



*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*

# Event studies with daily stock returns in Stata: Which command to use?

Thomas Kaspereit  
University of Luxembourg  
Esch-sur-Alzette  
Luxembourg  
thomas.kaspereit@uni.lu

**Abstract.** In this article, I provide an overview of existing community-contributed commands for executing event studies. I assess which command could have been used to conduct event studies that have appeared in the past 10 years in 3 leading accounting, finance, and management journals. The older command `eventstudy` provides a comfortable graphical user interface and good functionality for event studies that do not require hypotheses testing. The command `estudy`, described in Pacicco, Vena, and Venegoni (2018, *Stata Journal* 18: 461–476; 2021, *Stata Journal* 21: 141–151), provides a set of commonly applied test statistics and useful exporting routines to spreadsheet software and L<sup>A</sup>T<sub>E</sub>X for event studies with a limited number of events. The most complete command in terms of available test statistics and benchmark models as well as its ability to handle events with insufficient data, thin trading, and large samples is `eventstudy2`.

**Keywords:** `st0643`, event studies, `estudy`, `eventstudy`, `eventstudy2`

## 1 Introduction

Event studies represent a standardized method to measure and statistically assess stock price reactions to unanticipated events. For instance, Ball and Brown (1968) use this method to show that earnings surprises move stock prices. Fama et al. (1969) show that stock splits have a positive average impact on stock prices. Since the publication of these two seminal articles, event studies have become a workhorse method whenever researchers want to test whether any news event has an impact on stock prices. The scenarios range from dividend announcements (for example, Asquith and Mullins [1983]; Kane, Lee, and Marcus [1984]), mergers and acquisitions (for example, Capron and Pistre [2002]; Halpern [1983]), and changes in legislation and corporate litigation (for an overview, see Bhagat and Romano [2002a]; Bhagat and Romano [2002b]) to celebrity endorsement of products (for example, Agrawal and Kamakura [1995]), nuclear catastrophes (for example, Bowen, Castanias, and Daley [1983]; Hill and Schneeweis [1983]), and hurricanes (for example, Lamb [1998]).

In the past decades, several software solutions for conducting event studies have emerged, most notably the SAS<sup>®</sup>-based Eventus<sup>®</sup> software, which has been directly embedded into the Wharton Research Data Services (WRDS) platform and thus has become a gold standard for event studies that focus on U.S. firms. Nevertheless, proba-

bly because only top-ranked universities and other top research institutions have access to WRDS and Eventus, free event-study software packages in other programming environments (for example, R and Python) have become available. Also, Stata users can currently draw on three different community-contributed commands (in chronological order of their first appearance on the Statistical Software Components archive of the Boston College Department of Economics):

- `eventstudy` (Zhang, Li, and Xu 2013)
- `eventstudy2` (Kaspereit 2015, updated November 2019)
- `estudy` (Pacocco, Vena, and Venegoni 2018, 2019, 2021)

In this article, I analyze which of the three commands is suitable for which type of event study. My analysis reveals that the chronological order of appearance does not represent stages of evolution. Instead, each command is applicable to different types and tasks within the universe of event-study designs or has certain features that make it more or less suitable for specific types and tasks. The older command `eventstudy` provides a comfortable graphical user interface (GUI) and good functionality for event studies that do not require hypotheses testing. The command `estudy` provides a set of commonly applied test statistics and useful exporting routines to spreadsheet software and L<sup>A</sup>T<sub>E</sub>X. The most complete command in terms of available test statistics and benchmark models as well as its ability to handle events with insufficient data, thin trading, and large samples is `eventstudy2`.

My analysis is based on three pillars. First, I identify the conceptual characteristics of event studies. Instead of reiterating the statistical fundamentals of the event-study method, which have already been presented elsewhere (for example, Corrado [2011]; Kothari and Warner [2007]; MacKinlay [1997]), I focus on what conceptually constitutes an event study, that is, what researchers are aiming for when using this research design, and whether or how the three community-contributed commands meet these user demands. Second, I back my assertions by analyzing all event studies that have been published in three leading field journals: the *Journal of Accounting Research*, the *Journal of Finance*, and *Management Science*, during the period 2009–2018. Third, I assess the practical features and limitations of the three commands with respect to run time, consistency, and handling of thinly traded stocks.

My analysis does not focus on input and output routines because their usefulness is in the eye of the beholder, while test statistics, benchmark models, maximum sample sizes, and run times are established features. Note, though, that in my opinion the oldest command, `eventstudy`, scores highest in the domain of data input because it is the only command that provides a GUI. In the domain of input data, `eventstudy2` is the most complex command because it requires multiple `.dta` files (one for the event list, one for the security returns, and one for the market or factor returns). On the one hand, it will potentially take longer for the user to fully understand it. On the other hand, this data-input scheme is consistent with the data-delivery formats of popular financial data providers such as the Center for Research in Security Prices (CRSP), the

Institutional Brokers' Estimate System, and Compustat. The `estudy` command has the most comfortable output routines, including export to spreadsheet software and L<sup>A</sup>T<sub>E</sub>X.

## 2 Conceptual characteristics of event studies and community-contributed commands

### 2.1 Elements of event studies

In this section, I outline my framework of the three core elements, three supplemental elements, and two overarching principles of event studies, which will allow me to evaluate which of the three community-contributed event-study commands are most suitable for which empirical setting. In this framework (see table 1), the event leads the ranking of core elements because researchers are typically interested in measuring the impact of a specific event type on stock prices, for example, earnings announcements, stock splits, or dividend cuts. The firm and the event date (time) have to be properly identified but pose a methodological challenge rather than being at the center of the research.

Table 1. Elements and principles of event studies

Core elements	Supplemental elements	Overarching principles
1. Event(s)	· Macroeconomic confounding event(s)	· Aggregation
2. Firms(s)	· Firm-specific confounding event(s)	· Synchronization
3. Time	· Statistical hypotheses testing	

Because firms per se are not important and the focus is on the event, stock price reactions are aggregated across firms to eliminate random variation in returns not associated with the event. This corresponds to the overarching principle of aggregation (Corrado 2011, 212). Nevertheless, the firm ranks second in my list of core elements because many event studies aim at identifying how the impact of an event depends on firm characteristics, for example, firm size, magnitude of earnings surprise (Collins and Kothari 1989), or audit quality (Teoh and Wong 1993). In fact, as my analysis in the next section will show, these cross-sectional type of studies constitute a majority (97 out of 180 sample articles). Firms as individual objects, however, are rarely the object of research interest, and stock price reactions are either measured on an aggregated basis or hypothesized to be in a functional (linear) relationship with firm characteristics.

Time ranks third because researchers are typically not interested in whether an event has an impact on stock prices on a particular calendar day. For instance, it is unlikely that a researcher wants to analyze whether a stock split affects stock prices differently when announced on March 3 compared with September 15. In fact, the event-study method invokes the concept of event time, which is a timeline relative to the event day. For instance, if a similar event took place for Firm A on March 3 and Firm B

on September 15, calendar days March 2, 3, and 4 and September 14, 15, and 16 are redefined as days  $[-1]$ ,  $[0]$ , and  $[+1]$ , respectively. Thus, the researcher's or his or her software's first and very important task is to rearrange the stock return data and put them onto a common timeline that is relative to the event dates. This corresponds to the overarching principle of synchronization.

The event-study method distinguishes itself from a simple examination of stock returns by properly addressing the problem of confounding events and by defining test statistics (statistical hypotheses testing) that address various econometric issues. Confounding events are events other than the event of research interest that potentially impact stock prices. They can be of macroeconomic (affecting all firms to some extent) or firm-specific (presumably affecting only one firm) character. The event-study method is well designed to eliminate the impact of macroeconomic events without significant loss of observations. By calculating and assessing abnormal return relative to a market index or multiple-factor model, researchers can effectively address the effect of overall market movements on event firms' stock returns (MacKinlay 1997, 17–20). For instance, researchers can effectively address the effects of unanticipated changes in interest rates or terrorist attacks without even identifying these events. However, the event study method is incapable of addressing firm-specific confounding events. Those have to be identified by the researcher and taken into account by modifying the sample selection, potentially leading to some loss of observations.

## 2.2 Software requirements

From the above-described elements of event studies, several desirable features of event-study software solutions can be derived. They should assist the user in transforming the event and stock return data from common databases such as WRDS/CRSP, Datastream, or Yahoo! Finance from calendar time to event time. To that end, the command should, based on a common stock identifier and a date variable, merge a list of events with a dataset of stock returns. It should then rearrange the data to achieve an event-time structure with the date variable taking a value of zero at the event date (synchronization). This data management task is very important because it can be very time consuming and prone to error if executed manually using spreadsheet software.

The second core task any complete event-study software can perform is the calculation of abnormal returns against a benchmark model. Standard benchmark models are the constant mean return (COMEAN) model, the market model with a single market index as benchmark, and factor models such as the Fama and French (1993) three-factor model. Further, the software should be capable of calculating cumulative average abnormal returns (CAARs) and buy-and-hold average abnormal returns (Barber and Lyon 1997).

The third feature an event-study software should have is the implementation of statistical testing to assess (cumulative) average abnormal returns against the null hypothesis of them being zero. In fact, most of the methodological literature on event studies centers on the specification and empirical power of different parametric and nonparamet-

ric test statistics such as the crude dependence-adjustment  $t$  test by Brown and Warner (1980, 1985), the Patell (1976)  $Z$  statistic, the Corrado (1989) rank test, the Boehmer, Musumeci, and Poulsen (1991) parametric test with correction for event-induced volatility changes, the Kolari and Pynnönen (2010) adjustment of the Boehmer, Musumeci, and Poulsen (1991) test for cross-correlation, and the generalized rank (GRANK) test for CAARs (Kolari and Pynnönen 2011).

The fourth desirable feature of an event-study software package is its ability to present results and other output. Test statistics and statistical significance level should be tabulated alongside (cumulative) average abnormal returns. Further, a graphical presentation of CAARs is desirable because this is a standard presentation format in journal articles. The event-study software should report on events that had to be excluded and the reasons for their exclusion. Cumulative abnormal returns (CARs) should be made available for cross-sectional analysis.

## 2.3 Features of community-contributed commands

Table 2 summarizes the features of the three community-contributed commands. Although `eventstudy` and `eventstudy2` do not share any programming code, the latter can be considered a substantial extension of the former. While `eventstudy` and `eventstudy2` share the capability to synchronize data onto a common timeline that is relative to the events, `eventstudy` is restricted to the single-factor model to calculate abnormal returns. `eventstudy` does not provide any hypothesis testing capabilities, while `eventstudy2` provides plenty. However, `eventstudy` provides a GUI, which the other two commands are lacking. Thus, `eventstudy` can be used if researchers are exclusively interested in calculating CARs and are not interested in assessing statistical significance or plan to assess statistical significance using their own routines. Although most of the methodological literature on event studies focuses on statistical hypotheses testing, the analysis of journal publications in the next section reveals that some studies do not apply these tests but are interested only in factors that explain abnormal returns. Therefore, the command `eventstudy` maintains its *raison d'être* by being useful to researchers who can preserve run time by applying this less complex command.

Table 2. Features of community-contributed event-study commands

Feature↓    Command→	<code>eventstudy</code>	<code>eventstudy2</code>	<code>estudy</code>
Data management (Synchronization)	yes	yes	yes  <b>- Is able to use prices instead of returns</b>
Calculation of abnormal returns (Benchmark model)	- Market model	- Market model - Raw returns - Constant mean returns - Market adjusted returns - Factor model <b>(up to 12 factors)</b> - <b>Factor model with (G)ARCH</b> - <b>Buy-and-hold raw returns</b> - <b>Buy-and-hold abnormal returns</b>	- Market model - Raw returns - Constant mean returns - Market adjusted returns - Factor model <b>(up to maxvar)</b>
Hypothesis testing (Test statistics)		- <i>t</i> test (assuming independence) <b>- <i>t</i> test (crude adjustment)</b> - Patell <i>Z</i> statistic - Adjusted Patell statistic - Boehmer–Musumeci–Poulsen test - Kolari and Pynnönen test <b>- Generalized sign test</b> - Wilcoxon signed-ranks test <b>- Corrado rank test</b> <b>- Corrado and Zivney rank test</b> - GRANK test <b>- Bootstrapped <i>t</i> ratio</b>	- <i>t</i> test (assuming independence)  - Patell <i>Z</i> statistic - Adjusted Patell statistic - Boehmer–Musumeci–Poulsen test - Kolari and Pynnönen test  - Wilcoxon signed-ranks test  - GRANK test
Presentation (Tabulating abnormal returns; reporting on dropped observations)	- (Cumulative) abnormal returns are available for cross-sectional testing	- Tabulation of average abnormal returns and significance levels - Tabulation of cumulative <b>average</b> abnormal returns and significance levels <b>- Comprehensive reporting on dropped events</b> - Graphical display of cumulative average abnormal returns - (Cumulative) abnormal returns are available for cross-sectional testing	- Tabulation of cumulative ( <b>average</b> ) abnormal returns and significance levels  - Graphical display of cumulative average abnormal returns - (Cumulative) abnormal returns are available for cross-sectional testing <b>- L<sup>A</sup>T<sub>E</sub>X-formatted output tables</b> <b>- Excel output of results</b>

Table 2 also presents the differences in features of **eventstudy2** and **estudy**. Because Pacicco, Vena, and Venegoni (2018, 461) state that their **estudy** command “significantly improves the existing commands in terms of both completeness and user comprehension,” with reference to **eventstudy2**, these differences are highlighted by bold fonts. Because **estudy**’s data input is organized in wide rather than long format, it allows approximately as many factors to be included in the benchmark model as the respective Stata version can take variables. It is well known in the literature that one factor, the market index, or at most up to five factors (Fama and French 2015) add some explanatory power to the benchmark model. In fact, it is commonly known that the incremental effect on explanatory power is minor for all factors beyond the market index (MacKinlay 1997, 18). On the other hand, the wide-input data format of **estudy** imposes a restriction on the number of events. Pacicco, Vena, and Venegoni (2021, 3–4) state that their command can execute event studies with more than 24,000 companies. According to the outcomes of my tests of the **estudy** command, this limit applies not only to the number of companies but also to the number of events. It is important to understand that 24,000 companies would not impose a strong limitation because, even in big markets such as the U.S., samples rarely consist of more than 24,000 distinct companies. However, there are many studies that operate with samples of fewer companies but considerably more events (for example, Bhojraj et al. [2009]; Hail, Tahoun, and Wang [2014]; Savor and Wilson [2016]).

The **estudy** command provides output and statistical hypothesis testing by event firms, which **eventstudy2** does not. However, researchers very rarely report abnormal returns and their statistical significance for each event firm separately because this would stand against the main idea of event studies of measuring the general effect of a specific type of event on firms, which corresponds to the above derived principle of aggregation (see table 1). The event ranks first, the firm only second. In fact, the very fundamental idea of event studies is to measure the average impact of an event type on stock returns. This calls for aggregation of abnormal returns and allows the application of the law of large numbers to arrive at lower standard errors in hypothesis testing (Corrado 2011; MacKinlay 1997).

**eventstudy2** can calculate buy-and-hold abnormal returns and the respective bootstrapped *t*-ratio test statistic. It allows for different benchmarks for different event firms, which make the calculation of abnormal returns against characteristic-based benchmarks (Daniel et al. 1997), a method commonly used in finance and accounting research (for example, Da, Engelberg, and Gao [2011]), possible. It also reports on dropped observations or how it treats missing return observations, while the other two commands are lacking these features.

To conclude my conceptual comparison of the three community-contributed commands, I clearly see the relative merits of the **eventstudy** command if a researcher is interested in calculating only abnormal returns against the market model. **eventstudy** has a simple structure, which includes the most important data management tasks, and has a GUI that is most useful for inexperienced Stata users. **eventstudy2** is the most complete command and provides comprehensive data management routines, hypothesis testing, and output. **estudy** is a useful command for studies with a limited number of



events or if the researcher is interested in assessing the statistical significance of abnormal returns around the individual events. `estudy` is the only command that provides export routines to spreadsheet software and L<sup>A</sup>T<sub>E</sub>X.

### 3 Applicability to event studies in leading field journals

To substantiate my analysis of the usefulness of the three community-contributed event-study commands, I collect and analyze all studies that appeared between 2009 and 2018 in the *Journal of Finance*, *Journal of Accounting Research*, and *Management Science* and show which applied the event-study method either as their main method of analysis or as a tool to calculate abnormal returns for other purposes, for example, control variables.<sup>1</sup> The analysis in total comprises 180 articles, of which 55 appeared in the *Journal of Accounting Research* (17.5% of all articles that appeared in this journal during that period); 71 in the *Journal of Finance* (10.1%); and 54 in *Management Science* (3.0%). Thus, the event-study design can be considered one of the most prominent research methods in the journals' domains.

To assess the level of applicability of the three community-contributed commands, I evaluate them against the journal articles across two dimensions: the benchmark model that has been used in the study to calculate abnormal returns and the test statistics that have been used; see table 3. If a community-contributed command supports all benchmark models and all calculations of test statistics that are applied in a journal article, I classify its level of applicability as “fully applicable” with respect to that study. If a command supports at least one of the applied benchmark models and at least one test statistic, I classify its level of applicability as “partially applicable”. If the command is neither fully nor partially applicable, I classify it as “not applicable” with respect to that study.

---

1. The full dataset on which the following analyses are based is displayed in table 5 in the appendix.

Table 3. Applicability of community-contributed event-study commands

	eventstudy		eventstudy2		estudy	
Panel A: All three journals						
Fully applicable	15	8.33%	163	90.56%	105	58.33%
Partially applicable	4	2.22%	5	2.78%	17	9.44%
Not applicable	161	89.44%	12	6.67%	58	32.22%
Panel B: Journal of Accounting Research						
Fully applicable	3	5.45%	54	98.18%	32	58.18%
Partially applicable	1	1.82%	0	0.00%	5	9.09%
Not applicable	51	92.73%	1	1.82%	18	32.73%
Panel C: Journal of Finance						
Fully applicable	6	8.45%	65	91.55%	46	64.79%
Partially applicable	2	2.82%	1	1.41%	3	4.22%
Not applicable	63	88.73%	5	7.04%	22	30.99%
Panel D: Management Science						
Fully applicable	6	11.11%	44	81.48%	27	50.00%
Partially applicable	1	1.85%	4	5.63%	9	16.67%
Not applicable	47	87.04%	6	8.45%	18	33.33%

The information in this table is based on 180 articles published in the three journals between 2009 and 2018. The benchmark models and test statistics that are applied in these studies (see table 5 in the appendix) are then mapped to the features of community-contributed event study commands displayed in Table 2. If a command supports all benchmark models, all calculations of test statistics that are applied in a journal article, and the required data management tasks, its level of applicability is defined as “fully applicable” with respect to that study. If a command supports at least one of the applied benchmark models, at least one test statistic, and the required data management tasks, its level of applicability is defined as “partially applicable”. If the command is neither fully nor partially applicable, it is defined as “not applicable”.

The command **eventstudy** could have been used in 8.33% (fully applicable) and 2.22% (partially applicable) of all articles, which are the studies that do not test abnormal returns for statistical significance and use the market model or the COMEAN model.<sup>2</sup> **eventstudy2** has the highest levels of applicability with 90.56% (fully applicable) and 2.78% (partially applicable). **estudy** ranges between the two other commands with 58.33% (fully applicable) and 9.44% (partially applicable). This analysis does not consider any restrictions with respect to the maximum number of events (11,000 for **eventstudy** and 24,000 for **estudy** in Stata/MP) and is thus biased in favor of **eventstudy** and **estudy**.

Some further descriptive statistics of the journal articles are of interest to evaluate how convenient the community-contributed commands are. **eventstudy**’s and

2. **eventstudy** is restricted to the market model, but setting all market returns to zero provides results that are equivalent to those for the COMEAN.

`eventstudy2`'s data inputs are organized in long rather than wide format. The long format is also the format of the most common share-price databases: CRSP, Compustat, and China Stock Market & Accounting Research (CSMAR), which are used by about 93% of the studies.

## 4 Practical limitations

### 4.1 Run time

Run time can represent a material constraint in applying event study commands. To compare the three community-contributed commands, I create sample datasets by extracting return data from CRSP for the period 2005–2014. I randomly assign one event date per firm and ensure that all return data are available during the estimation window beginning 249 and ending 11 trading days before the event date as well as during the event window ranging from 10 trading days before to 10 trading days after the event. On the event date, I add 0.05 to the return variable to simulate an event causing an abnormal return of 5%. Further, I add a randomly generated<sup>3</sup> market index return variable. To simulate run time, I randomly select subsamples between 50 and 2,050 events, in steps of 100, and 6 larger samples of 5,000, 10,000, 30,000, 60,000, 90,000, and 120,000 events. I use Stata/MP4 16 on an Intel Xeon Gold 6126 CPU with 2.60 GHz, 2 sockets, 24 cores, and 48 logical processors. Nevertheless, because Stata/MP 16 will use a maximum of four logical processors, the run times are not expected to differ materially from those on common desktop PCs. However, for testing `eventstudy2` with the `parallel` option, I use 40 logical processors, which resembles run times on a high-performance computing cluster.

When one compares run times across community-contributed commands, it is important to recall some of their conceptual differences; see figure 1 for a visual comparison. `eventstudy` does not calculate any test statistics, which is why it is generally expected to be the fastest command in all scenarios. `eventstudy2` calculates and reports all available test statistics during every run and provides extensive data management capabilities. `estudy`, on the other hand, provides only one test statistic per run but provides it for each event firm separately. Thus, the prediction of run time for `eventstudy2` compared with `estudy` is less clear.

---

3. I use the function `uniform()` and divide by 20 to obtain a reasonable return distribution.

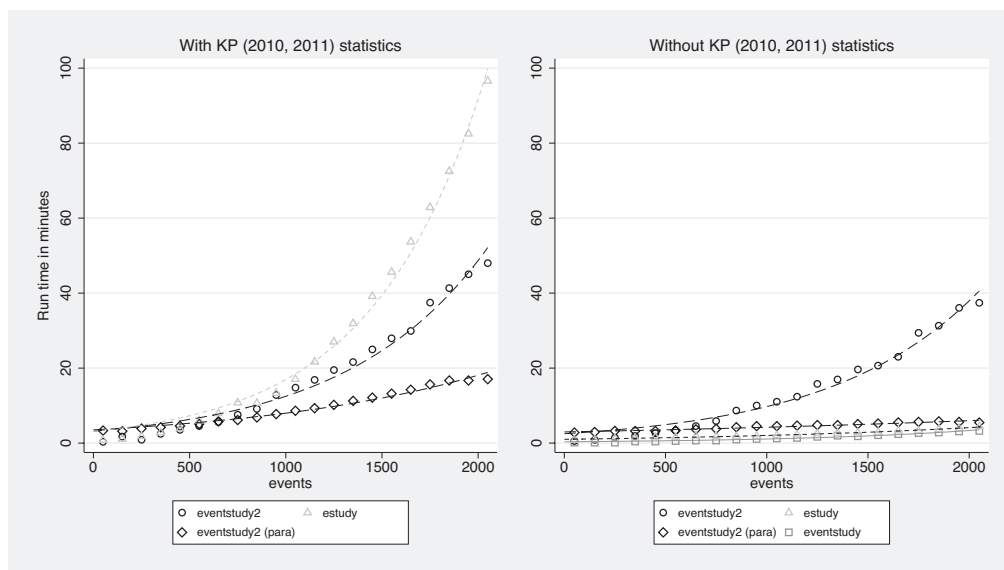


Figure 1. Execution times of event studies with 50 to 2,050 events

The left graph in figure 1 plots the run times for `eventstudy2`, `eventstudy2` with the `parallel` option, and `estudy` against the numbers of events. `estudy` is run with the `diagnosticsstat(KP)` option and `eventstudy2`'s option `nokolari` is not enabled, which in both instances triggers the calculation of the most calculation-intensive Kolari and Pynnönen (KP) (2010, 2011) statistics. The graphs point toward an exponential growth of run time with a considerably higher growth rate for `estudy`. While `eventstudy2` can execute event studies with 2,000 events in less than an hour, the run time for `estudy` approaches 100 minutes.<sup>4</sup> Further, the graph clearly demonstrates the benefits of the `parallel` option of `eventstudy2`, which already breaks even at around 700 events and is associated with a much lower growth rate. An event study with 2,000 events can be calculated in less than 20 minutes.

The right graph in figure 1 shows the run time when `estudy` is run with the `diagnosticsstat(Norm)` option and `eventstudy2` with the `nokolari` option, which suppress the calculation of the KP (2010, 2011) statistics. It also shows the run time of `eventstudy`, which does not provide any test statistics. The growth rate for `estudy` drops substantially, which demonstrates that much of the priorly observed sensitivity of the run time to the number of events is attributable to computing the KP (2010) statistic. However, `eventstudy2`'s run time depends less on test statistics, which are fully implemented in Mata, but is largely driven by its comprehensive data manage-

4. The KP (2010, 2011) statistics require calculation of all pairwise correlations between abnormal returns of event firms, which becomes an exponentially intense task with an increasing number of events for both `eventstudy2` and `estudy`. However, `estudy`'s feature to calculate test statistics for each event firm should not put it at an undue disadvantage, if programmed efficiently, because cross-correlations do not matter in single-event firm settings.

ment routines (for example, implementing the Maynes and Rumsey [1993] algorithm for handling thinly traded stocks) and reporting routines (reporting which events had to be dropped and for which reason).

As I demonstrated in my analysis of published event studies in section 3, most event studies comprise more than only a few thousand events. Therefore, I record the run time in hours of the three community-contributed commands for studies with samples of 5,000, 10,000, 30,000, 60,000, 90,000, and 120,000 events, if feasible, in table 4. I measure run times with and without the calculation of the KP (2010, 2011) statistics (as in figure 1).

Table 4. Run time in hours of community-contributed event-study commands

eventstudy		
Events	No test statistics available	
5,000	0.3	
10,000	1.0	
>11,000	eventstudy hits the matsize limit of 11,000.	
eventstudy2		
Events	With KP (2010, 2011) statistics	Without KP (2010, 2011) statistics
5,000	4.7	3.6
10,000	19.6	14.9
15,000	43.1	31.5
30,000	169.5	129.2
>30,000	Feasible but strong exponential growth.	
eventstudy2, parallel		
Events	With KP (2010, 2011) statistics	Without KP (2010, 2011) statistics
5,000	1.4	0.2
10,000	4.9	0.4
15,000	11.5	0.5
30,000	45.2	1.0
60,000	Feasible but	2.5
90,000	strong exponential growth	4.4
120,000	...	6.6
>120,000	...	Feasible.
estudy		
Events	With KP (2010, 2011) statistics	Without KP (2010, 2011) statistics
5,000	26.6	0.4
10,000	250.9	2.1
15,000	>24 days	5.7
23,000	>50 days	20.2
>24,000	estudy hits the maximum variables limit of 120,000.	

Most notably, my tests reveal that `eventstudy` hits Stata/MP 16's matsize limit of 11,000 when asked to calculate an event study with 11,000 or more events. `estudy`

hits the maximum number of variables limit of 120,000 when asked to calculate event studies with 24,000 or more events. Further, the run time of `estudy` increases drastically for larger samples when asked to calculate the KP (2010, 2011) statistics to spend 250.9 hours on a study with only 10,000 events will most likely be considered impracticable by most researchers. `eventstudy2` can perform this task in 19.6 hours (4.9 hours in parallel computing mode) because it loads the abnormal return matrices fully into Mata and calculates cross-correlations there, which is much more computationally efficient than correlating Stata variables.<sup>5</sup> Although `estudy` theoretically can run larger event studies with the KP (2010, 2011) statistics, I cannot obtain results for the 15,000 events sample after 24 days of uninterrupted calculation. However, an analysis of the time that `estudy` requires to calculate the cross-correlation of one event's abnormal returns with all other events' abnormal returns during the estimation windows allows me to estimate a lower boundary for the 23,000 events sample, which is at least 50 days of run time.

Without being asked to calculate KP (2010, 2011) statistics, `estudy` is considerably faster than `eventstudy2`. However, `eventstudy2` retakes the lead if run in parallel computing mode on 40 cores.

To conclude on the issue of run time, `eventstudy` and `estudy` are not suitable to run bigger event studies because of their handling of Stata/MP 16's limits. If the user is interested in obtaining KP (2010, 2011) statistics, the practical limits of `estudy` kick in much earlier than the theoretically feasible 23,000 events.

## 4.2 Consistency of results and thin trading

While calculation times, as demonstrated in the previous subsection, differ substantially across the three community-contributed event-study commands, the abnormal returns and test statistics they calculate should be consistent. To test this presumption, I use the previously described setting with 100 randomly selected event samples and repeat the analysis 100 times, each time using each of the 3 commands on the selected sample. I calculate CAARs for days [0], [1], [0; 1], and [-1; 1] as well as the KP (2010) statistics when using `eventstudy2` and `estudy`. Untabulated results show that all metrics exhibit almost perfect correlation across commands, which implies consistency in this ideal setting where no return data are missing.

However, in real-world settings, researchers commonly have to handle stock return data when stocks trade infrequently (thin trading). Let us assume the following scenario: a stock has a continuously compounded abnormal return of -2% on the event day [0] and +2% on the day after the event day [+1]. On the event day, however, the stock is not traded, which means that its abnormal return is not observable. The day after the event day, when the stock resumes trading, the observable abnormal return will be 0 because the closing price on this day will match the closing price on the day before the event day [-1]. How should an event-study command handle such situations? Ideally,

---

5. `estudy` stores cross-correlations in Mata but calculates them in Stata using the `correlate` command.

it recognizes that the return observed on day  $[+1]$  is a cumulated return and excludes it from the calculation of the abnormal return on day  $[+1]$ . Nevertheless, it should include this return observation in the calculation of the CAARs,  $\text{CAAR}[0, 1]$ . Further, the missing return on day  $[0]$  should not be set to 0 but excluded from the calculation of the average abnormal event day return,  $\text{AAR}[0]$ . **eventstudy2** follows these rules by implementing the Maynes and Rumsey (1993) algorithm for the handling of trade-to-trade returns and thinly traded stocks. The help files of **eventstudy** and **estudy** do not explain how the commands deal with this issue.

To get a better understanding of the ability of three community-contributed commands to handle thin trading, I artificially and randomly define half the event day  $[0]$  returns as thinly traded, which means that the return is compounded into the following day  $[+1]$  before being set to missing. Before introducing thin trading, I add a random return to the return on day  $[0]$  and subtract the same return on day  $[+1]$ . Thus, we know the true  $\text{AAR}[0]$  and  $\text{AAR}[+1]$  as well as that the  $\text{CAAR}[0, +1]$  and  $\text{CAAR}[-1, +1]$  are truly 0. Again, I perform 100 runs of 100 randomly selected samples using each of the three community-contributed event-study commands.

The upper left graph in figure 2 shows plots of measured average abnormal event day  $[0]$  returns on artificially induced abnormal returns. All three commands provide estimates that are close to the ideal 45°-line through the origin and are thus unbiased. Thus, none of the three commands erroneously attributes a zero return to the missing return observations that result from thin trading or nontrading. However, the results differ with respect to day  $[+1]$  (upper right graph), where **estudy** and **eventstudy** systemically underestimate the return reversal because they attribute some of the abnormal event day returns to day  $[+1]$ . Only **eventstudy2** realizes that about half the day  $[+1]$  returns are confounded with day  $[0]$ , at that time unobservable, returns.

The lower left graph in figure 2 demonstrates that this error is mitigated in the calculating of  $\text{CAAR}[0, 1]$  by **eventstudy** by first calculating CARs by event firm and across time and then averaging them across event firms (the latter has to be performed by the user). **estudy**, however, appears to first calculate AARs by time and across events and then averages them across time, which entertains the bias and creates an overestimation in terms of the absolute value of  $\text{CAAR}[0, 1]$ , which in my simulation is 0 by construction. In my simulation of perfect abnormal return reversal within one trading day, the bias is linearly related to the fraction of thinly traded stocks (50% in my simulation) and the induced abnormal return. For instance, we see that if half of event day returns suffer from thin trading and the induced abnormal return is 5%, **estudy** overestimates  $\text{CAAR}[0, +1]$  by about 2.5 percentage points. As can be seen from the graph in the lower right, the bias does not get weaker if the window is extended to three days, that is,  $\text{CAAR}[-1, +1]$ .

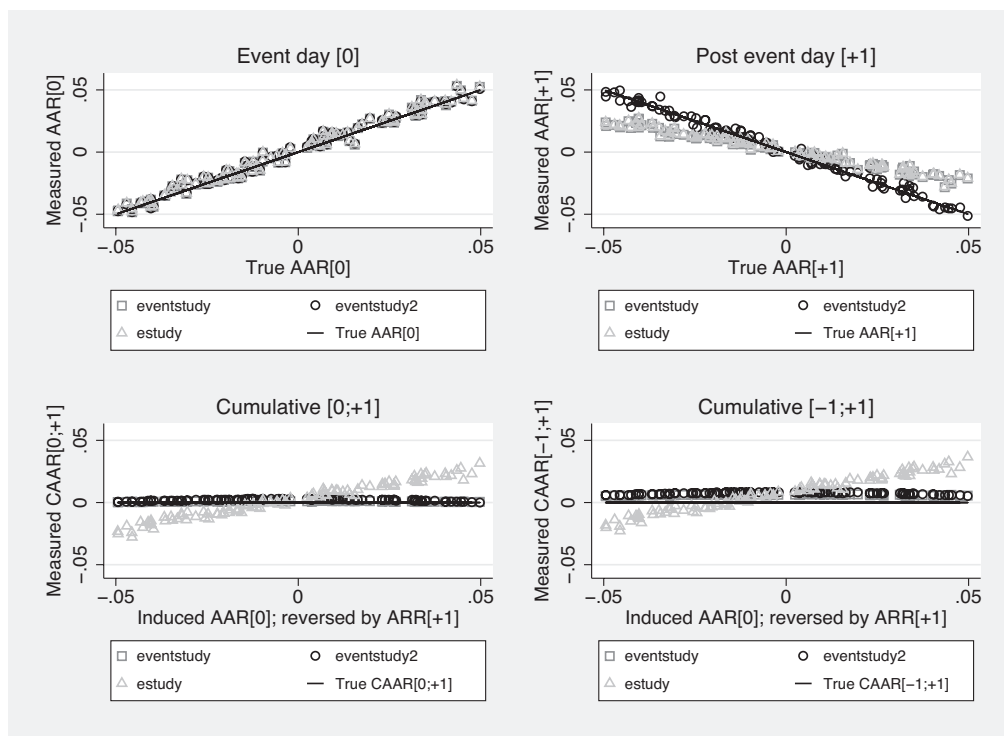


Figure 2. CAAR calculation with thin trading on the event day

To conclude, all three commands provide consistent results if thin trading is not present. If, however, thin trading is an issue and the return data are trade-to-trade returns, only `eventstudy2` provides unbiased results.

## 5 Conclusion

All three commands discussed in this article, `eventstudy`, `eventstudy2`, and `estudy`, are useful in conducting event studies as they are commonly performed in the accounting, finance, and management literature. In terms of completeness as I define it—that is, availability of test statistics and benchmark models, handling of thin trading and reporting on dropped observations—my command `eventstudy2` surpasses its alternatives. However, the other commands have superior input (`eventstudy`) or output (`estudy`) routines, which might make them the better choice for users who are operating with smaller samples or do not require complex test statistics. The `estudy` command might be particularly suited for analyses of data that come from Datastream as opposed to WRDS, because data that are extracted with Datastream request tables that typically come in wide rather than long format. The user should ensure, though, that his or her sample firms do not suffer from thin trading and that the sample is sufficiently



small. Overall, given the three available community-contributed commands, there is no need for Stata users to leave their preferred programming environment to conduct event studies.

Finally, because I am often asked about that via email or most recently at the 2020 Stata Conference, I would like to briefly explain the differences between the three community-contributed commands and the Stata code that is offered at the Princeton University website.<sup>6</sup> The Princeton code is a very useful starting point for writing one's own event-study code because it provides a good overview on how to initially organize the data. However, it does not provide any advanced hypothesis testing or input-output routines. Developing an event-study command takes years of intense work. `estudy.ado` has more than 1,400 and `eventstudy2.ado` more than 1,700 lines of code, and although the amount of code does not necessarily predict the quality of command, it can provide a hint to its complexity and thus functionality. If at all, the roughly 40 lines of code on the Princeton website are comparable, in terms of functionality, with the `eventstudy` but not the other two commands.

## Acknowledgments

I thank Joe Newton (the editor) and an anonymous referee for their valuable contributions. I also thank the attendees of the 2020 Stata Conference and all users whose feedback has substantially improved this article and the `eventstudy2` command.

## 6 References

- Abarbanell, J., and H. Park. 2017. Do bright-line earnings surprises really affect stock price reactions? *Management Science* 63: 1063–1084. <https://doi.org/10.1287/mnsc.2015.2376>.
- Abrahamson, M., T. Jenkinson, and H. Jones. 2011. Why don't U.S. issuers demand European fees for IPOs? *Journal of Finance* 66: 2055–2082. <https://doi.org/10.1111/j.1540-6261.2011.01699.x>.
- Agarwal, S., V. Y. S. Chen, and W. Zhang. 2016. The information value of credit rating action reports: A textual analysis. *Management Science* 62: 2218–2240. <https://doi.org/10.1287/mnsc.2015.2243>.
- Agarwal, V., W. Jiang, Y. Tang, and B. Yang. 2013. Uncovering hedge fund skill from the portfolio holdings they hide. *Journal of Finance* 68: 739–783. <https://doi.org/10.1111/jofi.12012>.
- Aggarwal, R., P. A. C. Saffi, and J. Sturgess. 2015. The role of institutional investors in voting: Evidence from the securities lending market. *Journal of Finance* 70: 2309–2346. <https://doi.org/10.1111/jofi.12284>.

---

6. [https://dss.princeton.edu/online\\_help/stats\\_packages/stata/eventstudy.html](https://dss.princeton.edu/online_help/stats_packages/stata/eventstudy.html).

- Agrawal, J., and W. A. Kamakura. 1995. The economic worth of celebrity endorsers: An event study analysis. *Journal of Marketing* 59: 56–62. <https://doi.org/10.2307/1252119>.
- Ahern, K. R., and J. Harford. 2014. The importance of industry links in merger waves. *Journal of Finance* 69: 527–576. <https://doi.org/10.1111/jofi.12122>.
- Akbas, F. 2016. The calm before the storm. *Journal of Finance* 71: 225–266. <https://doi.org/10.1111/jofi.12377>.
- Albuquerque, R., and E. Schroth. 2015. The value of control and the costs of illiquidity. *Journal of Finance* 70: 1405–1455. <https://doi.org/10.1111/jofi.12207>.
- Allee, K. D., and M. D. DeAngelis. 2015. The structure of voluntary disclosure narratives: Evidence from tone dispersion. *Journal of Accounting Research* 53: 241–274. <https://doi.org/10.1111/1475-679X.12072>.
- Ammann, M., P. Horsch, and D. Oesch. 2016. Competing with superstars. *Management Science* 62: 2842–2858. <https://doi.org/10.1287/mnsc.2015.2266>.
- Anderson, R. C., D. M. Reeb, and W. Zhao. 2012. Family-controlled firms and informed trading: Evidence from short sales. *Journal of Finance* 67: 351–385. <https://doi.org/10.1111/j.1540-6261.2011.01714.x>.
- Anderson, R. W., M. C. Bustamante, S. Guibaud, and M. Zervos. 2018. Agency, firm growth, and managerial turnover. *Journal of Finance* 73: 419–464. <https://doi.org/10.1111/jofi.12583>.
- Arikan, A. M., and R. M. Stulz. 2016. Corporate acquisitions, diversification, and the firm's life cycle. *Journal of Finance* 71: 139–194. <https://doi.org/10.1111/jofi.12362>.
- Ashbaugh-Skaife, H., D. W. Collins, W. R. Kinney Jr., and R. LaFond. 2009. The effect of SOX internal control deficiencies on firm risk and cost of equity. *Journal of Accounting Research* 47: 1–43. <https://doi.org/10.1111/j.1475-679X.2008.00315.x>.
- Asquith, P., and D. W. Mullins. 1983. The impact of initiating dividend payments on shareholders' wealth. *Journal of Business* 56: 77–96. <https://doi.org/10.1086/296187>.
- Babenko, I. 2009. Share repurchases and pay-performance sensitivity of employee compensation contracts. *Journal of Finance* 64: 117–150. <https://doi.org/10.1111/j.1540-6261.2008.01430.x>.
- Badoer, D. C., and C. M. James. 2016. The determinants of long-term corporate debt issuances. *Journal of Finance* 71: 457–492. <https://doi.org/10.1111/jofi.12264>.
- Ball, R., and P. Brown. 1968. An empirical evaluation of accounting income numbers. *Journal of Accounting Research* 6: 159–178. <https://doi.org/10.2307/2490232>.
- Barber, B. M., and J. D. Lyon. 1997. Detecting long-run abnormal stock returns: The empirical power and specification of test statistics. *Journal of Financial Economics* 43: 341–372. [https://doi.org/10.1016/S0304-405X\(96\)00890-2](https://doi.org/10.1016/S0304-405X(96)00890-2).

- Becher, D. A., J. B. Cohn, and J. L. Juergens. 2015. Do stock analysts influence merger completion? An examination of postmerger announcement recommendations. *Management Science* 61: 2430–2448. <https://doi.org/10.1287/mnsc.2014.2065>.
- Berkman, H., P. D. Koch, and P. J. Westerholm. 2014. Informed trading through the accounts of children. *Journal of Finance* 69: 363–404. <https://doi.org/10.1111/jofi.12043>.
- Berkman, H., and C. Truong. 2009. Event day 0? After-hours earnings announcements. *Journal of Accounting Research* 47: 71–103. <https://doi.org/10.1111/j.1475-679X.2008.00312.x>.
- Bernhardt, D., C. Wan, and Z. Xiao. 2016. The reluctant analyst. *Journal of Accounting Research* 54: 987–1040. <https://doi.org/10.1111/1475-679X.12120>.
- Betton, S., B. E. Eckbo, R. Thompson, and K. S. Thorburn. 2014. Merger negotiations with stock market feedback. *Journal of Finance* 69: 1705–1745. <https://doi.org/10.1111/jofi.12151>.
- Bhagat, S., and R. Romano. 2002a. Event studies and the law: Part I: Technique and corporate litigation. *American Law and Economics Review* 4: 141–168. <https://doi.org/10.1093/aler/4.1.141>.
- . 2002b. Event studies and the law: Part II: Empirical studies of corporate law. *American Law and Economics Review* 4: 380–423. <https://doi.org/10.1093/aler/4.2.380>.
- Bhojraj, S., P. Hribar, M. Picconi, and J. McInnis. 2009. Making sense of cents: An examination of firms that marginally miss or beat analyst forecasts. *Journal of Finance* 64: 2361–2388. <https://doi.org/10.1111/j.1540-6261.2009.01503.x>.
- Blankespoor, E., B. E. Hendricks, and G. S. Miller. 2017. Perceptions and price: Evidence from CEO presentations at IPO roadshows. *Journal of Accounting Research* 55: 275–327. <https://doi.org/10.1111/1475-679X.12164>.
- Boehmer, E., J. Musumeci, and A. B. Poulsen. 1991. Event-study methodology under conditions of event-induced variance. *Journal of Financial Economics* 30: 253–272. [https://doi.org/10.1016/0304-405X\(91\)90032-F](https://doi.org/10.1016/0304-405X(91)90032-F).
- Bowen, R. M., R. P. Castanias, and L. A. Daley. 1983. Intra-industry effects of the accident at Three Mile Island. *Journal of Financial and Quantitative Analysis* 18: 87–111. <https://doi.org/10.2307/2330806>.
- Bradley, D., S. Gokkaya, and X. Liu. 2017. Before an analyst becomes an analyst: Does industry experience matter? *Journal of Finance* 72: 751–792. <https://doi.org/10.1111/jofi.12466>.
- Brennan, M. J., S.-W. Huh, and A. Subrahmanyam. 2016. Asymmetric effects of informed trading on the cost of equity capital. *Management Science* 62: 2460–2480. <https://doi.org/10.1287/mnsc.2015.2250>.

- Brown, S. J., and J. B. Warner. 1980. Measuring security price performance. *Journal of Financial Economics* 8: 205–258. [http://dx.doi.org/10.1016/0304-405X\(80\)90002-1](http://dx.doi.org/10.1016/0304-405X(80)90002-1).
- . 1985. Using daily stock returns: The case of event studies. *Journal of Financial Economics* 14: 3–31. [https://doi.org/10.1016/0304-405X\(85\)90042-X](https://doi.org/10.1016/0304-405X(85)90042-X).
- Brown, S. V., and J. W. Tucker. 2011. Large-sample evidence on firms' year-over-year MD&A modifications. *Journal of Accounting Research* 49: 309–346. <https://doi.org/10.1111/j.1475-679X.2010.00396.x>.
- Bruno, V., J. Cornaggia, and K. J. Cornaggia. 2016. Does regulatory certification affect the information content of credit ratings? *Management Science* 62: 1578–1597. <https://doi.org/10.1287/mnsc.2015.2188>.
- Bushee, B. J., J. E. Core, W. Guay, and S. J. Hamm. 2010. The role of the business press as an information intermediary. *Journal of Accounting Research* 48: 1–19. <https://doi.org/10.1111/j.1475-679X.2009.00357.x>.
- Bushee, B. J., M. J. Jung, and G. S. Miller. 2011. Conference presentations and the disclosure milieu. *Journal of Accounting Research* 49: 1163–1192. <https://doi.org/10.1111/j.1475-679X.2011.00426.x>.
- Bushman, R. M., C. D. Williams, and R. Wittenberg-Moerman. 2017. The informational role of the media in private lending. *Journal of Accounting Research* 55: 115–152. <https://doi.org/10.1111/1475-679X.12131>.
- Call, A. C., G. S. Martin, N. Y. Sharp, and J. H. Wilde. 2018. Whistleblowers and outcomes of financial misrepresentation enforcement actions. *Journal of Accounting Research* 56: 123–171. <https://doi.org/10.1111/1475-679X.12177>.
- Cao, S. S., and G. S. Narayanamoorthy. 2012. Earnings volatility, post-earnings announcement drift, and trading frictions. *Journal of Accounting Research* 50: 41–74. <https://doi.org/10.1111/j.1475-679X.2011.00425.x>.
- Cao, Y., D. Dhaliwal, Z. Li, and Y. G. Yang. 2015. Are all independent directors equally informed? Evidence based on their trading returns and social networks. *Management Science* 61: 795–813. <https://doi.org/10.1287/mnsc.2013.1892>.
- Capron, L., and N. Pistre. 2002. When do acquirers earn abnormal returns? *Strategic Management Journal* 23: 781–794. <https://doi.org/10.1002/smj.262>.
- Cen, L., S. Dasgupta, and R. Sen. 2016. Discipline or disruption? Stakeholder relationships and the effect of takeover threat. *Management Science* 62: 2820–2841. <https://doi.org/10.1287/mnsc.2015.2252>.
- Chang, Y. Y., S. Dasgupta, and G. Hilary. 2010. CEO ability, pay, and firm performance. *Management Science* 56: 1633–1652. <https://doi.org/10.1287/mnsc.1100.1205>.
- Chava, S., K. Huang, and S. A. Johnson. 2018. The dynamics of borrower reputation following financial misreporting. *Management Science* 64: 4775–4797. <https://doi.org/10.1287/mnsc.2017.2739>.

- Cheong, F. S., and J. Thomas. 2018. Management of reported and forecast EPS, investor responses, and research implications. *Management Science* 64: 4277–4301. <https://doi.org/10.1287/mnsc.2017.2832>.
- Chhaochharia, V., Y. Grinstein, G. Grullon, and R. Michaely. 2017. Product market competition and internal governance: Evidence from the Sarbanes—Oxley Act. *Management Science* 63: 1405–1424. <https://doi.org/10.1287/mnsc.2015.2409>.
- Choudhary, P., S. Rajgopal, and M. Venkatachalam. 2009. Accelerated vesting of employee stock options in anticipation of FAS 123-R. *Journal of Accounting Research* 47: 105–146. <https://doi.org/10.1111/j.1475-679X.2008.00316.x>.
- Christensen, H. B., E. Lee, and M. Walker. 2009. Do IFRS reconciliations convey information? The effect of debt contracting. *Journal of Accounting Research* 47: 1167–1199. <https://doi.org/10.1111/j.1475-679X.2009.00345.x>.
- Cohen, L., and B. Schmidt. 2009. Attracting flows by attracting big clients. *Journal of Finance* 64: 2125–2151. <https://doi.org/10.1111/j.1540-6261.2009.01496.x>.
- Cohn, J. B., S. L. Gillan, and J. C. Hartzell. 2016. On enhancing shareholder control: A (Dodd-) frank assessment of proxy access. *Journal of Finance* 71: 1623–1668. <https://doi.org/10.1111/jofi.12402>.
- Collin-Dufresne, P., and V. Fos. 2015. Do prices reveal the presence of informed trading? *Journal of Finance* 70: 1555–1582. <https://doi.org/10.1111/jofi.12260>.
- Collins, D. W., and S. P. Kothari. 1989. An analysis of the intertemporal and cross-sectional determinants of earnings response coefficients. *Journal of Accounting and Economics* 11: 143–181. [http://dx.doi.org/10.1016/0165-4101\(89\)90004-9](http://dx.doi.org/10.1016/0165-4101(89)90004-9).
- Corrado, C. 1989. A nonparametric test for abnormal security-price performance in event studies. *Journal of Financial Economics* 23: 385–395. [https://doi.org/10.1016/0304-405X\(89\)90064-0](https://doi.org/10.1016/0304-405X(89)90064-0).
- Corrado, C. J. 2011. Event studies: A methodology review. *Accounting & Finance* 51: 207–234. <https://doi.org/10.1111/j.1467-629X.2010.00375.x>.
- Corrado, C. J., and T. L. Zivney. 1992. The specification and power of the sign test in event study hypothesis tests using daily stock returns. *Journal of Financial and Quantitative Analysis* 27: 465–478. <https://doi.org/10.2307/2331331>.
- Cowan, A. R. 1992. Nonparametric event study tests. *Review of Quantitative Finance and Accounting* 2: 343–358. <https://doi.org/10.1007/BF00939016>.
- Crane, A. D., and A. Koch. 2018. Shareholder litigation and ownership structure: Evidence from a natural experiment. *Management Science* 64: 5–23. <https://doi.org/10.1287/mnsc.2016.2561>.
- Crawford, S., W. Gray, B. R. Johnson, and R. A. Price. 2018. What motivates buy-side analysts to share recommendations online? *Management Science* 64: 2574–2589. <https://doi.org/10.1287/mnsc.2017.2749>.

- Cready, W., A. Kumas, and M. Subasi. 2014. Are trade size-based inferences about traders reliable? Evidence from institutional earnings-related trading. *Journal of Accounting Research* 52: 877–909. <https://doi.org/10.1111/1475-679X.12056>.
- Cready, W. M., and U. G. Gurun. 2010. Aggregate market reaction to earnings announcements. *Journal of Accounting Research* 48: 289–334. <https://doi.org/10.1111/j.1475-679X.2010.00368.x>.
- Cuñat, V., M. Gine, and M. Guadalupe. 2012. The vote is cast: The effect of corporate governance on shareholder value. *Journal of Finance* 67: 1943–1977. <https://doi.org/10.1111/j.1540-6261.2012.01776.x>.
- Da, Z., J. Engelberg, and P. Gao. 2011. In search of attention. *Journal of Finance* 66: 1461–1499. <https://doi.org/10.1111/j.1540-6261.2011.01679.x>.
- Daniel, K., M. Grinblatt, S. Titman, and R. Wermers. 1997. Measuring mutual fund performance with characteristic-based benchmarks. *Journal of Finance* 52: 1035–1058. <https://doi.org/10.1111/j.1540-6261.1997.tb02724.x>.
- de Bodt, E., J.-G. Cousin, and R. Roll. 2018. Full-stock-payment marginalization in merger and acquisition transactions. *Management Science* 64: 760–783. <https://doi.org/10.1287/mnsc.2016.2635>.
- De Franco, G., F. P. Vasvari, and R. Wittenberg-Moerman. 2009. The informational role of bond analysts. *Journal of Accounting Research* 47: 1201–1248. <https://doi.org/10.1111/j.1475-679X.2009.00348.x>.
- DeHaan, E., J. Madsen, and J. D. Piotroski. 2017. Do weather-induced moods affect the processing of earnings news? *Journal of Accounting Research* 55: 509–550. <https://doi.org/10.1111/1475-679X.12160>.
- Dellavigna, S., and J. M. Pollet. 2009. Investor inattention and Friday earnings announcements. *Journal of Finance* 64: 709–749. <https://doi.org/10.1111/j.1540-6261.2009.01447.x>.
- Demerjian, P., B. Lev, and S. McVay. 2012. Quantifying managerial ability: A new measure and validity tests. *Management Science* 58: 1229–1248. <https://doi.org/10.1287/mnsc.1110.1487>.
- Dimitrov, V., and P. C. Jain. 2011. It's showtime: Do managers report better news before annual shareholder meetings? *Journal of Accounting Research* 49: 1193–1221. <https://doi.org/10.1111/j.1475-679X.2011.00419.x>.
- Doidge, C., and A. Dyck. 2015. Taxes and corporate policies: Evidence from a quasi natural experiment. *Journal of Finance* 70: 45–89. <https://doi.org/10.1111/jofi.12101>.
- Doidge, C., G. A. Karolyi, and R. M. Stulz. 2010. Why do foreign firms leave U.S. equity markets? *Journal of Finance* 65: 1507–1553. <https://doi.org/10.1111/j.1540-6261.2010.01577.x>.

- Donelson, D. C., and J. J. Hopkins. 2016. Large market declines and securities litigation: Implications for disclosing adverse earnings news. *Management Science* 62: 3183–3198. <https://doi.org/10.1287/mnsc.2015.2306>.
- Døskeland, T. M., and H. K. Hvide. 2011. Do individual investors have asymmetric information based on work experience? *Journal of Finance* 66: 1011–1041. <https://doi.org/10.1111/j.1540-6261.2011.01658.x>.
- Doyle, J. T., and M. J. Magilke. 2013. Decision usefulness and accelerated filing deadlines. *Journal of Accounting Research* 51: 549–581.
- Drake, M. S., D. T. Roulstone, and J. R. Thornock. 2012. Investor information demand: Evidence from Google searches around earnings announcements. *Journal of Accounting Research* 50: 1001–1040. <https://doi.org/10.1111/j.1475-679X.2012.00443.x>.
- Durnev, A., and C. Mangen. 2009. Corporate investments: Learning from restatements. *Journal of Accounting Research* 47: 679–720. <https://doi.org/10.1111/j.1475-679X.2009.00332.x>.
- Dyck, A., A. Morse, and L. Zingales. 2010. Who blows the whistle on corporate fraud? *Journal of Finance* 65: 2213–2253. <https://doi.org/10.1111/j.1540-6261.2010.01614.x>.
- Dyreng, S. D., J. L. Hoopes, and J. H. Wilde. 2016. Public pressure and corporate tax behavior. *Journal of Accounting Research* 54: 147–186. <https://doi.org/10.1111/1475-679X.12101>.
- Edmans, A., I. Goldstein, and W. Jiang. 2012. The real effects of financial markets: The impact of prices on takeovers. *Journal of Finance* 67: 933–971. <https://doi.org/10.1111/j.1540-6261.2012.01738.x>.
- Engelberg, J., C. Sasseville, and J. Williams. 2012. Market madness? The case of mad money. *Management Science* 58: 351–364. <https://doi.org/10.1287/mnsc.1100.1290>.
- Ertimur, Y., F. Ferri, and D. Oesch. 2013. Shareholder votes and proxy advisors: Evidence from say on pay. *Journal of Accounting Research* 51: 951–996. <https://doi.org/10.1111/1475-679X.12024>.
- Falato, A., D. Li, and T. Milbourn. 2015. Which skills matter in the market for CEOs? Evidence from pay for CEO credentials. *Management Science* 61: 2845–2869. <https://doi.org/10.1287/mnsc.2014.2024>.
- Fama, E. F., L. Fisher, M. C. Jensen, and R. Roll. 1969. The adjustment of stock prices to new information. *International Economic Review* 10: 1–21.
- Fama, E. F., and K. R. French. 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33: 3–56. [https://doi.org/10.1016/0304-405X\(93\)90023-5](https://doi.org/10.1016/0304-405X(93)90023-5).
- . 2015. A five-factor asset pricing model. *Journal of Financial Economics* 116: 1–22. <https://doi.org/10.1016/j.jfineco.2014.10.010>.

- Fang, V. W., A. H. Huang, and J. M. Karpoff. 2016. Short selling and earnings management: A controlled experiment. *Journal of Finance* 71: 1251–1294. <https://doi.org/10.1111/jofi.12369>.
- Fang, V. W., A. H. Huang, and W. Wang. 2017. Imperfect accounting and reporting bias. *Journal of Accounting Research* 55: 919–962. <https://doi.org/10.1111/1475-679X.12170>.
- Fernando, C. S., A. D. May, and W. L. Megginson. 2012. The value of investment banking relationships: Evidence from the collapse of Lehman Brothers. *Journal of Finance* 235–270. <https://doi.org/10.1111/j.1540-6261.2011.01711.x>.
- Firth, M., C. Lin, P. Liu, and Y. Xuan. 2013. The client is king: Do mutual fund relationships bias analyst recommendations? *Journal of Accounting Research* 51: 165–200. <https://doi.org/10.1111/j.1475-679X.2012.00469.x>.
- Flammer, C. 2015. Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach. *Management Science* 61: 2549–2568. <https://doi.org/10.1287/mnsc.2014.2038>.
- Fosfuri, A., and M. S. Giarratana. 2009. Masters of war: Rivals' product innovation and new advertising in mature product markets. *Management Science* 55: 181–191. <https://doi.org/10.1287/mnsc.1080.0939>.
- Fracassi, C., and G. Tate. 2012. External networking and internal firm governance. *Journal of Finance* 67: 153–194. <https://doi.org/10.1111/j.1540-6261.2011.01706.x>.
- Franco, F., C. D. Ittner, and O. Urcan. 2017. Determinants and trading performance of equity deferrals by corporate outside directors. *Management Science* 63: 114–138. <https://doi.org/10.1287/mnsc.2015.2332>.
- Fu, F., and S. Huang. 2016. The persistence of long-run abnormal returns following stock repurchases and offerings. *Management Science* 62: 964–984. <https://doi.org/10.1287/mnsc.2015.2150>.
- Fung, S. Y. K., F. A. Gul, and S. Radhakrishnan. 2014. Investment banks' entry into new IPO markets and IPO underpricing. *Management Science* 60: 1297–1316. <https://doi.org/10.1287/mnsc.2013.1817>.
- Gande, A., and A. Saunders. 2012. Are banks still special when there is a secondary market for loans? *Journal of Finance* 67(5): 1649–1684. <https://doi.org/10.1111/j.1540-6261.2012.01769.x>.
- Garfinkel, J. A. 2009. Measuring investors' opinion divergence. *Journal of Accounting Research* 47: 1317–1348. <https://doi.org/10.1111/j.1475-679X.2009.00344.x>.
- Giannetti, M., G. Liao, and X. Yu. 2015. The brain gain of corporate boards: Evidence from China. *Journal of Finance* 70: 1629–1682. <https://doi.org/10.1111/jofi.12198>.



- Gilje, E. P., and J. P. Taillard. 2016. Do private firms invest differently than public firms? Taking cues from the natural gas industry. *Journal of Finance* 71: 1733–1778. <https://doi.org/10.1111/jofi.12417>.
- Gillan, S. L., J. C. Hartzell, and R. Parrino. 2009. Explicit versus implicit contracts: Evidence from CEO employment agreements. *Journal of Finance* 64: 1629–1655. <https://doi.org/10.1111/j.1540-6261.2009.01475.x>.
- Goldman, E. M., and P. P. Huang. 2015. Contractual vs. actual separation pay following CEO turnover. *Management Science* 61: 1108–1120. <https://doi.org/10.1287/mnsc.2014.1988>.
- Golubov, A., D. Petmezas, and N. G. Travlos. 2012. When it pays to pay your investment banker: New evidence on the role of financial advisors in M&As. *Journal of Finance* 67: 271–311. <https://doi.org/10.1111/j.1540-6261.2011.01712.x>.
- Gorton, G., M. Kahl, and R. J. Rosen. 2009. Eat or be eaten: A theory of mergers and firm size. *Journal of Finance* 64: 1291–1344. <https://doi.org/10.1111/j.1540-6261.2009.01465.x>.
- Green, T. C., and B.-H. Hwang. 2012. Initial public offerings as lotteries: Skewness preference and first-day returns. *Management Science* 58: 432–444. <https://doi.org/10.1287/mnsc.1110.1431>.
- Gurun, U. G., R. Johnston, and S. Markov. 2016. Sell-side debt analysts and debt market efficiency. *Management Science* 62: 682–703. <https://doi.org/10.1287/mnsc.2014.2145>.
- Hail, L., A. Tahoun, and C. Wang. 2014. Dividend payouts and information shocks. *Journal of Accounting Research* 52: 403–456. <https://doi.org/10.1111/1475-679X.12040>.
- Halpern, P. 1983. Corporate acquisitions: A theory of special cases? A review of event studies applied to acquisitions. *Journal of Finance* 38: 297–317. <https://doi.org/10.2307/2327962>.
- Hartzmark, S. M., and K. Shue. 2018. A tough act to follow: Contrast effects in financial markets. *Journal of Finance* 73(4): 1567–1613. <https://doi.org/10.1111/jofi.12685>.
- Hendershott, T., and A. Madhavan. 2015. Click or call? Auction versus search in the over-the-counter market. *Journal of Finance* 70: 419–447. <https://doi.org/10.1111/jofi.12164>.
- Henry, T. R., and J. L. Koski. 2017. Ex-dividend profitability and institutional trading skill. *Journal of Finance* 72: 461–494. <https://doi.org/10.1111/jofi.12472>.
- Hilary, G., C. Hsu, and R. Wang. 2014. Management forecast consistency. *Journal of Accounting Research* 52: 163–191. <https://doi.org/10.1111/1475-679X.12033>.

- Hill, J., and T. Schneeweis. 1983. The effect of Three Mile Island on electric utility stock prices: A note. *Journal of Finance* 38: 1285–1292. <https://doi.org/10.1111/j.1540-6261.1983.tb02297.x>.
- Hirshleifer, D., S. S. Lim, and S. H. Teoh. 2009. Driven to distraction: Extraneous events and underreaction to earnings news. *Journal of Finance* 64: 2289–2325. <https://doi.org/10.1111/j.1540-6261.2009.01501.x>.
- Hobson, J. L., W. J. Mayew, and M. Venkatachalam. 2012. Analyzing speech to detect financial misreporting. *Journal of Accounting Research* 50: 349–392. <https://doi.org/10.1111/j.1475-679X.2011.00433.x>.
- Hsu, H.-C., A. V. Reed, and J. Rocholl. 2010. The new game in town: Competitive effects of IPOs. *Journal of Finance* 65: 495–528. <https://doi.org/10.1111/j.1540-6261.2009.01542.x>.
- Huang, A. H., R. Lehavy, A. Y. Zang, and R. Zheng. 2018. Analyst information discovery and interpretation roles: A topic modeling approach. *Management Science* 64: 2833–2855. <https://doi.org/10.1287/mnsc.2017.2751>.
- Huang, S., and G. Hilary. 2018. Zombie board: Board tenure and firm performance. *Journal of Accounting Research* 56: 1285–1329. <https://doi.org/10.1111/1475-679X.12209>.
- Hui, K. W., and P. E. Yeung. 2013. Underreaction to industry-wide earnings and the post-forecast revision drift. *Journal of Accounting Research* 51: 701–737. <https://doi.org/10.1111/1475-679X.12006>.
- Hutton, I., D. Jiang, and A. Kumar. 2015. Political values, culture, and corporate litigation. *Management Science* 61: 2905–2925. <https://doi.org/10.1287/mnsc.2014.2106>.
- Ibbotson, R. G. 1975. Price performance of common stock new issues. *Journal of Financial Economics* 2: 235–272. [https://doi.org/10.1016/0304-405X\(75\)90015-X](https://doi.org/10.1016/0304-405X(75)90015-X).
- Iliev, P. 2010. The effect of SOX Section 404: Costs, earnings quality, and stock prices. *Journal of Finance* 65: 1163–1196. <https://doi.org/10.1111/j.1540-6261.2010.01564.x>.
- Jagolinzer, A. D. 2009. SEC Rule 10b5-1 and insiders' strategic trade. *Management Science* 55: 224–239. <https://doi.org/10.1287/mnsc.1080.0928>.
- Jagolinzer, A. D., D. F. Larcker, and D. J. Taylor. 2011. Corporate governance and the information content of insider trades. *Journal of Accounting Research* 49: 1249–1274. <https://doi.org/10.1111/j.1475-679X.2011.00424.x>.
- Jame, R., R. Johnston, S. Markov, and M. C. Wolfe. 2016. The value of crowdsourced earnings forecasts. *Journal of Accounting Research* 54: 1077–1110. <https://doi.org/10.1111/1475-679X.12121>.

- Jenter, D., and K. Lewellen. 2015. CEO preferences and acquisitions. *Journal of Finance* 70: 2813–2852. <https://doi.org/10.1111/jofi.12283>.
- Jenter, D., K. Lewellen, and J. B. Warner. 2011. Security issue timing: What do managers know, and when do they know it? *Journal of Finance* 66: 413–443. <https://doi.org/10.1111/j.1540-6261.2010.01638.x>.
- Jiang, W., K. Li, and W. Wang. 2012. Hedge funds and Chapter 11. *Journal of Finance* 67: 513–560. <https://doi.org/10.1111/j.1540-6261.2012.01724.x>.
- Jiang, W., T. Li, and D. Mei. 2018. Influencing control: Jawboning in risk arbitrage. *Journal of Finance* 73: 2635–2675. <https://doi.org/10.1111/jofi.12721>.
- Jin, W., J. Livnat, and Y. Zhang. 2012. Option prices leading equity prices: Do option traders have an information advantage? *Journal of Accounting Research* 50: 401–432. <https://doi.org/10.1111/j.1475-679X.2012.00439.x>.
- Johnson, T. L., and E. C. So. 2018. Asymmetric trading costs prior to earnings announcements: Implications for price discovery and returns. *Journal of Accounting Research* 56: 217–263. <https://doi.org/10.1111/1475-679X.12189>.
- Jorion, P., and G. Zhang. 2009. Credit contagion from counterparty risk. *Journal of Finance* 64: 2053–2087. <https://doi.org/10.1111/j.1540-6261.2009.01494.x>.
- Kadyrzhanova, D., and M. Rhodes-Kropf. 2011. Concentrating on governance. *Journal of Finance* 66: 1649–1685. <https://doi.org/10.1111/j.1540-6261.2011.01684.x>.
- Kahl, M., A. Shivdasani, and Y. Wang. 2015. Short-term debt as bridge financing: Evidence from the commercial paper market. *Journal of Finance* 70: 211–255. <https://doi.org/10.1111/jofi.12216>.
- Kalaigannam, K., T. Kushwaha, J.-B. E. M. Steenkamp, and K. R. Tuli. 2013. The effect of CRM outsourcing on shareholder value: A contingency perspective. *Management Science* 59: 748–769. <https://doi.org/10.1287/mnsc.1120.1565>.
- Kane, A., Y. K. Lee, and A. Marcus. 1984. Earnings and dividend announcements: Is there a corroboration effect? *Journal of Finance* 39: 1091–1099. <https://doi.org/10.1111/j.1540-6261.1984.tb03894.x>.
- Kaniel, R., S. Liu, G. Saar, and S. Titman. 2012. Individual investor trading and return patterns around earnings announcements. *Journal of Finance* 67: 639–680. <https://doi.org/10.1111/j.1540-6261.2012.01727.x>.
- Karolyi, G. A., and A. G. Taboada. 2015. Regulatory arbitrage and cross-border bank acquisitions. *Journal of Finance* 70: 2395–2450. <https://doi.org/10.1111/jofi.12262>.
- Karolyi, S. A. 2018. Personal lending relationships. *Journal of Finance* 73: 5–49. <https://doi.org/10.1111/jofi.12589>.
- Karpoff, J. M., and X. Lou. 2010. Short sellers and financial misconduct. *Journal of Finance* 65: 1879–1913. <https://doi.org/10.1111/j.1540-6261.2010.01597.x>.

- Kaspereit, T. 2015. eventstudy2: Stata module to perform event studies with complex test statistics. Statistical Software Components S458086, Department of Economics, Boston College. <https://ideas.repec.org/c/boc/bocode/s458086.html>.
- Kecskés, A., R. Michaely, and K. L. Womack. 2017. Do earnings estimates add value to sell-side analysts' investment recommendations? *Management Science* 63: 1855–1871. <https://doi.org/10.1287/mnsc.2015.2385>.
- Keung, E., Z.-X. Lin, and M. Shih. 2010. Does the stock market see a zero or small positive earnings surprise as a red flag? *Journal of Accounting Research* 48: 105–136. <https://doi.org/10.1111/j.1475-679X.2009.00354.x>.
- Kim, Y., and M. Song. 2015. Management earnings forecasts and value of analyst forecast revisions. *Management Science* 61: 1663–1683. <https://doi.org/10.1287/mnsc.2014.1920>.
- Klein, A., and E. Zur. 2009. Entrepreneurial shareholder activism: Hedge funds and other private investors. *Journal of Finance* 64: 187–229. <https://doi.org/10.1111/j.1540-6261.2008.01432.x>.
- Knittel, C. R., and V. Stango. 2014. Celebrity endorsements, firm value, and reputation risk: Evidence from the Tiger Woods scandal. *Management Science* 60: 21–37. <https://doi.org/10.1287/mnsc.2013.1749>.
- Koester, A., R. Lundholm, and M. Soliman. 2016. Attracting attention in a limited attention world: Exploring the causes and consequences of extreme positive earnings surprises. *Management Science* 62: 2871–2896. <https://doi.org/10.1287/mnsc.2015.2286>.
- Kolari, J. W., and S. Pynnönen. 2010. Event study testing with cross-sectional correlation of abnormal returns. *Review of Financial Studies* 23: 3996–4025. <https://doi.org/10.1093/rfs/hhq072>.
- . 2011. Nonparametric rank tests for event studies. *Journal of Empirical Finance* 18: 953–971. <https://doi.org/10.1016/j.jempfin.2011.08.003>.
- Kolasinski, A. C., A. V. Reed, and M. C. Ringgenberg. 2013. A multiple lender approach to understanding supply and search in the equity lending market. *Journal of Finance* 68: 559–595. <https://doi.org/10.1111/jofi.12007>.
- Kothari, S., and J. Warner. 2007. The econometrics of event studies. In *Handbook of Corporate Finance: Empirical Corporate Finance*, ed. B. E. Eckbo. Vol. 1, chap. 1, 3–36. Amsterdam: Elsevier.
- Kothari, S. P., S. Shu, and P. D. Wysocki. 2009. Do managers withhold bad news? *Journal of Accounting Research* 47: 241–276. <https://doi.org/10.1111/j.1475-679X.2008.00318.x>.

- Krüger, P., A. Landier, and D. Thesmar. 2015. The WACC fallacy: The real effects of using a unique discount rate. *Journal of Finance* 70: 1253–1285. <https://doi.org/10.1111/jofi.12250>.
- Kumar, A. 2010. Self-selection and the forecasting abilities of female equity analysts. *Journal of Accounting Research* 48: 393–435. <https://doi.org/10.1111/j.1475-679X.2009.00362.x>.
- Kutsuna, K., J. K. Smith, and R. L. Smith. 2009. Public information, IPO price formation, and long-run returns: Japanese evidence. *Journal of Finance* 64: 505–546. <https://doi.org/10.1111/j.1540-6261.2008.01440.x>.
- Lamb, R. P. 1998. An examination of market efficiency around hurricanes. *Financial Review* 33: 163–172. <https://doi.org/10.1111/j.1540-6288.1998.tb01614.x>.
- Lee, L. F., A. P. Hutton, and S. Shu. 2015. The role of social media in the capital market: Evidence from consumer product recalls. *Journal of Accounting Research* 53: 367–404. <https://doi.org/10.1111/1475-679X.12074>.
- Lee, L. F., and A. K. Lo. 2016. Do opinions on financial misstatement firms affect analysts' reputation with investors? Evidence from reputational spillovers. *Journal of Accounting Research* 54(4): 1111–1148. <https://doi.org/10.1111/1475-679X.12119>.
- Lemmon, M., L. X. Liu, M. Q. Mao, and G. Nini. 2014. Securitization and capital structure in nonfinancial firms: An empirical investigation. *Journal of Finance* 69: 1787–1825. <https://dx.doi.org/10.2139/ssrn.1964647>.
- Leung, E., and D. Veenman. 2018. Non-GAAP earnings disclosure in loss firms. *Journal of Accounting Research* 56: 1083–1137. <https://doi.org/10.1111/1475-679X.12216>.
- Levi, M., K. Li, and F. Zhang. 2010. Deal or no deal: Hormones and the mergers and acquisitions game. *Management Science* 56(9): 1462–1483. <https://doi.org/10.1287/mnsc.1100.1206>.
- Levi, S., and X.-J. Zhang. 2015. Do temporary increases in information asymmetry affect the cost of equity? *Management Science* 61: 354–371. <https://doi.org/10.1287/mnsc.2013.1887>.
- Li, Y., and L. Zhang. 2015. Short selling pressure, stock price behavior, and management forecast precision: Evidence from a natural experiment. *Journal of Accounting Research* 53: 79–117. <https://doi.org/10.1111/1475-679X.12068>.
- Loh, R. K., and R. M. Stulz. 2018. Is sell-side research more valuable in bad times? *Journal of Finance* 73: 959–1013. <https://doi.org/10.1111/jofi.12611>.
- Loughran, T., and B. McDonald. 2011. When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks. *Journal of Finance* 66: 35–65. <https://doi.org/10.1111/j.1540-6261.2010.01625.x>.

- . 2014. Measuring readability in financial disclosures. *Journal of Finance* 69: 1643–1671. <https://doi.org/10.1111/jofi.12162>.
- Louis, H., and A. Sun. 2010. Investor inattention and the market reaction to merger announcements. *Management Science* 56: 1781–1793. <https://doi.org/10.1287/mnsc.1100.1212>.
- Louis, H., A. X. Sun, and O. Urcan. 2013. Do analysts sacrifice forecast accuracy for informativeness? *Management Science* 59: 1688–1708. <https://doi.org/10.1287/mnsc.1120.1675>.
- Loureiro, G., and A. G. Taboada. 2015. Do improvements in the information environment enhance insiders' ability to learn from outsiders? *Journal of Accounting Research* 53: 863–905. <https://doi.org/10.1111/1475-679X.12082>.
- Lui, D., S. Markov, and A. Tamayo. 2012. Equity analysts and the market's assessment of risk. *Journal of Accounting Research* 50: 1287–1317. <https://doi.org/10.1111/j.1475-679X.2012.00462.x>.
- Lyon, J. D., B. M. Barber, and C.-L. Tsai. 1999. Improved methods for tests of long-run abnormal stock returns. *Journal of Finance* 54: 165–201. <https://doi.org/10.1111/0022-1082.00101>.
- MacKinlay, A. C. 1997. Event studies in economics and finance. *Journal of Economic Literature* 35: 13–39.
- Madsen, J. 2017. Anticipated earnings announcements and the customer–supplier anomaly. *Journal of Accounting Research* 55: 709–741. <https://doi.org/10.1111/1475-679X.12158>.
- Manchiraju, H., and S. Rajgopal. 2017. Does corporate social responsibility (CSR) create shareholder value? Evidence from the Indian Companies Act 2013. *Journal of Accounting Research* 55: 1257–1300. <https://doi.org/10.1111/1475-679X.12174>.
- Manconi, A., M. Massa, and L. Zhang. 2018. The informational role of corporate hedging. *Management Science* 64: 3843–3867. <https://doi.org/10.1287/mnsc.2016.2717>.
- Martin, X., and R. Shalev. 2017. Target firm-specific information and acquisition efficiency. *Management Science* 63: 672–690. <https://doi.org/10.1287/mnsc.2015.2371>.
- Masulis, R. W., and S. Mobbs. 2011. Are all inside directors the same? Evidence from the external directorship market. *Journal of Finance* 66: 823–872. <https://doi.org/10.1111/j.1540-6261.2011.01653.x>.
- Masulis, R. W., C. Wang, and F. Xie. 2009. Agency problems at dual-class companies. *Journal of Finance* 64: 1697–1727. <https://doi.org/10.1111/j.1540-6261.2009.01477.x>.
- Mayew, W. J., and M. Venkatachalam. 2012. The power of voice: Managerial affective states and future firm performance. *Journal of Finance* 67: 1–43. <https://doi.org/10.1111/j.1540-6261.2011.01705.x>.

- Maynes, E., and J. Rumsey. 1993. Conducting event studies with thinly traded stocks. *Journal of Banking & Finance* 17: 145–157. [https://doi.org/10.1016/0378-4266\(93\)90085-R](https://doi.org/10.1016/0378-4266(93)90085-R).
- McNally, W. J., A. Shkilko, and B. F. Smith. 2017. Do brokers of insiders tip other clients? *Management Science* 63: 317–332. <https://doi.org/10.1287/mnsc.2015.2287>.
- Michels, J. 2017. Disclosure versus recognition: Inferences from subsequent events. *Journal of Accounting Research* 55: 3–34. <https://doi.org/10.1111/1475-679X.12128>.
- Milian, J. A. 2015. Unsophisticated arbitrageurs and market efficiency: Overreacting to a history of underreaction? *Journal of Accounting Research* 53: 175–220. <https://doi.org/10.1111/1475-679X.12070>.
- Nguyen, B. D., and K. M. Nielsen. 2014. What death can tell: Are executives paid for their contributions to firm value? *Management Science* 60: 2994–3010. <https://doi.org/10.1287/mnsc.2014.2011>.
- Oxley, J. E., R. C. Sampson, and B. S. Silverman. 2009. Arms race or détente? How interfirm alliance announcements change the stock market valuation of rivals. *Management Science* 55: 1321–1337. <https://doi.org/10.1287/mnsc.1090.1022>.
- Pacicco, F., L. Vena, and A. Venegoni. 2018. Event study estimations using Stata: The estudy command. *Stata Journal* 18: 461–476. <https://doi.org/10.1177/1536867X1801800211>.
- . 2019. estudy: Stata module to perform an event study. Statistical Software Components S458628, Department of Economics, Boston College. <https://ideas.repec.org/c/boc/bocode/s458628.html>.
- . 2021. From common to firm-specific event dates: A new version of the estudy command. *Stata Journal* 21: 141–151. <https://doi.org/10.1177/1536867X211000010>.
- Patell, J. M. 1976. Corporate forecasts of earnings per share and stock price behavior: Empirical test. *Journal of Accounting Research* 14: 246–276. <https://doi.org/10.2307/2490543>.
- Peress, J. 2010. Product market competition, insider trading, and stock market efficiency. *Journal of Finance* 65: 1–43. <https://doi.org/10.1111/j.1540-6261.2009.01522.x>.
- Qian, J., and J. L. Zhu. 2018. Return to invested capital and the performance of mergers and acquisitions. *Management Science* 64: 4818–4834. <https://doi.org/10.1287/mnsc.2017.2766>.
- Rajamani, A., M. van der Poel, A. de Jong, and S. Ongena. 2017. The international diversification of banks and the value of their cross-border M&A advice. *Management Science* 63: 2211–2232. <https://doi.org/10.1287/mnsc.2015.2396>.

- Ransbotham, S., and S. Mitra. 2010. Target age and the acquisition of innovation in high-technology industries. *Management Science* 56: 2076–2093. <https://doi.org/10.1287/mnsc.1100.1223>.
- Robinson, A. B., K. R. Tuli, and A. K. Kohli. 2015. Does brand licensing increase a licensor's shareholder value? *Management Science* 61: 1436–1455. <https://doi.org/10.1287/mnsc.2014.1980>.
- Ryngaert, M., and S. Thomas. 2012. Not all related party transactions (RPTs) are the same: Ex ante versus ex post RPTs. *Journal of Accounting Research* 50: 845–882. <https://doi.org/10.1111/j.1475-679X.2012.00437.x>.
- Savor, P., and M. Wilson. 2016. Earnings announcements and systematic risk. *Journal of Finance* 71: 83–138. <https://doi.org/10.1111/jofi.12361>.
- Savor, P. G., and Q. Lu. 2009. Do stock mergers create value for acquirers? *Journal of Finance* 64: 1061–1097. <https://doi.org/10.1111/j.1540-6261.2009.01459.x>.
- Serfling, M. 2016. Firing costs and capital structure decisions. *Journal of Finance* 71: 2239–2286. <https://doi.org/10.1111/jofi.12403>.
- Servaes, H., and A. Tamayo. 2014. How do industry peers respond to control threats? *Management Science* 60: 380–399. <https://doi.org/10.1287/mnsc.2013.1773>.
- Seybert, N., and H. I. Yang. 2012. The party's over: The role of earnings guidance in resolving sentiment-driven overvaluation. *Management Science* 58: 308–319. <https://doi.org/10.1287/mnsc.1110.1386>.
- Sheen, A. 2014. The real product market impact of mergers. *Journal of Finance* 69: 2651–2688. <https://doi.org/10.1111/jofi.12200>.
- Shenoy, J. 2012. An examination of the efficiency, foreclosure, and collusion rationales for vertical takeovers. *Management Science* 58: 1482–1501. <https://doi.org/10.1287/mnsc.1110.1498>.
- Shon, J., and S. Veliotis. 2013. Insiders' sales under rule 10b5-1 plans and meeting or beating earnings expectations. *Management Science* 59: 1988–2002. <https://doi.org/10.1287/mnsc.1120.1669>.
- Shroff, N., A. X. Sun, H. D. White, and W. Zhang. 2013. Voluntary disclosure and information asymmetry: Evidence from the 2005 securities offering reform. *Journal of Accounting Research* 51: 1299–1345. <https://doi.org/10.1111/1475-679X.12022>.
- Silvers, R. 2016. The valuation impact of SEC enforcement actions on nontarget foreign firms. *Journal of Accounting Research* 54: 187–234. <https://doi.org/10.1111/1475-679X.12098>.
- Solomon, D. H. 2012. Selective publicity and stock prices. *Journal of Finance* 67: 599–638. <https://doi.org/10.1111/j.1540-6261.2012.01726.x>.



- Spiegel, M., and H. Tookes. 2013. Dynamic competition, valuation, and merger activity. *Journal of Finance* 68: 125–172. <https://doi.org/10.1111/j.1540-6261.2012.01796.x>.
- Teoh, S. H., and T. J. Wong. 1993. Perceived auditor quality and the earnings response coefficient. *Accounting Review* 68: 346–366.
- Thirumalai, S., and K. K. Sinha. 2011. Product recalls in the medical device industry: An empirical exploration of the sources and financial consequences. *Management Science* 57: 376–392. <https://doi.org/10.1287/mnsc.1100.1267>.
- von Lilienfeld-Toal, U., and S. Ruenzi. 2014. CEO ownership, stock market performance, and managerial discretion. *Journal of Finance* 69: 1013–1050. <https://doi.org/10.1111/jofi.12139>.
- Vyas, D. 2011. The timeliness of accounting write-downs by U.S. financial institutions during the financial crisis of 2007–2008. *Journal of Accounting Research* 49: 823–860. <https://doi.org/10.1111/j.1475-679X.2011.00410.x>.
- Wang, C. 2014. Accounting standards harmonization and financial statement comparability: Evidence from transnational information transfer. *Journal of Accounting Research* 52: 955–992. <https://doi.org/10.1111/1475-679X.12055>.
- Wang, S., and M. Welker. 2011. Timing equity issuance in response to information asymmetry arising from IFRS adoption in Australia and Europe. *Journal of Accounting Research* 49: 257–307. <https://doi.org/10.1111/j.1475-679X.2010.00392.x>.
- Wilcoxon, F. 1945. Individual comparisons by ranking methods. *Biometrics Bulletin* 1: 80–83. <https://doi.org/10.2307/3001968>.
- Williams, J. 2013. Financial analysts and the false consensus effect. *Journal of Accounting Research* 51: 855–907. <https://doi.org/10.1111/1475-679X.12016>.
- Zhang, X., C. Li, and X. Xu. 2013. eventstudy: Stata module to perform event studies in finance. Statistical Software Components S457615, Department of Economics, Boston College. <https://econpapers.repec.org/software/bocbocode/s457615.htm>.
- Zhao, X. 2017. Does information intensity matter for stock returns? Evidence from Form 8-K filings. *Management Science* 63: 1382–1404. <https://doi.org/10.1287/mnsc.2015.2408>.

### About the author

Dr. habil. Thomas Kaspereit has been an associate professor of financial accounting at the University of Luxembourg since September 2016. He is the author of `eventstudy2`.

## A Appendix

Below are tables of event studies in three leading field journals published during the period 2009–2018.

Table 5. Studies using the event study method

Authors	Sample period	Datasources	Benchmark models	Test statistics	Events
Abarbanell and Park (2017)	1993–2012	CRSP	BH_MATCH	<i>t</i> stat	47,977
Abrahamson, Jenkinson, and Jones (2011)	1998–2007	CRSP	MA	None	2,788
Agarwal, Jiang, Tang, and Yang (2013)	2004–2007	CRSP	MM	Patell Z, GenSign	66
Agarwal, Chen, and Zhang (2016)	1998–2010	CRSP	MA	None	3,046
Agarwal, Saffi, and Sturgess (2015)	2007–2009	CRSP	RAW	None	3,053
Ahern and Harford (2014)	1986–2010	CRSP	MA	None	not reported
Akbas (2016)	1980–2011	CRSP	MA	None	366,454
Albuquerque and Schroth (2015)	1990–2010	CRSP	RAW	None	114
Allee and DeAngelis (2015)	2004–2014	CRSP	MA, FM	None	33,428
Ammann, Horsch, and Oesch (2016)	1992–2008	CRSP	MM	<i>t</i> stat	1,875
Anderson, Reeb, and Zhao (2012)	2005–2007	CRSP	PEA	<i>t</i> stat	1,571
Anderson et al. (2018)	1992–2014	CRSP	RAW	None	27,615
Arikan and Stulz (2016)	1975–2008	CRSP	MA	<i>t</i> stat, Wilcoxon	3,081
Ashbaugh-Skaife et al. (2009)	2003–2005	CRSP	BH_IND	Wilcoxon	787
Babenko (2009)	1996–2002	CRSP	MM	None	1,174
Badoer and James (2016)	2001–2001	CRSP	COMEAN	<i>t</i> stat	1
Becher et al. (2015)	1993–2008	Treasury	RAW, CAL	None, <i>t</i> stat	5,381
Berkman and Truong (2009)	2000–2004	CRSP, yahoo/Finance	BA	<i>t</i> stat	38,031
Berkman et al. (2014)	1999–2010	Compustat Global	MA	4,136	<i>t</i> stat
Bernhardt et al. (2016)	2003–2010	CRSP	BH_IND	<i>t</i> stat	24,793
Berton et al. (2014)	1980–2008	CRSP	MM	None	6,150
Bhadrakumar et al. (2009)	1988–2006	CRSP	MA, BH_MATCH, CAL	<i>t</i> stat, BS <i>t</i> stat	35,530
Blankspear et al. (2017)	2011–2013	CRSP	BH_MATCH	None	224
Bradley et al. (2017)	1983–2011	CRSP	MA	None	40,719
Brennan et al. (2016)	1993–2010	CRSP	MA	None	not reported
Brown and Tucker (2011)	1997–2006	CRSP	BH_MATCH	<i>t</i> stat	23,487
Bruno et al. (2016)	1999–2003	CRSP	MA	None	2,002
Bushee et al. (2010)	1993–2004	CRSP	BH_MATCH	<i>t</i> stat	27,987
Bushee et al. (2011)	1999–2007	CRSP	MA	<i>t</i> stat, Wilcoxon	95,105
Bushman et al. (2017)	2000–2012	CRSP	MA	None	41,760
Call et al. (2018)	1978–2012	CRSP	MA	None	658
Cao and Narayananmoorthy (2012)	1987–2008	CRSP	BH_IND	None	305,908
Cao et al. (2015)	2000–2010	CRSP	BH_IND, PEA	None	40,807
Cao et al. (2016)	1979–1995	CRSP	BH_MATCH	None	62,041
Chang et al. (2010)	1992–2002	CRSP	MM, FM, BH_IND, BH_MATCH	<i>t</i> stat, Wilcoxon	298
Chava et al. (2018)	1989–2007	CRSP	MM	None	1,677
Cheong and Thomas (2018)	1993–2013	CRSP	MA	None	197,004
Choudharia et al. (2017)	1999–2006	CRSP	MM	None	6,643
Christchary et al. (2009)	2004–2005	CRSP	MM	<i>t</i> stat	365
Christensen et al. (2009)	2004–2004	CRSP	MA	None	136
Cohen and Schmidt (2009)	1993–2003	CRSP	MA	None	266,520
Collin-Dufresne and Fos (2015)	2010–2010	CRSP	COMEAN	CDA	3,126
Crane and Koch (2018)	1994–2010	CRSP	BH_IND	<i>t</i> stat	3,126
Crawford et al. (2018)	1980–2012	CRSP	MA	None	26,766
Cready and Gamm (2010)	2008–2010	CRSP	MM, FM	<i>t</i> stat, CDA	3,751
Cready et al. (2014)	1973–2006	CRSP	RAW	<i>t</i> stat	8,312
Cunat et al. (2012)	2003–2010	CRSP	BA	None	11,683
Da et al. (2017)	1997–2007	CRSP	FM	<i>t</i> stat	2,377
De Bondt et al. (2018)	2004–2007	CRSP	BH_MATCH	None	185
De Franco et al. (2009)	1990–2014	CRSP, Datastream	MA	None	5,148
Deffuan et al. (2017)	2002–2005	TRACE/FSID	BH_MATCH	<i>t</i> stat	13,811
DeLavigna and Pollet (2009)	1990–2013	CRSP	BH_MATCH	None	193,109
	1984–2006	CRSP	BH_BETA	None	49,537

Continued on next page

Table 5 (continued)

Authors	Sample period	Datasources	Benchmark models	Test statistics	Events
Demerjian et al. (2012)	1992–2009	CRSP	RAW	<i>t</i> stat	2,229
Dimitrov and Jain (2011)	1996–2005	CRSP	BA	<i>t</i> stat	26,408
Doidge et al. (2010)	2002–2008	CRSP	MM	CDA, GenSign	137
Doidge and Dyck (2015)	2006–2006	Datstream	EP	<i>t</i> stat	149
Donelson and Hopkins (2016)	1996–2007	CRSP	MA	None	175,129
Doskeland and Hvide (2011)	1994–2005	OSE	BH_MATCH, CAL	BS returns	116
Doyle and Maglikle (2013)	2004–2007	CRSP	BH_MATCH	None	1,172
Drake et al. (2012)	2005–2008	CRSP	BH_MATCH	<i>t</i> stat	4,139
Durnev and Mangen (2009)	1997–2002	CRSP	MA	Patell Z, GenSign	67,443
Dyck et al. (2010)	1996–2004	CRSP	EP	<i>t</i> stat	216
Dyck et al. (2016)	2011–2011	Compustat Global	BH_IND	BS <i>t</i> stat	1,520
Edmans et al. (2012)	1980–2007	CRSP	BA	None	6,555
Engelberg et al. (2012)	2005–2009	CRSP	MA, FM, BH_MATCH	<i>t</i> stat, Wilcoxon	826
Ertimur et al. (2013)	2010–2011	CRSP	MM	None	1,771
Falato et al. (2015)	1993–2005	CRSP	BH_IND	<i>t</i> stat	<3,000
Fang et al. (2016)	2005–2007	CRSP	MA	None	5,702
Fang et al. (2017)	1997–2006	CRSP	FM	KP	946
Fernando et al. (2012)	2008–2008	CRSP	MA, MM, BH_MATCH	<i>t</i> stat	29,505
Firth et al. (2013)	2004–2008	CRSP	MM, FM	None	1,845
Fiammer (2015)	1997–2012	CRSP	EP	<i>t</i> stat	115
Fofuri and Giarratana (2009)	1999–2003	yahoo!Finance	MM	MM	3,863
Fracassi and Tate (2012)	2000–2007	CRSP	BH_IND, BH_MATCH	<i>t</i> stat	28,536
Francia et al. (2017)	1999–2009	CRSP	BH_MATCH, CAL	<i>t</i> stat	14,309
Fu and Huang (2016)	1984–2012	CRSP	IRATS		
Fung et al. (2014)	1993–2007	CSMAR	RAW	None	321
Gaude and Saunders (2012)	1999–2009	CRSP	MA	Patell Z	323
Garfinkel (2009)	2002–2002	CRSP	MM	None	13,017
Giannetti et al. (2015)	1999–2009	CSMAR	MA	None	185
Gilje and Taillard (2016)	2003–2010	CRSP	MM	Patell Z	167
Gillan et al. (2009)	2000–2000	CRSP	BH_IND	None	494
Goldman and Huang (2015)	1993–2007	CRSP	MA	<i>t</i> stat	287
Golubov et al. (2012)	1996–2009	CRSP	MM	None	3,995
Gorton et al. (2009)	1985–1999	CRSP	MA	None	1,334
Green and Hwang (2012)	1975–2008	CRSP	BH_MATCH	None	7,975
Gurun et al. (2016)	2002–2004	CRSP	RAW	<i>t</i> stat	1,100
Hail et al. (2014)	1993–2008	Datstream	MA	None	222,766
Hartzmark and Shue (2018)	1984–2013	CRSP	BH_MATCH	None	75,897
Hendershott and Madhavan (2015)	2010–2011	CRSP	RAW	None	11,122
Henry and Koski (2017)	1999–2007	CRSP	MM	<i>t</i> stat	24,741
Hilary et al. (2014)	2002–2010	CRSP	MA, BH_MATCH	None	6,813
Hirshleifer et al. (2009)	1995–2004	CRSP	BH_MATCH	None	112,839
Hobson et al. (2012)	2007–2007	CRSP	MA	None	111
Hsu et al. (2010)	1980–2001	CRSP	MM	Patell Z	4,188
Huang et al. (2018)	2003–2012	CRSP	MA	None	17,733
Huang and Hilary (2018)	1998–2010	CRSP	BH_MATCH	Wilcoxon	78
Hui and Yeung (2013)	2004–2008	CRSP	MM, FM	<i>t</i> stat	25,195
Hutton et al. (2015)	1993–2007	CRSP	FM	<i>t</i> stat	34,318
Iliev (2010)	2002–2005	CRSP	MA, BH_IND	<i>t</i> stat	10
Jagolinzer (2009)	2000–2005	CRSP	PEA	<i>t</i> stat	30,924
Jagolinzer et al. (2011)	2006–2007	CRSP	BH_MATCH	None	260
Jame et al. (2016)	2012–2013	CRSP	RAW, MA, BA	<i>t</i> stat	3,429
Jenter et al. (2011)	1991–2004	CRSP	MA	<i>t</i> stat	651
Jenter and Lewellen (2015)	1989–2007	CRSP, Datastream, Bloomberg	MA	None	2,801
Jiang et al. (2012)	1996–2007	CRSP	FM	None	277
Jiang et al. (2018)	2000–2015	CRSP	FM	<i>t</i> stat, Wilcoxon	255

Continued on next page

Table 5 (continued)

Authors	Sample period	Datasources	Benchmark models	Test statistics	Events
Jin et al. (2012)	1996–2010	CRSP	BH_MATCH	None	71,482
Johnson and So (2018)	1993–2012	CRSP	MM	<i>t</i> stat	12,472
Jorion and Zhang (2009)	1999–2005	CRSP	MM	CDA	251
Kadyrzhanova and Rhodes-Kropf (2011)	1990–2006	CRSP	MM	None	872
Kahl et al. (2015)	1991–2008	CRSP	MM	<i>t</i> stat, GenSign	3,325
Kalaignanam et al. (2013)	1996–2006	CRSP	FM	BMP	158
Kaniel et al. (2012)	2000–2003	CRSP	MM	<i>t</i> stat	17,564
Karolyi and Taboada (2015)	1995–2012	CRSP	MM	<i>t</i> stat	3,307
Karolyi (2018)	1994–2012	CRSP	MM, MA	None	9,458
Karpoff and Lou (2010)	1988–2005	CRSP	MM, MA	<i>t</i> stat	454
Kecskés et al. (2017)	1994–2010	CRSP	BH_MATCH	<i>t</i> stat	65,523
Keung et al. (2010)	1992–2006	CRSP	EP	None	139,885
Kim and Song (2015)	1996–2009	CRSP	EP	<i>t</i> stat	3,841,786
Klein and Zur (2009)	1995–2005	CRSP	BH_MATCH	<i>t</i> stat, Wilcoxon	139
Knittel and Stango (2014)	2009–2009	CRSP	EP	GenSign, Wilcoxon	1
Koester et al. (2016)	1998–2007	CRSP	BH_IND	None	44,525
Kolinski et al. (2013)	2003–2007	CRSP	BH_IND	None	586,435
Kothari et al. (2009)	1962–2004	CRSP	MA	None	5,803
Krüger et al. (2015)	1992–2007	CRSP	MA	None	6,366
Kumar (2010)	1983–2005	CRSP	MA	None	1,953,481
Kutsuna et al. (2009)	1997–2003	JASDAQ	BH_IND	None	487
Lee et al. (2015)	2000–2012	CRSP	MA	<i>t</i> stat	405
Lee and Lo (2016)	1994–2008	CRSP	MA	None	112,564
Lemmon et al. (2014)	1996–2009	CRSP	MM	CDA	231
Leung and Veenman (2018)	2006–2014	CRSP	BH_MATCH	None	6,417
Levi et al. (2010)	1997–2007	CRSP	MM, MM	None	357
Levi and Zhang (2015)	1993–2009	CRSP	EP	<i>t</i> stat	109,547
Li and Zhang (2015)	2004–2005	CRSP	MA	None	1,622
Loh and Stulz (2018)	1990–2014	CRSP	BA	None	71,070
Loughran and McDonald (2011)	1994–2008	CRSP	BH_IND	None	50,115
Loughran and McDonald (2014)	1994–2011	CRSP	BH_IND	None	28,434
Louis and Sun (2010)	1994–2006	CRSP	MA, BH_MATCH	<i>t</i> stat	1,923
Louis et al. (2013)	1995–2006	CRSP	MA	None	4,492
Loureiro and Taboada (2015)	1990–2012	Datstream	MM	None	9,844
Lui et al. (2012)	2000–2006	CRSP	MA	<i>t</i> stat, Wilcoxon	12,394
Madsen (2017)	1990–2014	CRSP	MA	None	33,740
Manchiraju and Rajgopal (2017)	2009–2013	CMIE	MM	Wilcoxon	556
Manconi et al. (2018)	2002–2009	CRSP	BH_MATCH	None	71,623
Martin and Shalev (2017)	1980–2012	CRSP	MM	None	2,138
Masulis et al. (2009)	1994–2002	CRSP	MM	None	410
Masulis and Mobbs (2011)	2007–2006	CRSP	MM	<i>t</i> stat, Wilcoxon	118
Mayew and Venkataram (2012)	2007–2007	TSX	BA	None	1,647
McNally et al. (2017)	2004–2006	CRSP	BH_MATCH	<i>t</i> stat	3,761
Michels (2017)	1994–2012	CRSP	BH_IND	<i>t</i> stat	78
Milian (2015)	1996–2010	CRSP	MA	None	76,462
Nguyen and Nielsen (2014)	1991–2008	CRSP	MM, FM	Patell Z, Wilcoxon	149
Oxley et al. (2009)	1994–2004	CRSP, Datastream	MM, MM	<i>t</i> stat	8,918
Peress (2010)	1996–2005	CRSP	FM	None	28,172
Qian and Zhu (2018)	1980–2013	CRSP	CAPM	None	3,533
Rajamani et al. (2017)	1990–2005	Datstream	MM	Patell Z	571
Ransbotham and Mitra (2010)	1995–2001	CRSP	MA, MM, FM	Patell Z, GenSign	140
Robinson et al. (2015)	1996–2006	CRSP	FM	CDA, Corrado,	171
			BS returns	GenSign	421
Ryngaert and Thomas (2012)	1996–2006	CRSP	MM	None	1,050
Savor and Lu (2009)	1978–2003	CRSP	BH_MATCH	None	626,567
Savor and Wilson (2016)	1974–2012	CRSP	MA	None	

Continued on next page

Table 5 (continued)

Authors	Sample period	Datasources	Benchmark models	Test statistics	Events
Serfling (2016)	1977–1998	CRSP	MM, FM	$t$ stat	12
Servaes and Tamayo (2014)	1983–2005	CRSP	MA	$t$ stat, GenSign	2,450
Seybert and Yang (2012)	1996–2006	CRSP	MA, MA	None	31,360
Shen (2014)	1980–2009	CRSP	MA	$t$ stat	38
Shenoy (2012)	1981–2004	CRSP	MM	Patell Z, GenSign	114
Shon and Veliotis (2013)	2003–2010	CRSP	MA	None	16,214
Shroff et al. (2013)	2003–2008	CRSP	MA	None	1,484
Silvers (2016)	1995–2010	Datastream	FM	$t$ stat	28
Solomon (2012)	2002–2007	CRSP	BH-MATCH	None	340,928
Spiegel and Tookes (2013)	1990–2009	CRSP	MA, MM	None	183
Thirumalai and Sinha (2011)	2002–2005	CRSP	MM, COMEAN, MM	$t$ stat, Patell Z, Wilcoxon, BS $t$ stat	223
von Lilienfeld-Toal and Ruenzi (2014)	1988–2010	CRSP	MA, MM	$t$ stat	not reported
Vyas (2011)	2007–2008	CRSP	BH-IND	None	406
Wang and Welker (2011)	2002–2009	Datastream	MM, BH-IND	None	1,431
Wang (2014)	2001–2008	Datastream	FM	None	34,357
Williams (2013)	1985–2011	CRSP	BH-MATCH	None	202,326
Zhao (2017)	1994–2009	CRSP	unknown	None	>480,000

mark models are raw returns (RAW), the COMEAN (MacKinlay 1997, 17), the market-adjusted return model (MA), returns adjusted against a benchmark that is not the market index (BA), the market model (MM) (MacKinlay 1997, 18), a multiple-factor model (FM) (for example, Peress [2010], Fn. 27), buy-and-hold abnormal returns against a single market index (BH-IND) (for example, Ashbaugh-Skafe et al. [2009], 32), buy-and-hold abnormal returns against an individual benchmark (BH-MATCH), for example, Lyon, Barber, and Tsai [1999], 167–173, the calendar portfolio approach (CAL) (for example, Lyon, Barber, and Tsai [1999], 167–173), the capital asset pricing model (CAPM) (MacKinlay 1997, 19), the returns across time and securities model (IRATS) (Ibbotson 1975), the event parameter approach (EP), the capital asset pricing model (CAPM) (MacKinlay 1997, 19), the beta-adjusted buy-and-hold abnormal returns (BH-BETA) (Dellavigna and Pollet 2009, 721), and “unknown”, which means that the author or authors do not report which benchmark model they use. Test statistics are simple cross-sectional or time-series  $t$  tests of whether abnormal returns are different from zero ( $t$  stat), the crude dependence adjustment (CDA) (Brown and Warner 1980, 223, 253), the Patell Z test (Patell 1976, 254–258), the Boehmer, Musumeci, and Poulsen (BMP) (1991, 258–270) test of standardized residuals corrected for event-induced changes in volatility, the Kolari and Fynnönen (KP) (2010, 4003) test of standardized residuals corrected for event-induced changes in volatility and cross-correlation, the Corrado (1989, 387–388) rank test or the Corrado and Zivney (1992, 345–346) rank test corrected for event-induced volatility of rankings (Corrado), the generalized sign test according to Cowan (1992, 345–346), the Wilcoxon (1945) signed-ranks test, and bootstrapped versions of the  $t$  test (for example, Lyon, Barber, and Tsai [1999], 173–175). BS: bootstrap; FSD: Fixed Income Securities Database; JASDAQ: Japan Association of Securities Dealers Automated Quotation; OSE: Oslo Stock Exchange; TRACE: Trade Reporting and Compliance Engine; TSX: Toronto Stock Exchange.