## 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:

$$
\mathrm{R}_{\mathrm{i}, \mathrm{t}}=\frac{\mathrm{P}_{\mathrm{i}, \mathrm{t}}}{\mathrm{P}_{\mathrm{i}, \mathrm{t}-1}}-1
$$

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 ( $R_{\text {ind, }, t}$ ) benchmarks.

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

$$
A R_{i, t}=R_{i, t}-\left(\alpha_{i}+\beta 1_{i} R_{m, t}+\beta 2_{i} R_{i n d, t}\right)
$$

where $R_{m, t}$ and $R_{\text {ind,t }}$ are the returns of the market and industry on day $t$, respectively. $\alpha_{i}, \beta 1_{i}$ 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. ${ }^{2}$

[^0]The average abnormal returns (AAR) were calculated as:

$$
A A R_{t}=\frac{1}{N_{t}} \sum_{i=1}^{N_{t}} A R_{i, t}
$$

Where $N_{t}$ is the number of firms in the subsample. $A A R_{t}$ 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

$$
\mathrm{CAAR}_{\mathrm{T}}=\sum_{\mathrm{t}=-10}^{\mathrm{T}} A A R_{\mathrm{t}}
$$

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 $\pm 2.58 \sigma$.

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.

[^1]The test statistic for any AAR for any day $t$ was calculated as

$$
\mathrm{t} \text {-statistic }=\frac{A A R_{t}}{\hat{\mathrm{~S}}\left(\mathrm{AAR} R_{\mathrm{t}}\right)},
$$

where

$$
\hat{S}\left(A A R_{t}\right)=\sqrt{\left(\sum_{t=-110}^{-11}\left(\mathrm{AAR}_{t}-\overline{\mathrm{AR}_{t}}\right)\right) / 100},
$$

and

$$
\overline{\operatorname{AAR}_{\mathrm{t}}}=\frac{1}{100} \sum_{\mathrm{t}=-110}^{-11} \mathrm{AAR}_{\mathrm{t}}
$$

$A A R_{t}$ 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

$$
\text { t-statistic }=\frac{\mathrm{CAAR}_{T}}{\hat{\mathrm{~S}}\left(\mathrm{CAAR}_{T}\right)},
$$

where

$$
\hat{S}\left(\mathrm{CAAR}_{\mathrm{T}}\right)=\sqrt{\sum_{\mathrm{t}=-10}^{T} \hat{\mathrm{~S}}^{2}\left(\mathrm{AAR}_{\mathrm{t}}\right)}
$$

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 (llaris) | 2016-04-27 |
| Novartis | NVS | Ceritinib (Zykadia) | 2013-03-15 |
| Novartis | NVS | Ceritinib (Zykadia) | 2017-02-23 |
| Novartis | NVS | CTLO19 (Kymriah) | 2014-07-07 |
| Novartis | NVS | CTLO19 (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 / LEEO11 (Kisqali) | 2016-08-03 |
| Novartis | NVS | Ribociclib / LEEO11 (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) | $2016-06-28$ |
| Zogenix | QURE | AMT-060 | 2010-06 |

## 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 |
| ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| $\mathbf{- 1 0}$ | $0.10 \%$ | $0.14 \%$ | 0.47 | $0.10 \%$ | $0.14 \%$ | 0.47 |
| $\mathbf{- 9}$ | $0.17 \%$ | $0.14 \%$ | 0.24 | $0.27 \%$ | $0.20 \%$ | 0.18 |
| $\mathbf{- 8}$ | $0.00 \%$ | $0.14 \%$ | 0.98 | $0.26 \%$ | $0.25 \%$ | 0.28 |
| $\mathbf{- 7}$ | $-0.08 \%$ | $0.14 \%$ | 0.59 | $0.19 \%$ | $0.28 \%$ | 0.50 |
| $\mathbf{- 6}$ | $0.02 \%$ | $0.14 \%$ | 0.91 | $0.21 \%$ | $0.32 \%$ | 0.52 |
| $\mathbf{- 5}$ | $0.03 \%$ | $0.14 \%$ | 0.81 | $0.24 \%$ | $0.35 \%$ | 0.49 |
| $\mathbf{- 4}$ | $0.10 \%$ | $0.14 \%$ | 0.49 | $0.34 \%$ | $0.37 \%$ | 0.37 |
| $\mathbf{- 3}$ | $-0.16 \%$ | $0.14 \%$ | 0.27 | $0.18 \%$ | $0.40 \%$ | 0.65 |
| $\mathbf{- 2}$ | $-0.12 \%$ | $0.14 \%$ | 0.38 | $0.06 \%$ | $0.42 \%$ | 0.89 |
| $\mathbf{- 1}$ | $0.16 \%$ | $0.14 \%$ | 0.26 | $0.21 \%$ | $0.45 \%$ | 0.63 |
| $\mathbf{0}$ | $0.13 \%$ | $0.14 \%$ | 0.35 | $0.35 \%$ | $0.47 \%$ | 0.46 |
| $\mathbf{1}$ | $-0.06 \%$ | $0.14 \%$ | 0.67 | $0.29 \%$ | $0.49 \%$ | 0.56 |
| $\mathbf{2}$ | $-0.19 \%$ | $0.14 \%$ | 0.18 | $0.09 \%$ | $0.51 \%$ | 0.85 |
| $\mathbf{3}$ | $0.16 \%$ | $0.14 \%$ | 0.26 | $0.25 \%$ | $0.53 \%$ | 0.63 |
| $\mathbf{4}$ | $0.19 \%$ | $0.14 \%$ | 0.17 | $0.45 \%$ | $0.55 \%$ | 0.41 |
| $\mathbf{5}$ | $0.00 \%$ | $0.14 \%$ | 1.00 | $0.45 \%$ | $0.57 \%$ | 0.43 |
| $\mathbf{6}$ | $0.05 \%$ | $0.14 \%$ | 0.70 | $0.50 \%$ | $0.58 \%$ | 0.39 |
| $\mathbf{7}$ | $-0.08 \%$ | $0.14 \%$ | 0.57 | $0.42 \%$ | $0.60 \%$ | 0.48 |
| $\mathbf{8}$ | $-0.14 \%$ | $0.14 \%$ | 0.34 | $0.29 \%$ | $0.62 \%$ | 0.64 |
| $\mathbf{9}$ | $-0.08 \%$ | $0.14 \%$ | 0.55 | $0.20 \%$ | $0.63 \%$ | 0.75 |
| $\mathbf{1 0}$ | $-0.15 \%$ | $0.14 \%$ | 0.28 | $0.05 \%$ | $0.65 \%$ | 0.94 |
| $\mathbf{1 1}$ | $-0.18 \%$ | $0.14 \%$ | 0.21 | $-0.13 \%$ | $0.66 \%$ | 0.85 |
| $\mathbf{1 2}$ | $0.05 \%$ | $0.14 \%$ | 0.74 | $-0.08 \%$ | $0.68 \%$ | 0.91 |
| $\mathbf{1 3}$ | $-0.09 \%$ | $0.14 \%$ | 0.53 | $-0.17 \%$ | $0.69 \%$ | 0.81 |
| $\mathbf{1 4}$ | $-0.09 \%$ | $0.14 \%$ | 0.53 | $-0.26 \%$ | $0.71 \%$ | 0.72 |
| $\mathbf{1 5}$ | $0.00 \%$ | $0.14 \%$ | 0.97 | $-0.26 \%$ | $0.72 \%$ | 0.72 |
| $\mathbf{1 6}$ | $-0.16 \%$ | $0.14 \%$ | 0.26 | $-0.42 \%$ | $0.74 \%$ | 0.57 |
| $\mathbf{1 7}$ | $-0.02 \%$ | $0.14 \%$ | 0.89 | $-0.44 \%$ | $0.75 \%$ | 0.57 |
| $\mathbf{1 8}$ | $0.09 \%$ | $0.14 \%$ | 0.51 | $-0.35 \%$ | $0.76 \%$ | 0.56 |
| $\mathbf{1 9}$ | $-0.07 \%$ | $0.14 \%$ | 0.61 | $-0.42 \%$ | $0.78 \%$ | 0.65 |
| $\mathbf{2 0}$ | $-0.05 \%$ | $0.14 \%$ | 0.70 | $-0.47 \%$ | $0.79 \%$ | 0.59 |
| $\mathbf{2 1}$ | $-0.04 \%$ | $0.14 \%$ | 0.76 | $-0.51 \%$ | $0.80 \%$ | 0.55 |
| $\mathbf{2 2}$ | $-0.18 \%$ | $0.14 \%$ | 0.21 | $-0.69 \%$ | $0.81 \%$ | 0.52 |
| $\mathbf{2 3}$ | $0.15 \%$ | $0.14 \%$ | 0.27 | $-0.54 \%$ | $0.83 \%$ | 0.40 |
| $\mathbf{2 4}$ | $0.04 \%$ | $0.14 \%$ | 0.78 | $-0.50 \%$ | $0.84 \%$ | 0.52 |
| $\mathbf{2 5}$ | $-0.08 \%$ | $0.14 \%$ | 0.60 | $-0.57 \%$ | $0.85 \%$ | 0.55 |
| $\mathbf{2 6}$ | $0.22 \%$ | $0.14 \%$ | 0.12 | $-0.35 \%$ | $0.86 \%$ | 0.50 |
|  |  |  |  | 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 |


| $\mathbf{7 3}$ | $-0.18 \%$ | $0.14 \%$ | 0.19 | $-0.93 \%$ | $1.30 \%$ | 0.47 |
| :--- | ---: | :--- | :--- | :--- | :--- | :--- |
| $\mathbf{7 4}$ | $0.02 \%$ | $0.14 \%$ | 0.88 | $-0.91 \%$ | $1.30 \%$ | 0.49 |
| $\mathbf{7 5}$ | $0.05 \%$ | $0.14 \%$ | 0.72 | $-0.86 \%$ | $1.31 \%$ | 0.51 |
| $\mathbf{7 6}$ | $-0.07 \%$ | $0.14 \%$ | 0.64 | $-0.93 \%$ | $1.32 \%$ | 0.48 |
| $\mathbf{7 7}$ | $0.02 \%$ | $0.14 \%$ | 0.89 | $-0.91 \%$ | $1.33 \%$ | 0.49 |
| $\mathbf{7 8}$ | $0.02 \%$ | $0.14 \%$ | 0.90 | $-0.89 \%$ | $1.34 \%$ | 0.50 |
| $\mathbf{7 9}$ | $-0.23 \%$ | $0.14 \%$ | 0.11 | $-1.12 \%$ | $1.34 \%$ | 0.40 |
| $\mathbf{8 0}$ | $-0.12 \%$ | $0.14 \%$ | 0.38 | $-1.24 \%$ | $1.35 \%$ | 0.36 |
| $\mathbf{8 1}$ | $-0.20 \%$ | $0.14 \%$ | 0.17 | $-1.44 \%$ | $1.36 \%$ | 0.29 |
| $\mathbf{8 2}$ | $0.20 \%$ | $0.14 \%$ | 0.16 | $-1.24 \%$ | $1.36 \%$ | 0.36 |
| $\mathbf{8 3}$ | $0.30 \%$ | $0.14 \%$ | 0.03 | $-0.94 \%$ | $1.37 \%$ | 0.49 |
| $\mathbf{8 4}$ | $0.00 \%$ | $0.14 \%$ | 1.00 | $-0.94 \%$ | $1.38 \%$ | 0.50 |
| $\mathbf{8 5}$ | $-0.04 \%$ | $0.14 \%$ | 0.80 | $-0.98 \%$ | $1.39 \%$ | 0.48 |
| $\mathbf{8 6}$ | $0.22 \%$ | $0.14 \%$ | 0.12 | $-0.76 \%$ | $1.39 \%$ | 0.59 |
| $\mathbf{8 7}$ | $-0.23 \%$ | $0.14 \%$ | 0.11 | $-0.98 \%$ | $1.40 \%$ | 0.48 |
| $\mathbf{8 8}$ | $-0.22 \%$ | $0.14 \%$ | 0.12 | $-1.20 \%$ | $1.41 \%$ | 0.39 |
| $\mathbf{8 9}$ | $-0.18 \%$ | $0.14 \%$ | 0.20 | $-1.38 \%$ | $1.42 \%$ | 0.33 |
| $\mathbf{9 0}$ | $0.13 \%$ | $0.14 \%$ | 0.36 | $-1.25 \%$ | $1.42 \%$ | 0.38 |

## Pre-Commercial Firms

| Day | AAR |
| ---: | :---: |
| -10 | $0.79 \%$ |
| -9 | $-0.59 \%$ |
| -8 | $-0.89 \%$ |
| -7 | $0.30 \%$ |
| -6 | $-0.24 \%$ |
| -5 | $-0.17 \%$ |
| -4 | $-0.18 \%$ |
| -3 | $-0.87 \%$ |
| -2 | $0.71 \%$ |
| -1 | $-0.20 \%$ |
| 0 | $6.99 \%$ |
| 1 | $2.27 \%$ |
| 2 | $0.49 \%$ |
| 3 | $0.75 \%$ |
| 4 | $-0.37 \%$ |
| 5 | $-0.50 \%$ |
| 6 | $-0.52 \%$ |
| 7 | $0.46 \%$ |
| 8 | $0.49 \%$ |
| 9 | $-0.44 \%$ |
| 10 | $-0.77 \%$ |
| 11 | $-0.01 \%$ |
| 12 | $-0.06 \%$ |
| 13 | $-0.68 \%$ |

AAR St Dev AAR P-Value
0.41

CAAR CAAR St Dev
CAAR St Dev CAAR P-Value

| $0.96 \%$ | 0.41 | $0.79 \%$ |
| :--- | :---: | ---: |
| $0.96 \%$ | 0.54 | $0.20 \%$ |
| $0.96 \%$ | 0.35 | $-0.69 \%$ |
| $0.96 \%$ | 0.75 | $-0.39 \%$ |
| $0.96 \%$ | 0.80 | $-0.62 \%$ |
| $0.96 \%$ | 0.86 | $-0.80 \%$ |
| $0.96 \%$ | 0.85 | $-0.98 \%$ |
| $0.96 \%$ | 0.36 | $-1.85 \%$ |
| $0.96 \%$ | 0.46 | $-1.14 \%$ |
| $0.96 \%$ | 0.84 | $-1.34 \%$ |
| $0.96 \%$ | 0.00 | $5.65 \%$ |
| $0.96 \%$ | 0.02 | $7.92 \%$ |
| $0.96 \%$ | 0.61 | $8.41 \%$ |
| $0.96 \%$ | 0.43 | $9.16 \%$ |
| $0.96 \%$ | 0.70 | $8.79 \%$ |
| $0.96 \%$ | 0.60 | $8.29 \%$ |
| $0.96 \%$ | 0.59 | $7.78 \%$ |
| $0.96 \%$ | 0.63 | $8.24 \%$ |
| $0.96 \%$ | 0.61 | $8.73 \%$ |
| $0.96 \%$ | 0.64 | $8.29 \%$ |
| $0.96 \%$ | 0.42 | $7.51 \%$ |
| $0.96 \%$ | 0.99 | $7.50 \%$ |
| $0.96 \%$ | 0.95 | $7.44 \%$ |
| $0.96 \%$ | 0.48 | $6.76 \%$ |


| $0.96 \%$ | 0.41 |
| :--- | :--- |
| $1.35 \%$ | 0.88 |
| $1.66 \%$ | 0.68 |
| $1.91 \%$ | 0.84 |
| $2.14 \%$ | 0.77 |
| $2.34 \%$ | 0.73 |
| $2.53 \%$ | 0.70 |
| $2.70 \%$ | 0.49 |
| $2.87 \%$ | 0.69 |
| $3.02 \%$ | 0.66 |
| $3.17 \%$ | 0.07 |
| $3.31 \%$ | 0.02 |
| $3.45 \%$ | 0.01 |
| $3.58 \%$ | 0.01 |
| $3.70 \%$ | 0.02 |
| $3.83 \%$ | 0.03 |
| $3.94 \%$ | 0.05 |
| $4.06 \%$ | 0.04 |
| $4.17 \%$ | 0.04 |
| $4.28 \%$ | 0.05 |
| $4.38 \%$ | 0.09 |
| $4.49 \%$ | 0.09 |
| $4.59 \%$ | 0.10 |
| $4.69 \%$ | 0.15 |


| $\mathbf{1 4}$ | $-0.18 \%$ | $0.96 \%$ | 0.85 | $6.58 \%$ | $4.78 \%$ | 0.17 |
| :--- | ---: | ---: | ---: | ---: | :--- | :--- |
| $\mathbf{1 5}$ | $0.51 \%$ | $0.96 \%$ | 0.60 | $7.09 \%$ | $4.88 \%$ | 0.15 |
| $\mathbf{1 6}$ | $-0.18 \%$ | $0.96 \%$ | 0.85 | $6.90 \%$ | $4.97 \%$ | 0.16 |
| $\mathbf{1 7}$ | $-0.22 \%$ | $0.96 \%$ | 0.82 | $6.69 \%$ | $5.06 \%$ | 0.19 |
| $\mathbf{1 8}$ | $-0.25 \%$ | $0.96 \%$ | 0.79 | $6.44 \%$ | $5.15 \%$ | 0.21 |
| $\mathbf{1 9}$ | $-0.33 \%$ | $0.96 \%$ | 0.73 | $6.10 \%$ | $5.24 \%$ | 0.24 |
| $\mathbf{2 0}$ | $0.44 \%$ | $0.96 \%$ | 0.64 | $6.55 \%$ | $5.32 \%$ | 0.22 |
| $\mathbf{2 1}$ | $-0.26 \%$ | $0.96 \%$ | 0.78 | $6.29 \%$ | $5.41 \%$ | 0.25 |
| $\mathbf{2 2}$ | $0.26 \%$ | $0.96 \%$ | 0.79 | $6.55 \%$ | $5.49 \%$ | 0.23 |
| $\mathbf{2 3}$ | $-0.06 \%$ | $0.96 \%$ | 0.95 | $6.49 \%$ | $5.58 \%$ | 0.24 |
| $\mathbf{2 4}$ | $0.19 \%$ | $0.96 \%$ | 0.85 | $6.68 \%$ | $5.66 \%$ | 0.24 |
| $\mathbf{2 5}$ | $0.56 \%$ | $0.96 \%$ | 0.56 | $7.24 \%$ | $5.74 \%$ | 0.21 |
| $\mathbf{2 6}$ | $-0.20 \%$ | $0.96 \%$ | 0.84 | $7.04 \%$ | $5.82 \%$ | 0.23 |
| $\mathbf{2 7}$ | $-0.43 \%$ | $0.96 \%$ | 0.65 | $6.61 \%$ | $5.90 \%$ | 0.26 |
| $\mathbf{2 8}$ | $0.87 \%$ | $0.96 \%$ | 0.36 | $7.48 \%$ | $5.97 \%$ | 0.21 |
| $\mathbf{2 9}$ | $-0.26 \%$ | $0.96 \%$ | 0.79 | $7.22 \%$ | $6.05 \%$ | 0.23 |
| $\mathbf{3 0}$ | $-0.92 \%$ | $0.96 \%$ | 0.33 | $6.30 \%$ | $6.12 \%$ | 0.30 |
| $\mathbf{3 1}$ | $-0.61 \%$ | $0.96 \%$ | 0.53 | $5.69 \%$ | $6.20 \%$ | 0.36 |
| $\mathbf{3 2}$ | $0.01 \%$ | $0.96 \%$ | 0.99 | $5.70 \%$ | $6.27 \%$ | 0.36 |
| $\mathbf{3 3}$ | $0.28 \%$ | $0.96 \%$ | 0.77 | $5.98 \%$ | $6.34 \%$ | 0.35 |
| $\mathbf{3 4}$ | $-0.30 \%$ | $0.96 \%$ | 0.76 | $5.68 \%$ | $6.42 \%$ | 0.38 |
| $\mathbf{3 5}$ | $-0.13 \%$ | $0.96 \%$ | 0.89 | $5.55 \%$ | $6.49 \%$ | 0.39 |
| $\mathbf{3 6}$ | $-0.64 \%$ | $0.96 \%$ | 0.50 | $4.91 \%$ | $6.56 \%$ | 0.45 |
| $\mathbf{3 7}$ | $-0.07 \%$ | $0.96 \%$ | 0.94 | $4.84 \%$ | $6.63 \%$ | 0.46 |
| $\mathbf{3 8}$ | $-0.28 \%$ | $0.96 \%$ | 0.77 | $4.56 \%$ | $6.69 \%$ | 0.50 |
| $\mathbf{3 9}$ | $-0.09 \%$ | $0.96 \%$ | 0.93 | $4.48 \%$ | $6.76 \%$ | 0.51 |
| $\mathbf{4 0}$ | $-1.04 \%$ | $0.96 \%$ | 0.28 | $3.44 \%$ | $6.83 \%$ | 0.61 |
| $\mathbf{4 1}$ | $-0.84 \%$ | $0.96 \%$ | 0.38 | $2.60 \%$ | $6.90 \%$ | 0.71 |
| $\mathbf{4 2}$ | $0.04 \%$ | $0.96 \%$ | 0.97 | $2.63 \%$ | $6.96 \%$ | 0.95 |
| $\mathbf{4 3}$ | $-0.80 \%$ | $0.96 \%$ | 0.40 | $1.83 \%$ | $7.03 \%$ | 0.95 |
| $\mathbf{4 4}$ | $-0.27 \%$ | $0.96 \%$ | 0.78 | $1.57 \%$ | $7.09 \%$ | 0.79 |
| $\mathbf{4 5}$ | $-0.44 \%$ | $0.96 \%$ | 0.64 | $1.12 \%$ | $7.16 \%$ | 0.83 |
| $\mathbf{4 6}$ | $-0.32 \%$ | $0.96 \%$ | 0.74 | $0.80 \%$ | $7.22 \%$ | 0.88 |
| $\mathbf{4 7}$ | $0.21 \%$ | $0.96 \%$ | 0.83 | $1.01 \%$ | $7.28 \%$ | 0.91 |
| $\mathbf{4 8}$ | $-0.46 \%$ | $0.96 \%$ | 0.63 | $0.54 \%$ | $7.35 \%$ | 0.89 |
| $\mathbf{4 9}$ | $-0.88 \%$ | $0.96 \%$ | 0.36 | $-0.34 \%$ | $7.41 \%$ | 0.94 |
| $\mathbf{5 0}$ | $-0.10 \%$ | $0.96 \%$ | 0.92 | $-0.44 \%$ | $7.47 \%$ | 0.96 |
| $\mathbf{5 1}$ | $-0.64 \%$ | $0.96 \%$ | 0.51 | $-1.08 \%$ | $7.53 \%$ | 0.95 |
| $\mathbf{5 2}$ | $-0.06 \%$ | $0.96 \%$ | 0.95 | $-1.14 \%$ | $7.59 \%$ | 0.89 |
| $\mathbf{5 3}$ | $-0.05 \%$ | $0.96 \%$ | 0.96 | $-1.18 \%$ | $7.65 \%$ | 0.88 |
| $\mathbf{5 4}$ | $0.10 \%$ | $0.96 \%$ | 0.92 | $-1.09 \%$ | $7.71 \%$ | 0.88 |
| $\mathbf{5 5}$ | $0.42 \%$ | $0.96 \%$ | 0.66 | $-0.67 \%$ | $7.77 \%$ | 0.89 |
| $\mathbf{5 6}$ | $0.36 \%$ | $0.96 \%$ | 0.71 | $-0.31 \%$ | $7.83 \%$ | 0.93 |
| $\mathbf{5 7}$ | $0.09 \%$ | $0.96 \%$ | 0.92 | $-0.21 \%$ | $7.89 \%$ | 0.97 |
| $\mathbf{5 8}$ | $0.27 \%$ | $0.96 \%$ | 0.78 | $0.06 \%$ | $7.94 \%$ | 0.98 |
| $\mathbf{5 9}$ | $-0.52 \%$ | $0.96 \%$ | 0.58 | $-0.46 \%$ | $8.00 \%$ | 0.9 |


| 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 |


[^0]:    ${ }^{1}$ Benninga, S. (2014). Using a Two-Factor Model of Returns for an Event Study. In Financial Modeling (pp. 350-355). Cambridge, MA: MIT Press.
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[^1]:    ${ }^{3}$ 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):331.

