Firm Caracteristics and Long-Run Stock Returns after Corporate Events

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Background

- Long-run abnormal stock return event studies:
  - The buy-and-hold abnormal return (BHAR) method.
    - The control firm is chosen from matching.
  - The calendar time portfolio approach.
- Previously known corporate events with abnormal returns:
  - Mergers and acquisitions (M&As).
  - Initial public offerings (IPOs).
  - Seasoned equity offerings (SEOs).
  - Cash dividends.

Research Questions

- Does market have a striking degree of inefficiency?
- Do long-run abnormal returns differ significantly from zero?
- Is matching with size and book-to-market perfect?

Main Findings

- Control-firm matching requires more conditions:
  - Idiosyncratic volatility.
  - Liquidity.
  - Return momentum.
  - Capital investment.
- Abnormal returns disappear after adequate matching.
- Need not event-specific explanations.

Brief Review on Event Studies (1/2)

- Loughran and Ritter (1995)
  - IPO and SEO firms underperform in the long-run.
  - Benchmark: size-adjusted matching.
- Barber and Lyon (1997)
  - BHAR $\succeq$ CAR[1]

$$CAR = \sum_{t=1}^{\tau} [R_{it} - E(R_{it})]$$

$$BHAR = \prod_{t=1}^{\tau} [1 + R_{it}] - \prod_{t=1}^{\tau} [1 + E(R_{it})]$$

  - Reasons for misspecification:
    - New listing bias.
    - Rebalancing bias.
    - Skewness bias.
  - Size and book-to-market matched control firm.

[1] Cumulative abnormal return

Brief Review on Event Studies (2/2)

- Lyon, Barber, and Tsai (1999)
  - BHAR with bootstrapped skewness adjusted t-statistic.
  - Calendar time portfolio.
  - Potential problems for non-random samples.
- Mitchell and Stafford (2000)
  - Lyon, Barber, and Tsai's (1999) methodologies are flawed.
  - Consider the dependence of multiyear abnormal returns.
- Loughran and Ritter (2000)
  - Low power of calendar time portfoilo to detect abnormal returns.

"Because neither BHAR nor calendar time portfolio method is perfect, it is valuable to continue to refine both methods and to assess the consistency of results across methods."

Table 1. Summary of Findings in the Related Literature

Author(s)	Sample period	Sample size	Firm or deal type	Holding period (years)	Equal-weighted BHARs (%)	Alpha - calendar time portfolio (%)
Panel A: M&As						
Loughran and Vijh (1997)	1970–1989	385	Stock M&As	5	−24.2***	
Loughran and Vijh (1997)	1970–1989	196	Cash M&As	5	18.5	
Loughran and Vijh (1997)	1970–1989	207	Mixed M&As	5	−9.6	
Loughran and Vijh (1997)	1970–1989	788	All	5	−6.5	
Rau and Vermaelen (1998)	1980–1991	2,823	Mergers	3	−4.04	
Rau and Vermaelen (1998)	1980–1991	316	Tender offers	3	8.85	
Moeller, Schlingemann, and Stulz (2004)	1980–2001	12,023	All	3		0.18
Harford (2005)	1981–2000		All			0.25
Betton, Eckbo, and Thorburn (2008)	1980–2003	11,483	All	5	−21.9***	0.08
Panel B: SEOs						
Loughran and Ritter (1995)	1970–1990	3,702	All	5	−59.4[a]	
Spiess and Affleck-Graves (1995)	1975–1989	1,247	All	3	−22.8***	
Jegadeesh (2000)	1970–1993	2,992	All	5	−34.3***	−0.31***
Brav, Geczy, and Gompers (2000)[b]	1975–1992	3,775	All	5	−26.3[a]	−0.19
Eckbo, Masulis, and Norli (2007)	1980–2000	4,971	Industrial	5	−29.7***	−0.18
Fu, Huang, and Lin (2012)	1980–2002	5,062	All	3	−12.67***	−0.40***
Fu, Huang, and Lin (2012)	2003–2010	1,583	All	3	−4.65	−0.19
Panel C: IPOs						
Loughran and Ritter (1995)	1970–1990	4,753	All	5	−50.7[a]	
Brav and Gompers (1997)[b]	1976–1992	934	Venture-backed	5	16.5[a]	0.07
Brav and Gompers (1997)[b]	1975–1992	3,407	Non-venture-backed	5	0.9[a]	−0.52***
Brav, Geczy, and Gompers (2000)[b]	1975–1992	3,501	All	5	6.6[a]	−0.19
Eckbo, Masulis, and Norli (2007)	1980–2000	5,018	Industrial	5	−18.0***	−0.16
Panel D: Dividend initiations						
Michaely, Thaler, and Womack (1995)	1964–1988	561	All	5	24.8***,[c]	
Boehme and Sorescu (2002)	1927–1998	1,645	All	3	21.7***,[d]	0.21

Data

- M&A
  - Thomson Financial's SDC database.
  - 1980 - 2005.
  - Matching: closest BM with MC 70% - 130%.
  - 3,972 obs.
- SEO
  - Thomson Financial's SDC database.
  - 1980 - 2005.
  - Matching: closest BM with MC 70% - 130%.
  - 5,131 obs.
- IPO
  - Thomson Financial's SDC database.
  - 1980 - 2005.
  - Matching: closest but greater MC.
  - 8,966 obs.
- Dividend initiation.
  - CRSP database.
  - 1980 - 2005.
  - Matching: closest BM with MC 70% - 130%.
  - 887 obs.

Table 2. Number of Event Firms

Year	M&A	SEO	IPO	Dividend
1980	1	184	99	25
1981	9	186	263	26
1982	1	210	94	13
1983	0	500	588	17
1984	5	94	274	24
1985	73	152	265	20
1986	98	189	570	29
1987	91	115	443	24
1988	90	55	222	47
1989	101	103	194	46
1990	66	82	178	40
1991	90	240	367	32
1992	106	188	536	28
1993	142	261	692	30
1994	219	171	508	36
1995	283	256	511	53
1996	351	332	795	22
1997	325	265	535	29
1998	409	198	344	15
1999	336	205	498	24
2000	288	209	364	17
2001	205	163	93	18
2002	151	171	79	26
2003	168	196	67	119
2004	187	240	199	70
2005	177	166	188	57
Total	3,972	5,131	8,966	887

Characteristics

- Idiosyncratic volatility
  - Ang, Hodrick, Xing, and Zhang (2006).
  - Annualized standard deviation of residuals in monthly regressions of daily stock returns on three factors.
- Illiquidity
  - Amihud (2002).
  - Average of daily ratio of absolute stock return to trading volume.
- Capital investment
  - Lyandres, Sun, and Zhang (2008)
  - Annual change in gross property, plant, and equipment plus inventory, divided by assets.
- Momentum
  - Cumulative return from 12th month to 2nd month prior to that month.
- Market beta
  - Estimated in 120 months around events by market model.

Wealth Relative

- BHAR

$$\begin{aligned}\mathrm{BHAR}_{eT} &= \prod_{t=1}^{T}(1+r_{et}) - \prod_{t=1}^{T}(1+r_{mt}) \\ &= \exp\left[\sum_{t=1}^{T}\ln(1+r_{et})\right] - \exp\left[\sum_{t=1}^{T}\ln(1+r_{mt})\right]\end{aligned}$$

- Wealth relative (Loughran and Ritter, 1995)

$$\begin{aligned}\mathrm{WR}_{eT} &= \exp\left\{\sum_{t=1}^{T}\left[\ln(1+r_{et}) - \ln(1+r_{mt})\right]\right\} \\ &= \frac{\prod_{t=1}^{T}(1+r_{et})}{\prod_{t=1}^{T}(1+r_{mt})}\end{aligned}$$

- To test $\mathrm{BHAR} = 0 \sim$ to test $\mathrm{WR} = 1$.

Empirical Model

- Model specification:

$$\ln(1 + r_{et}) - \ln(1 + r_{mt}) = \alpha + \beta_1 \Delta\text{Beta}_{et} + \beta_2 \Delta\text{Size}_{et} + \beta_3 \Delta\text{BM}_{et} + \beta_4 \Delta\text{Mom}_{et} + \beta_5 \Delta\text{Illiquidity}_{et} + \beta_6 \Delta\text{IdioVol}_{et} + \beta_7 + \Delta\text{Investment}_{et} + \epsilon_{et}$$

- Estimated wealth relative:

$$\text{WR}_{eT} = \exp(\hat{\alpha} T)$$

- Improvements:
  - Variation in characteristics.
  - Variation across time.
  - Better statistical properties by log returns.

Table 3. Summary Statistics for BHAR and Log Returns

Variable	M&As		SEOs		IPOs		Dividend initiations	
	60-month BHARs	Difference in log return	60-month BHARs	Difference in log return	60-month BHARs	Difference in log return	60-month BHARs	Difference in log return
Mean	−0.079	−0.005	−0.073	−0.003	−0.354	−0.012	0.286	0.004
Std. dev.	4.333	0.216	2.084	0.207	3.834	0.246	3.099	0.192
Skewness	28.972	−0.231	−0.933	−0.138	12.707	−0.232	3.331	−0.05
Kurtosis	1451.123	11.949	44.848	11.577	692.636	9.337	47.546	11.015
Minimum	−75.631	−4.131	−38.710	−4.066	−65.414	−3.739	−22.021	−2.157
5th percentile	−2.761	−0.338	−2.699	−0.321	−3.918	−0.396	−3.343	−0.288
25th percentile	−0.730	−0.102	−0.755	−0.103	−1.233	−0.128	−0.720	−0.091
Median	−0.058	−0.002	−0.015	−0.001	−0.316	−0.007	0.210	0.002
75th percentile	0.549	0.097	0.616	0.100	0.481	0.111	0.987	0.099
95th percentile	2.300	0.317	2.320	0.309	2.998	0.359	3.755	0.298
Maximum	209.833	3.049	20.281	3.097	187.646	2.708	37.230	2.546

Results

- Siginificance of α in BHAR disappear when
  - All characteristics are included.
  - Non-linear form is considered.
- Calendar time portfolio indicates absence of abnormal returns.
- No longer conflicts between two methods in modified model.
  (Could be sample specific)

Table 4. Regression Results

Panel A. SEOs

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)	OLS (7)	OLS (8)	OLS (9)	OLS (10)	Fama-MacBeth (11)
Panel A: SEOs											
Dependent variable: Difference in log return											
ΔBeta		−0.0090***							−0.0040*	−0.0041*	−0.0024
		(−3.160)							(−1.742)	(−1.830)	(−1.227)
$\Delta Beta^2$										0.0015	0.0026
										(0.752)	(1.018)
ΔSize			0.0031*						−0.0003	−0.0002	−0.0018
			(1.656)						(−0.167)	(−0.088)	(−1.132)
$\Delta Size^2$										0.0010	−0.0003
										(0.474)	(−0.126)
ΔBM				0.0043***					0.0044***	0.0045***	0.0028*
				(2.650)					(2.800)	(2.843)	(1.702)
ΔBM^2										0.0008	−0.0014
										(0.415)	(−0.569)
ΔMomentum					0.0154***				0.0117***	0.0117***	0.0102***
					(5.040)				(3.962)	(3.954)	(4.300)
$\Delta momentum^2$										0.0002	0.0005
										(0.115)	(0.159)
ΔIlliquidity						0.0015			0.0016	0.0018	0.0006
						(0.942)			(1.003)	(1.111)	(0.314)
$\Delta Illiquidity^2$										0.0006	−0.0007
										(0.255)	(−0.209)
ΔIdio. volatility							−0.0188***		−0.0157***	−0.0157***	−0.0150***
							(−6.320)		(−5.994)	(−6.040)	(−6.913)
$\Delta Idio.\ volatility^2$										0.0033	0.0083**
										(1.479)	(2.146)
ΔInvestment								−0.0055***	−0.0044***	−0.0043***	−0.0045***
								(−3.820)	(−3.208)	(−3.148)	(−2.950)
$\Delta Investment^2$										−0.0016	−0.0010
										(−0.813)	(−0.331)
Constant	−0.0028**	−0.0016	−0.0032**	−0.0026*	−0.0029**	−0.0027**	−0.0014	−0.0012	−0.0000	−0.0019	−0.0018
	(−2.012)	(−1.426)	(−2.375)	(−1.956)	(−2.079)	(−2.072)	(−1.101)	(−1.011)	(−0.017)	(−1.143)	(−0.870)
Cluster by date	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	215,853	214,515	215,605	208,241	215,801	209,602	215,782	181,857	169,152	169,152	169,082
Adjusted R^2	0.000	0.001	0.000	0.000	0.002	0.000	0.003	0.000	0.004	0.004	0.100
Wealth relative	0.845	0.908	0.825	0.856	0.840	0.850	0.919	0.931	1.000	0.892	0.898

Table 4. Regression Results

Panel B. IPOs

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)	OLS (7)	OLS (8)	OLS (9)	OLS (10)	Fama-MacBeth (11)
Panel B: IPOs											
ΔBeta		−0.0089**							−0.0027	−0.0026	−0.0016
		(−2.468)							(−0.871)	(−0.878)	(−0.689)
$\Delta Beta^2$										−0.0030	−0.0020
										(−0.951)	(−0.715)
ΔSize			−0.0007						0.0011	0.0011	0.0011
			(−0.354)						(0.474)	(0.471)	(0.578)
$\Delta Size^2$										0.0017	0.0028
										(0.684)	(0.977)
ΔBM				0.0150***					0.0072***	0.0070***	0.0058***
				(5.859)					(3.710)	(3.653)	(3.345)
ΔBM^2										−0.0042*	−0.0042
										(−1.790)	(−1.632)
ΔMomentum					0.0235***				0.0154***	0.0154***	0.0127***
					(6.550)				(4.027)	(4.023)	(5.043)
$\Delta momentum^2$										0.0011	0.0040
										(0.437)	(1.512)
ΔIlliquidity						0.0064***			0.0079***	0.0076***	0.0071***
						(3.746)			(3.398)	(3.313)	(3.197)
$\Delta Illiquidity^2$										0.0024	0.0029
										(0.738)	(0.834)
ΔIdio. volatility							−0.0259***		−0.0215***	−0.0214***	−0.0218***
							(−6.270)		(−5.450)	(−5.442)	(−7.582)
$\Delta Idio.\ volatility^2$										−0.0020	−0.0044
										(−0.774)	(−1.431)
ΔInvestment								−0.0152***	−0.0084***	−0.0083***	−0.0074***
								(−6.535)	(−4.091)	(−4.088)	(−4.640)
$\Delta Investment^2$										−0.0038	−0.0060**
										(−1.577)	(−2.124)
Constant	−0.0115***	−0.0079***	−0.0114***	−0.0109***	−0.0105***	−0.0113***	−0.0089***	−0.0099***	−0.0034**	−0.0010	−0.0015
	(−5.008)	(−4.591)	(−5.172)	(−4.428)	(−4.608)	(−5.088)	(−4.703)	(−3.818)	(−2.185)	(−0.387)	(−0.547)
Cluster by date	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	447,655	246,693	395,406	270,995	429,147	388,674	437,347	236,523	152,796	152,796	152,708
Adjusted R^2	0.000	0.000	0.000	0.001	0.003	0.000	0.004	0.001	0.005	0.005	0.088
Wealth relative	0.502	0.623	0.505	0.520	0.533	0.508	0.586	0.552	0.815	0.942	0.914

Table 4. Regression Results

Panel C. M&As

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)	OLS (7)	OLS (8)	OLS (9)	OLS (10)	Fama-MacBeth (11)
Panel C: Mergers and acquisitions											
ΔBeta		−0.0064							−0.0003	−0.0001	−0.0000
		(−1.614)							(−0.083)	(−0.017)	(−0.011)
$\Delta Beta^2$										−0.0055**	−0.0028
										(−1.989)	(−1.123)
ΔSize			0.0031						0.0010	0.0006	0.0003
			(1.509)						(0.523)	(0.329)	(0.210)
$\Delta Size^2$										−0.0008	−0.0009
										(−0.283)	(−0.333)
ΔBM				0.0031					0.0038*	0.0036*	0.0017
				(1.566)					(1.906)	(1.813)	(0.996)
ΔBM^2										0.0020	0.0026
										(0.749)	(0.900)
ΔMomentum					0.0145***				0.0101**	0.0102**	0.0082***
					(3.689)				(2.582)	(2.588)	(3.176)
$\Delta momentum^2$										0.0013	0.0041
										(0.560)	(1.475)
ΔIlliquidity						0.0046**			0.0059***	0.0055***	0.0028
						(2.500)			(3.064)	(2.869)	(1.370)
$\Delta Illiquidity^2$										−0.0027	−0.0033
										(−0.784)	(−0.857)
ΔIdio. volatility							−0.0178***		−0.0168***	−0.0167***	−0.0157***
							(−4.328)		(−4.535)	(−4.546)	(−6.404)
$\Delta Idio.\ volatility^2$										−0.0051*	−0.0079**
										(−1.791)	(−2.428)
ΔInvestment								−0.0068***	−0.0056***	−0.0057***	−0.0042**
								(−3.597)	(−3.079)	(−3.124)	(−2.558)
$\Delta Investment^2$										−0.0003	0.0015
										(−0.103)	(0.579)
Constant	−0.0046***	−0.0044***	−0.0050***	−0.0045***	−0.0045***	−0.0041***	−0.0039***	−0.0049***	−0.0035***	0.0002	−0.0005
	(−4.300)	(−4.708)	(−4.364)	(−4.145)	(−4.229)	(−4.175)	(−4.023)	(−3.947)	(−3.492)	(0.105)	(−0.233)
Cluster by date	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	160,900	159,860	160,739	155,132	160,860	160,856	160,845	125,458	120,133	120,133	119,682
Adjusted R^2	0.000	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.003	0.004	0.112
Wealth relative	0.759	0.768	0.741	0.763	0.763	0.782	0.791	0.745	0.811	1.012	0.970

Table 4. Regression Results

Panel D. Dividend Initiations

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)	OLS (7)	OLS (8)	OLS (9)	OLS (10)	Fama-MacBeth (11)
Panel D: Dividend initiations											
ΔBeta		−0.0054**							−0.0028	−0.0025	−0.0039
		(−2.255)							(−1.166)	(−1.035)	(−1.220)
$\Delta Beta^2$										0.0095**	0.0118**
										(2.453)	(2.173)
ΔSize			0.0041**						0.0045**	0.0054**	0.0077**
			(2.128)						(2.117)	(2.548)	(2.585)
$\Delta Size^2$										−0.0061	−0.0059
										(−1.472)	(−1.034)
ΔBM				0.0025					0.0052**	0.0052**	0.0056*
				(1.193)					(2.081)	(2.078)	(1.840)
ΔBM^2										−0.0041	−0.0015
										(−0.975)	(−0.286)
ΔMomentum					0.0132***				0.0095***	0.0088***	0.0070**
					(5.079)				(3.441)	(3.161)	(1.991)
$\Delta momentum^2$										0.0016	0.0035
										(0.395)	(0.627)
ΔIlliquidity						0.0039*			0.0055**	0.0054**	0.0072**
						(1.795)			(2.027)	(1.967)	(2.072)
$\Delta Illiquidity^2$										0.0060	0.0099
										(1.104)	(1.481)
ΔIdio. volatility							−0.0167***		−0.0144***	−0.0139***	−0.0171***
							(−6.185)		(−5.193)	(−4.915)	(−4.739)
$\Delta Idio.\ volatility^2$										0.0004	0.0020
										(0.089)	(0.359)
ΔInvestment								−0.0042**	−0.0040*	−0.0045**	−0.0050*
								(−2.079)	(−1.875)	(−2.092)	(−1.754)
$\Delta Investment^2$										0.0028	−0.0013
										(0.682)	(−0.219)
Constant	0.0040***	0.0041***	0.0036***	0.0040***	0.0034***	0.0043***	0.0037***	0.0053***	0.0041***	0.0010	−0.0008
	(3.518)	(3.549)	(3.190)	(3.610)	(3.017)	(3.769)	(3.317)	(4.387)	(3.452)	(0.276)	(−0.165)
Cluster by date	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	44,956	44,854	44,853	43,233	44,935	43,867	44,934	33,574	31,742	31,742	31,211
Adjusted R^2	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.000	0.004	0.004	0.221
Wealth relative	1.271	1.279	1.241	1.271	1.226	1.294	1.249	1.374	1.279	1.062	0.953

Table 4. Regression Results

Panel E. Calendar Time Portfolio Method

	SEO (1)	IPO (2)	M&A (3)	Dividend initiation (4)
Panel E: The calendar time portfolio method				
Dependent variable: Excess portfolio return				
MKT	1.1853***	1.0784***	1.0507***	0.9525***
	(44.562)	(28.650)	(42.153)	(27.157)
SMB	0.8619***	1.0321***	0.6891***	0.6759***
	(16.605)	(14.574)	(13.748)	(9.528)
HML	−0.0725	−0.3100***	0.1189**	0.4275***
	(−1.433)	(−4.189)	(2.291)	(7.853)
UMD	−0.2209***	−0.3016***	−0.2371***	−0.0719*
	(−6.188)	(−4.689)	(−6.066)	(−1.959)
Alpha	0.0009	0.0020	0.0009	0.0013
	(0.927)	(1.204)	(0.848)	(1.025)
Observations	369	365	308	355
Adjusted R^2	0.941	0.878	0.941	0.832

Assumption of Non-Variant Characteristics

- Table 5 shows the same results as Table 4.
  - No abnormal returns.
- Characteristics measured prior to event have explanatory power.
- Still desirable to allow for time variation.
  - Exist differential drift through time in average characteristics.

Conclusions

- Previous matching is imperfect.
  - Quality of matching degrades over time.
  - Various characteristics to be considered.
- Simple regression-based method explains BHARs.
- Need not event-specific explanations.

Discussion