Stock Splits and Cash Flows: A New Test of the Signaling Hypothesis

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WEB APPENDIX

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Table 1
The Number of Split and Non-split Firms over the 1963-2014 Period

Split firms are identified as those with CRSP distribution code of 5523 and a split factor of at least five for four. Stock prices and monthly returns of split and non-split firms are retrieved from the CRSP monthly U.S. Stock database, and financial data are retrieved from the COMPUSTAT annual database. To be included in the sample, a firm must have: (1) positive total assets; (2) positive total shareholders' equity; and (3) price and annual return data available.

Year	Split Firms	Non-split Firms
1963 - 1977	1,347	25,714
1978 - 1982	1,436	15,577
1983 - 1987	2,077	17,779
1988 - 1992	1,100	20,447
1993 - 1997	2,159	26,763
1998 - 2002	1,643	27,221
2003 - 2008	1,131	27,858
2009 - 2014	264	24,065
Total	11,157	185,424

Table 2
Descriptive Statistics by Sub-sample Period

ROE is defined as operating income before depreciation over total stockholders' equity. MB is the market value of equity divided by total stockholders' equity. Size is defined as the natural log of total assets. Return is the annualized geometric return. DP is an indicator variable which equals one if the dividend payment, the sum of common dividends and preferred dividends is greater than zero. Otherwise, DP equals zero. OCF is a proportion of operating cash flow to total assets, where operating cash flow is measured by operating income before depreciation. FCF is a proportion of free cash flow to total assets, where free cash flow is measured by operating income before depreciation minus the sum of total income taxes, total interest and related expense, and common dividends and preferred dividends. ROE, MB, OCF, and FCF are winsorized at 5% and 95% levels. Numbers in parentheses are standard errors. ***: Significant at the level of 1%.

	Split Firms			**Non-split Firms**		
	1963-1992	**1993-2014**	**1963-2014**	**1963-1992**	**1993-2014**	**1963-2014**
ROE	0.389	0.340	0.366	0.253	0.197	0.221
	(0.002)***	(0.003)***	(0.002)***	(0.001)	(0.001)	(0.001)
MB	2.938	3.763	3.323	1.720	2.309	2.056
	(0.027)***	(0.032)***	(0.021)***	(0.006)	(0.006)	(0.004)
Size	5.052	6.540	5.745	4.466	5.989	5.336
	(0.025)***	(0.026)***	(0.019)***	(0.008)	(0.007)	(0.005)
Price	23.993	30.435	26.995	16.492	21.306	19.242
	(0.224)***	(0.294)***	(0.184)***	(0.069)	(0.143)	(0.087)
Return	0.536	0.605	0.568	0.150	0.162	0.157
	(0.012)***	(0.034)***	(0.017)***	(0.003)	(0.003)	(0.002)
DP	0.754	0.573	0.669	0.615	0.473	0.534
	(0.006)***	(0.007)***	(0.004)***	(0.002)	(0.002)	(0.001)
OCF	0.174	0.139	0.157	0.107	0.070	0.086
	(0.001)***	(0.001)***	(0.001)***	(0.000)	(0.000)	(0.000)
FCF	0.084	0.083	0.084	0.039	0.028	0.033
	(0.001)***	(0.001)***	(0.001)***	(0.000)	(0.000)	(0.000)

Table 3
Logistic Regression

$$f(i)_t = \beta_0 + \beta_1 ROE_{i,t-1} + \beta_2 MB_{i,t-1} + \beta_3 Size_{i,t-1} + \beta_4 Price_{i,t-1} + \beta_5 Return_{i,t-1} + \beta_6 DP_{i,t-1} + \beta_7 OCF_{i,t-1} + \beta_8 FCF_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where f(i) is the linear predictor function for firm i, and equals one if the firm splits its shares at t = 1 and zero otherwise. ROE is defined as operating income before depreciation over total stockholders' equity. MB is the market value of equity divided by total stockholders' equity. Size is defined as the natural log of total assets. Return is the annualized geometric return. DP is an indicator variable, which equals one if the dividend payment (the sum of common dividends and preferred dividends) is greater than zero. Otherwise, DP equals zero. OCF is proportion of operating cash flow to total assets, where operating cash flow is measured by operating income before depreciation. FCF is proportion of free cash flow to total assets, where free cash flow is measured by operating income before depreciation minus the sum of total income taxes, total interest and related expense, and common dividends and preferred dividends. ROE, MB, Size, Price, Return, DP, OCF, and FCF are lagged one year. ROE, MB, OCF, and FCF are winsorized at 5% and 95% levels. Variance is estimated with the Huber/White/sandwich robust variances estimator (see White (1980)). Numbers in parentheses are standard errors. ***: Significant at the level of 1%.

	1963-1992	**1993-2014**
ROE	1.570	0.491
	(0.126)***	(0.114)***
MB	0.077	0.202
	(0.011)***	(0.009)***
Size	-0.087	0.005
	(0.013)***	(0.013)
Price	0.027	0.004
	(0.002)***	(0.001)***
Return	0.570	0.288
	(0.036)***	(0.021)***
DP	0.491	0.595
	(0.046)***	(0.039)***
OCF	-1.370	-2.727
	(0.453)***	(0.449)***
FCF	5.642	8.108
	(0.543)***	(0.448)***
Constant	-4.191	-4.466
	(0.066)***	(0.071)***
Pseudo R^2	0.149	0.097

Table 4
Firm Characteristics of Dividend- and Non-dividend Payers

Facpr is the CRSP split factor that is greater than or equal to 0.25. Price is the closing price of a security for the last trading day of the year, adjusted for distributions. MV is the natural log of the market value of equity. Runup is the percentage change in price, defined as the closing price at t=0 over the closing price at t=-1 minus one. OCF is the ratio of operating cash flow to total assets, where operating cash flow is measured by operating income before depreciation. FCF is the ratio of free cash flow to total assets, where free cash flow is measured by operating income before depreciation minus the sum of total income taxes, total interest and related expense, and common dividends and preferred dividends. OCF and FCF are winsorized at 5% and 95% levels. Numbers in parentheses are standard errors. ***, **, and *: Significant at the level of 1%, 5%, and 10%, respectively.

	Dividend Payers			**Non-dividend Payers**		
	1963-1992	**1993-2014**	**1963-2014**	**1963-1992**	**1993-2014**	**1963-2014**
Facpr	0.820	0.886	0.846	0.801	0.858	0.835
	(0.009)	(0.014)*	(0.008)	(0.017)	(0.010)	(0.009)
Price	26.323	30.295	27.885	17.757	30.600	25.407
	(0.270)***	(0.316)	(0.207)***	(0.352)	(0.520)	(0.355)
MV	5.315	6.703	5.861	4.289	6.575	5.651
	(0.025)***	(0.039)***	(0.023)***	(0.039)	(0.037)	(0.032)
Lag(Runup)	0.396	0.343	0.375	0.703	0.880	0.816
	(0.009)	(0.010)	(0.007)	(0.032)***	(0.058)***	(0.039)***
OCF	0.178	0.122	0.156	0.163	0.157	0.159
	(0.001)***	(0.002)	(0.001)	(0.003)	(0.002)***	(0.002)***
FCF	0.083	0.068	0.077	0.087	0.100	0.095
	(0.001)	(0.001)	(0.001)	(0.002)***	(0.002)***	(0.001)***

le 5
t Factor Determinants

$pr_t = \beta_0 + \beta_1 Price_{t-1} + \beta_2 MV_{t-1} + \beta_3 Runup_{t-1} + res_t$
$pr_t = \beta_0 + \beta_1 Price_{t-1} + \beta_2 MV_{t-1} + \beta_3 Runup_{t-1} + \beta_4 OCF_{t-1} + res_{OCF,t}$
$pr_t = \beta_0 + \beta_1 Price_{t-1} + \beta_2 MV_{t-1} + \beta_3 Runup_{t-1} + \beta_4 FCF_{t-1} + res_{FCF,t}$

re Facpr is the CRSP split factor that is greater than or equal to 0.25. Price is the closing price of a security for the last trading day of the y
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e at t=0 over the closing price at t=-1 minus one. OCF is the ratio of operating cash flow to total assets, where operating cash flow is measu
perating income before depreciation. FCF is the ratio of free cash flow to total assets, where free cash flow is measured by operating incon
re depreciation minus the sum of total income taxes, total interest and related expense, and common dividends and preferred dividends. OC
FCF are winsorized at 5% and 95% levels. Variance is estimated with the Huber/White/sandwich robust variances estimator (see White
80)). Numbers in parentheses are standard errors. ***, **, and *: Significant at the level of 1%, 5%, and 10%, respectively.

el A: 1963-1992	**All Split Firms**			**Dividend Payers**			**Non-dividend Payers**		
	Eq. (2)	**Eq. (3)**	**Eq. (4)**	**Eq. (2)**	**Eq. (3)**	**Eq. (4)**	**Eq. (2)**	**Eq. (3)**	**Eq. (4)**
	0.011	0.010	0.010	0.010	0.010	0.010	0.017	0.017	0.017
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.004)***	(0.004)***	(0.004)**
	-0.043	-0.042	-0.042	-0.031	-0.030	-0.030	-0.094	-0.086	-0.084
	(0.018)***	(0.018)**	(0.018)**	(0.019)	(0.019)	(0.019)	(0.031)***	(0.030)***	(0.030)**
p	0.057	0.060	0.062	0.051	0.055	0.056	0.030	0.031	0.031
	(0.015)***	(0.015)***	(0.015)***	(0.019)***	(0.019)***	(0.019)***	(0.021)	(0.021)	(0.021)
		-0.291			-0.091			-0.708	
		(0.103)***			(0.109)			(0.233)***	
			-0.448			-0.238			-0.956
			(0.161)***			(0.188)			(0.303)**
tant	0.623	0.669	0.656	0.560	0.574	0.576	0.763	0.848	0.812
	(0.035)***	(0.041)***	(0.037)***	(0.039)***	(0.044)***	(0.041)***	(0.066)***	(0.075)***	(0.070)**
	0.238	0.236	0.236	0.268	0.264	0.264	0.189	0.200	0.200

le 5
t Factor Determinants (Continues)

el B: 1993-2014	All Split Firms			Dividend Payers			Non-dividend Payers		
	Eq. (2)	**Eq. (3)**	**Eq. (4)**	**Eq. (2)**	**Eq. (3)**	**Eq. (4)**	**Eq. (2)**	**Eq. (3)**	**Eq. (4)**
	0.015	0.015	0.015	0.017	0.017	0.017	0.008	0.008	0.008
	(0.001)***	(0.001)***	(0.001)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)**
	-0.112	-0.112	-0.110	-0.127	-0.127	-0.124	-0.050	-0.048	-0.048
	(0.014)***	(0.014)***	(0.014)***	(0.019)***	(0.019)***	(0.019)***	(0.018)***	(0.018)***	(0.018)**
p	0.000	0.001	0.001	-0.019	-0.014	-0.013	0.011	0.010	0.010
	(0.012)	(0.012)	(0.012)	(0.030)	(0.028)	(0.028)	(0.012)	(0.012)	(0.012)
		0.228			0.429			-0.182	
		(0.089)***			(0.134)***			(0.126)	
			0.167			0.376			-0.256
			(0.124)			(0.205)*			(0.171)
tant	0.942	0.911	0.919	0.931	0.885	0.893	0.824	0.844	0.841
	(0.048)***	(0.044)***	(0.044)***	(0.064)***	(0.054)***	(0.055)***	(0.062)***	(0.064)***	(0.063)**
	0.382	0.388	0.387	0.471	0.482	0.481	0.165	0.167	0.167

el C: 1963-2014	All Split Firms			Dividend Payers			Non-dividend Payers		
	Eq. (2)	**Eq. (3)**	**Eq. (4)**	**Eq. (2)**	**Eq. (3)**	**Eq. (4)**	**Eq. (2)**	**Eq. (3)**	**Eq. (4)**
	0.013	0.013	0.013	0.013	0.013	0.013	0.010	0.010	0.010
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.002)***	(0.002)***	(0.002)**
	-0.072	-0.070	-0.070	-0.072	-0.069	-0.069	-0.058	-0.057	-0.055
	(0.011)***	(0.010)***	(0.011)***	(0.013)***	(0.013)***	(0.013)***	(0.016)***	(0.016)***	(0.015)**
p	0.013	0.014	0.014	0.019	0.025	0.026	0.011	0.010	0.010
	(0.011)	(0.011)	(0.011)	(0.016)	(0.016)	(0.016)	(0.012)	(0.011)	(0.011)
		-0.142			-0.069			-0.324	
		(0.065)**			(0.079)			(0.112)***	
			-0.174			-0.160			-0.450
			(0.100)*			(0.136)			(0.151)**
tant	0.738	0.753	0.744	0.683	0.682	0.682	0.796	0.842	0.828
	(0.025)***	(0.027)***	(0.025)***	(0.030)***	(0.031)***	(0.029)***	(0.043)***	(0.047)***	(0.045)**
	0.305	0.306	0.306	0.357	0.359	0.359	0.160	0.163	0.163

le 6
t Period Return Prediction

$ET_t = \beta_0 + \beta_1 res_t + \varepsilon_t$
$ET_t = \beta_0 + \beta_1 res_{OCF,t} + \varepsilon_t$
$ET_t = \beta_0 + \beta_1 res_{FCF,t} + \varepsilon_t$

re CRET is a change in a firm's annual return from the prior year, and res, $res_{OCF,t}$ and $res_{FCF,t}$ are the residuals in Equations (2), (3), and (4) ectively. OCF is a ratio of operating cash flow to total assets where operating cash flow is measured by operating income before depreciati F is a ratio of free cash flow to total assets where free cash flow is measured by operating income before depreciation minus the sum of total ome taxes, total interest and related expense, and common dividends and preferred dividends. OCF and FCF are winsorized at 5% and 95% ls. Variance is estimated with the Huber/White/sandwich robust variances estimator (see White (1980)). Numbers in parentheses are stand rs. ***, **, and *: Significant at the level of 1%, 5%, and 10%, respectively.

el A: 1963-1992	All Split Firms			Dividend Payers			Non-dividend Payers		
	Eq. (5)	**Eq. (6)**	**Eq. (7)**	**Eq. (5)**	**Eq. (6)**	**Eq. (7)**	**Eq. (5)**	**Eq. (6)**	**Eq. (7)**
es	0.167			0.145			0.196		
	(0.040)***			(0.030)***			(0.116)*		
s_{OCF}		0.161			0.142			0.177	
		(0.040)***			(0.030)***			(0.116)	
s_{FCF}			0.161			0.142			0.175
			(0.040)***			(0.030)***			(0.116)
nstant	-0.134	-0.136	-0.136	-0.138	-0.138	-0.138	-0.121	-0.128	-0.128
	(0.016)***	(0.016)***	(0.016)***	(0.014)***	(0.014)***	(0.014)***	(0.054)**	(0.055)**	(0.055)*
R^2	0.006	0.006	0.006	0.007	0.007	0.007	0.004	0.003	0.003

le 6
t Period Return Prediction (Continues)

el B: 1993-2014	All Split Firms			Dividend Payers			Non-dividend Payers		
	Eq. (5)	**Eq. (6)**	**Eq. (7)**	**Eq. (5)**	**Eq. (6)**	**Eq. (7)**	**Eq. (5)**	**Eq. (6)**	**Eq. (7)**
res	0.214			0.102			0.266		
	(0.069)***			(0.036)***			(0.198)		
s_{OCF}		0.225			0.110			0.254	
		(0.072)***			(0.039)***			(0.203)	
s_{FCF}			0.223			0.112			0.260
			(0.072)***			(0.039)***			(0.202)
nstant	-0.159	-0.160	-0.160	-0.101	-0.103	-0.103	-0.241	-0.242	-0.242
	(0.036)***	(0.037)***	(0.037)***	(0.015)***	(0.016)***	(0.016)***	(0.085)***	(0.086)***	(0.086)**
R^2	0.002	0.002	0.002	0.006	0.006	0.006	0.001	0.001	0.001

el C: 1963-2014	All Split Firms			Dividend Payers			Non-dividend Payers		
	Eq. (5)	**Eq. (6)**	**Eq. (7)**	**Eq. (5)**	**Eq. (6)**	**Eq. (7)**	**Eq. (5)**	**Eq. (6)**	**Eq. (7)**
res	0.174			0.124			0.226		
	(0.039)***			(0.022)***			(0.118)*		
s_{OCF}		0.175			0.129			0.209	
		(0.041)***			(0.023)***			(0.121)*	
s_{FCF}			0.177			0.129			0.217
			(0.041)***			(0.023)***			(0.121)*
nstant	-0.146	-0.147	-0.147	-0.123	-0.124	-0.124	-0.197	-0.200	-0.200
	(0.019)***	(0.019)***	(0.019)***	(0.010)***	(0.010)***	(0.010)***	(0.058)***	(0.058)***	(0.058)**
R^2	0.003	0.003	0.003	0.007	0.007	0.007	0.001	0.001	0.001

le 7
fitability Prediction, 1963-2014

$- NI_{t-1})/TE_{t-1} = \beta_0 + \beta_1 res_{0,\,t-1} + \beta_2 ROE_{t-1} + \varepsilon_t$
$Fp_t - OCFp_{t-1})/TE_{t-1} = \beta_0 + \beta_1 res_{0,\,t-1} + \beta_2 ROCFp_{t-1} + \varepsilon_t$
$CF_t - FrCF_{t-1})/TE_{t-1} = \beta_0 + \beta_1 res_{0,\,t-1} + \beta_2 RFrCF_{t-1} + \varepsilon_t$ (

re t=0, 1, and 2, NI is net income, TE is total equity, and res_0 is the residual in Equation (2) with the lagged variables, ROE is the return on
ity, OCFp is operating cash flow measured by operating income before depreciation, ROCFp is the return on operating cash flow, i.e., the ra
perating cash flow to total equity, FrCF is free cash flow measured by operating income before depreciation minus the sum of total income
s, total interest and related expense, and common dividends and preferred dividends, and RFrCF is the return on free cash flow, i.e., the rati
ree cash flow to total equity. ROE, ROCFp, and RFrCF are lagged variables and winsorized at 5% and 95% levels. Variance is estimated v
Huber/White/sandwich robust variances estimator (see White (1980)). Numbers in parentheses are standard errors. ***, **, and *: Signific
he level of 1%, 5%, and 10%, respectively.

el A: Eq. (8)	**All Split Firms**			**Dividend Payers**			**Non-dividend Paye**		
	t = 0	**t = 1**	**t = 2**	**t = 0**	**t = 1**	**t = 2**	**t = 0**	**t = 1**	**t = 2**
res	0.061	0.103	0.498	0.066	0.119	0.272	0.054	0.085	0.773
	(0.012)***	(0.041)***	(0.177)***	(0.013)***	(0.040)***	(0.241)	(0.019)***	(0.084)	(0.268)**
OE	0.097	0.532	0.025	0.164	0.540	0.859	0.085	0.616	-2.878
	(0.104)	(0.238)**	(0.651)	(0.099)*	(0.154)***	(0.343)**	(0.151)	(0.619)	(2.464)
nstant	0.063	0.018	0.260	0.041	0.006	0.050	0.082	0.024	0.845
	(0.020)***	(0.053)	(0.140)*	(0.019)**	(0.034)	(0.119)	(0.028)***	(0.131)	(0.457)*
R^2	0.030	0.059	0.110	0.041	0.120	0.137	0.020	0.038	0.251

le 7
fitability Prediction, 1963-2014 (Continues)

el B: Eq. (9)	All Split Firms			Dividend Payers			Non-dividend Paye		
	t = 0	**t = 1**	**t = 2**	**t = 0**	**t = 1**	**t = 2**	**t = 0**	**t = 1**	**t = 2**
res	0.082	0.192	0.497	0.083	0.162	0.543	0.075	0.204	0.477
	(0.022)***	(0.074)***	(0.189)***	(0.022)***	(0.084)*	(0.252)**	(0.036)**	(0.118)*	(0.277)*
OCFp	0.378	0.501	0.884	0.334	0.494	1.107	0.422	0.696	0.371
	(0.087)***	(0.128)***	(0.404)**	(0.069)***	(0.151)***	(0.509)**	(0.128)***	(0.301)**	(0.436)
nstant	0.013	0.041	0.078	0.002	0.001	-0.061	0.046	0.031	0.351
	(0.035)	(0.052)	(0.179)	(0.029)	(0.073)	(0.247)	(0.048)	(0.099)	(0.203)*
R^2	0.160	0.111	0.161	0.123	0.173	0.269	0.206	0.098	0.068

el C: Eq. (10)	All Split Firms			Dividend Payers			Non-dividend Payers		
	t = 0	**t = 1**	**t = 2**	**t = 0**	**t = 1**	**t = 2**	**t = 0**	**t = 1**	**t = 2**
res	0.046	0.116	0.182	0.049	0.102	0.211	0.042	0.134	0.171
	(0.013)***	(0.047)**	(0.151)	(0.011)***	(0.046)**	(0.179)	(0.022)*	(0.083)	(0.246)
FrCF	0.380	0.447	0.998	0.260	0.500	0.909	0.420	0.337	1.194
	(0.074)***	(0.220)**	(0.314)***	(0.053)***	(0.119)***	(0.395)**	(0.099)***	(0.585)	(0.516)**
nstant	0.005	0.029	-0.010	0.015	-0.002	-0.012	0.023	0.087	-0.011
	(0.017)	(0.051)	(0.091)	(0.012)	(0.031)	(0.111)	(0.025)	(0.137)	(0.161)
R^2	0.173	0.085	0.169	0.099	0.221	0.246	0.209	0.036	0.126