1989, JAE	Annual sales divided by cash and cash equivalents
saleinv	Ou and Penman	1989, JAE	Annual sales divided by total inventory
salerec	Ou and Penman	1989, JAE	Annual sales divided by accounts receivable
secured	Valta	2016, JFQA	Total liability scaled secured debt
securedind	Valta	2016, JFQA	An indicator equal to 1 if company has secured debt obligations
sfe	Elgers, Lo, and Pfeiffer	2001, TAR	Analysts mean annual earnings forecast for nearest upcoming fiscal year from most recent month available prior to month of portfolio formation from I/B/E/S summary files scaled by price per share at fiscal quarter end
sgr	Lakonishok, Shleifer, and Vishny	1994, JF	Annual percent change in sales (*sale*)
sin	Hong & Kacperczyk	2009, JFE	An indicator variable equal to 1 if a company's primary industry classification is in smoke or tobacco, beer or alcohol, or gaming
SP	Barbee, Mukherji, and Raines	1996, FAJ	Annual revenue (*sale*) divided by fiscal year-end market capitalization
std_dolvol	Chordia, Subrahmanyam, and Anshuman	2001, JFE	Monthly standard deviation of daily dollar trading volume
std_turn	Chordia, Subrahmanyam, and Anshuman	2001, JFE	Monthly standard deviation of daily share turnover
stdacc	Bandyopadhyay, Huang, and Wirjanto	2010, WP	Standard deviation for 16 quarters of accruals (*acc* measured with quarterly Compustat) scaled by sales; if *saleq* = 0, then scale by 0.01

(*continued*)

Acronym	Author(s)	Date, Journal	Definition of the characteristic-based anomaly variable
stdcf	Huang	2009, JEF	Standard deviation for 16 quarters of cash flows divided by sales (*saleq*); if *saleq* = 0, then scale by 0.01. Cash flows defined as *ibq* minus quarterly accruals
sue	Rendelman, Jones, and Latane	1982, JFE	Unexpected quarterly earnings divided by fiscal-quarter-end market cap. Unexpected earnings is I/B/E/S actual earnings minus median forecasted earnings if available, else it is the seasonally differenced quarterly earnings before extraordinary items from Compustat quarterly file
tang	Almeida and Campello	2007, RFS	Cash holdings + 0.715 × receivables +0.547 × inventory + 0.535 × PPE/ totl assets
tb	Lev and Nissim	2004, TAR	Tax income, calculated from current tax expense divided by maximum federal tax rate, divided by income before extraordinary items
turn	Datar, Naik, and Radcliffe	1998, JFM	Average monthly trading volume for most recent 3 months scaled by number of shares outstanding in current month
zerotrade	Liu	2006, JFE	Turnover weighted number of zero trading days for most recent 1 month

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