

Cyber Risk In A New Era: Recent Cyber Events And Impact On Company Financials

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Methodologies

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S&P Global
Ratings

Key Takeaways

- We analyzed cyberattacks (data breaches) from 2007 to 2019 for 32 rated companies for a total of 41 events—as reported on Google News.
- We found that the data breaches didn't have a lasting effect on revenue and EBITDA.
- However, they may weaken equity prices and widen credit default swap spreads in the short term.
- The study did not cover cyber events that did not involve data breaches, the analysis of which may lead to a different conclusion.
- Cyberattacks may impact creditworthiness if material and expose previously undetected governance weaknesses.

Companies In **The Study**

- **Technology:** Apple, Adobe, Microsoft, Sony, T-Mobile, Vodafone, and Verizon.
- **Financial Institutions:** Citigroup, Capital One, First American Financial, JPMorgan Chase, and Wells Fargo.
- **Corporates:** Anthem, Boeing, Community Health Systems, Delta, Equifax, Quest Diagnostics, Disney, eBay, Global Payments, Home Depot, Health Net, Marriott, Rite Aid, Staples, Target, TJ Maxx, Under Armour, Walmart, and British Airways.

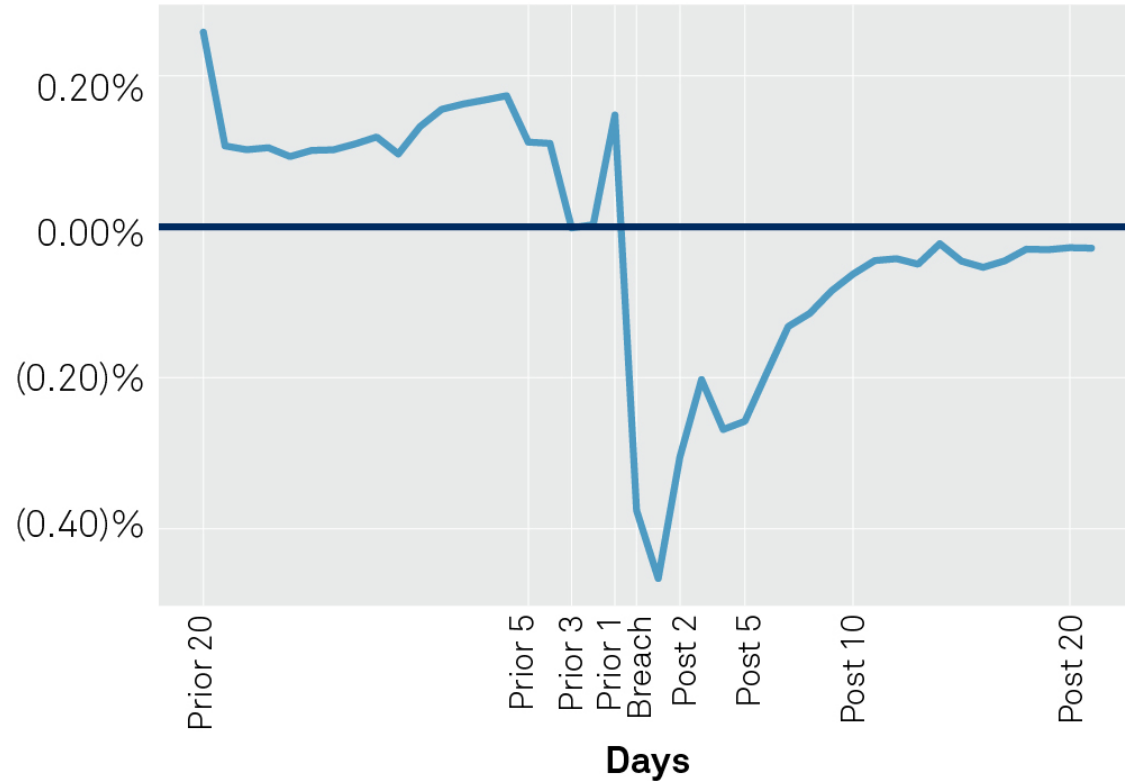
Findings

- **Equity prices:** Most data breach events cause a drop in equity prices after the event has been reported in the news, which rebound and normalize in subsequent weeks.
- **CDS spreads:** Some data breach events may cause a rise in credit default swap spreads after the event is reported, which normalize in subsequent weeks.
- **Financial ratios:** We did not see clear evidence of quarterly deterioration when analyzing the impact on revenue and EBITDA. Due to the nature of quarterly reporting, that may give time for companies to mitigate any effects on financials.
- We found only half of the events in the studied sample in filings to the U.S. Securities and Exchange Commission.

Findings

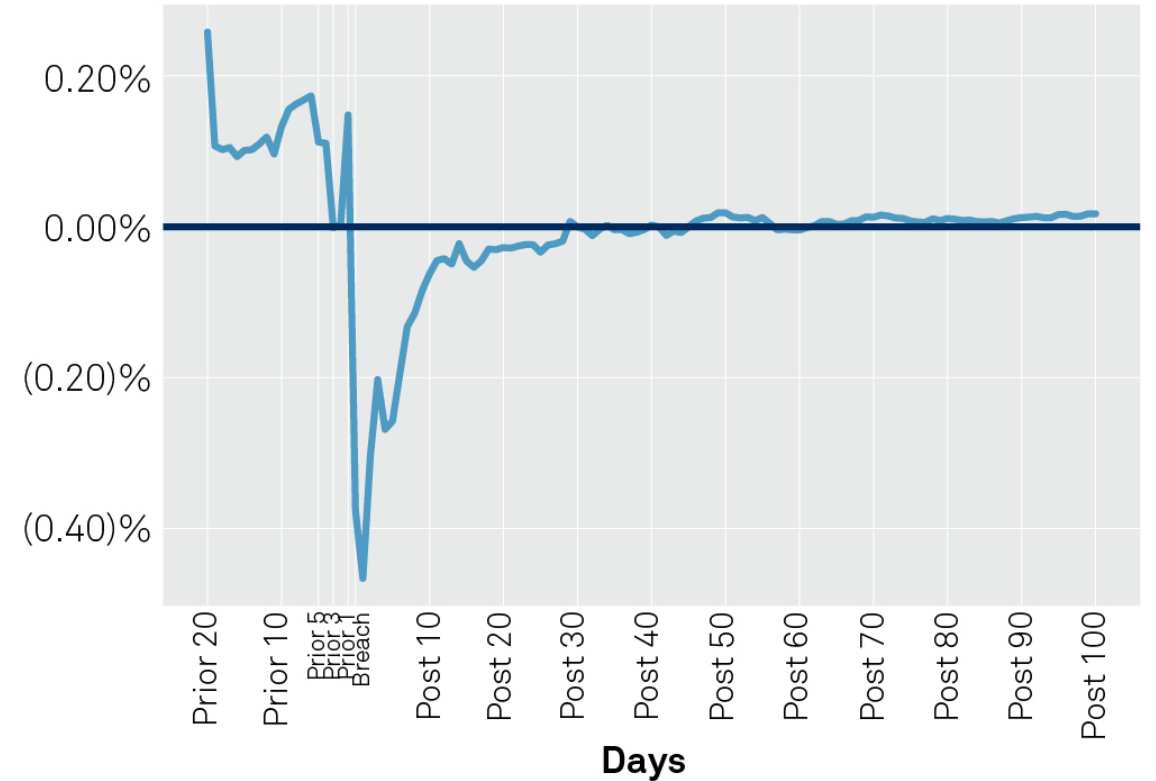
The Average Equity Price Return Was Close To -0.5% The Day After Data Breach Event

The average equity price return 20 days before and after the day of breach event



Source: Compustat, S&P Global Market Intelligence.

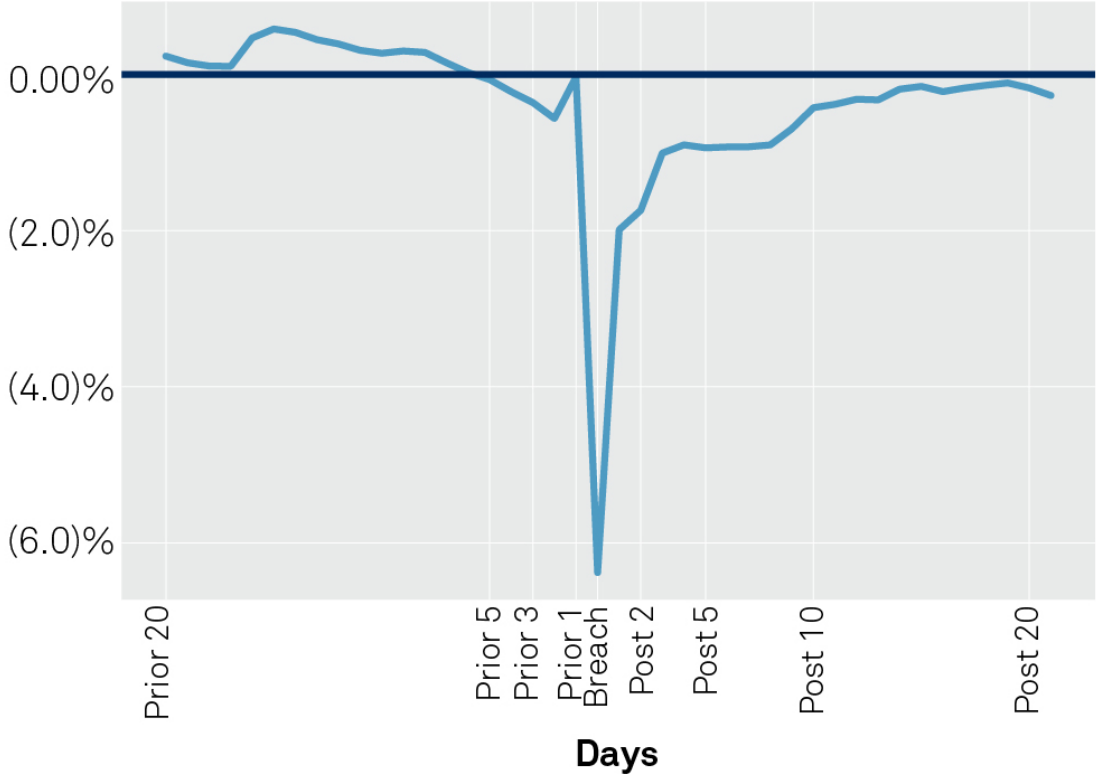
The average equity price return 20 days before and 100 days after the day of breach event



Source: Compustat, S&P Global Market Intelligence.

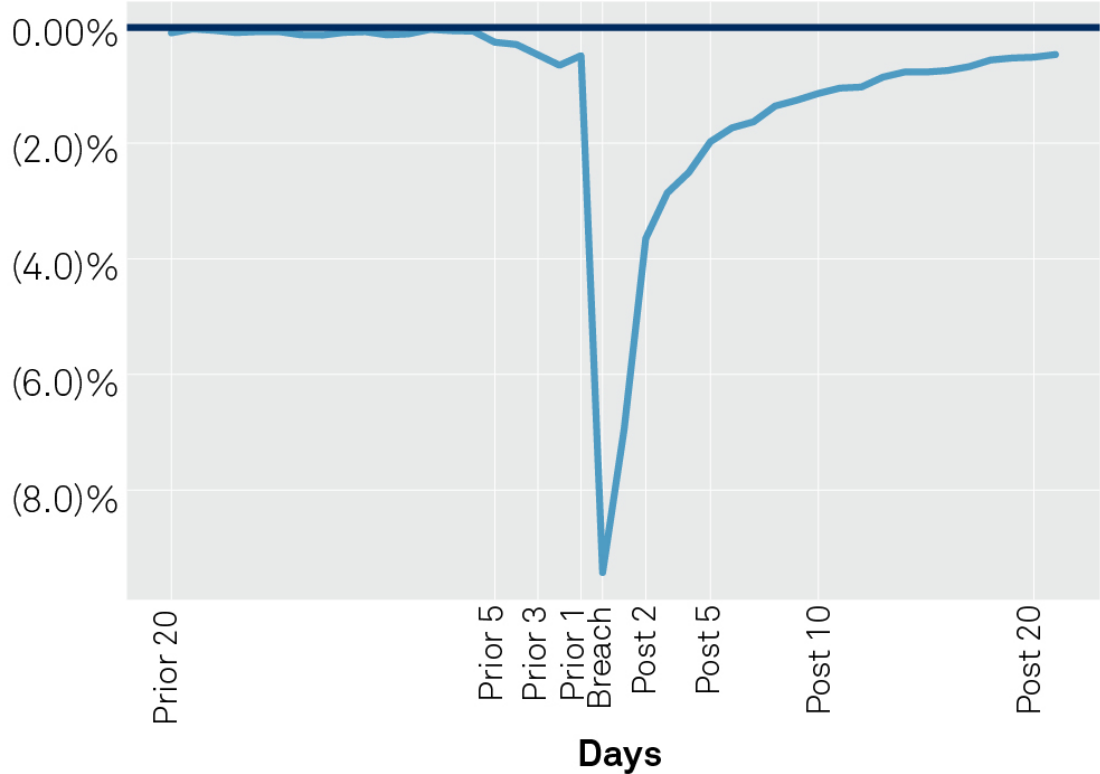
Marriott And Global Payments Showed The Largest Drops In Equity Price Returns, During the Breach Events

Marriott – average abnormal stock return



Source: Compustat, S&P Global Market Intelligence.

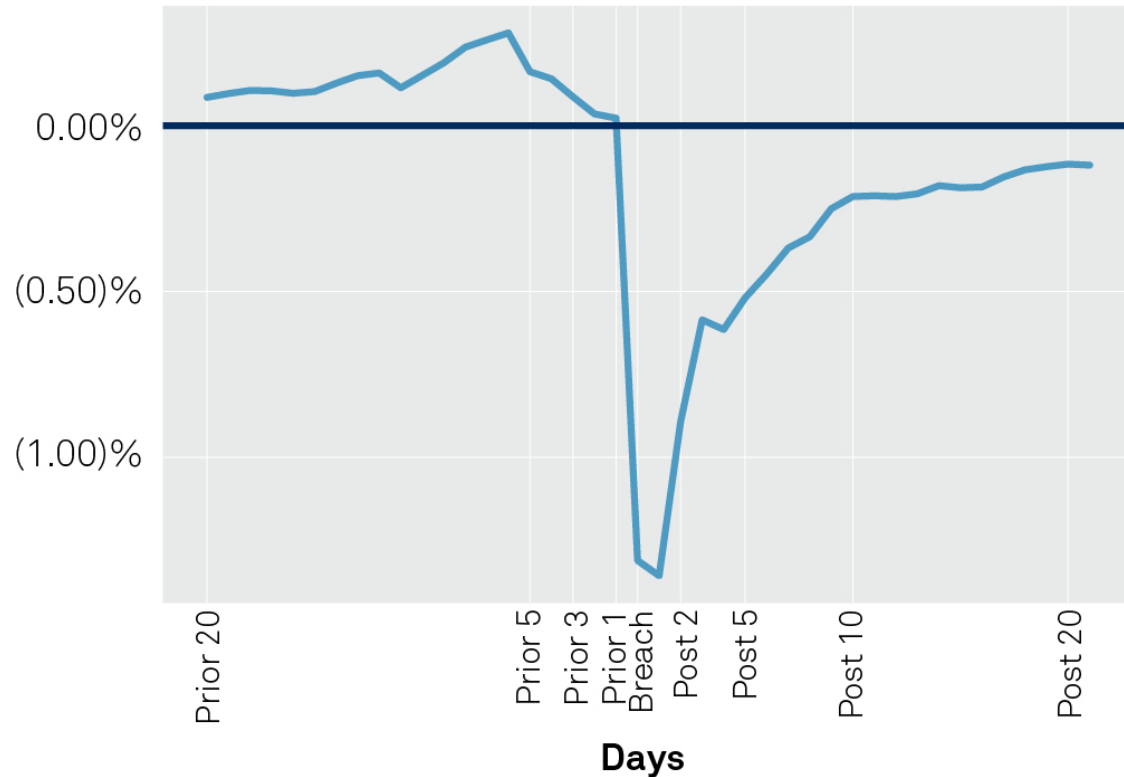
Global Payments – average abnormal stock return



Source: Compustat, S&P Global Market Intelligence.

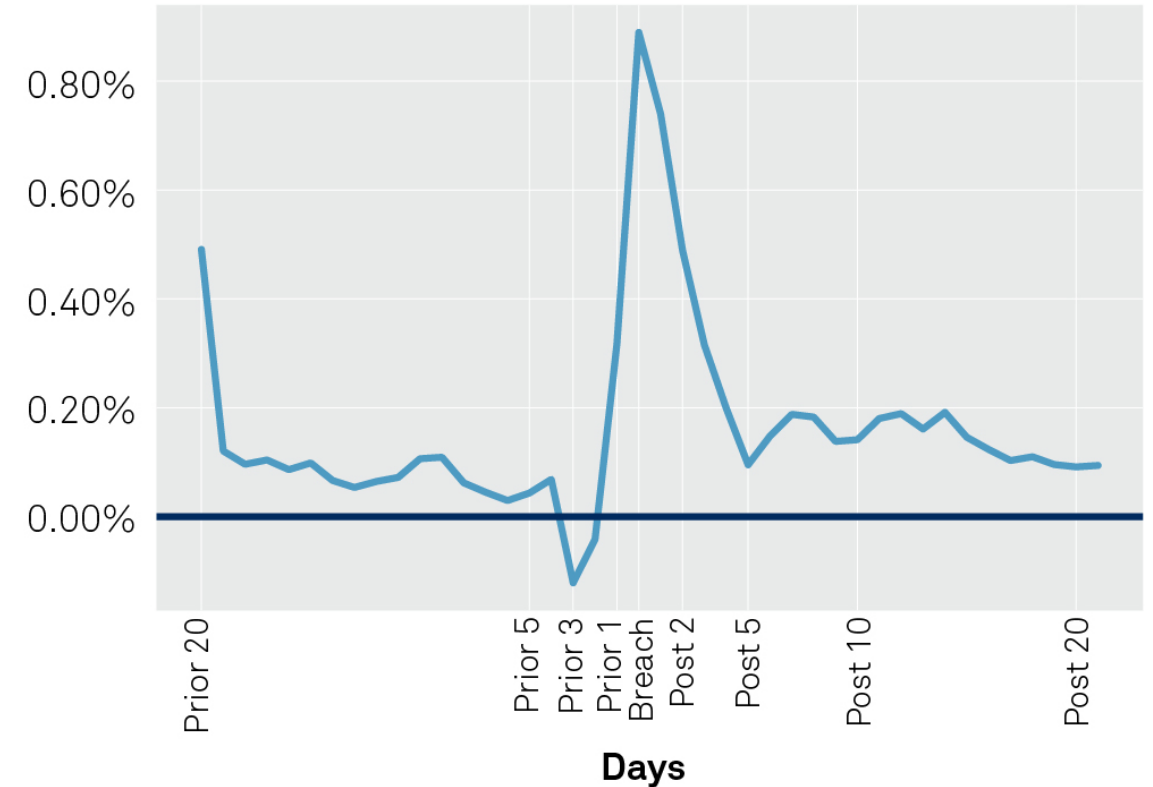
Not All Companies Showed Drops In Equity Price Returns Around Breach Events

Average decline in equity price returns 20 days before and after the day of the data breach



Source: Compustat, S&P Global Market Intelligence.

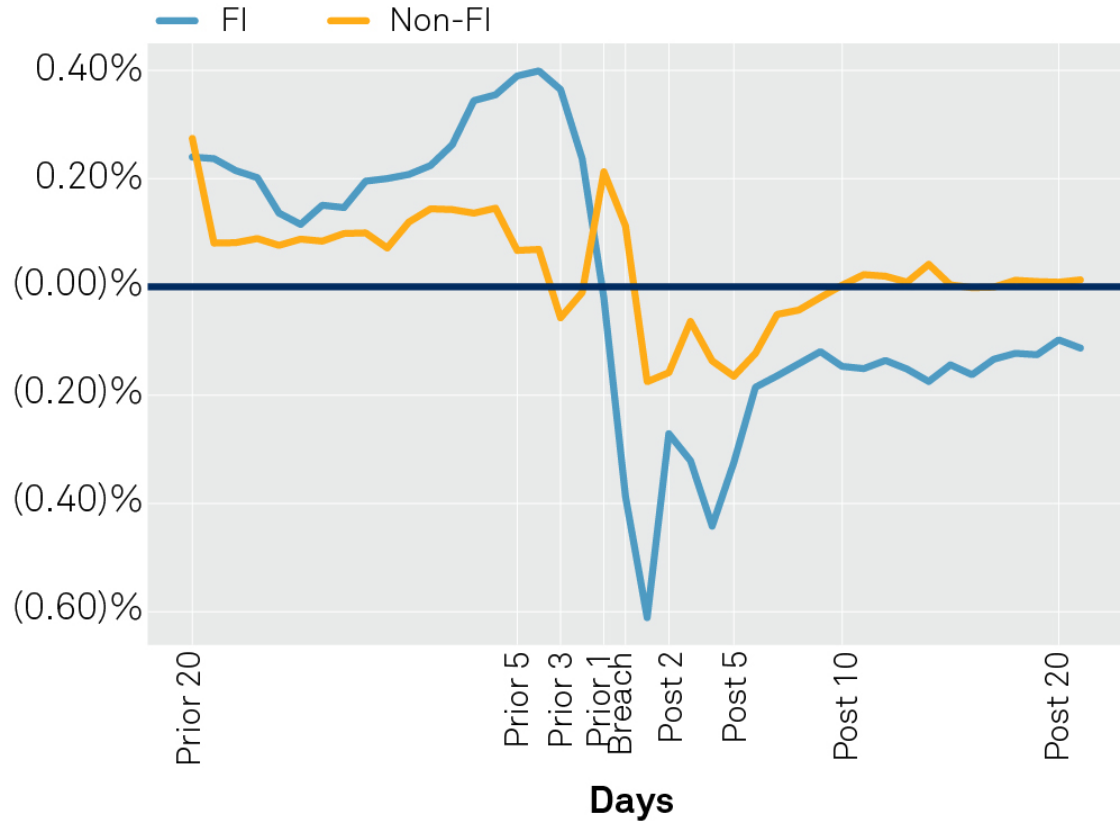
A small subset of companies in the sample showed a non-negative change in equity price returns around day of data breach



Source: Compustat, S&P Global Market Intelligence.

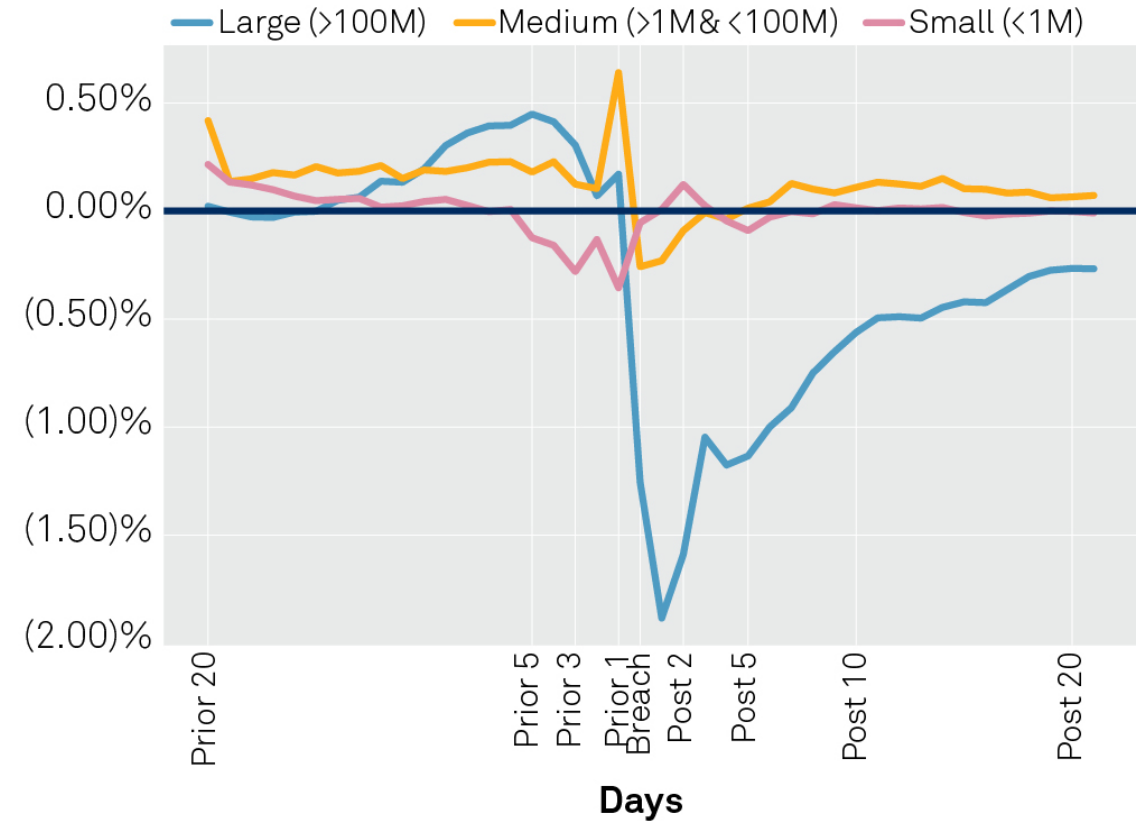
Large Breaches And The Financial Institutions Sector Experienced Sharper Declines

Equity price returns declined more sharply for financial institutions



Source: Compustat, S&P Global Market Intelligence.

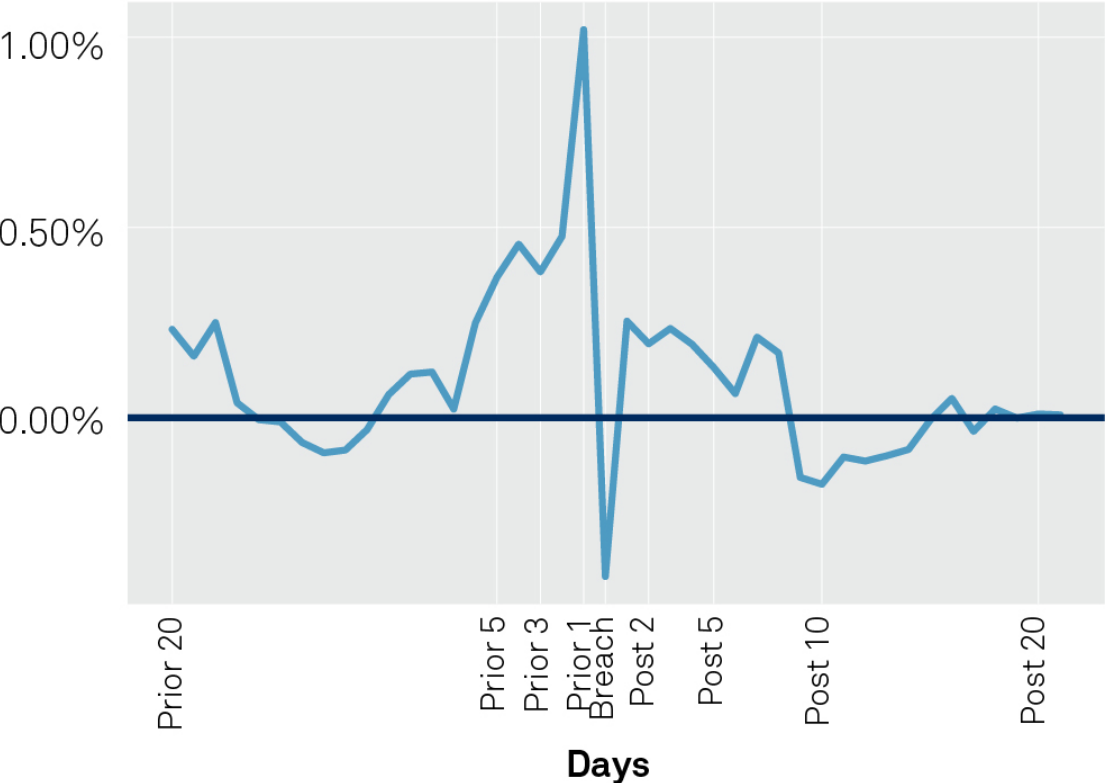
Equity price returns declined more sharply for companies with large breaches



Source: Compustat, S&P Global Market Intelligence.

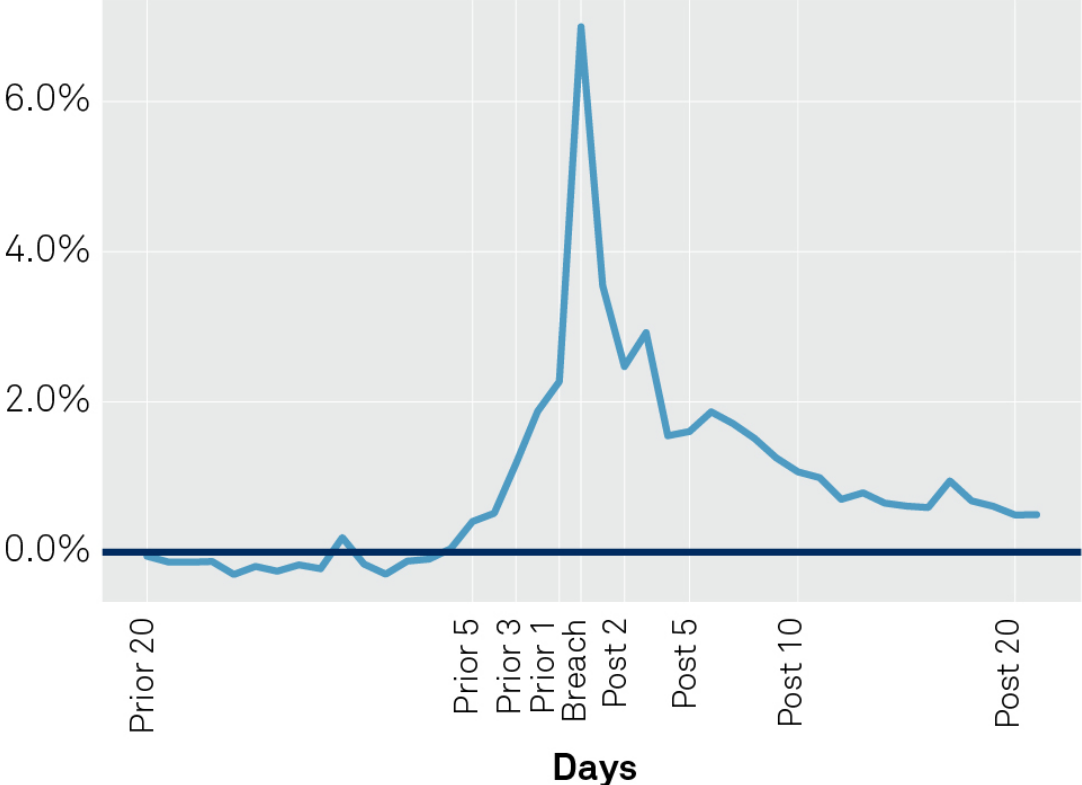
CDS Spreads Widen 0.2% On Average One Day After Data Breach

CDS spread percent changes 20 days prior and after day of data breach



CDS data was available for 20 events (17 companies). Source: S&P Global Ratings, Intercontinental Exchange Credit Market Analysis (ICE CMA).

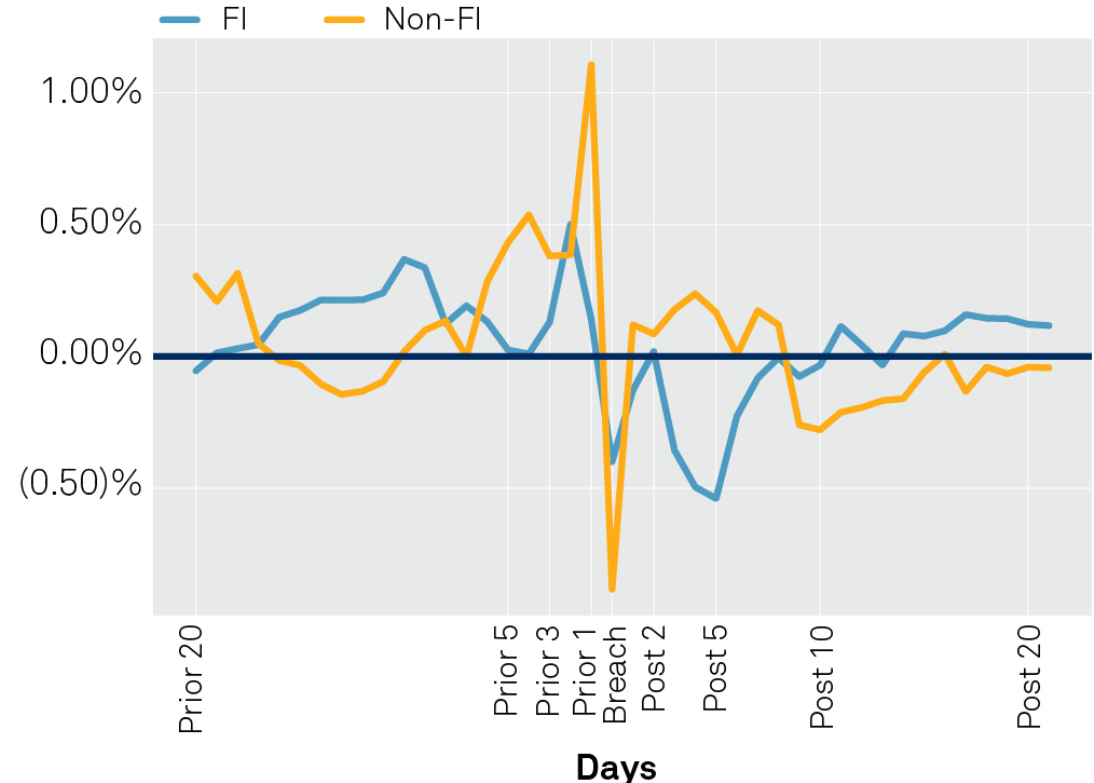
Marriott: CDS spread percent changes 20 days prior and after day of data breach



Source: S&P Global Ratings, Intercontinental Exchange Credit Market Analysis (ICE CMA).

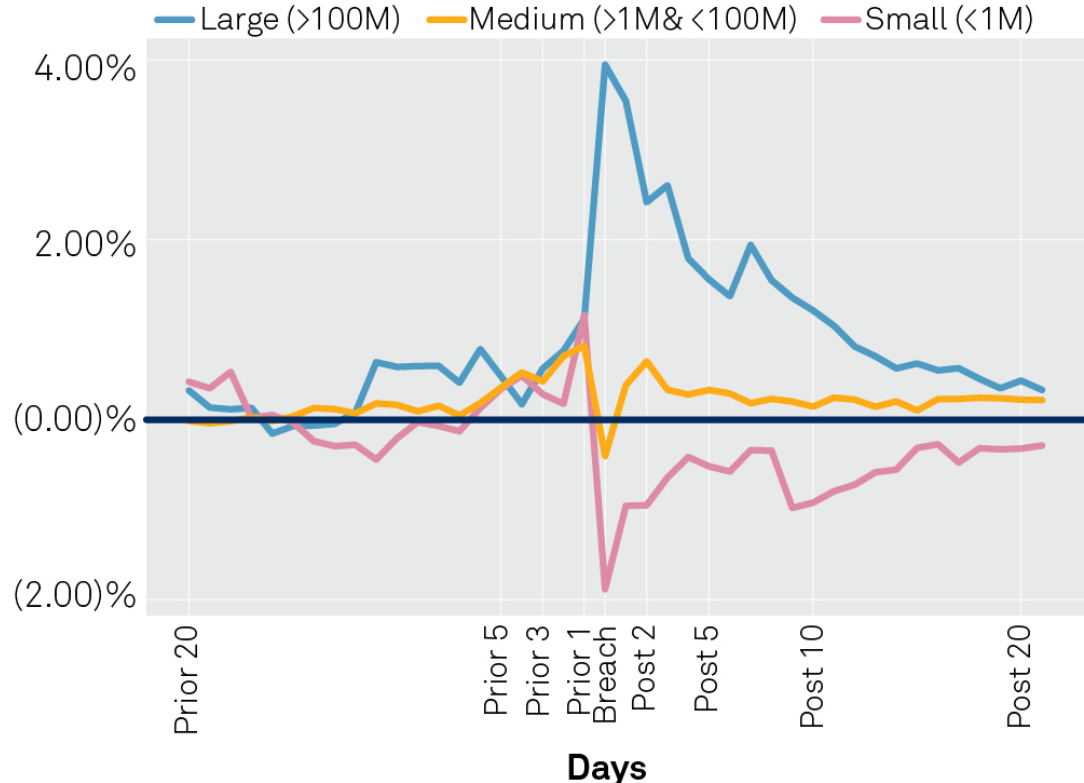
CDS Spreads Increase For Some Companies On The Day Or Day After Breach

CDS spreads changes 20 days before and after day of data breach for financial and nonfinancial companies, excluding Marriott



CDS data was available for 20 events (17 companies). Source: S&P Global Ratings, Intercontinental Exchange Credit Market Analysis (ICE CMA).

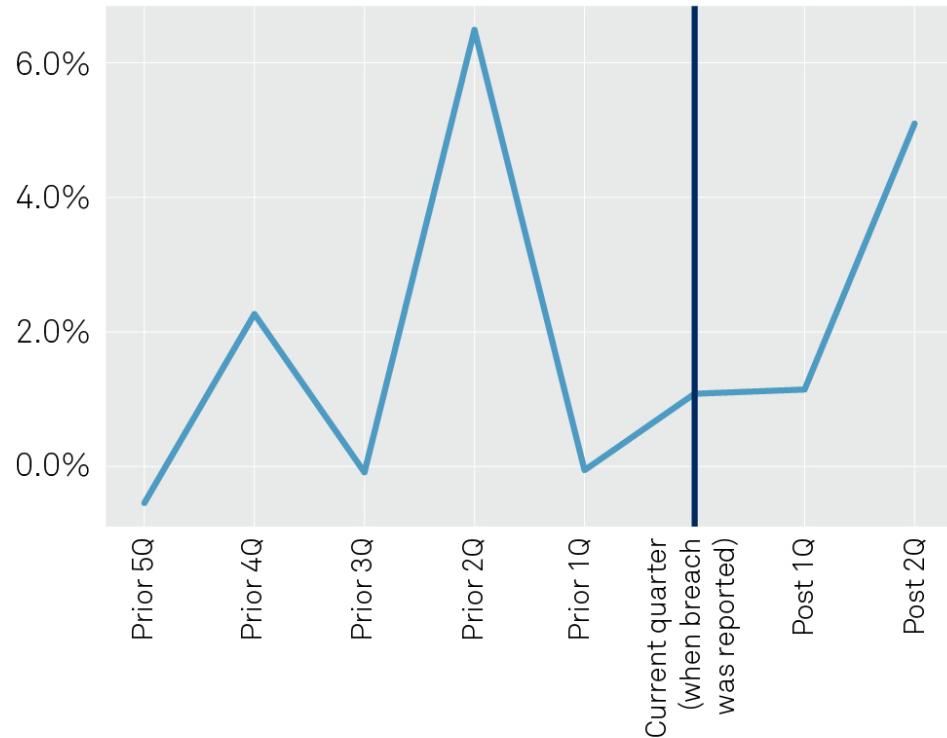
CDS spread changes for companies with large numbers of breached records increased on the day of the breach to 4% on average



Source: S&P Global Ratings, Intercontinental Exchange Credit Market Analysis (ICE CMA).

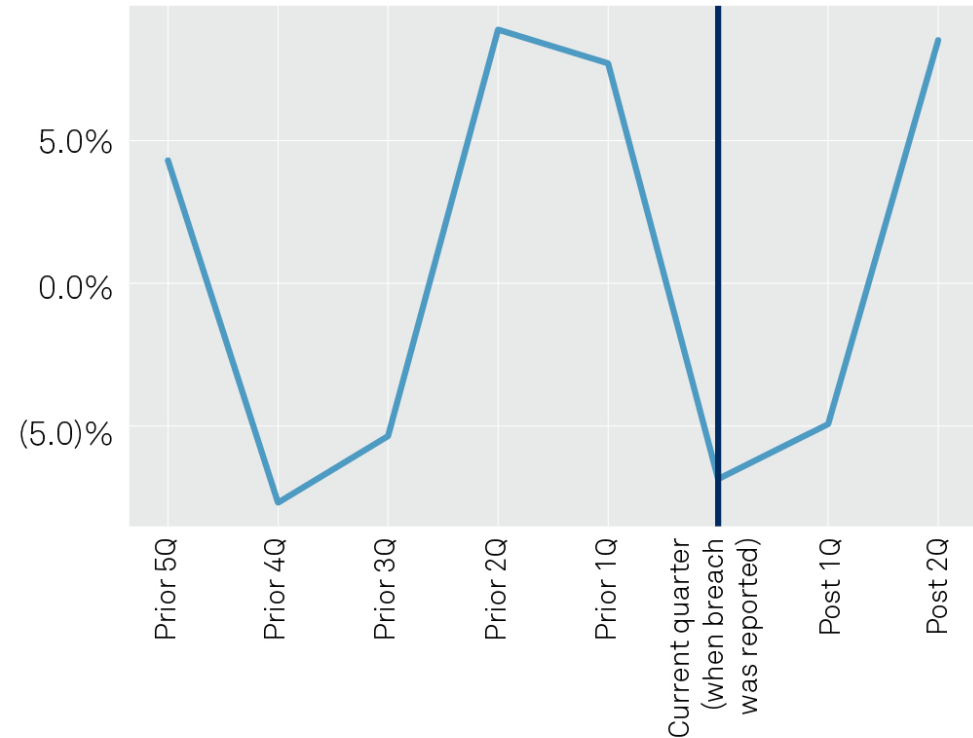
We See No Clear Evidence Of Declines In Quarterly Revenue Attributed To Data Breaches

Average quarterly revenue changes in the five quarters prior and two quarters after the data breach



The average above is based on 35 events with quarterly data. Source: S&P Global Ratings.

Some companies saw revenue decline in the quarter of the data breach and subsequent quarter, but those could be seasonal effects

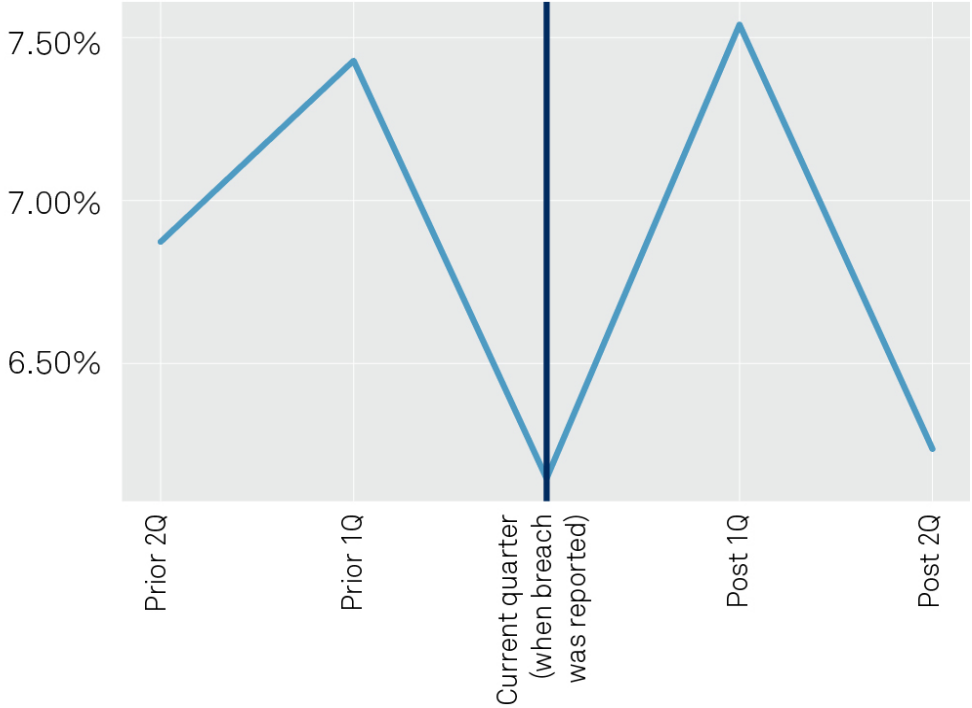


Source: S&P Global Ratings.

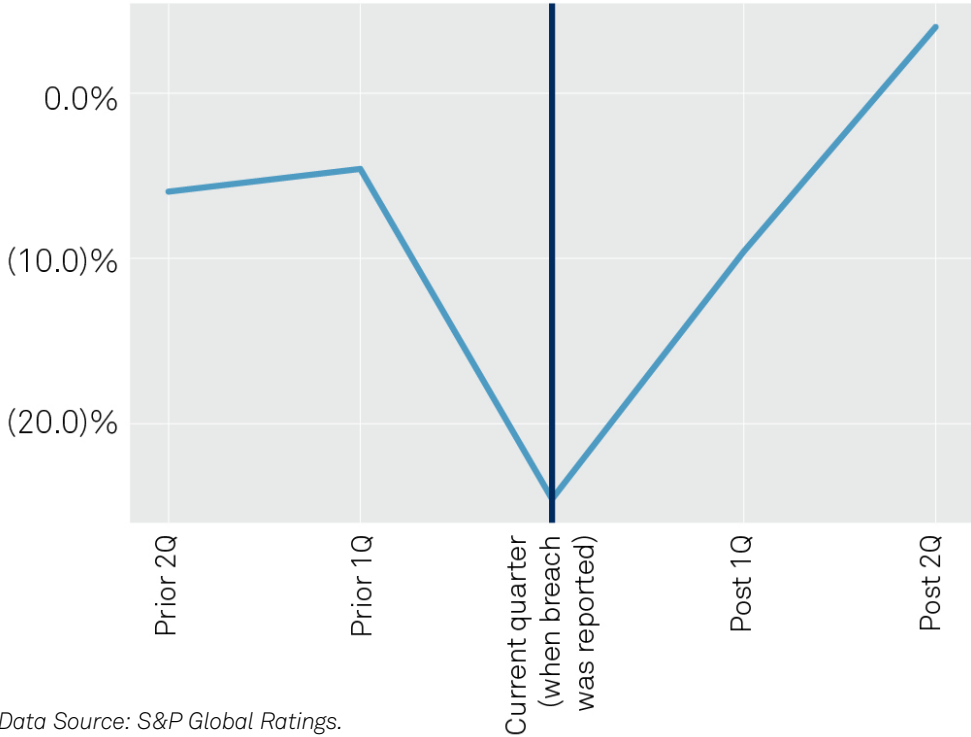
We See No Clear Relationship Between Year-On-Year Changes In Quarterly Revenue And Data Breach Events

- On average, returns remained positive, but some companies saw declines in revenue.
- We believe companies that handle cyberattacks well can manage and maintain revenue in the aftermath of an attack.

Average changes in quarterly revenue are non-negative year on year



Some companies saw drops in revenue in the quarter the breach was reported and in the subsequent quarter

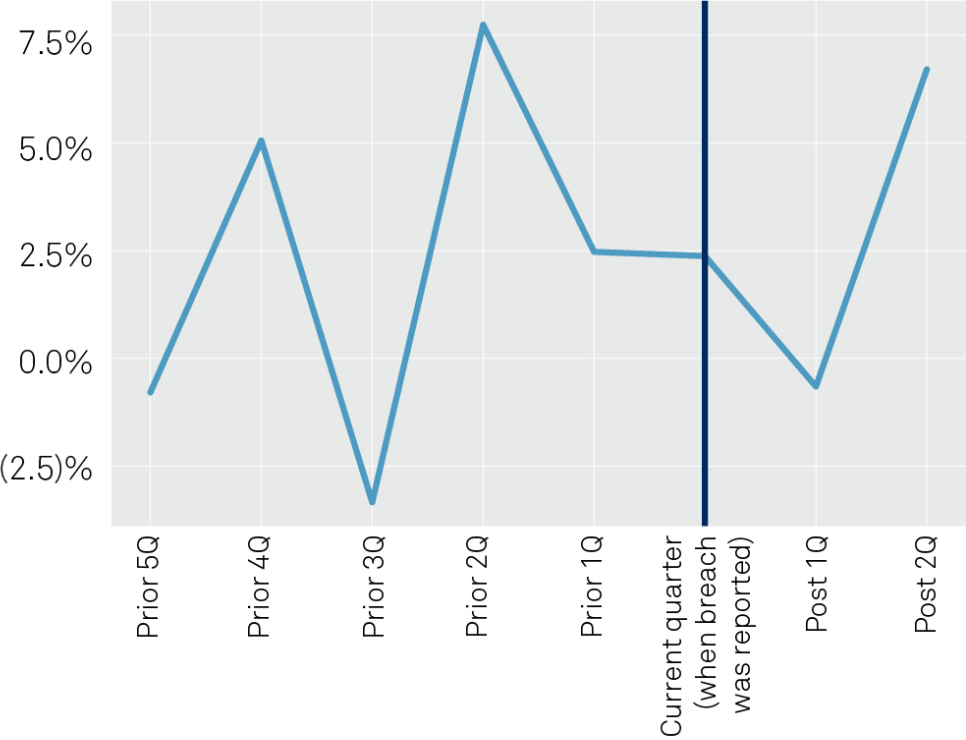


The average above is based on 36 events. Data Source: S&P Global Ratings.

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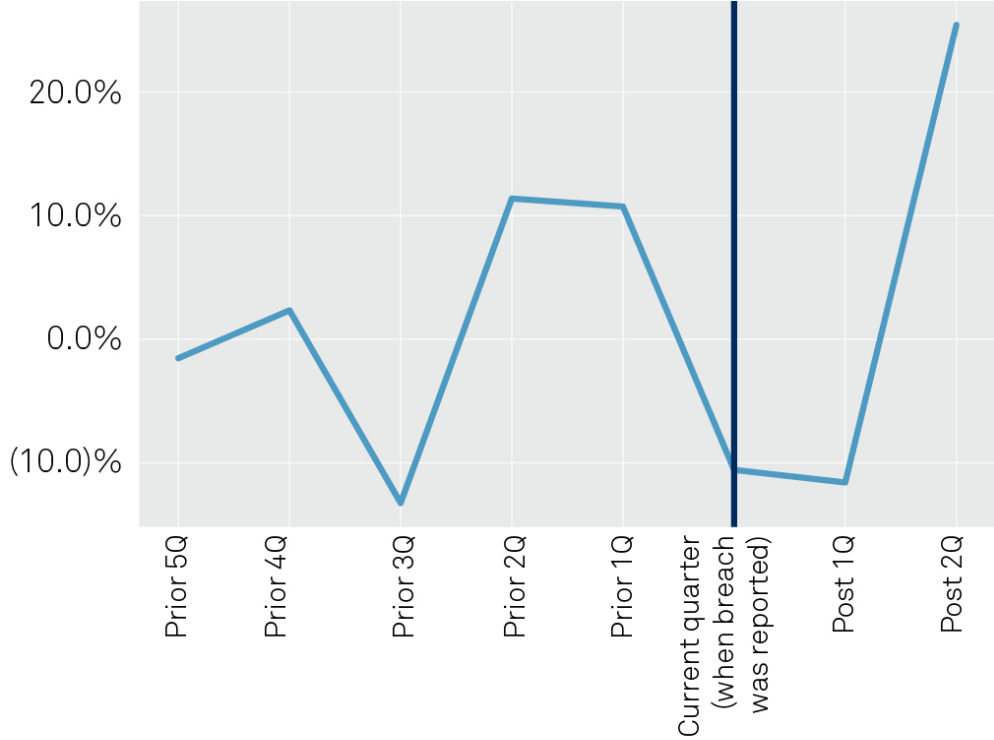
We See No Clear Negative Relationship Between Quarterly Changes In EBITDA And Data Breaches

Average changes in quarterly EBITDA in the five quarters before and the two quarters after the data breach



The average above is based on 29 events with quarterly data. Selected outliers are excluded.
Data Source: S&P Global Ratings.

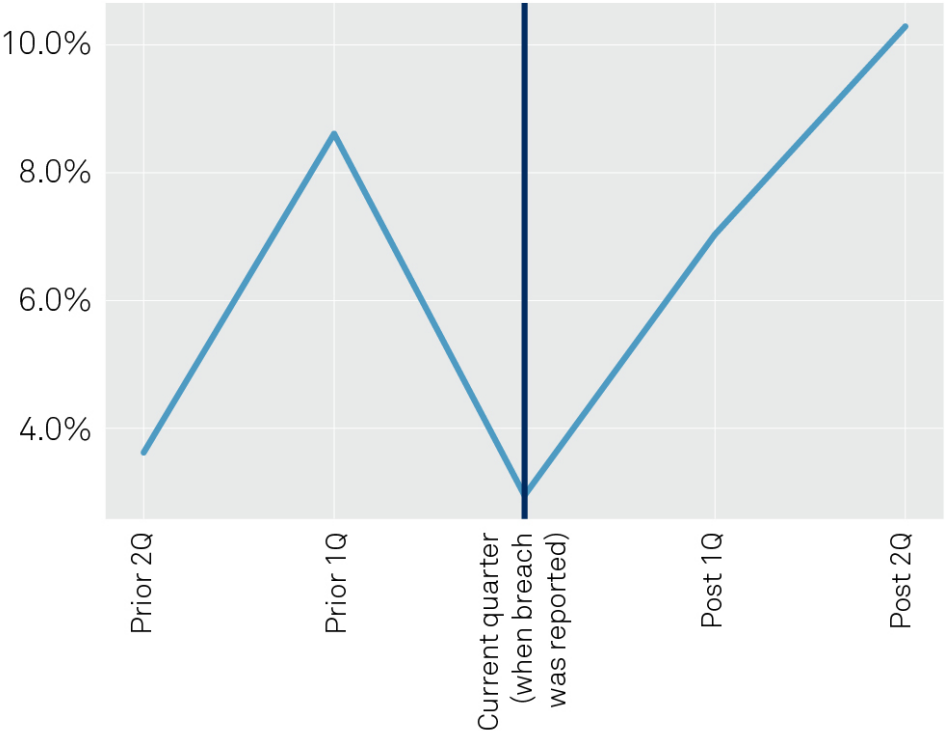
Some companies saw drops in EBITDA in the quarter of the breach and one quarter after, but those could be seasonal effects



Data Source: S&P Global Ratings.

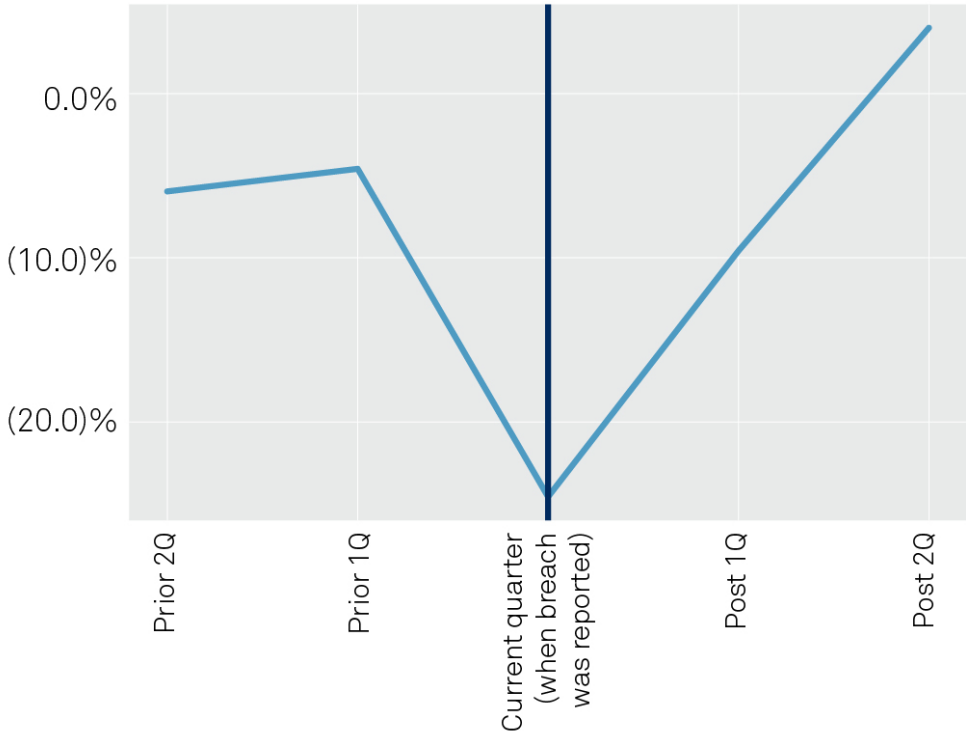
Year-On-Year Quarterly EBITDA Changes Show No Clear Relationship With Data Breaches

Average changes in quarterly EBITDA are non-negative year on year



The average above is based on 31 events with quarterly data. Selected outliers are excluded. Data Source: S&P Global Ratings.

Some companies saw a drop in EBITDA in the quarter of the data breach and the subsequent quarter



Data Source: S&P Global Ratings.

Methodology

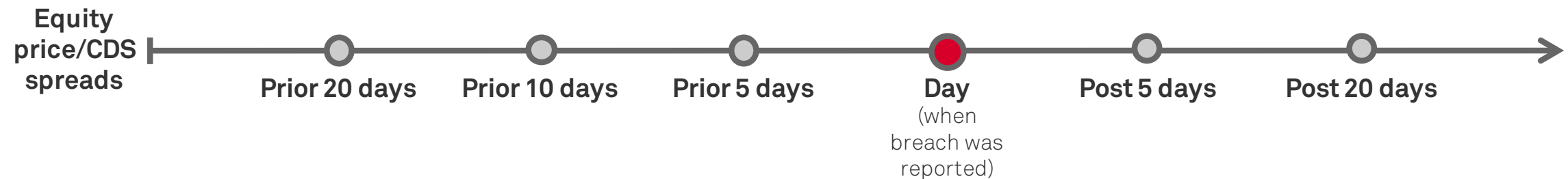
Defining The Metrics To Measure The Impact On Equity And CDS Spreads

- To extract the signal in the equity data and create a measure to compare across companies, we normalized daily equity returns by subtracting the daily return for the S&P 500 or the NASDAQ Composite index, depending on the company's listing:
$$\text{Abnormal equity return} = \text{daily return} - \text{S\&P 500 or NASDAQ daily return}$$
- To extract the signal in the CDS data and create a measure to compare across companies we normalized the daily CDS percent changes by subtracting the daily percent change for the relevant Credit Default Swap Index (CDX IG/CDX HY 5y):
$$\text{Abnormal CDS \% change} = \text{daily \% change} - \text{CDX daily \% change}$$
 - **Post x-Day(s)**: denotes the daily average of abnormal returns from day 0 (event date) to day x
 - **Prior x-Day(s)**: denotes the daily average of abnormal returns from day -1 (day prior to the event date) to day -x

Event Window

Event window for daily abnormal returns (normalized returns)

Event window is (-20,20): 20 business days before the breach report date to 20 business days (and longer up to 100 days) afterwards

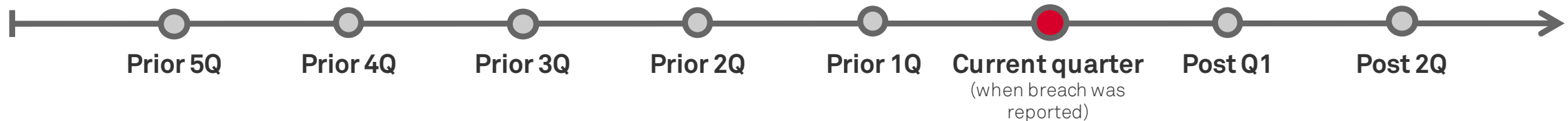


Defining The Metrics To Measure The Impact On Financial Ratios

- To extract the signal for the company's revenue and EBITDA, we used consecutive quarterly percent changes, for five quarters before and two quarters after the data breach.
- We also looked at year-on-year quarterly percent changes for the two financial ratios to determine any seasonality effects.
 - **Post x-Quarters:** denote the quarterly percent changes (consecutive or year-on-year)
 - **Prior x-Quarters:** denote the quarterly percent changes (consecutive or year-on-year)

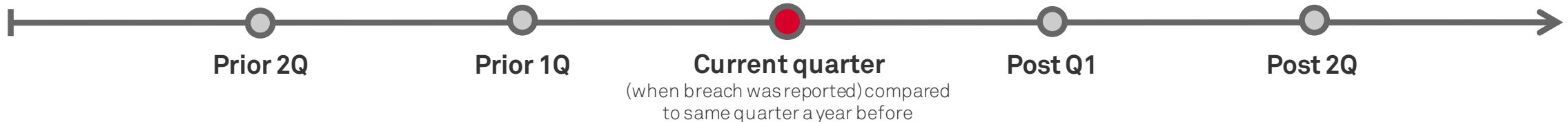
Event Window For Consecutive Quarterly Changes

Financial ratios - event window is (-5Q, 2Q): five quarters before the breach report date to two quarters afterwards



Event window For Year-On-Year Quarterly Changes

Event window is (-2Q, 2Q): two quarters before the breach report date to two quarters afterwards.
Changes are calculated with respect to the same quarter in the previous year



Appendix: List Of Cyber Events Included In The Study

Company	Type	Ticker	Total Records	Date of reporting
Anthem	CORP	ANTM	80,000,000.00	02/06/2015
Boeing	CORP	BA	unknown	07/11/2014
Boeing	CORP	BA	36,000.00	02/27/2017
British Airways	CORP	IAG	380,000.00	09/06/2018
Community Health Systems	CORP	CYH	4,500,000.00	08/15/2014
Delta	CORP	DAL	825,000.00	04/05/2018
Disney (The Walt Disney Company)	CORP	DIS	356,000.00	08/30/2016
eBay	CORP	EBAY	145,000,000.00	05/21/2014
Global Payments	CORP	GPN	7,000,000.00	03/30/2012
Health Net	CORP	HNT	1,500,000.00	11/19/2009
Health Net	CORP	HNT	1,900,000.00	03/15/2011
Home Depot	CORP	HD	56,000,000.00	09/18/2014
Marriott	CORP	MAR	500,000,000.00	11/30/2018
Quest Diagnostics	CORP	DGX	34,000.00	12/12/2016
Quest Diagnostics	CORP	DGX	12,000,000.00	06/03/2019
Rite Aid	CORP	RAD	521.00	07/30/2014
Staples	CORP	SPLS	1,200,000.00	12/19/2014
Target	CORP	TGT	40,000,000.00	12/19/2013
TJ Maxx (TJX)	CORP	TJX	46,000,000.00	03/29/2007
Under Armour	CORP	UAA	150,000,000.00	03/28/2018
Walmart	CORP	WMT	28,000.00	06/08/2016
Walmart	CORP	WMT	4,800.00	03/02/2016
Equifax	CORP	EFX	145,000,000.00	09/07/2017
Equifax	CORP	EFX	431,000.00	05/06/2016

Appendix: List Of Cyber Events Included In The Study (Continued)

Company	Type	Ticker	Total Records	Date of reporting
First American Financial	FS	FAF	885,000,000.00	05/24/2019
Capital One	FS	COF	106,000,000.00	07/29/2019
Citi	FS	C	117,600.00	07/27/2017
ING	FS	ING	50,000.00	03/02/2019
JP Morgan Chase	FS	JPM	83,000,000.00	09/10/2014
JP Morgan Chase	FS	JPM	465,000.00	12/05/2013
Wells Fargo	FS	WFC	50,000.00	07/24/2017
Adobe	TECH	ADBE	3,000,000.00	10/04/2013
Adobe	TECH	ADBE	7,500,000.00	10/25/2019
Apple	TECH	AAPL	1,000,000.00	04/09/2012
Apple	TECH	AAPL	114,000.00	06/09/2010
Microsoft	TECH	MSFT	773,000,000.00	04/12/2019
Sony	TECH	SNE	101,000,000.00	04/27/2011
T-Mobile	TECH	TMUS	70,000,000.00	10/12/2017
T-Mobile	TECH	TMUS	75,000,000.00	05/24/2018
Verizon	TECH	VZ	6,000,000.00	07/12/2017
Vodafone	TECH	VOD	2,000,000.00	09/12/2013

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