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Forensic Finance

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During popular prime-time television shows, forensic investigators use specialized but wide-ranging scientific knowledge of chemical trace evidence, bacteria, DNA, teeth, insects, and other specialties to collect and sift evidence of possible crimes. In economics and finance, forensic investigators apply their own specialized knowledge of prices, quantities, timing, and market institutions—and sometimes discover or substantiate evidence that is used by regulatory or criminal enforcement agencies.

One early episode in forensic finance was discussed in this journal in 1995. In their article, William Christie and Paul Schultz describe how they began a research project to look at intraday patterns in spreads between bid and ask prices on the Nasdaq market. At this time, bids and asks were quoted in increments of one-eighth of a dollar. However, they noticed that in their data, stocks were quoted almost exclusively in even-eighths. As they write: "In other words, quotes rarely used any of the one-eighth, three-eighths, five-eighths, or seven-eighths price fractions. We checked whether we had made any errors in downloading the data, but found none. We checked our programs, and found no code that could have produced such a bizarre result. We turned to an alternative data source . . . the results were identical. We were stunned. It seemed inconceivable that almost 60 market makers simply forgot to use one-half of the possible price fractions for a period of almost two months." They wrote that that this pattern offered strong circumstantial evidence of collusion between brokerage firms making markets in Nasdaq stocks. Their research led to regulatory investigations by the Securities and Exchange Commission and class action lawsuits that were settled for over $1 billion. More-

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over, the practice of quoting in even-eighths ended quite abruptly as soon as their results were publicized.

Of course, not all subjects in forensic finance arise out of what Christie and Schultz (1995) called "serendipity in the social sciences." In some cases, academics have been the first to identify a practice. In other cases, regulators or financial journalists have identified isolated situations, and an academic study has been a catalyst for raising the level of attention. In general, practitioners, journalists, and regulators often have better knowledge of anecdotal evidence, whereas academics can provide large-sample evidence of patterns.

In this article, I will discuss four recent topics in forensic finance, all of which have attracted media attention: 1) the late trading of mutual funds, 2) stock option backdating, 3) the allocation of underpriced initial public offerings to corporate executives, and 4) changes in the records of stock analyst recommendations. In most of these cases, once certain practices or patterns have been publicized, financial industry practice has changed. As Louis Brandeis (1914) wrote in *Other People's Money—And How the Bankers Use It*, a collection of essays that could be considered an early work of forensic finance, "Sunlight is said to be the best of disinfectants."

Although I will focus on these four financial examples, academic economists have used large-sample evidence to produce a statistical smoking gun in other contexts. Steven Levitt's articles on the facilitation of cheating on standardized tests by schoolteachers (Jacob and Levitt, 2003) and in Sumo wrestling matches (Duggan and Levitt, 2002) immediately come to mind.

Late Trading of Mutual Funds

U.S. government rules require mutual funds to allow investors to trade based on the market price of the stocks held in the fund's portfolio, with the value of the portfolio referred to as the net asset value.[1] The vast majority of U.S.-based mutual funds calculate net asset value once per day, when stock exchanges close at 4 p.m. Eastern time. All mutual fund buy or sell orders received during the trading day are consequently executed using a price for a share in the mutual fund based on the closing net asset value on that day. Orders received after 4 p.m. should be priced at the closing net asset value on the following trading day.

The net asset value for a mutual fund is generally based on the most recent

[1] The discussion here is about open-end mutual funds, which differ from closed-end funds. A closed-end fund issues shares, which are then traded on an organized exchange. The closed-end fund invests the proceeds of the offering in stocks, bonds, or other assets. Investors who buy the closed-end fund shares can resell the shares at whatever the market price happens to be, but there is no direct linkage between the market price and the market value of the underlying assets. An open-end mutual fund, on the other hand, permits an investor to sell the shares at the net asset value (minus any fee for the transaction), with the mutual fund then selling underlying assets if investors in the aggregate are net sellers. Closed-end funds are not mutual funds.

transaction prices. These prices might not reflect current valuations for two reasons: illiquidity and time zones. First, some assets are only infrequently traded. For example, a mutual fund that owns small company stocks, with some of the stocks trading only several times per day, may have a net asset value at 4 p.m. that does not fully reflect movements in the broader market that occurred late in the trading day. Second, a mutual fund that invests in international stocks traded in different time zones will have closing prices that occur at different times during the day. For example, the London Stock Exchange is open from 8 a.m. until 4:30 p.m. London time, which is 3 a.m. to 11:30 a.m. Eastern time in New York. Thus, a sharp upward market movement that occurs after 11:30 a.m. in New York isn't reflected in London Stock Exchange prices until the next day. Prices that don't fully reflect current information are known as "stale prices." Buying and selling mutual funds that hold international stocks, to take advantage of differences in the time that markets close for the day, is commonly known as "market timing," although a more accurate name might be "stale-price risk arbitrage."

Being able to trade at a stale price presents a profitable trading opportunity. If the stale price is low relative to what would be implied, you can buy mutual fund shares before the price predictably rises; if the stale price is high, you can sell mutual fund shares before the price predictably falls. Over time, this strategy allows an investor to expand its share of ownership in the mutual fund and thus dilutes the value of the positions held by other investors, resulting in a wealth transfer. A number of academic papers have documented the opportunities that exist for an investor to boost returns by diluting other shareholders in international mutual funds, including Bhargava, Bose, and Dubofsky (1998), Chalmers, Edelen, and Kadlec (2001), and Goetzmann, Ivkovic, and Rouwenhorst (2001). To minimize such wealth transfers, some mutual funds impose either fees or other restrictions on investors who trade frequently. TIAA-CREF, for example, in October 2007 adopted a policy in which accountholders who sell and then buy back into the same mutual fund within a 60-calendar day period are not permitted to transact in that fund for the next 90 calendar days.

Many mutual funds that invest in domestic stocks accept orders received from financial intermediaries, such as brokerage firms, that aggregate the trades of individuals and then submit the aggregated order after 4 p.m. In 2003, a "late trading" scandal arose involving mutual funds that permitted certain hedge funds to trade after 4 p.m. at the 4 p.m. closing prices—while at the same time telling investors that such late trading was not permitted. Many companies wait until shortly after U.S. stock exchanges close at 4 p.m. to make major announcements. These announcements frequently move the aggregate market, as revealed in the market price of Standard and Poor's 500 futures contracts that are traded after the market closes. Trading in stocks or mutual funds after these announcements at prices that existed before the announcements can be quite profitable because it takes advantage of a stale price.

Although both market timing and late trading involve taking advantage of stale

prices, late trading involves submitting trades after a deadline for such trades has passed, whereas market timing does not.

The ability to dilute long-term mutual fund shareholders via market timing activities had been known for years. Eric Zitzewitz (2003) pointed out that many mutual fund boards, in spite of their fiduciary responsibility to act in the interests of shareholders, had done little or nothing to prevent market timing activities. Furthermore, Zitzewitz presented empirical evidence that mutual funds that charged higher fees to investors and that had more insiders on the board were least likely to prevent market timing. It had never occurred to Zitzewitz, however, that mutual funds might knowingly be permitting hedge funds to engage in late trading.

When then–New York State Attorney General Eliot Spitzer announced on September 3, 2003, that a hedge fund, Canary Capital Partners LLC, and related entities had agreed to pay $40 million in fines and restitution for engaging in late trading, Zitzewitz was set up to conduct immediate empirical tests to investigate the extent of late trading. He reasoned that since returns on stock index futures after 4 p.m. would be unknowable before 4 p.m., there should be no correlation between the daily flows of money into a fund and post–4 p.m. stock index futures returns, unless late trading was occurring. Within several hours of Spitzer's announcement, Zitzewitz had calculated the correlations between the daily flows into various mutual funds and post–4 p.m. stock index futures returns. Within the week, he had conducted robustness checks and written up his results, examining alternative explanations for the patterns, and e-mailed his findings to other academics who had written papers on market timing. By September 11, barely a week later, the financial press had become aware of his findings.

In a working paper, subsequently revised with an abbreviated version published in the 2006 *American Economic Review Papers and Proceedings*, Zitzewitz found that late trading in U.S. mutual funds was often done in combination with market timing, since both strategies rely for their profitability on frequent trading using net asset values based on stale prices. He was able to estimate the magnitude of late trading, concluding that there was evidence of late trading in about 60 percent of mutual fund families, whereas only 10 percent of fund families admitted to being aware of it. (Many mutual funds were unaware of late trading because the hedge funds doing it were executing their trades through intermediaries that aggregated the trades of individual investors. Mutual funds usually delegated the enforcement of the 4 p.m. deadline to brokers and other third parties.) His estimates imply that during 1998–2003, late trading imposed average costs on long-term shareholders of 3.8 basis points per year in international mutual funds and 0.9 basis points per year in domestic equity funds, amounts that imply annual wealth transfers of about $400 million. Using the same methodology, he found no evidence of late trading after September 2003, when Spitzer's legal case and his own research had been publicized by the financial press.

Why did some mutual fund families knowingly allow late trading, even though this would harm the returns earned by their long-term shareholders and, due to lower returns, reduce money that would otherwise flow into the funds? Regulatory

investigations have revealed that many mutual fund firms received a quid pro quo, usually from hedge funds, in exchange for the right to conduct market timing and/or late trading. In some cases, a hedge fund agreed to place money in a mutual fund that had high fees in return for being permitted to engage in late trading in other large mutual funds run by the same fund family. The logic for the mutual fund firm was that the fees earned from the investment in the high-fee fund would more than offset the reduced fees that other investors paid because a tiny drop in net returns would have little impact on the fund inflows and outflows from other investors. In other cases, high-ranking employees of the mutual fund organization allegedly engaged in the practices themselves.

While it lasted, this tradeoff may have worked to the benefit of the mutual fund firms that permitted late trading. For the mutual fund families that were caught knowingly engaging in this activity, however, the penalties were severe. During 2003–2007, according to numbers compiled in Zitzewitz (2007), 20 mutual fund families paid $1.45 billion in restitution to shareholders, and $0.99 billion in penalties. Furthermore, these mutual funds suffered additional large indirect penalties due to a loss in fees after clients withdrew money.

Because of his role in identifying the magnitude of late trading, Eric Zitzewitz testified before Congress on two occasions: in 2003 shortly after the scandal was unearthed by state regulators and in 2005 when there were hearings regarding the settlements that had been negotiated with the mutual fund families by regulators from state governments and the U.S. Securities and Exchange Commission. His 2007 paper concludes that the settlements involving New York State (when Eliot Spitzer was Attorney General) involved much more severe penalties and restitution than when New York State was not involved. Zitzewitz and others suggest that the difference in outcomes was because the Security and Exchange Commission's Division of Investment Management had been "captured" by the industry that it oversees, the mutual fund industry.

After the late trading scandal came to light in September 2003, many of the large mutual fund families that knowingly permitted the late trading were forced to hire independent consultants, approved by the Securities and Exchange Commission, to estimate damages and oversee reforms. A number of finance professors were hired for the role.

Employee Stock Option Backdating

On January 19, 2000, when computer manufacturer Apple's stock closed at $106.56 per share, Apple announced that one week previously it had granted options to buy 10 million shares to CEO Steve Jobs with an exercise price of the January 12 closing market price of $87.19. The January 12th close was the lowest closing price of the two months prior to January 19. Seven years later, Apple admitted that the dates of many options grants had been chosen retroactively, and that documents purporting to show that the board of directors had approved the

grants on the dates chosen had in some cases been fabricated. Wealth transfers from option backdating can be large. For the January 2000 grant alone, if there was a 70 percent chance that the options would eventually be exercised, the difference between the January 12th and 19th dates for the exercise price was worth almost $140 million to Jobs due to the difference between the $87.19 and $106.56 exercise prices.

In the 1990s, stock options became a larger and larger fraction of total compensation for the top managers of publicly traded U.S. corporations and, especially in technology industries, for other employees as well. Employee stock options give the recipient the right to purchase stock at a fixed price, known as the exercise price, with the firm issuing these shares if the options are exercised. If the stock price later rises to above the exercise price, the employee can exercise the options and receive shares that are worth the current market price. The issuance of additional shares, however, dilutes the ownership interests of the existing stockholders. To take an extreme example, if a company with nine million shares outstanding grants employees the right to buy one million shares at a price of zero, when the employees exercise these options the existing shareholders will be left owning 90 percent of the firm rather than 100 percent of the firm, lowering the value per share by 10 percent.

Until 2006, the financial accounting for stock options did not treat this compensation cost as an expense that affected reported company income, either at the time of granting the options or at their exercise. However, one requirement for there to be no immediate expensing was that the market price of the stock on the date that the option was granted could not be higher than the exercise price. Thus, for the majority of stock options, the exercise price is the closing market price on the day of (or the day before) the grant date.

In a 1997 article, David Yermack had shown that stock option grants to Fortune 500 chief executive officers during 1992–1994 occurred disproportionately before positive abnormal stock returns, with the average abnormal return being a little over 1 percent in the month after the grant date. Yermack attributed this result to a tendency to grant options immediately before the announcement of good news, a practice subsequently termed "spring loading."

In a 2005 article, Erik Lie documented that this post-grant pattern had grown stronger over time, with average abnormal returns of more than 3 percent in the month after the grant date during 1999–2002 for companies in the Standard and Poor's 1500. Furthermore, he showed that this post-grant increase in stock price was mirrored by an almost identical decrease in the month before the grant. Although this pre-grant drop could in principle be attributed to the announcement of bad news immediately before the grant date, Lie suggested that there was another explanation. His curiosity had been piqued by a pattern he noticed: executives seemed to have the ability to predict the return on the aggregate stock market in the week after the grant date. This pattern is not consistent with Yermack's (1997) hypothesis that firms wait to announce positive company-specific good news until after the grant date. Lie hypothesized that, instead, the patterns

were partly due to some firms choosing a grant date *after* having observed on what date during a month the stock was at its lowest price. The purpose of this backdating is to pick a past date when the stock price was particularly low, resulting in a lower exercise price and thus a more valuable option.

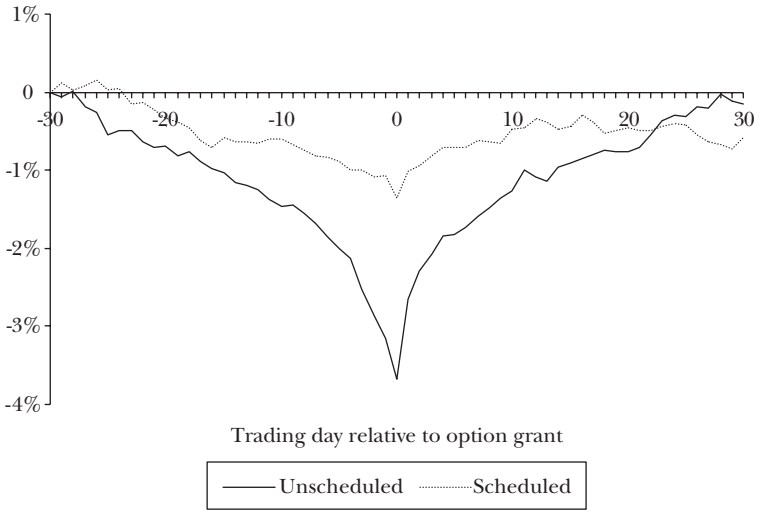
A company's management might wish to grant options at a lower-than-current-market exercise price for three reasons: 1) if managers are receiving some of these cheap options, they receive an increased value directly if and when the options are exercised; 2) if employees expect to receive cheap options, they should be willing to accept lower direct wages, which lowers reported employee compensation expense and boosts reported profits; and 3) when backdated options are exercised, the realized value of the options is deductible from taxable income, lowering the company's tax bill and conserving corporate cash. Offsetting this last effect, however, is the fact that the company receives less cash from a lower exercise price. Backdating is not illegal in itself; if the backdating is acknowledged when it occurs, it can be legal. But backdating does require specific accounting and tax treatment, which includes treating the cheap backdated options as an expense. Moreover, if a company is following a procedure for granting employee stock options at lower exercise prices than public market shareholders believe to be the case, the company might be construed as engaging in securities fraud.

Lie's 2005 article, and his subsequent work with Randall Heron (Heron and Lie, 2007, 2008), as well as simultaneous work by M. P. Narayanan and Nejat Seyhun (forthcoming), provided a plethora of evidence suggesting that many executive stock options were systematically backdated. For example, a minority of companies have policies of granting stock options on the same date every year, referred to as scheduled grants. Other grants occur on less predictable dates, allowing for more opportunistic behavior. Lie's 2005 article showed that the abnormal return patterns were stronger for unscheduled grants than for scheduled grants, as shown in Figure 1.

Another piece of circumstantial evidence is that the pattern of abnormal returns became muted after a regulatory change that was part of the 2002 Sarbanes–Oxley Act. Although it didn't attract a lot of attention at the time, one of the details of Sarbanes–Oxley was that top executives in publicly traded companies had to report insider trades, including the receipt of stock option grants, within two business days of the transaction, rather than the previously required deadline of the tenth day of the following calendar month (or, in some cases, even later). This change allowed Heron and Lie (2007) to examine whether the tendency to grant options on dates with a low stock price was predominately due to backdating or to gaming the release of company news. They show a dramatic change in the price patterns before and after August 29, 2002, when the reporting lag changed due to Sarbanes–Oxley. This change is illustrated in Figure 2.

Even after Sarbanes–Oxley mandated that firms report stock option grants to top executives within two days of being granted, not all firms complied with the law. This fact allowed both Heron and Lie (2007) and Narayanan and Seyhun (forthcoming) to examine the abnormal stock return patterns for firms that reported

Figure 1
Cumulative Abnormal Stock Returns around Stock Option Grants



Source: Lie (2005, figure 1).
Note: The figure above displays the cumulative abnormal stock returns from 30 trading days before through trading 30 days after stock option grants to chief executive officers for 5,977 grants during 1992–2002. The cumulative abnormal return for event date t is calculated as the sum of the daily abnormal returns from date $t - 30$ to date t. Abnormal stock returns are estimated using the three-factor model described in Fama and French (1993), where the estimation period is the year ending 50 trading days before the award date. An award is classified as scheduled if it occurred within one week of the one-year anniversary of the prior year's award date and unscheduled if it did not occur within one week of this anniversary or if no options were awarded during the prior year.

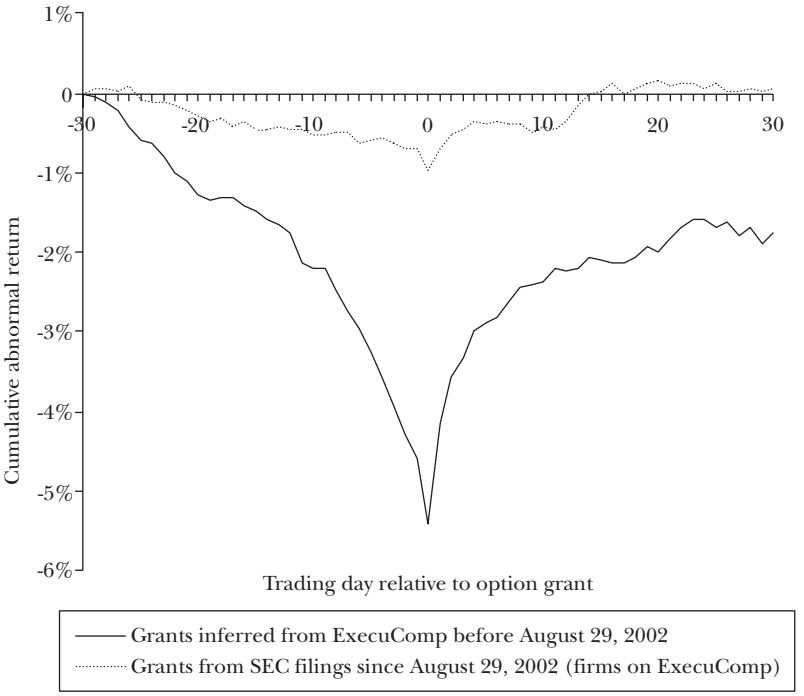
grants within two days versus those that delayed in reporting. Both papers report that firms that complied with the law show only minimal stock price patterns surrounding option grant dates, but that firms that continued to report late still show suspicious patterns. Both articles suggest that backdating was a major reason for delayed reporting for many of the firms that report late.

Although Lie (2005) and Heron and Lie (2007, 2008) use abnormal returns in their empirical analysis, the stock return patterns are even stronger for raw returns,[2] as shown by Narayanan and Seyhun (forthcoming). This pattern is what one would expect if backdating, rather than merely gaming the release of company-specific information, is behind the patterns. Heron and Lie (2008) report that a disproportionate fraction of stock option grants occur on the day of the month with the lowest stock price. Before August 29, 2002, 13.0 percent of the grants occurred on the date of the lowest monthly price, whereas afterwards, 8.2 percent did. Both of these numbers are much higher than the 4.8 percent that would be expected if grants were randomly distributed across the 21 trading days in a typical month.

[2] Raw returns are simple returns, while abnormal returns include adjustments for overall market movements.

Figure 2

Cumulative Abnormal Returns around Executive Stock Option Grant Dates, before and after Sarbanes–Oxley Reporting Requirement Change



Source: Heron and Lie (2007, figure 4).
Note: The figure displays the cumulative abnormal stock returns from 30 trading days before through trading 30 days after unscheduled stock option grants to chief executive officers. ExecuComp is a database compiled by Standard and Poor's that includes information from stock option grants contained in proxy statements from more than 2,000 large U.S. companies. The firms not on ExecuComp are primarily small companies. August 29, 2002, is the date after which the Sarbanes-Oxley Act required quicker reporting of stock option grants.

As recently as early 2006, however, the academic research on stock option backdating attracted little attention. Lie's 2005 *Management Science* article had been rejected by several finance journals. Heron and Lie's 2007 *Journal of Financial Economics* article and Narayanan and Seyhun's forthcoming *Review of Financial Studies* article were both rejected at another finance journal, with referees being skeptical that anything as egregious as backdating was occurring. In retrospect, Lie and Heron and Lie's case would have been stronger if the papers had shown the patterns using raw returns, rather than market-adjusted returns or—as a referee had insisted—abnormal returns using a three-factor model. With adjusted returns, the degree to which firms were picking a date with the lowest price was obscured. Narayanan and Seyhun, however, did use raw returns, but still received a negative reaction from a referee in early 2005 when they first submitted their article for

publication. None of these articles, however, gave any specific examples. While Lie did bring his research to the attention of the U.S. Securities and Exchange Commission, the regulators conducted only a limited investigation into the practice.

But on November 3, 2005, a *Wall Street Journal* article by Buckman, Maremont, and Richardson (2005) reported that three top executives of Mercury Interactive, a technology company, had resigned amid disclosures about stock option backdating at the company that was uncovered in an internal investigation. Coincidentally, Heron and Lie were about to send back to the *Journal of Financial Economics* a revised version of their working paper investigating the magnitude of backdating and the effect that Sarbanes–Oxley had had on it. After reading the *Wall Street Journal* article, Heron sent an e-mail to the reporters who wrote the article, telling them that the Mercury Interactive case was just the tip of an iceberg. He included his working paper with Erik Lie as an attachment. *Wall Street Journal* reporter Mark Maremont realized that this was something big, and the newspaper launched its own investigation. In the meantime, the *Wall Street Journal* article on Mercury Interactive's backdating lessened the reservations of the *Journal of Financial Economics* referee, contributing to the article's acceptance.

On March 18, 2006, the *Wall Street Journal* brought option backdating to prominence with a page-one article (Forelle and Bandler, 2006) presenting specific examples of suspicious patterns at a number of companies, whose names had been supplied by Erik Lie. Option backdating became a major scandal. In this article, the *Wall Street Journal* consulted with Lie and Yermack as well as with statistics professor John Emerson. The *Journal's* article singled out several companies with frequent patterns of granting stock options to top executives on the day of the lowest stock price of a quarter.

Within months, scores of companies announced that they had discovered irregularities in their accounting for employee stock options, and over 50 chief executive officers, chief financial officers, and general counsels resigned, according to a tally maintained on the *Wall Street Journal*'s website.[3] Internal and government investigations, some of which had been underway even before the *Journal's* article, discovered frequent cases of backdating and numerous cases of fabricated supporting documents. A number of corporate executives were indicted on criminal charges. Comverse Technology chief executive officer Kobi Alexander fled to Namibia. On August 7, 2007, Gregory Reyes, the former chief executive of Brocade Communications, was convicted on ten counts including conspiracy and fraud in connection with backdated stock options. As of November 2007, approximately 30 class-action lawsuits have been filed. Some have been settled, with executives paying back money to the company, the companies making some changes to corporate

[3] A tally compiled by the research firm Glass Lewis & Co. LLC lists 257 publicly traded companies that have announced internal investigations, SEC inquiries, or Justice Department subpoenas as of March 16, 2007.

governance, and the companies paying the fees of the plaintiffs' lawyers (Jones, 2007).

How widespread was stock option backdating before it became the focus of regulatory attention after the publication of the *Wall Street Journal* article in March 2006? In a 2008 working paper, Heron and Lie estimate that 23 percent of unscheduled option grants to top executives were backdated during the time period extending from 1996 until the two-day filing requirement took effect on August 29, 2002, and 10 percent of these option grants were still backdated after this date. They estimate that 29 percent of publicly traded U.S. firms manipulated grants to top executives at some point between 1996 and 2005, with the frequency higher for tech firms, small firms, and firms with high stock price volatility. Even though scores of executives have borne personal consequences for stock option backdating, these numbers imply that the vast majority of executives involved have not borne any penalties.

What is the effect on a firm's shareholders of the revelation of stock option backdating? Narayanan, Schipani, and Seyhun (2007) estimate that the revelation of backdating resulted in a stock price drop for the average firm of approximately 7 percent, corresponding to about $400 million in market value. By contrast, they estimate that the average gain from backdating to the executives is only about $500,000 per firm annually. The disproportionate effect suggests that the private gains to the individuals are small in comparison to the costs imposed on shareholders by effects such as the disruption of the executive ranks for those firms for which the practice was disclosed.

Because of Erik Lie's role in uncovering the backdating of employee stock options—research that started with several rejections from academic journals—*TIME Magazine,* in May 2007, featured him as one of the 100 most influential people in the world (Spitzer, 2007). In April 2007, for the series of articles on backdating written by Charles Forelle, James Bandler, Mark Maremont, and Steve Stecklow, the *Wall Street Journal* won the Pulitzer Prize for public service. The *Wall Street Journal* had devoted substantial resources to its investigation of grant backdating.[4] Nonetheless, if Randall Heron had not sent an e-mail to three *Journal* reporters, the scandal might not have emerged.

[4] In December 2006, the *Journal* also ran a story (Maremont and Forelle, 2006) suggesting that some executives had retroactively chosen the date at which their options were exercised, a practice that in some circumstances would reduce the executives' personal taxes while increasing the company's taxes. The article was based on ongoing research by Heron, Lie, and Yermack and by David Cicero (2007). The gain on the option for the individual is taxed as ordinary income, whereas any stock price appreciation after the option is exercised would be taxed as a long-term capital gain if the stock is held long enough to qualify for long-term gains status. Thus, choosing an exercise date with a lower market price for the stock will shift some of the gain received by the executive from ordinary income into long-term capital gains status if the stock is held for long enough after the option exercise.

Table 1
Citigroup's Allocations of Initial Public Offerings to former Worldcom Chief Executive Bernie Ebbers

IPO	*Month of IPO*	*Ebber's shares*	*Offer price*	*Market price*	*First-day profit*
McLeod	7/96	200,000	$20.00	$25.13	$1,026,000
Tag Heuer	9/96	5,000	$19.55	$20.00	$2,250
Qwest Communications	6/97	205,000	$22.00	$28.00	$1,230,000
TV Azteca	8/97	1,000	$18.25	$19.19	$900
Box Hill Systems	9/97	5,000	$15.00	$20.62	$28,100
Nextlink Communications	9/97	200,000	$17.00	$23.25	$1,077,300
China Mobile HK	10/97	2,000	$30.50	$28.00	-$5,000
Metromedia Fiber Network	10/97	100,000	$16.00	$21.38	$538,000
Teligent	11/97	30,000	$21.50	$25.63	$123,900
Earthshell	3/98	12,500	$21.00	$23.56	$32,000
Rhythms NetConnections	4/99	10,000	$21.00	$69.13	$481,300
Juno Online	5/99	10,000	$13.00	$11.63	-$13,700
Juniper Networks	6/99	5,000	$34.00	$98.88	$324,400
Focal Communications	7/99	5,000	$13.00	$19.50	$32,500
Williams Communications	10/99	35,000	$23.00	$28.06	$177,100
Radio Unica	10/99	4,000	$16.00	$27.44	$45,800
Chartered Semiconductor	10/99	5,000	$20.00	$33.19	$66,000
UPS	11/99	2,000	$50.00	$67.38	$34,800
KPNQwest	11/99	20,000	$20.81	$29.81	$180,000
Tycom Ltd	7/00	7,500	$32.00	$37.00	$37,500
Signalsoft	8/00	5,000	$17.00	$21.88	$24,400

Source: Documents supplied by Citigroup to the U.S. House of Representatives Committee on Financial Services in August 2002. The first-day profit is the capital gain that would have been received if all of the shares that Bernie Ebbers was allocated at the offer price were sold on the first day of trading at the closing market price.

Spinning of Initial Public Offerings

In the late 1990s, many investment banking firms allocated underpriced initial public offerings (IPOs) to the personal brokerage accounts of top executives of corporations. For example, the Salomon Smith Barney division of Citigroup and its predecessors made the allocations shown in Table 1 to Bernie Ebbers, the disgraced former chief executive of Worldcom who is currently serving a 25-year sentence in federal prison for securities fraud. During 1996–2001, while Bernie Ebbers was receiving these IPO allocations, Worldcom paid over $100 million in investment banking fees on various deals, with almost all of these fees going to Citigroup and its predecessors. In "Corporate Executive Bribery: An Empirical Analysis," Xiaoding Liu and I examine the economic consequences of the practice by investment banking firms of allocating underpriced ("hot") IPOs to the personal brokerage accounts of corporate executives, a practice known as "spinning" (Liu and Ritter, 2007).

The vast majority of initial public offerings in the United States use a mecha-

nism known as bookbuilding, in which an investment bank (the bookrunner) receives orders to purchase shares from institutional investors and then, if the offer is oversubscribed, has near total discretion in allocating the shares. The majority of IPOs are issued at an offer price that is below the market price of the shares at the close of the first day of trading, with this offer price negotiated between the investment banker and the issuing firm after the purchase orders are received. In 1999–2000, for example, when underpricing was especially severe, the average first-day return for the 803 companies going public in the United States was 65 percent. Most of the shares in these IPOs were allocated to institutional investors, but some of the shares were allocated to the personal brokerage accounts of corporate executives.

One would expect that competitive pressure among investment banks would tend to eliminate this underpricing—perhaps even with a fee structure that rewards the investment bank for a lower degree of underpricing. For moderate-size initial public offerings in the United States, however, the investment banking fees show almost no cross-sectional dispersion. In Loughran and Ritter (2004), Tim Loughran and I posit that two agency problems allowed severe underpricing to grow and persist in the late 1990s.

Because of the ability to collect additional commission payments, known as "soft dollars," from institutional investors that are competing for allocations of the underpriced shares, bookrunners make greater profits on an initial public offering if the company being sold allows greater underpricing. An underpriced IPO leaves money on the table, calculated as the product of the number of shares issued times the first-day capital gain per share received by investors that were allocated shares at the offer price. More money left on the table is beneficial to the bookrunner because rent-seeking investors are willing to pay additional soft dollars on other trades as a way of currying favor for these allocations. Thus, the investment bank seeks to increase its profits by leaving more money on the table, thus attracting more commission business. Because underwriters have discretion regarding to whom shares are allocated when bookbuilding is used, they have an incentive to underprice IPOs.

Why might the company agree, at least tacitly, to such an underpricing arrangement? In a working paper, Xiaoding Liu and I find that the initial public offerings of companies whose executives were being "spun" near the time of the IPO were underpriced more, and these companies are less likely to switch investment bankers on subsequent deals (Liu and Ritter, 2007). This evidence is consistent with the interpretation that by taking advantage of agency problems and bribing executives, one can affect the actions of the executives. Of course, the more severe underpricing of these IPOs results in the issuing firms raising less money and reducing the returns of their pre-issue shareholders.

Although government investigations uncovered documents from investment bankers that clearly state that the allocation of hot initial public offerings to corporate executives was intended to influence the corporate decisions of the executives, not all of the recipients viewed the preferential allocations as outright

bribes, morally equivalent to receiving envelopes of cash. Some of the executives had enough doubts about the ethical issues associated with accepting the hot IPO allocations that they tried to conceal their receipt, but other executives viewed the hot allocations as a badge of honor, certifying that they were important enough to receive preferential treatment.

The research in which I have been involved draws on data from nontraditional sources: contacts with financial journalists and leads from consulting. The data on the hundreds of executives who were being spun by Credit Suisse First Boston (CSFB, now known as just Credit Suisse), come from a government exhibit that was introduced in the prosecution of CSFB executive Frank Quattrone on obstruction-of-justice charges. I became aware of the data when a financial journalist alerted me to the existence of the exhibit, an Excel spreadsheet that listed the name, corporate position, company, and a CSFB spinning priority code for individuals being spun as of March 2000, at the peak of the technology stock bubble. These accounts were popularly known as "Friend of Frank" accounts. This list was augmented by a separate list of 63 Friend of Frank accountholders who lived in Silicon Valley that ran in the March 7, 2003, edition of the *San Jose Mercury-News*. This list, which included the names of executives of companies that had gone public after March 2000, overlapped with the names on the Excel spreadsheet, and contained the number of IPOs each executive received and the first-day profits on these allocations.

The data on the scores of executives being spun by Citigroup come from an investigation and prosecution of spinning conducted by the office of the Attorney General of New York State. I was hired as a consultant on this case, and because it was a government investigation that was not subject to confidentiality agreements, I was able to file a Freedom of Information Act request to put the data into the public domain. If I had not worked as a consultant, however, I wouldn't have known what information had been compiled or just where it was.

The names of other executives who were spun by other investment bankers—including Goldman Sachs, Hambrecht & Quist (subsequently acquired by Chase Manhattan and now part of JPMorgan), and Piper Jaffray—have been reported in press reports, regulatory settlements, and congressional hearings. Because the names reported in these contexts tend to be those of prominent individuals, we do not use this information, fearing that such a list would have a sample selection bias. But by assuming that other companies were not involved in spinning and focusing on only a subset of the companies whose executives were spun, our empirical work underestimates the economic consequences of the spinning.

From the sources just named, we identified 134 officers and directors of 56 companies that went public in 1996–2000, for which one or more of the corporate executives was a recipient of hot initial public offering allocations from its book-runner. CSFB and Citigroup (and its predecessors) also took an additional 141 companies public during this time period for which we have no evidence that the executives were spun, giving a total of 197 IPOs by these underwriters (out of 2,260 IPOs in total during this five-year period). We find that, holding other determi-

nants of the underpricing of IPOs constant, the companies whose executives were receiving the "hot" allocations were underpriced by 18 percent more (that is, first-day returns of 48 rather than 30 percent). For the 54 of these 197 companies that conducted a public equity offering within a few years after going public, only 5 percent of those whose executives who were spun switched lead underwriters, whereas 31 percent of the other companies switched underwriters. In other words, providing preferential IPO allocations to executives was effective: it resulted in more money being left on the table in the IPO, and greater loyalty on subsequent investment banking deals.

It is instructive to examine how much of the extra money left on the table from these 56 initial public offerings flowed back into the pockets of the executives being bribed. For 113 of the 134 executives, from 37 separate companies, we have information on the number of IPOs that they were allocated and the first-day profits on these IPOs. These 113 executives received an average of 24 separate allocations with total profits averaging $436,000 per executive or $1,331,000 per company. For these companies, our regression analysis indicates that the incremental amount of money left on the table due to spinning averaged $14.5 million per company. The issuers (and their shareholders) thus received $14.5 million less in proceeds than they would have received if the executives hadn't been co-opted. Taking the ratio of these numbers ($1,331,000/$14,500,000), about 9 percent of the incremental amount of money left on the table flowed back into the pockets of the executives, before tax.

Because this research into "spinning" was undertaken after regulatory intervention had already occurred, this academic research has not affected policy directly. However, the regulatory and government investigators who generated this data were focused on specific enforcement goals; academic researchers can use the same data to answer a variety of general questions: What fraction of the losses to shareholders from self-dealing are captured by the executives involved? (In this case, about 9 percent.) Are agency problems important for explaining certain decisions in financial markets? (In this case, yes.)

Rewriting the History of Market Recommendations

Unlike the previous research topics, sometimes a pattern that at first raises suspicions turns out to have a more innocuous explanation. Nevertheless the investigation of suspicious changes in stock analyst recommendations (discussed in this section) led to the discovery of major data errors in a widely used database. After being alerted to the problem, the data vendor cleaned up the data and instituted changes in its procedures to prevent similar problems from arising in the future.

The Thomson Financial I/B/E/S (Institutional Brokers Estimate System) databases are the standard sources to find the earnings forecasts and buy and sell recommendations made by equity analysts. These databases are used by money

managers, regulators, academics, and others for a variety of uses, including measuring the track records of individual analysts. Almost all brokerage firms provide the stock recommendations and earnings forecasts produced by their stock analysts, which I/B/E/S then tabulates and makes available to subscribers. This database has been used in hundreds of academic research papers.

I/B/E/S reports recommendations using the five integers from 1 to 5, with 1 corresponding to "strong buy," 2 to "buy", 3 to "hold," 4 to "sell," and 5 to "strong sell." Prior to 2002, many brokerage firms had four, six, or even 12 possible recommendation levels, with terminologies such as "recommended list/outperform/market perform/sell" or "strong buy/buy/accumulate/outperform/hold/sell." Because different brokerage firms used different terminology, and a "buy" might be the highest recommendation at one brokerage house but only the second-highest recommendation at another, I/B/E/S had to implement some rules to convert the recommendations into its five-point numerical scores.

While working on an empirical paper using analyst stock recommendations for U.S. stocks, Alexander Ljungqvist, Christopher Malloy, and Felicia Marston noticed that downloads of the I/B/E/S recommendations database obtained at different points in time were not identical, through all the downloads referred to the same sample period, from November 1993 to July 2002. When they attempted to identify the reason for the differences, they discovered that 36,755 out of 280,463 analysts' recommendations in the July 18, 2002, version of the dataset were different on the March 20, 2003, version. The changes fell into four categories: 1) 8,963 alterations (3.2 percent of all records), such as a buy recommendation being changed to a hold recommendation; 2) 4,318 deletions of records (1.5 percent) that appear in the 2002 database but not in the 2003 database; 3) 18,471 additions (6.6 percent); and 4) 5,003 anonymizations (1.8 percent) in which the code number for the analyst who gave the recommendation has been removed.

Especially prior to regulatory reforms implemented in 2002, and in the heat of the stock market run-up in the second half of the 1990s, stock recommendations were heavily tilted towards bullish recommendations that I/B/E/S coded as a 1 or a 2.[5] When Ljungqvist, Malloy, and Marston (2008) compared the 2002 and 2003 datasets, they discovered that a disproportionate number of the new or altered recommendations were given bearish values of 3, 4, or 5. The average recommendation that was deleted had a relatively bullish value of 1.63, but the average addition had a relatively bearish value of 2.45. This finding initially raised the suspicion that many of these changes had been made to give the appearance of less of a bullish bias on the part of the analysts, especially for stocks that had subsequently underperformed. They decided to investigate this further, resulting in their 2008 paper "Rewriting History."

[5] Before complaining too loudly about the conflicts of interest faced by analysts that result in a tilt towards buy recommendations, readers of this article who teach might ask themselves whether a "C" grade in their courses really means that the student is average. Furthermore, they might ask themselves whether they give as many D and F grades as they give A and B grades.

The authors approached Thomson Financial seeking an explanation of how analyst records became anonymized. According to the authors and press reports (for example, Alpert, 2007), Thomson Financial initially showed limited willingness to explain how and why analyst recommendations that were previously identified as coming from a specific analyst had been changed to anonymous recommendations coming from the analyst's brokerage house. As greater attention focused on the issue, the authors expanded their analysis to include the deleted, added, and altered records, and Thomson Financial began to cooperate and address the issues, maintaining that most of the changes were the result of a series of programming errors on their part affecting data entry.

Business acquisitions, according to Thomson Financial, are partly to blame for some of the data problems. At the start of 2001, Thomson Financial owned 52 percent of First Call, a different company collecting and disseminating the recommendations and forecasts of stock market analysts. Then in 2001, Thomson Financial acquired the other 48 percent of First Call and also acquired I/B/E/S. Thus, in 2002 the firm was attempting to integrate some of the information provided by First Call and I/B/E/S. Also in 2002, many brokerage firms switched to a simpler three-point recommendation system that corresponds to "buy/hold/sell," although frequently the terminology is something like "overweight/marketweight/underweight."

To illustrate one particular programming error, consider the hypothetical brokerage firm ABC, Inc., which used the following recommendations before and after August 25, 1998, that I/B/E/S translated into numerical values:

Prior to August 25, 1998	*After August 25, 1998*
Strong buy (I/B/E/S = 1)	
Buy (I/B/E/S = 2)	Buy (I/B/E/S = 1)
Accumulate (I/B/E/S = 3)	Accumulate (I/B/E/S =2)
Market Outperform (I/B/E/S = 3)	Market Outperform (I/B/E/S = 3)
Market Perform (I/B/E/S =4)	Mkt. Performer (I/B/E/S = 4)
Sell (I/B/E/S = 5)	Sell (I/B/E/S = 5)

I/B/E/S uses what it calls a "broker translation table" to map ABC's recommendation of "market perform" to an I/B/E/S recommendation level of 4. Over time, however, as in the example above, a broker may change its language or spelling for a given recommendation category: for example, broker ABC above changes its "market perform" to "mkt. performer." According to Thomson, its data entry clerks occasionally overwrote existing entries in their translation table when they encountered wording changes in a broker's recommendations. In the above case, a clerk might overwrite ABC's "market perform" entry when adding "mkt. performer" to the broker translation table without realizing that the broker translation table will fail to recognize any of the historic "market perform" recommendations, resulting in these recommendations disappearing. "Additions" can then result when another data entry clerk at some point adds the "market perform" entry back to the translation table.

As part of an internal investigation by Thomson, it was revealed that some processing errors, such as the one described above, had occurred over a number of years, deleting one or more entire rating category of a given broker. In response to the Ljungqvist, Malloy, and Marston (2008) working paper, Thomson has attempted to purge the 2007 and later versions of its I/B/E/S databases of the data errors that existed in earlier versions. The most extreme change is apparently between the March 18, 2004, version of their database and the September 20, 2007, version, with 30 percent of the observations being different.

An important issue concerns whether statistical inference is altered by the changed data. The recommendations have been used to ascertain whether individual analysts have displayed an ability to recommend winning stocks, with researchers looking for both high returns after buy recommendations and low returns following sell recommendations. The recommendations of analysts as a group have also been used to test whether profitable trading strategies exist based on buying stocks after analysts upgrade or downgrade a stock.

Ljungqvist, Malloy, and Marston (2008) investigate whether the changes in the data make much difference. They report that a portfolio of stocks that analysts upgraded during the previous two weeks produces an abnormal return of 19.1 basis points per day during the March 10, 2000, to March 18, 2004, period using the 2004 database, but only 15.9 basis points per day for the same time period using the 2007 database. Without compounding, the difference amounts to 8.1 percent per year, since there are approximately 252 trading days per year. A portfolio of stocks that were downgraded by analysts during the same time period underperforms by 9.5 basis points per day using the 2004 database, but only 7.8 basis points per day using the 2007 database. The difference amounts to 4.3 percent per year. The authors provide evidence that the magnitude of the quantitative results of many studies that utilize the I/B/E/S recommendations has been affected by the changes to the database over time.

An important positive externality generated by the Ljungqvist, Malloy, and Marston (2008) investigation is that Thomson Financial has for the most part purged its data of the problems documented by their study. Furthermore, Thomson has changed its data handling procedures going forward to prevent inadvertent alterations of the data from occurring. Thus, the data quality for future research has been improved.

Summary

Work in forensic finance typically shares some common elements: There is some rule that sets a standard for competitive behavior or fiduciary responsibility, which provides a benchmark for what findings might matter. There is good detailed data on the price, quantity, and timing of transactions, which is sometimes available from nonconventional sources like regulatory agencies, court proceedings, or datasets kept by businesses that are not primarily for academic research. And those

doing the research possess a strong background understanding of how specific financial institutions or mechanisms work in a particular market.

Finally, researchers have to consider whether an empirical pattern has an innocuous explanation, or whether it represents a situation in which a small group of financial market insiders is benefiting at the expense of the broader investing public. Many referees and editors—perhaps steeped in a mindset in which agency problems are mitigated by reputation effects, or perhaps out of a sheer naïveté common among academics—have proven loath to accept interpretations of the data that are not innocuous. Sometimes, however, statistical analysis uncovers patterns that do not have innocuous explanations. Unfortunately the slow process of publishing in academic journals means that regulators may react to a problem before the relevant study has had a chance to wind its way through the refereeing process.

In this article, in the first three cases—late trading by mutual funds, the backdating of employee stock options, and the allocation of hot shares in initial public offerings to corporate executives—scores if not hundreds of individual participants were aware of unethical or illegal practices that went on for years. The fourth case, of changes in the dataset of equity analyst recommendations, appears to be the consequence of sloppiness by a data vendor rather than a deliberate attempt to remove embarrassing recommendations. Inquiries from academics, publicized by the financial press, led the data vendor to correct its errors and institute procedures to reduce the likelihood of similar errors occurring in the future.

For the questions of potential interest to forensic finance, there is likely to be a useful interaction between academics, the financial press, regulators, and policymakers. Financial journalists can play an important role in bringing patterns of behavior to the attention of policymakers. Financial journalists, however, are not usually well-equipped to undertake careful empirical documentation and test alternative hypotheses. Academic researchers have generally not been the first to uncover controversial activities caused by agency problems, but academic researchers have frequently been able to provide large-sample evidence that sheds light on whether a problem is relegated to a few isolated instances or is more widespread.

Regulators were slow to react to some long-standing industry practices that changed as soon as they were publicized. But the U.S. regulatory framework for the financial services industry does offer a variety of regulators: federal government regulators, like the Securities and Exchange Commission; self-regulatory industry agencies such as the Financial Industry Regulatory Authority, which is the merged successor to the earlier self-regulatory bodies for the New York Stock Exchange and the National Association of Securities Dealers; and state regulators. Sometimes critics tout the virtues of having a single regulator, like the one-stop Financial Services Authority in the United Kingdom. But competition between regulators does seem to result in some actions being taken that otherwise might not occur.

Sometimes the cooperation between these groups is explicit, like in the *Wall Street Journal*'s investigation of stock option backdating, where financial journalists

worked jointly with academic researchers, or when academics serve as consultants to legal or regulatory proceedings. In other cases, forensic finance efforts will proceed along separate but parallel and reinforcing tracks.

For academics, this collaboration with the media has its advantages and disadvantages. One advantage is that interacting with financial journalists in some cases has brought more attention than would otherwise be the case if journalists were restricted to examining isolated instances or if the academic research was conducted in isolation. On the other hand, unlike medical research, which imposes an embargo on publicizing research findings to nonspecialists until an article is published in a peer-reviewed journal, the academic economics and finance profession has no such protocol. There is a danger that academic researchers will attempt to publicize preliminary results that nonspecialists are not well-equipped to evaluate with appropriate skepticism. At this point, however, I am hard-pressed to think of an example in which financial economists have had an impact on corporate policy or regulators on the basis of preliminary research findings that were later severely questioned. Instead, the bigger problem for financial economics is the production of many papers that are of interest to only a handful of academic specialists.

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