Why Did the Investment-Cash Flow Sensitivity Decline over Time?

Online Appendix

Notes for Table A1: Investment–cash flow ratio sensitivity

Our simple model implies that a firm's current cash flow ratio $C_t/\tilde{C}_{t|t-1}$ plays an informational role to guide the firm's investment, where $\tilde{C}_{t|t-1}$ is the prediction of C_t given the information at $t-1$. However, in our empirical tests, we follow the literature to use the asset-scaled cash flow as a proxy for the cash flow ratio. To examine whether our results are sensitive to asset scaling, we estimate the investment–cash flow ratio sensitivity and report the results in Table A1.

Panel A reports the mean, median and standard deviation of cash flow ratio (CFR). CFR is defined as the ratio of the current cash flow of a firm over the sum of the cash flows in the previous three years. We use the average cash flows over the previous three years of a firm as a proxy for $\tilde{C}_{t|t-1}$. In order to make the coefficients more comparable with other scalars such as total assets, we use the sum of the three years of cash flow as the denominator of CFR without changing statistical significance. Panel B of the table reports the panel regressions of capital expenditure (INV) on the market-to-book ratio (MB), cash flow ratio (CFR) and its cross-product term with tangible capital (TC).

Panel A shows that the mean cash flow ratio declines over time. Its standard deviation, however, increases over time. Panel B shows that the investment–cash flow ratio sensitivity is significantly positive in all periods. This sensitivity also declines over time, which mirrors the pattern of the investment–cash flow sensitivity over time, as reported in the Table 2 of the paper. When the cross-product term of cash flow ratio and tangible capital is included in the regression, the coefficient of the cash flow ratio becomes either insignificant or negative. However, the regression coefficient of the cross-product term is positive and highly significant. These results suggest that our simple model does capture the insights in the investment–cash flow sensitivity literature.

Notes for Table A2: Firm-years with positive and negative cash flow

Allayannis and Mozumdar (2004) observe that when the cash flow is negative, the firm is likely in financial distress and is able to make only the absolutely essential investments. Any further cutback in investment in response to further declines in cash flow is impossible, so that investment-cash flow sensitivity is very low for these firms.

To investigate whether the declining trend in the investment–cash flow sensitivity is driven by the increase in the number of firms with negative cash flows in recent years, we divide all the firm-years into positive and negative cash flow subsamples. We examine the descriptive statistics and the investment, cash flow and sales regressions. The results are given in Table A2.

From Panel A, we can see that firm-years involving negative cash flow are rare in the first 10-year subperiod, but steadily increase in number until the second-last subperiod. The firm-years involving negative cash flow are associated with a lower level of investment, on average about half of that of the firm-years with positive cash flow. The firms with negative cash flow tend to have low tangible capital and high intangible capital. Panel B shows that the variation in cash flow and intangible capital is higher for the negative-cash-flow subsample than for the positive one.

The investment-cash flow sensitivity is much lower for the negative-cash-flow subsample than for the positive one as Panel C shows. Note that this is not purely mechanical. The slope coefficient of any simple linear regression is positively determined by the covariance of, not the means of, the two variables, and negatively determined by the variance of the explanatory variable, which is cash flow in our case. It is the increase in the cash flow variance that drives the sensitivity lower, consistent with our hypotheses on the predictability of cash flow. Note that in both subsamples, the investment-cash flow sensitivity shows a declining pattern. The fact that positive-cash-flow firms also display a declining sensitivity pattern indicates that the pattern requires a better explanation than the argument reliant on negative cash flow. The regression results with the cross-product term with tangible capital shows that much of variation in the investment with cash flow can be explained by its association with tangible capital in both subsamples. That drives home the productivity-based explanation.

The results in Panels D and E add further support to the explanation based on productive capital structure by showing that the declining investment-cash flow sensitivity in both subsamples is associated with the declining autocorrelation of cash flow, the increasing magnitude of unpredictable cash flow, and the increased reliance of firms on intangible capital over tangible capital. Overall, while the distinction between firms with positive and negative cash flow does reveal certain patterns regarding the investment-cash flow sensitivity, the evidence for our hypotheses regarding the productivity of tangible capital speaks for itself.

Notes for Table A3: Tournaments among alternative explanations

Studies in the literature have documented that many firm characteristics have evolved over time in addition to tangible capital. These characteristics may affect both the capital investments and the investment-cash flow sensitivity.

In the paper, we have investigated how six firm characteristics, WW index (WW), leverage ratio (LR), cash holdings (CH), working capital (WC), firm size (SZ) and research and development expenses (RD) affect the investment–cash flow sensitivity collectively. This table explores their individual effects. We report the results in panels A, B, C, D, E and F. We further run horse racing tests to compare their performance with TC.

The results can be summarized as follows. First, none of the cross-product terms of the six firm characteristics and CF shows statistically significant coefficients in all five subperiods without the cross-product term CF*TC. The coefficients of CF*CH, CF*SZ and CF*RD are insignificant in the first subperiod. The coefficient of CF*WW is insignificant in the fourth subperiod. The coefficients of CF*WC and CF*LR are insignificant in the first two subperiods and the last two subperiods respectively.

Second, the signs of the coefficients of CF*WW, CF*LR, CF*WC and CF*SZ are inconsistent with the financial constraint argument. For example, firms with a larger WW index, a higher leverage or a smaller size should be more financially constrained, and should exhibit higher investment–cash flow sensitivity. However, the coefficients of CF*WW and CF*LR are negative, and that of CF*SZ is positive. Working capital as a substitute for cash holdings should alleviate financial

constraints, thereby reducing the investment–cash flow sensitivity. Yet the coefficient of CF*WC is positive, when it is significant in the later three subperiods.

Third, when the cross-product term of cash flow and tangible capital (CF*TC) is included in the investment regression together with any of the other cross-product terms, the coefficient of CF*TC is always highly significant. Furthermoe, the significance of CF*CH and CF*RD is reduced by the incorporation of CF*TC. These are the only two cross-product terms that show correct signs in the investment regression without CF*TC.

Fourth, when the cross-product terms of these variables and CF are included in the investment regression one at a time, the adjusted R^2s of regressions barely increase. Recall that the adjusted R^2s of the investment regression without any cross-product in Table 2 of the paper are 13.2%, 10.1%, 8.4%, 9.3% and 5.7% in the five subperiods. Panel C in Table 3A shows that when CF*CH is added into the investment regression, the adjusted R^2 only increases by 0.2%, 0.4%, 0.6% and 0.3% in second, third, fourth and fifth subperiods respectively. The R^2s barely change in the first subperiod. However, Table 2 in the paper shows that when TC*CF is included in the investment regression, R^2 increases by 1.6%, 1.8%, 2.2%, 1.4% and 2.3% in the five subperiods. Moreover, the other five firm characteristics improve the adjusted R^2 of the investment regression even less than cash holdings (CH) do.

Fifth, similar to the last point, in the third-last column we construct two variables to measure the portion of variation in the investment–cash flow sensitivity resulting from that in different firm characteristics. $\sigma(a_4X)$ measures the portion of variation in the investment–cash flow sensitivity attributable to that in X where X can be WW, LR, CH, WC, SZ or RD. $\sigma(a_3\text{TC} + a_4X)$ measures the portion of variation in the investment–cash flow sensitivity explained by TC and X together. Table 3A shows that the six variables combined explain a limited portion of the variation in the investment–cash flow sensitivity. However, when TC is used together with each of these variables to explain the investment–cash flow sensitivity, the explanatory power increases significantly. For example, Panel C of Table 3A shows that $\sigma(a_4\text{CH})$ is 0.02 in the second subperiod. However, when TC and CH are used together to explain the investment–cash flow sensitivity in the same subperiod, $\sigma(a_3\text{TC} + a_4\text{CH})$ is 0.077, which is 3.85 times as large as $\sigma(a_4\text{CH})$.

The above results suggest that (1) most of the alternative variables are unable to explain the investment–cash flow sensitivity, except for cash holding and R&D, which have limited explanatory power; and (2) the impact of tangible capital on the investment–cash flow sensitivity dominates all the alternative variables considered here and the result is robust.

Table A1
Investment–cash flow ratio sensitivity

This table presents the 10-year panel regressions of investment on cash flow ratio and its cross-product term with tangible capital for the full sample. INV and TC are physical investment and tangible capital respectively, scaled by total assets. MB is the market-to-book ratio. Cash flow ratio, CFR, is defined as the ratio of current cash flow to the sum of the cash flows in the previous three years. NF is the average number of firms. The regressions are estimated with firm and year effects. The t-statistic to the right of an estimate is adjusted using a Huber/White robust standard error. The regression residual is allowed to cluster at the firm level. R^2 is the adjusted R^2 for serially demeaned panel data.

A. Descriptive statistics: CFR

Period	Mean	Median	STD	NF
1967-1976	0.42	0.40	0.35	1309.8
1977-1986	0.37	0.41	0.70	1658.0
1987-1996	0.40	0.40	0.99	1617.3
1997-2006	0.35	0.38	1.16	1706.6
2007-2016	0.34	0.36	0.99	1319.7

B. $\mathrm{INV}_{i,t} = a_0 + a_1\mathrm{MB}_{i,t-1} + a_2\mathrm{CFR}_{i,t} + a_3\mathrm{CFR}_{i,t}\mathrm{TC}_{i,t-1} + \varepsilon_{i,t}$

Period	MB	t-stat	CFR	t-stat	CFR*TC	t-stat	R^2 (%)
1967-1976	0.013	13.09	0.012	8.28			7.4%
1977-1986	0.017	13.60	0.007	10.28			5.2%
1987-1996	0.015	16.35	0.003	8.00			6.4%
1997-2006	0.008	14.69	0.002	7.21			8.9%
2007-2016	0.008	11.80	0.001	4.89			5.4%
1967-1976	0.013	13.35	-0.005	-1.74	0.064	5.07	8.0%
1977-1986	0.018	13.71	0.001	0.45	0.024	4.12	5.4%
1987-1996	0.015	16.47	-0.001	-0.91	0.016	5.08	6.7%
1997-2006	0.008	14.79	-0.001	-1.32	0.011	5.32	9.2%
2007-2016	0.008	11.97	-0.001	-2.77	0.012	5.12	5.8%

Table A2

Firm-years with positive vs. negative cash flow

For firm-years with positive and negative cash flow, panels A and B of this table present the 10-year panel means and standard deviations, respectively, of physical investment (INV), cash flows (CF), sales (SA), tangible capital (TC) and intangible capital (IC), all scaled by total assets, and the market-to-book ratio (MB). MB, TC and IC are measured at the beginning of the year. NF is the average number of firms. Panels C, D and E present the results of the investment, cash flow and sales regressions, respectively. The regressions are estimated with fixed firm and year effects. The t-statistic to the right of an estimate is adjusted using a Huber/White robust standard error. The regression residual is allowed to cluster at the firm level. R^2 is the adjusted R^2 for serially demeaned panel data.

A. Mean

Positive cash flow firm-years

Period	INV	MB	CF	SA	TC	IC	NF
1967-1976	0.08	1.39	0.11	1.62	0.33	0.36	1287.1
1977-1986	0.08	1.24	0.12	1.67	0.31	0.45	1599.3
1987-1996	0.07	1.61	0.12	1.46	0.30	0.57	1588.9
1997-2006	0.06	1.85	0.12	1.27	0.27	0.63	1663.6
2007-2016	0.04	1.79	0.11	1.12	0.23	0.70	1297.8

Negative cash flow firm-years

Period	INV	MB	CF	SA	TC	IC	NF
1967-1976	0.04	1.16	-0.06	1.25	0.27	0.40	59.8
1977-1986	0.05	1.50	-0.12	1.17	0.27	0.58	216.5
1987-1996	0.04	2.04	-0.18	1.02	0.23	0.87	409.2
1997-2006	0.03	2.44	-0.26	0.81	0.19	1.20	673.3
2007-2016	0.03	2.39	-0.29	0.77	0.16	1.50	553.2

B. Standard deviation

Positive cash flow firm-years

Period	INV	MB	CF	SA	TC	IC	NF
1967-1976	0.06	1.05	0.06	0.68	0.15	0.22	1287.1
1977-1986	0.07	0.69	0.06	0.68	0.15	0.28	1599.3
1987-1996	0.06	1.04	0.07	0.63	0.17	0.43	1588.9
1997-2006	0.05	1.39	0.08	0.61	0.18	0.52	1663.6
2007-2016	0.04	1.18	0.08	0.58	0.17	0.61	1297.8

Negative cash flow firm-years

Period	INV	MB	CF	SA	TC	IC	NF
1967-1976	0.04	0.80	0.05	0.69	0.14	0.25	59.8
1977-1986	0.06	1.15	0.12	0.68	0.16	0.40	216.5
1987-1996	0.05	1.80	0.19	0.62	0.16	0.68	409.2
1997-2006	0.04	2.11	0.27	0.64	0.17	1.06	673.3
2007-2016	0.04	2.15	0.32	0.60	0.17	1.32	553.2

Table A2 (Cont'd)

C. Investment regression: $\text{Inv}_{it} = a_0 + a_1\text{MB}_{i,t-1} + a_2\text{CF}_(i,t) + a_3\text{CF}_(i,t)\text{TC}_(i,t-1) + \varepsilon_{it}$

Positive cash flow firm-years

Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	NF	R^2
1967-1976	0.007	6.38	0.318	19.14			1287.1	13.4%
1977-1986	0.008	6.61	0.249	21.18			1599.3	10.7%
1987-1996	0.010	11.58	0.123	16.50			1588.9	9.3%
1997-2006	0.007	11.83	0.082	15.84			1663.6	12.3%
2007-2016	0.006	9.72	0.065	13.08			1297.8	8.4%
1967-1976	0.007	7.08	0.134	5.92	0.582	8.19	1287.1	14.9%
1977-1986	0.009	8.16	0.065	4.00	0.686	12.92	1599.3	13.1%
1987-1996	0.010	12.53	-0.013	-1.37	0.604	15.07	1588.9	13.0%
1997-2006	0.007	12.34	-0.002	-0.36	0.405	11.05	1663.5	15.5%
2007-2016	0.006	9.99	-0.020	-3.39	0.443	11.73	1297.8	13.9%

Negative cash flow firm-years

Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	NF	R^2
1967-1976	0.009	3.18	0.103	3.81			59.8	6.9%
1977-1986	0.013	5.17	0.059	4.68			216.5	4.9%
1987-1996	0.008	7.55	0.026	5.38			409.2	5.2%
1997-2006	0.005	12.43	0.016	5.27			673.3	5.7%
2007-2016	0.004	8.48	0.018	6.14			553.2	4.5%
1967-1976	0.010	3.29	-0.026	-0.65	0.465	3.69	59.8	9.7%
1977-1986	0.013	4.94	0.012	0.72	0.181	2.39	216.5	5.6%
1987-1996	0.008	7.69	0.005	0.65	0.101	3.10	409.2	5.8%
1997-2006	0.005	12.20	0.005	1.44	0.060	3.14	673.2	6.2%
2007-2016	0.004	8.19	0.010	2.82	0.058	2.72	553.2	5.1%

Table A2 (Cont'd)

D. Cash flow regression: $\mathrm{CF}_{i,t} = \psi_0 + \psi_1 \mathrm{CF}_{i,t-1} + \xi_{i,t}, \;\; \sigma_\xi = \sqrt{Var(\xi_{i,t})}$

Positive cash flow firm-years

Period	CF	t-stat	σ_ξ	NF	R^2
1967-1976	0.523	38.61	0.035	1287.1	37.2%
1977-1986	0.449	26.97	0.049	1599.3	28.1%
1987-1996	0.319	16.27	0.071	1588.9	16.2%
1997-2006	0.283	14.30	0.086	1663.6	13.1%
2007-2016	0.307	11.11	0.085	1297.8	14.1%

Negative cash flow firm-years

Period	CF	t-stat	σ_ξ	NF	R^2
1967-1976	0.260	5.77	0.063	59.8	9.9%
1977-1986	0.290	9.86	0.103	216.5	11.0%
1987-1996	0.287	13.34	0.148	409.2	10.7%
1997-2006	0.225	14.71	0.183	673.3	9.2%
2007-2016	0.247	13.30	0.183	553.2	11.5%

E. Sales regressions: $\ln \overline{\mathrm{Sales}}_{i,t} = \gamma + \alpha \ln \overline{\mathrm{TC}}_{i,t-1} + \beta \ln \overline{\mathrm{IC}}_{i,t-1} + \zeta_{i,t}, \;\; \sigma_\zeta = \sqrt{Var(\zeta_{i,t})}$

Positive cash flow firm-years

Period	$\ln \overline{\mathrm{TC}}$	t-stat	$\ln \overline{\mathrm{IC}}$	t-stat	σ_ζ	NF	R^2
1967-1976	0.511	22.85	0.330	15.76	0.255	1287.1	88.3%
1977-1986	0.434	33.21	0.362	29.90	0.280	1599.3	81.0%
1987-1996	0.427	32.58	0.345	27.93	0.306	1588.9	76.3%
1997-2006	0.392	33.12	0.363	34.08	0.324	1663.5	72.4%
2007-2016	0.333	13.93	0.419	23.59	0.326	1297.8	74.9%

Negative cash flow firm-years

Period	$\ln \overline{\mathrm{TC}}$	t-stat	$\ln \overline{\mathrm{IC}}$	t-stat	σ_ζ	NF	R^2
1967-1976	0.479	7.67	0.436	4.95	0.352	59.8	73.5%
1977-1986	0.429	16.06	0.413	13.10	0.467	216.5	56.2%
1987-1996	0.434	20.77	0.378	12.73	0.538	409.2	50.9%
1997-2006	0.376	20.20	0.407	18.38	0.605	673.2	38.6%
2007-2016	0.333	16.54	0.333	13.98	0.623	553.2	29.9%

Table A3
Alternative explanations

This table presents the 10-year panel regressions of investment on the market-to-book ratio (MB), cash flow (CF), the product term of CF with tangible capital (TC), and other firm characteristics. These characteristics include WW-index (WW), leverage (LR), cash holding (CH), working capital (WC), firm size (SZ), and R&D expenditure (RD). $\sigma(a_4X)$ and $\sigma(a_3\text{TC}+a_4X)$ are the standard deviations of a_4X and $a_3\text{TC}+a_4X$ respectively, where X could be WW, LR, CH, WC, SZ or RD. The regression is estimated with firm and year fixed effects. The t-statistic to the right of an estimate is adjusted using a Huber/White robust standard error. The regression residual is allowed to cluster at the firm level. NF is the average number of firms. R^2 is the adjusted R^2 for serially demeaned panel data.

A. $\text{Inv}_{it} = a_0 + a_1\text{MB}_{i,t-1} + a_2\text{CF}_{i,t} + a_3\text{CF}_{i,t}\text{TC}_{i,t-1} + a_4\text{CF}_{i,t}\text{WW}_{i,t-1} + \varepsilon_{it}$

Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*WW	t-stat	$\sigma(a_4\text{WW})$	NF	R^2
1967-1976	0.007	7.51	0.242	12.51			-0.142	-1.87	0.013	1346.9	13.3%
1977-1986	0.010	8.48	0.136	7.31			-0.266	-2.40	0.034	1813.2	10.4%
1987-1996	0.009	12.76	0.047	7.83			-0.290	-7.39	0.036	1995.7	9.4%
1997-2006	0.007	17.98	0.037	14.24			0.000	0.00	0.000	2332.3	9.3%
2007-2016	0.006	13.51	0.029	11.61			-0.000	-5.20	0.000	1845.4	5.6%
Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*WW	t-stat	$\sigma(a_3\text{TC}+a_4\text{WW})$	NF	R^2
1967-1976	0.008	8.23	0.076	3.32	0.591	8.77	-0.071	-0.97	0.092	1346.9	14.8%
1977-1986	0.011	9.74	0.022	1.52	0.485	9.08	-0.159	-1.81	0.082	1813.2	12.0%
1987-1996	0.009	13.85	-0.014	-1.83	0.311	9.97	-0.209	-5.36	0.066	1995.7	11.0%
1997-2006	0.007	17.65	0.005	1.39	0.168	8.89	0.000	1.07	0.030	2332.1	10.7%
2007-2016	0.005	12.87	0.001	0.41	0.174	7.62	-0.000	-1.80	0.031	1845.4	8.0%

B. $\text{Inv}_{it} = a0 + a_1\text{MB}_{i,t-1} + a_2\text{CF}_{i,t} + a_3\text{CF}_{i,t}\text{TC}_{i,t-1} + a_4\text{CF}_{i,t}\text{LR}_{i,t-1} + \varepsilon_{it}$

Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*LR	t-stat	$\sigma(a_4\text{LR})$	NF	R^2
1967-1976	0.006	6.00	0.326	19.66			-0.267	-5.77	0.041	1256.5	13.3%
1977-1986	0.010	8.10	0.218	18.23			-0.140	-4.02	0.023	1765.6	10.5%
1987-1996	0.010	14.86	0.092	16.80			-0.038	-3.61	0.008	1891.9	8.4%
1997-2006	0.006	14.84	0.044	12.77			-0.004	-0.93	0.001	2136.6	9.1%
2007-2016	0.005	11.53	0.032	10.43			-0.001	-0.16	0.000	1715.5	5.4%
Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*LR	t-stat	$\sigma(a_3\text{TC}+a_4\text{LR})$	NF	R^2
1967-1976	0.006	6.35	0.146	6.45	0.611	9.15	-0.302	-6.92	0.101	1256.5	15.0%
1977-1986	0.010	8.87	0.085	5.58	0.536	10.88	-0.186	-5.36	0.082	1765.6	12.4%
1987-1996	0.010	14.94	0.011	1.56	0.377	11.16	-0.058	-4.15	0.063	1891.9	10.8%
1997-2006	0.006	14.49	0.007	1.65	0.192	8.56	-0.011	-2.08	0.034	2136.4	10.7%
2007-2016	0.005	11.04	-0.002	-0.65	0.213	8.37	-0.002	-0.33	0.037	1715.5	8.3%

Table A3 (Cont.'d)

C. $\text{Inv}_{it} = a0 + a_1\text{MB}_{i,t-1} + a_2\text{CF}_{i,t} + a_3\text{CF}_{i,t}\text{TC}_{i,t-1} + a_4\text{CF}_{i,t}\text{CH}_{i,t-1} + \varepsilon_{it}$

Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*CH	t-stat	$\sigma(a_4\text{CH})$	NF	R^2
1967-1976	0.008	7.76	0.276	18.36			-0.054	-0.73	0.004	1346.9	13.2%
1977-1986	0.012	10.13	0.197	20.59			-0.183	-4.47	0.020	1815.8	10.3%
1987-1996	0.011	16.29	0.098	19.12			-0.108	-6.60	0.018	1998.1	8.8%
1997-2006	0.007	17.94	0.055	15.45			-0.068	-8.47	0.015	2336.7	9.9%
2007-2016	0.005	13.16	0.042	11.11			-0.041	-5.74	0.009	1850.9	6.0%
Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*CH	t-stat	$\sigma(a_3\text{TC}+a_4\text{CH})$	NF	R^2
1967-1976	0.008	7.89	0.071	3.14	0.617	8.96	0.112	1.54	0.093	1346.9	14.9%
1977-1986	0.012	10.67	0.044	2.92	0.500	9.58	-0.032	-0.75	0.077	1815.8	11.9%
1987-1996	0.011	16.62	0.010	1.22	0.331	10.08	-0.031	-1.82	0.058	1998.1	10.6%
1997-2006	0.007	17.73	0.017	4.21	0.147	7.70	-0.032	-4.07	0.030	2336.5	10.8%
2007-2016	0.005	12.88	0.001	0.24	0.174	7.18	0.000	0.04	0.031	1850.9	8.0%

D. $\text{Inv}_{it} = a0 + a_1\text{MB}_{i,t-1} + a_2\text{CF}_{i,t} + a_3\text{CF}_{i,t}\text{TC}_{i,t-1} + a_4\text{CF}_{i,t}\text{WC}_{i,t-1} + \varepsilon_{it}$

Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*WC	t-stat	$\sigma(a_4\text{WC})$	NF	R^2
1967-1976	0.008	7.58	0.268	10.18			-0.028	-0.51	0.004	1160.8	12.4%
1977-1986	0.011	9.59	0.169	10.00			0.016	0.42	0.003	1798.9	10.0%
1987-1996	0.010	15.27	0.064	11.09			0.059	3.88	0.010	1958.4	8.3%
1997-2006	0.006	17.03	0.031	11.38			0.064	7.94	0.011	2297.2	9.7%
2007-2016	0.005	12.67	0.027	11.32			0.041	6.15	0.007	1813.1	6.0%
Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*WC	t-stat	$\sigma(a_3\text{TC}+a_4\text{WC})$	NF	R^2
1967-1976	0.009	8.52	-0.004	-0.15	0.668	9.70	0.175	3.57	0.087	1160.8	14.2%
1977-1986	0.012	10.66	-0.042	-2.11	0.585	12.26	0.186	4.94	0.077	1798.9	12.2%
1987-1996	0.010	15.64	-0.023	-2.70	0.353	10.86	0.102	6.22	0.056	1958.4	10.5%
1997-2006	0.006	16.62	-0.004	-1.11	0.176	9.30	0.075	8.47	0.033	2297.0	11.2%
2007-2016	0.005	12.14	0.001	0.16	0.171	7.75	0.041	5.26	0.031	1813.1	8.3%

E. $\text{Inv}_{it} = a0 + a_1\text{MB}_{i,t-1} + a_2\text{CF}_{i,t} + a_3\text{CF}_{i,t}\text{TC}_{i,t-1} + a_4\text{CF}_{i,t}\text{SZ}_{i,t-1} + \varepsilon_{it}$

Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*SZ	t-stat	$\sigma(a_4\text{SZ})$	NF	R^2
1967-1976	0.007	7.63	0.288	12.24			-0.005	-0.86	0.007	1346.9	13.3%
1977-1986	0.011	9.07	0.138	9.80			0.012	3.01	0.023	1815.7	10.2%
1987-1996	0.010	14.41	0.037	4.66			0.013	5.60	0.029	1997.7	8.8%
1997-2006	0.007	17.21	0.021	4.62			0.005	4.17	0.011	2336.4	9.4%
2007-2016	0.005	12.93	0.017	4.00			0.003	3.16	0.008	1850.9	5.8%
Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*SZ	t-stat	$\sigma(a_3\text{TC}+a_4\text{SZ})$	NF	R^2
1967-1976	0.008	8.33	0.120	4.69	0.607	9.07	-0.009	-1.94	0.089	1346.9	14.9%
1977-1986	0.012	10.43	0.034	2.35	0.505	9.80	0.002	0.40	0.078	1815.7	11.9%
1987-1996	0.010	15.44	-0.017	-2.02	0.329	10.25	0.007	2.76	0.063	1997.7	10.7%
1997-2006	0.006	17.06	-0.007	-1.40	0.165	8.77	0.004	2.91	0.033	2336.2	10.7%
2007-2016	0.005	12.62	-0.004	-0.76	0.172	7.47	0.002	1.29	0.031	1850.9	8.0%

F.$\text{Inv}_{it} = a0 + a_1\text{MB}_{i,t-1} + a_2\text{CF}_{i,t} + a_3\text{CF}_{i,t}\text{TC}_{i,t-1} + a_4\text{CF}_{i,t}\text{RD}_{i,t-1} + \varepsilon_{it}$

Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*RD	t-stat	$\sigma(a_4\text{RD})$	NF	R^2
1967-1976	0.007	7.58	0.272	18.31			-0.026	-0.12	0.001	1346.9	13.2%
1977-1986	0.011	9.78	0.187	19.12			-0.212	-1.97	0.009	1815.8	10.1%
1987-1996	0.010	15.16	0.101	17.32			-0.173	-7.20	0.013	1998.1	8.9%
1997-2006	0.006	16.64	0.059	18.12			-0.109	-10.77	0.012	2336.9	10.2%
2007-2016	0.005	12.03	0.043	12.88			-0.058	-7.07	0.007	1851.0	6.2%
Period	MB	t-stat	CF	t-stat	CF*TC	t-stat	CF*RD	t-stat	$\sigma(a_3\text{TC}+a_4\text{RD})$	NF	R^2
1967-1976	0.008	8.16	0.080	3.81	0.604	9.01	0.234	1.14	0.091	1346.9	14.8%
1977-1986	0.012	10.65	0.038	2.63	0.509	10.11	-0.003	-0.03	0.078	1815.8	11.9%
1987-1996	0.010	15.87	0.021	2.93	0.328	10.48	-0.126	-4.81	0.059	1998.1	10.8%
1997-2006	0.006	16.42	0.027	6.53	0.153	8.26	-0.094	-8.64	0.032	2336.7	11.3%
2007-2016	0.005	11.66	0.013	3.23	0.166	7.35	-0.042	-4.69	0.031	1851.0	8.3%