Stock price effects of breakthrough therapy designation

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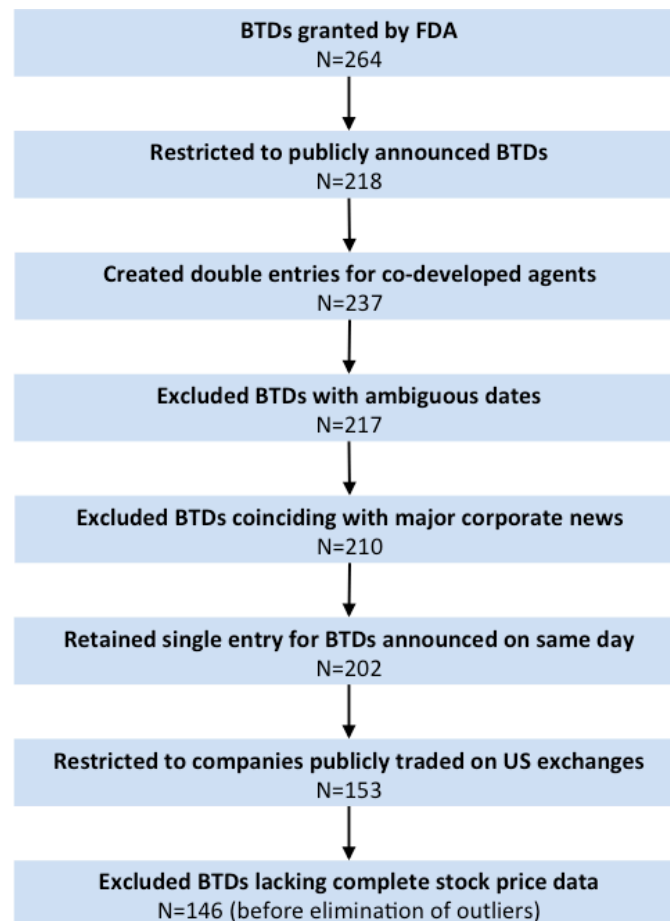Supplementary Box 1 | **Methods and data**

1. Methods

1a. Sample definition and data collection

Event data collection

The website Friends of Cancer Research (http://www.focr.com/) lists all publicly available Breakthrough Therapy Designations (BTD), which were downloaded with a cut-off on 06/30/18. For partnered products, we treated each partner as if it had independently received the BTD, and thus generated an entry for each co-developing company.

For each BTD, we identified the original press release and excluded companies that did not disclose the exact BTD announcement date. Further, we excluded companies that are not publicly traded on a US stock exchange, and those that had incomplete stock price data in the event period (as of 08/24/18). We also excluded BTDs that coincided with major corporate press releases (e.g., quarterly results or clinical trial news). In cases where the same company announced several BTDs on the same date, we retained only one for analysis. This yielded 146 BTDs (102 commercial, 44 pre-commercial). Subsequently, we identified three outliers and excluded them from the final CAAR analysis (see later section).

Stock price collection

The historical closing stock prices (unadjusted) for the range of -111 days to +90 days around the disclosure of the BTD events were downloaded from https://finance.yahoo.com/. Historical stock prices from delisted companies were downloaded from https://amigobulls.com or https://barchart.com. For all respective time frames, we also downloaded stock price data for the market (S&P500) and the industry (XBI biotechnology index) from https://finance.yahoo.com/.

1b. Two-factor market model and CAAR analysis

Market model methodology

Abnormal returns were calculated for each firm for each day in the event period, using coefficients calculated with a two-factor market model in the estimation period, Day -110 to Day -11 in respect to the BTD event. Those results were used to determine the cumulative average abnormal returns (CAARs) for the two subsamples commercial and pre-commercial firms in the event period, Day -10 through Day 90.

The returns for each firm and trading day over the prior trading day were calculated as:

$$R_{i,t} = \frac{P_{i,t}}{P_{i,t-1}} - 1$$

where $R_{i,t}$ is the return for firm i on day t and $P_{i,t}$ is the closing stock price of firm i on day t. The same formula was used to calculate the returns of the market ($R_{m,t}$) and industry ($R_{ind,t}$) benchmarks.

For each firm the abnormal return $AR_{i,t}$ on day t was specified using a two-factor market model[1]:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta 1_i R_{m,t} + \beta 2_i R_{ind,t})$$

where $R_{m,t}$ and $R_{ind,t}$ are the returns of the market and industry on day t, respectively. α_i, $\beta 1_i$ and $\beta 2_i$ are the coefficients of the multivariate regression that is used to estimate the relationship between each company, the market (S&P 500) and the industry (XBI) during the estimation period from Day -110 to -11 prior to the BTD event.

CAAR methodology

Once the daily abnormal returns were estimated, the cumulative average abnormal for commercial and pre-commercial firms were calculated based on standard methodology.[2]

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[1] Benninga, S. (2014). Using a Two-Factor Model of Returns for an Event Study. In *Financial Modeling* (pp. 350-355). Cambridge, MA: MIT Press.
[2] Schweitzer R. 1989. How do stock returns react to special events? Business Rev (Federal Reserve Bank of Philadelphia), July/August:17-29.

The average abnormal returns (AAR) were calculated as:

$$AAR_t = \frac{1}{N_t} \sum_{i=1}^{N_t} AR_{i,t}$$

Where N_t is the number of firms in the subsample. AAR_t is the average abnormal return for all firms in the subsample for day t. The CAAR for each period within the event window ending on Day T was calculated as

$$CAAR_T = \sum_{t=-10}^{T} AAR_t$$

where T was each day between Day -10 through Day 90.

1c. Outlier identification

To identify outliers, we calculated the cumulative abnormal returns (CARs) for each BTD announcement observation from Day -10 to Day 90 of the event period. Outliers were identified as observations that were outside of the range of the mean subsample CAR $\pm2.58\sigma$.

For the subsample of 102 commercial firm BTD announcements, the CARs calculated from the ARs of the two-factor model resulted in a mean CAR of -1.41% and a standard deviation of 20.46%, resulting in a range of -54.21% to 51.39%. Two observations fell outside of the range for the commercial observations: a BTD for Exelixis (8/24/15) had a CAR of -82.48%, and a BTD for Vertex (1/6/13) had a CAR of 63.96%.

For the subsample of 44 pre-commercial firm BTD announcements, the CARs calculated from the ARs of the two-factor model resulted in a mean CAR of 0.27% and a standard deviation of 70.34%, resulting in a range of -181.21% to 181.75%. One observation fell outside of the range for the pre-commercial observations: the BTD for GlycoMimetics (5/17/17) had a CAR of 209.82%.

1d. Test statistics

The statistical tests for determining if AARs and CAARs are statistically significant were calculated based on existing methodology used for event studies.[3,4]

The abnormal returns were calculated for each firm for each day in the estimation period and those results are used to determine the test statistics for the two subsamples of commercial and pre-commercial firms in the event period, Day -10 through Day 90.

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[3] Black HA, Fields MA, Schweitzer RL. 1990. Changes in Interstate Banking Laws: The Impact on Shareholder Wealth. J Finance 45(5):1663-1671.
[4] Brown SJ, Warner JB. 1985. Using Daily Stock Returns: The Case of Event Studies. J Finan Econ 14(3):3-31.

The test statistic for any AAR for any day t was calculated as

$$\text{t-statistic} = \frac{AAR_t}{\hat{S}(AAR_t)},$$

where

$$\hat{S}(AAR_t) = \sqrt{\left(\sum_{t=-110}^{-11} (AAR_t - \overline{AAR_t})\right)\Big/ 100},$$

and

$$\overline{AAR_t} = \frac{1}{100} \sum_{t=-110}^{-11} AAR_t.$$

AAR_t is the average abnormal return for all firms in the subsample for day t. The time period for the estimation period was Day -110 through Day -11, resulting in 100 days in the estimation period.

The test statistic for any CAAR for any period within the event window ending on Day T was calculated as

$$\text{t-statistic} = \frac{CAAR_T}{\hat{S}(CAAR_T)},$$

where

$$\hat{S}(CAAR_T) = \sqrt{\sum_{t=-10}^{T} \hat{S}^2(AAR_t)}.$$

Since the BTD announcement for an individual firm appears to occur without regard to announcements for other firms, statistical tests were conducted assuming cross-sectional independence.

2. Data

2a. Complete list of included BTDs

		Commercial Firms	
Sponsor	**Ticker**	**Agent / Alternative Name (Trade Name)**	**Date of BTD disclosure**
Abbvie	ABBV	Elotuzumab (Empliciti)	2014-05-19
Abbvie	ABBV	Glecaprevir + Pibrentasvir (Mavyret)	2016-09-30
AbbVie	ABBV	Ibrutinib (Imbruvica)	2016-06-29
AbbVie	ABBV	Paritaprevir / ABT-450 (Viekira Pak)	2013-05-06
Abbvie	ABBV	Upadacitinib / ABT-494	2018-01-09
AbbVie	ABBV	Venetoclax (Venclexta)	2015-05-07
AbbVie	ABBV	Venetoclax (Venclexta)	2016-01-20
AbbVie	ABBV	Venetoclax (Venclexta)	2016-01-28
Abbvie	ABBV	Venetoclax (Venclexta)	2017-07-28
Alexion	ALXN	Asfotase Alfa (Strensiq)	2013-05-28
Alexion	ALXN	cPMP / ALXN1011	2013-10-24
Allergan	AGN	Rapastinel / GLYX-13	2016-01-29
Amgen	AMGN	Blinatumomab (Blincyto)	2014-07-01
Ariad	ARIA	Brigatinib / AP26113 (Alunbrig)	2014-10-02
Astellas	ALPMY	Enfortumab Vedotin	2018-03-26
AstraZeneca	AZN	Acalabrutinib (Calquence)	2017-08-01
AstraZeneca	AZN	Durvalumab (Imfinzi)	2016-02-17
AstraZeneca	AZN	Durvalumab (Imfinzi)	2017-07-31
AstraZeneca	AZN	Olaparib (Lynparza)	2016-01-28
AstraZeneca	AZN	Osimertinib (Tagrisso)	2017-10-09
Biomarin	BMRN	Valoctocogene Roxaparvovec	2017-10-26
Bristol-Myers Squibb	BMY	Daclatasvir (Daklinza) + Asunaprevir	2014-02-24
Bristol-Myers Squibb	BMY	Elotuzumab (Empliciti)	2014-05-19
Bristol-Myers Squibb	BMY	Fostemsavir / BMS-663068	2015-07-21
Bristol-Myers Squibb	BMY	Nivolumab (Opdivo)	2014-05-14
Bristol-Myers Squibb	BMY	Nivolumab (Opdivo)	2014-09-26
Bristol-Myers Squibb	BMY	Nivolumab (Opdivo)	2015-09-02
Bristol-Myers Squibb	BMY	Nivolumab (Opdivo)	2015-09-16
Bristol-Myers Squibb	BMY	Nivolumab (Opdivo)	2016-04-25
Bristol-Myers Squibb	BMY	Nivolumab (Opdivo)	2016-06-27
Bristol-Myers Squibb	BMY	Nivolumab (Opdivo)	2017-10-16
Bristol-Myers Squibb	BMY	Nivolumab (Opdivo) + Ipilimumab (Yervoy)	2018-03-27
Celgene	CELG	Lisocabtagene maraleucel / JCAR017	2016-12-20
Daiichi Sankyo	DSNKY	DS-8201	2017-08-30
Daiichi Sankyo	DSNKY	Pexidartinib / PLX3397	2015-11-02
Dyax	DYAX	Lanadelumab / DX-2930	2015-07-07

Eli Lilly	LLY	Abemaciclib (Verzenio)	2015-10-08
Gilead Sciences	GILD	Idelalisib (Zydelig)	2013-11-18
GlaxoSmithKline	GSK	Dabrafenib (Tafinlar)	2014-01-13
GlaxoSmithKline	GSK	Drisapersen (Kyndrisa)	2013-06-27
GlaxoSmithKline	GSK	Eltrombopag (Promacta)	2014-02-03
GlaxoSmithKline	GSK	Meningococcal Group B Vaccine (Bexsero)	2018-01-07
GlaxoSmithKline	GSK	Ofatumumab (Arzerra)	2013-09-13
GlaxoSmithKline	GSK	Tafenoquine (Krintafel)	2013-12-20
Incyte	INCY	Ruxolitinib (Jakafi)	2016-06-23
Johnson & Johnson	JNJ	Daratumumab (Darzalex)	2013-05-01
Johnson & Johnson	JNJ	Daratumumab (Darzalex)	2016-07-25
Johnson & Johnson	JNJ	Erdafitinib	2018-03-15
Johnson & Johnson	JNJ	Esketamine (Ketanest)	2016-08-16
Johnson & Johnson	JNJ	Ibrutinib (Imbruvica)	2013-02-12
Johnson & Johnson	JNJ	Ibrutinib (Imbruvica)	2013-04-08
Johnson & Johnson	JNJ	Ibrutinib (Imbruvica)	2016-06-29
Merck	MRK	Avelumab (Bavencio)	2015-11-18
Merck	MRK	Avelumab (Bavencio) + Axitinib (Inlyta)	2017-12-21
Merck	MRK	Ebola Zaire Vaccine / V920	2016-07-25
Merck	MRK	Grazoprevir + Elbasvir (Zepatier)	2013-10-22
Merck	MRK	Grazoprevir + Elbasvir (Zepatier)	2015-04-08
Merck	MRK	Lenvatinib (Lenvima) + Pembrolizumab (Keytruda)	2018-01-09
Merck	MRK	Pembrolizumab (Keytruda)	2013-04-24
Merck	MRK	Pembrolizumab (Keytruda)	2014-10-27
Merck	MRK	Pembrolizumab (Keytruda)	2015-11-02
Merck	MRK	Pembrolizumab (Keytruda)	2016-04-18
Merck	MRK	Pembrolizumab (Keytruda)	2017-02-03
Novartis	NVS	Bimagrumab / BYM338	2013-08-20
Novartis	NVS	Canakinumab (Ilaris)	2016-04-27
Novartis	NVS	Ceritinib (Zykadia)	2013-03-15
Novartis	NVS	Ceritinib (Zykadia)	2017-02-23
Novartis	NVS	CTL019 (Kymriah)	2014-07-07
Novartis	NVS	CTL019 (Kymriah)	2017-04-18
Novartis	NVS	Dabrafenib (Tafinlar) + Trametinib (Mekinist)	2017-10-23
Novartis	NVS	Eltrombopag (Promacta)	2018-01-04
Novartis	NVS	Fingolimod (Gilenya)	2017-12-18
Novartis	NVS	Meningococcal Group B Vaccine (Bexsero)	2014-04-07
Novartis	NVS	Midostaurin / PKC412 (Rydapt)	2016-02-19
Novartis	NVS	Ribociclib / LEE011 (Kisqali)	2016-08-03
Novartis	NVS	Ribociclib / LEE011 (Kisqali)	2018-01-03
Novartis	NVS	Serelaxin (Reasanz)	2013-06-21
Omeros	OMER	OMS721	2017-06-13
Pfizer	PFE	Avelumab (Bavencio)	2015-11-18

Pfizer	PFE	Avelumab (Bavencio) + Axitinib (Inlyta)	2017-12-21
Pfizer	PFE	Crizotinib (Xalkori)	2015-04-21
Pfizer	PFE	Inotuzumab Ozogamicin (Besponsa)	2015-10-19
Pfizer	PFE	Lorlatinib	2017-04-27
Pfizer	PFE	Palbociclib (Ibrance)	2013-04-09
Pfizer	PFE	PF-04965842	2018-02-14
Pfizer	PFE	SPK-9001	2016-07-21
Pfizer	PFE	Trumenba (Menactra)	2014-03-20
Regeneron	REGN	Aflibercept (Eylea)	2014-09-16
Regeneron	REGN	Cemiplimab / REGN2810	2017-09-08
Regeneron	REGN	Dupilumab (Dupixent)	2014-11-20
Regeneron	REGN	Evinacumab	2017-04-06
Sanofi	SNY	Cemiplimab / REGN2810	2017-09-08
Sanofi	SNY	Dupilumab (Dupixent)	2014-11-20
Sanofi	SNY	Olipudase alfa	2015-06-04
Seattle Genetics	SGEN	Brentuximab Vedotin (Adcetris)	2016-11-10
Seattle Genetics	SGEN	Brentuximab Vedotin (Adcetris)	2017-10-02
Seattle Genetics	SGEN	Enfortumab Vedotin	2018-03-26
Shire	SHPG	Maralixibat / SHP625	2016-06-13
Shire	SHPG	Maribavir / SHP620	2018-01-04
Teva	TEVA	Deutetrabenazine (Austedo)	2015-11-09

Pre-Commercial Firms

Sponsor	Ticker	Agent / Alternative Name (Trade Name)	Date of BTD disclosure
Abeona	ABEO	EB-101	2017-08-29
Acadia	ACAD	Pimavanserin (Nuplazid)	2014-09-02
Achaogen	AKAO	Plazomicin	2017-05-23
Adaptimmune	ADAP	Affinity enhanced T-cell therapy	2016-02-09
Alnylam	ALNY	Givosiran / ALN-AS1	2017-05-31
Alnylam	ALNY	Lumasiran	2018-03-12
Alnylam	ALNY	Patisiran (Onpattro)	2017-11-20
Atara Bio	ATRA	EBV-CTL	2015-03-02
AveXis	AVXS	Onasemnogene Abeparvovec / AVXS-101	2016-07-20
BlueBird	BLUE	LentiGlobin	2015-02-02
Cara	CARA	Difelikefalin / CR845	2017-06-23
Catalyst	CPRX	Amifampridine (Firdapse)	2013-08-27
Celladon	CLDN	Mydicar	2014-04-10
Celldex	CLDX	Rindopepimut	2015-02-23
Clovis	CLVS	Rociletinib / CO-1686 (Xegafri)	2014-05-19
Clovis	CLVS	Rucaparib (Rubraca)	2015-04-06
DBV	DBVT	Viaskin Peanut	2015-04-09

Fennec	FENC	Sodium thiosulfate (Pedmark)	2018-03-27
Global Blood	GBT	Voxelotor	2018-01-09
Ignyta	RXDX	Entrectinib	2017-05-15
Immunomedics	IMMU	Sacituzumab govitecan / IMMU-132	2016-02-05
Intercept	ICPT	Obeticholic acid (Ocaliva)	2015-01-29
Juno	JUNO	Lisocabtagene maraleucel / JCAR017	2016-12-20
Kite	KITE	Axicabtagene ciloleucel (Yescarta)	2015-12-07
Loxo	LOXO	Larotrectinib (LOXO-101)	2016-07-13
MEI	MEIP	Pracinostat	2016-08-01
Neurocrine	NBIX	Valbenazine / NBI-98854 (Valbenazine)	2014-10-30
Pharmacyclics	PCYC	Ibrutinib (Imbruvica)	2013-02-12
Pharmacyclics	PCYC	Ibrutinib (Imbruvica)	2013-04-08
Portola	PTLA	Andexanet alfa / PRT4445 (AndexXa)	2013-11-25
Progenics	PGNX	Ultratrace iobenguane I-131 (Azedra)	2015-07-28
Proteostasis	PTI	PTI-428	2018-03-12
Sage	SAGE	Allopregnanolone / SAGE-547	2016-09-06
Sage	SAGE	SAGE-217	2018-02-07
Spark	ONCE	SPK-9001	2016-07-21
Stemline	STML	SL-401	2016-08-23
Synageva	GEVA	Sebelipase Alfa (Kanuma)	2013-05-20
Synthetic	SYN	Ribaxamase / SYN-004	2017-05-11
Tonix	TNXP	TNX-102 (Tonmya)	2016-12-19
Trevena	TRVN	Oliceridine / TRV130	2016-02-22
Ultragenyx	RARE	Burosumab-twza / KRN23 (Crysvita)	2016-06-28
uniQure	QURE	AMT-060	2017-01-30
Zogenix	ZGNX	Fenfluramine / ZX008 (Pondimin)	2018-02-06

2b. Complete list of CAARs

Two-factor model (S&P 500 and XBI), with outliers removed; see methods for details.

p<0.05 indicated in yellow; p<0.01 indicated in green.

			Commercial Firms			
Day	AAR	AAR St Dev	AAR P-Value	CAAR	CAAR St Dev	CAAR P-Value
-10	0.10%	0.14%	0.47	0.10%	0.14%	0.47
-9	0.17%	0.14%	0.24	0.27%	0.20%	0.18
-8	0.00%	0.14%	0.98	0.26%	0.25%	0.28
-7	-0.08%	0.14%	0.59	0.19%	0.28%	0.50
-6	0.02%	0.14%	0.91	0.21%	0.32%	0.52
-5	0.03%	0.14%	0.81	0.24%	0.35%	0.49
-4	0.10%	0.14%	0.49	0.34%	0.37%	0.37
-3	-0.16%	0.14%	0.27	0.18%	0.40%	0.65
-2	-0.12%	0.14%	0.38	0.06%	0.42%	0.89
-1	0.16%	0.14%	0.26	0.21%	0.45%	0.63
0	0.13%	0.14%	0.35	0.35%	0.47%	0.46
1	-0.06%	0.14%	0.67	0.29%	0.49%	0.56
2	-0.19%	0.14%	0.18	0.09%	0.51%	0.85
3	0.16%	0.14%	0.26	0.25%	0.53%	0.63
4	0.19%	0.14%	0.17	0.45%	0.55%	0.41
5	0.00%	0.14%	1.00	0.45%	0.57%	0.43
6	0.05%	0.14%	0.70	0.50%	0.58%	0.39
7	-0.08%	0.14%	0.57	0.42%	0.60%	0.48
8	-0.14%	0.14%	0.34	0.29%	0.62%	0.64
9	-0.08%	0.14%	0.55	0.20%	0.63%	0.75
10	-0.15%	0.14%	0.28	0.05%	0.65%	0.94
11	-0.18%	0.14%	0.21	-0.13%	0.66%	0.85
12	0.05%	0.14%	0.74	-0.08%	0.68%	0.91
13	-0.09%	0.14%	0.53	-0.17%	0.69%	0.81
14	-0.09%	0.14%	0.53	-0.26%	0.71%	0.72
15	0.00%	0.14%	0.97	-0.26%	0.72%	0.72
16	-0.16%	0.14%	0.26	-0.42%	0.74%	0.57
17	-0.02%	0.14%	0.89	-0.44%	0.75%	0.56
18	0.09%	0.14%	0.51	-0.35%	0.76%	0.65
19	-0.07%	0.14%	0.61	-0.42%	0.78%	0.59
20	-0.05%	0.14%	0.70	-0.47%	0.79%	0.55
21	-0.04%	0.14%	0.76	-0.51%	0.80%	0.52
22	-0.18%	0.14%	0.21	-0.69%	0.81%	0.40
23	0.15%	0.14%	0.27	-0.54%	0.83%	0.52
24	0.04%	0.14%	0.78	-0.50%	0.84%	0.55
25	-0.08%	0.14%	0.60	-0.57%	0.85%	0.50
26	0.22%	0.14%	0.12	-0.35%	0.86%	0.68

27	0.26%	0.14%	0.06	-0.09%	0.87%	0.92
28	-0.02%	0.14%	0.91	-0.10%	0.88%	0.91
29	0.11%	0.14%	0.42	0.01%	0.90%	0.99
30	-0.05%	0.14%	0.70	-0.04%	0.91%	0.96
31	-0.23%	0.14%	0.10	-0.28%	0.92%	0.76
32	-0.08%	0.14%	0.55	-0.36%	0.93%	0.70
33	-0.13%	0.14%	0.38	-0.49%	0.94%	0.60
34	-0.15%	0.14%	0.28	-0.64%	0.95%	0.50
35	-0.07%	0.14%	0.60	-0.71%	0.96%	0.46
36	-0.10%	0.14%	0.46	-0.82%	0.97%	0.40
37	0.17%	0.14%	0.24	-0.65%	0.98%	0.51
38	0.11%	0.14%	0.44	-0.54%	0.99%	0.59
39	-0.08%	0.14%	0.59	-0.62%	1.00%	0.54
40	0.18%	0.14%	0.21	-0.44%	1.01%	0.67
41	0.01%	0.14%	0.95	-0.43%	1.02%	0.67
42	0.04%	0.14%	0.79	-0.39%	1.03%	0.70
43	0.22%	0.14%	0.12	-0.17%	1.04%	0.87
44	-0.02%	0.14%	0.88	-0.19%	1.05%	0.85
45	-0.12%	0.14%	0.39	-0.31%	1.06%	0.77
46	0.07%	0.14%	0.63	-0.25%	1.07%	0.82
47	-0.13%	0.14%	0.37	-0.37%	1.08%	0.73
48	-0.17%	0.14%	0.24	-0.54%	1.09%	0.62
49	-0.10%	0.14%	0.49	-0.64%	1.10%	0.56
50	-0.06%	0.14%	0.69	-0.70%	1.11%	0.53
51	0.12%	0.14%	0.40	-0.58%	1.11%	0.60
52	-0.31%	0.14%	0.03	-0.89%	1.12%	0.43
53	-0.13%	0.14%	0.36	-1.02%	1.13%	0.37
54	0.01%	0.14%	0.97	-1.01%	1.14%	0.38
55	0.11%	0.14%	0.45	-0.90%	1.15%	0.43
56	0.20%	0.14%	0.16	-0.71%	1.16%	0.54
57	0.13%	0.14%	0.36	-0.58%	1.17%	0.62
58	-0.14%	0.14%	0.34	-0.71%	1.18%	0.55
59	-0.22%	0.14%	0.13	-0.93%	1.18%	0.43
60	-0.03%	0.14%	0.81	-0.96%	1.19%	0.42
61	-0.02%	0.14%	0.91	-0.98%	1.20%	0.42
62	-0.06%	0.14%	0.67	-1.04%	1.21%	0.39
63	0.09%	0.14%	0.51	-0.94%	1.22%	0.44
64	0.10%	0.14%	0.46	-0.84%	1.23%	0.49
65	0.04%	0.14%	0.76	-0.79%	1.23%	0.52
66	0.20%	0.14%	0.15	-0.59%	1.24%	0.63
67	0.19%	0.14%	0.18	-0.40%	1.25%	0.75
68	-0.06%	0.14%	0.70	-0.46%	1.26%	0.72
69	-0.05%	0.14%	0.73	-0.51%	1.27%	0.69
70	-0.24%	0.14%	0.08	-0.75%	1.27%	0.56
71	0.20%	0.14%	0.16	-0.55%	1.28%	0.67
72	-0.20%	0.14%	0.16	-0.75%	1.29%	0.56

Day	AAR	AAR St Dev	AAR P-Value	CAAR	CAAR St Dev	CAAR P-Value
73	-0.18%	0.14%	0.19	-0.93%	1.30%	0.47
74	0.02%	0.14%	0.88	-0.91%	1.30%	0.49
75	0.05%	0.14%	0.72	-0.86%	1.31%	0.51
76	-0.07%	0.14%	0.64	-0.93%	1.32%	0.48
77	0.02%	0.14%	0.89	-0.91%	1.33%	0.49
78	0.02%	0.14%	0.90	-0.89%	1.34%	0.50
79	-0.23%	0.14%	0.11	-1.12%	1.34%	0.40
80	-0.12%	0.14%	0.38	-1.24%	1.35%	0.36
81	-0.20%	0.14%	0.17	-1.44%	1.36%	0.29
82	0.20%	0.14%	0.16	-1.24%	1.36%	0.36
83	0.30%	0.14%	0.03	-0.94%	1.37%	0.49
84	0.00%	0.14%	1.00	-0.94%	1.38%	0.50
85	-0.04%	0.14%	0.80	-0.98%	1.39%	0.48
86	0.22%	0.14%	0.12	-0.76%	1.39%	0.59
87	-0.23%	0.14%	0.11	-0.98%	1.40%	0.48
88	-0.22%	0.14%	0.12	-1.20%	1.41%	0.39
89	-0.18%	0.14%	0.20	-1.38%	1.42%	0.33
90	0.13%	0.14%	0.36	-1.25%	1.42%	0.38

Pre-Commercial Firms

Day	AAR	AAR St Dev	AAR P-Value	CAAR	CAAR St Dev	CAAR P-Value
-10	0.79%	0.96%	0.41	0.79%	0.96%	0.41
-9	-0.59%	0.96%	0.54	0.20%	1.35%	0.88
-8	-0.89%	0.96%	0.35	-0.69%	1.66%	0.68
-7	0.30%	0.96%	0.75	-0.39%	1.91%	0.84
-6	-0.24%	0.96%	0.80	-0.62%	2.14%	0.77
-5	-0.17%	0.96%	0.86	-0.80%	2.34%	0.73
-4	-0.18%	0.96%	0.85	-0.98%	2.53%	0.70
-3	-0.87%	0.96%	0.36	-1.85%	2.70%	0.49
-2	0.71%	0.96%	0.46	-1.14%	2.87%	0.69
-1	-0.20%	0.96%	0.84	-1.34%	3.02%	0.66
0	6.99%	0.96%	0.00	5.65%	3.17%	0.07
1	2.27%	0.96%	0.02	7.92%	3.31%	0.02
2	0.49%	0.96%	0.61	8.41%	3.45%	0.01
3	0.75%	0.96%	0.43	9.16%	3.58%	0.01
4	-0.37%	0.96%	0.70	8.79%	3.70%	0.02
5	-0.50%	0.96%	0.60	8.29%	3.83%	0.03
6	-0.52%	0.96%	0.59	7.78%	3.94%	0.05
7	0.46%	0.96%	0.63	8.24%	4.06%	0.04
8	0.49%	0.96%	0.61	8.73%	4.17%	0.04
9	-0.44%	0.96%	0.64	8.29%	4.28%	0.05
10	-0.77%	0.96%	0.42	7.51%	4.38%	0.09
11	-0.01%	0.96%	0.99	7.50%	4.49%	0.09
12	-0.06%	0.96%	0.95	7.44%	4.59%	0.10
13	-0.68%	0.96%	0.48	6.76%	4.69%	0.15

14	-0.18%	0.96%	0.85	6.58%	4.78%	0.17
15	0.51%	0.96%	0.60	7.09%	4.88%	0.15
16	-0.18%	0.96%	0.85	6.90%	4.97%	0.16
17	-0.22%	0.96%	0.82	6.69%	5.06%	0.19
18	-0.25%	0.96%	0.79	6.44%	5.15%	0.21
19	-0.33%	0.96%	0.73	6.10%	5.24%	0.24
20	0.44%	0.96%	0.64	6.55%	5.32%	0.22
21	-0.26%	0.96%	0.78	6.29%	5.41%	0.25
22	0.26%	0.96%	0.79	6.55%	5.49%	0.23
23	-0.06%	0.96%	0.95	6.49%	5.58%	0.24
24	0.19%	0.96%	0.85	6.68%	5.66%	0.24
25	0.56%	0.96%	0.56	7.24%	5.74%	0.21
26	-0.20%	0.96%	0.84	7.04%	5.82%	0.23
27	-0.43%	0.96%	0.65	6.61%	5.90%	0.26
28	0.87%	0.96%	0.36	7.48%	5.97%	0.21
29	-0.26%	0.96%	0.79	7.22%	6.05%	0.23
30	-0.92%	0.96%	0.33	6.30%	6.12%	0.30
31	-0.61%	0.96%	0.53	5.69%	6.20%	0.36
32	0.01%	0.96%	0.99	5.70%	6.27%	0.36
33	0.28%	0.96%	0.77	5.98%	6.34%	0.35
34	-0.30%	0.96%	0.76	5.68%	6.42%	0.38
35	-0.13%	0.96%	0.89	5.55%	6.49%	0.39
36	-0.64%	0.96%	0.50	4.91%	6.56%	0.45
37	-0.07%	0.96%	0.94	4.84%	6.63%	0.46
38	-0.28%	0.96%	0.77	4.56%	6.69%	0.50
39	-0.09%	0.96%	0.93	4.48%	6.76%	0.51
40	-1.04%	0.96%	0.28	3.44%	6.83%	0.61
41	-0.84%	0.96%	0.38	2.60%	6.90%	0.71
42	0.04%	0.96%	0.97	2.63%	6.96%	0.71
43	-0.80%	0.96%	0.40	1.83%	7.03%	0.79
44	-0.27%	0.96%	0.78	1.57%	7.09%	0.83
45	-0.44%	0.96%	0.64	1.12%	7.16%	0.88
46	-0.32%	0.96%	0.74	0.80%	7.22%	0.91
47	0.21%	0.96%	0.83	1.01%	7.28%	0.89
48	-0.46%	0.96%	0.63	0.54%	7.35%	0.94
49	-0.88%	0.96%	0.36	-0.34%	7.41%	0.96
50	-0.10%	0.96%	0.92	-0.44%	7.47%	0.95
51	-0.64%	0.96%	0.51	-1.08%	7.53%	0.89
52	-0.06%	0.96%	0.95	-1.14%	7.59%	0.88
53	-0.05%	0.96%	0.96	-1.18%	7.65%	0.88
54	0.10%	0.96%	0.92	-1.09%	7.71%	0.89
55	0.42%	0.96%	0.66	-0.67%	7.77%	0.93
56	0.36%	0.96%	0.71	-0.31%	7.83%	0.97
57	0.09%	0.96%	0.92	-0.21%	7.89%	0.98
58	0.27%	0.96%	0.78	0.06%	7.94%	0.99
59	-0.52%	0.96%	0.58	-0.46%	8.00%	0.95

60	0.77%	0.96%	0.42	0.31%	8.06%	0.97
61	-0.83%	0.96%	0.38	-0.53%	8.11%	0.95
62	-0.97%	0.96%	0.31	-1.50%	8.17%	0.85
63	-0.71%	0.96%	0.46	-2.20%	8.23%	0.79
64	0.06%	0.96%	0.95	-2.14%	8.28%	0.80
65	-0.08%	0.96%	0.93	-2.22%	8.34%	0.79
66	0.27%	0.96%	0.78	-1.96%	8.39%	0.82
67	0.36%	0.96%	0.71	-1.60%	8.45%	0.85
68	1.07%	0.96%	0.26	-0.53%	8.50%	0.95
69	-0.43%	0.96%	0.65	-0.96%	8.55%	0.91
70	0.25%	0.96%	0.80	-0.72%	8.61%	0.93
71	-0.66%	0.96%	0.49	-1.37%	8.66%	0.87
72	0.44%	0.96%	0.64	-0.93%	8.71%	0.92
73	-0.43%	0.96%	0.65	-1.36%	8.77%	0.88
74	0.71%	0.96%	0.46	-0.65%	8.82%	0.94
75	-0.05%	0.96%	0.96	-0.70%	8.87%	0.94
76	-0.70%	0.96%	0.47	-1.40%	8.92%	0.88
77	0.03%	0.96%	0.98	-1.37%	8.97%	0.88
78	0.87%	0.96%	0.36	-0.50%	9.02%	0.96
79	-0.24%	0.96%	0.80	-0.74%	9.07%	0.93
80	-0.36%	0.96%	0.71	-1.10%	9.12%	0.90
81	-0.07%	0.96%	0.94	-1.18%	9.17%	0.90
82	-0.36%	0.96%	0.71	-1.53%	9.22%	0.87
83	-0.59%	0.96%	0.54	-2.12%	9.27%	0.82
84	-0.32%	0.96%	0.74	-2.44%	9.32%	0.79
85	-1.34%	0.96%	0.16	-3.78%	9.37%	0.69
86	0.23%	0.96%	0.81	-3.55%	9.42%	0.71
87	-0.54%	0.96%	0.57	-4.08%	9.47%	0.67
88	-0.54%	0.96%	0.57	-4.62%	9.52%	0.63
89	0.60%	0.96%	0.53	-4.02%	9.56%	0.67
90	-0.58%	0.96%	0.54	-4.60%	9.61%	0.63