

7-5-2012

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Working Paper Citation

Beny, Laura N. and Seyhun, Nejat, "Has Insider Trading Become More Rampant in the United States? Evidence from Takeovers" (2012). *Law & Economics Working Papers*. Paper 50.

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Has Illegal Insider Trading Become More Rampant in the United States? Empirical Evidence from Takeovers¹

Laura Nyantung Beny and H. Nejat Seyhun²

Introduction

Insider trading³ has long sparked popular outrage about the perceived excesses of Wall Street and corporate insiders' abuse of their privileged positions at the expense of

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³ Insider trading is defined as trading by individuals or corporations based on illegally obtained material, non-public information. In most jurisdictions, including the USA, material information is information that reasonable investors would consider likely

ordinary investors (i.e., widows, orphans and the rest of us). This is especially true during economic recessions and capital market downturns, as in recent years. At such times, populist outrage over insider trading and other types of corporate fraud soars to peak levels. In turn, this places great pressure on regulators and prosecutors to pursue alleged inside traders with greater ferocity than in economic normal times.⁴ Indeed, in the last few years, USA federal authorities have increased the ante, enforcing insider trading laws with renewed vigor.

A prominent recent example is the Galleon case, the largest insider trading scandal in the USA in decades. This case ultimately resulted in 2011 in a criminal conviction and an eleven-year prison sentence for Raj Rajaratnam, the man at the center of the scandal. The case involved widespread information networks and insider trading at several prominent hedge funds, including Galleon Management, LP, the former multi-billion dollar hedge fund founded and run by Mr. Rajaratnam. The USA government alleged that various high-level executives at such illustrious companies as McKinsey & Co., Intel Corporation, and IBM had provided material non-public information to the

to affect the financial security's price, and non-public information is information that is not available to investors who are corporate outsiders.

⁴ See Stuart Banner, *Anglo-American Securities Regulation: Cultural and Political Roots, 1690-1860* (2002).

hedge funds. Through a complex network of business and personal relationships and information sharing, the Galleon scheme yielded more than \$49 million in illegal profits or loss avoidance. The USA Department of Justice (DOJ) and the Securities and Exchange Commission (SEC) aggressively pursued the alleged culprits in a variety of civil and criminal proceedings. Along the way, they have issued stern remarks in the press, presumably both to warn would-be offenders and to feed populist sentiment.

Furthermore, USA authorities claim to have many more insider trading enforcement actions in the pipeline: “The current investigation—which traces its roots to an SEC inquiry in 2007 and FBI agents gaining court approval to use wiretaps to snare targets—has resulted in 66 people being charged with insider trading and related crimes, and 57 convictions, the largest crackdown on insider trading in modern law enforcement history.”⁵ According to federal law enforcement officials, cases have been “scheduled out” for the next 5 years and it is likely that “hundreds” of individuals will be charged in the coming years, including another hedge fund industry player of similar stature to Mr. Rajaratnam. SAC Capital and Citadel Investments are two of the large hedge funds that have been issued subpoenas in the current investigation.⁶

⁵ Charlie Gasparino & Sital Patel, Here’s a Tip: Insider Trading Cases Will Pile Up for Years, FOX Business, February 21, 2012

⁶ Id.

Another recent development is the increasing severity of punishment upon conviction for insider trading offenses. Both the probability of serving in prison as well as length of prison sentences have significantly increased. Between 1993 and 1999, fewer than 5% of defendants received two or more years of prison sentences upon conviction. This ratio increased to more than 25% between 2000 and 2009, and about 50% in the last two years. These findings indicate a ten-fold increase in the probability of receiving a prison sentence over the past fifteen years or so. Similarly, the median length of prison sentences given by the courts also rose. Between 1993 and 1999, the median prison sentence was only 11.5 months. During the past decade, the median prison sentence rose to 18 months. Finally, in the past two years, the median prison sentence for convicted defendants in New York federal courts rose to 2.5 years in prison, which indicates more than doubling of the length of prison sentences.⁷ From all outward appearances, then, it appears that federal insider trading enforcement, convictions and sentences are on the rise. Indeed, in Part II we present evidence that civil enforcement has increased significantly over time.

How should we interpret this evidence of increased enforcement intensity? One explanation is that the USA (popular opinion, regulators, etc.) has become less tolerant of

⁷ See Chad Bray & Rob Barry, Long Jail Terms on the Rise, *The Wall Street Journal*, October 13, 2011.

illegal insider trading. Another possibility is that insider trading has become more profitable in spite of enhanced enforcement efforts. As a consequence, there is more crime and thus more visible enforcement. While we are unable systematically to test the first explanation (increased intolerance), we can test the second explanation, which we refer to as the increased illegal trading hypothesis.

In this study, we test the increased illegal insider trading hypothesis by examining the pricing of common stock and options in the context of corporate takeovers. Corporate takeovers provide an excellent opportunity to engage in illegal insider trading in the common stock and call options of a target firm. Stock prices typically jump significantly on announcement of the takeover attempt. Call options on the target stock provide an even bigger windfall gain to option traders by enabling them to further leverage the announcement day returns on target shares.

We investigate our hypothesis using a sample of 1,177 tender offers between 1996 and 2011. We pursue two methodologies. First, we examine abnormal returns to target firms' stock around the takeover announcement. The increased illegal insider trading hypothesis predicts that the pre-bid stock price run-up has increased over time, consistent with greater profitability and incidence of illegal insider trading.

Second, we examine the pricing of call options on target firms' stocks around the takeover announcement. If the increased illegal insider trading hypothesis is valid, the call options should exhibit increasing evidence of rich pricing prior to takeover

announcements over time. That is, if increased insider trading is responsible for the pre-bid volume and price effects on bidder firms' stocks, we will observe an increase in the implied volatility of the target firms' stock because insiders will bid up the price of the target options by taking large options positions to benefit from the stock price run-up. Option prices are monotonically and positively related to option volatility. We implement the binomial option pricing model to compute implied volatilities.

Our results are consistent with the increased illegal trading hypothesis. We find that the average pre-announcement stock price run-up for target firms has increased substantially between 1996 and 2011, which cannot be explained by changes in initial toehold investments but is consistent with an increase in the incidence of insider trading. We also find that implied option volatilities increase prior to the tender offer announcement date, consistent with the presence of illegal insider trading. Finally, we find a (weakly) positive relationship between implied volatility and the pre-bid price run-up, which is also consistent with our increased illegal insider trading hypothesis. Overall, our evidence suggests that the recent increase in USA enforcement intensity is likely due to an increase in the incidence of illegal insider trading.

The Article is organized as follows. Part II provides an overview of USA federal insider trading law and presents SEC enforcement trends over time. Part III presents our hypotheses and empirical methodology. Part IV presents the data and empirical results. Finally, Part V concludes.

I. Overview of USA federal insider trading law and enforcement

A. Substantive law

There are three main doctrines according to which trading on material non-public information is illegal under USA federal laws. These are the disclose or abstain rule, misappropriation theory and Rule 14e-3 of the Securities Exchange Act.⁸

The disclose or abstain rule emerged from the USA Supreme Court's interpretation of § 10(b) of the Securities Exchange Act of 1934 and Rule 10b-5 promulgated thereunder. In *Chiarella v. United States*⁹ and *Dirks v. SEC*,¹⁰ the USA Supreme Court held that the basis for insider trading liability is breach of a fiduciary duty that the defendant owes to contemporaneous traders. That is, if a corporate insider owes a fiduciary duty to shareholders trading contemporaneously, he or she has a duty to disclose the material non-public information or refrain from trading. The insiders upon

⁸ See generally Stephen M. Bainbridge, *Securities Law: Insider Trading* (1999).

⁹ 445 U.S. 222 (1980).

¹⁰ 463 U.S. 646 (1983).

whom such a fiduciary duty rests obviously include officers, directors and controlling shareholders.

However, USA courts have also interpreted the disclose or abstain rule to include various corporate outsiders, deemed “constructive insiders”, under certain circumstances. In particular, “[t]he outsider must obtain material nonpublic information from the issuer. The issuer must expect the outsider to keep the disclosed information confidential. Finally, the relationship must at least imply such a duty.”¹¹ In addition, a “tippee” who has received material non-public information from an insider or constructive insider is also subject to the disclose or abstain rule if “the tipper has breached a fiduciary duty by disclosing information to the tippee, and the tippee knows or has reason to know of the breach of duty.”¹²

The USA Supreme Court endorsed the misappropriation theory in *U.S. vs. O’Hagan*.¹³ In this case, the Court held that an attorney (Mr. O’Hagan) violated § 10(b) of the 1934 Exchange Act and Rule 10b-5 when he bought shares and call options on the shares of a company that was the subject of a takeover and made a profit of over \$4.3 million. Although the attorney was not an insider of either the takeover target or the

¹¹ Stephen M. Bainbridge, *Insider Trading: An Overview 2* (2000).

¹² *Id.*

¹³ *U.S. v. O’Hagan*, 521 U.S. 642 (1997)

acquiring firm, he worked for the law firm that was representing the latter firm (though he did not work on the acquisition). The Supreme Court held that he had engaged in illegal insider trading by virtue of the fact that he had misappropriated non-public information from the entity to whom he owed a fiduciary duty (the law firm), even though it was not the issuer of shares.

Finally, § 14(e) of the Exchange Act and Rule 14e-3 promulgated thereunder prohibit insider trading in the context of tender offers. Pursuant to Rule 14e-3, it is illegal for any person in knowing possession of material information about a tender offer to buy or sell a security while in possession of such information.¹⁴ At first blush, the rule seems rather broad because it applies to anybody who possesses such information and trades without publicly disclosing it before trading. In addition, it does not matter whether she received the information directly or indirectly from the target, the offeror, or a third person acting on their behalf; the prohibition still applies. Furthermore, liability under Rule 14e-3 does not require a pre-existing fiduciary relationship, but attaches to anybody who trades while in possession of the aforementioned information. Nevertheless, the scope of the rule is quite narrow. It only applies once the offeror has taken significant steps toward making its offer to the target company, and it only relates to information concerning a tender offer.

¹⁴ 17 C.F.R. § 240.14e-3.

B. USA enforcement mechanisms and recent trends

While USA insider trading laws have been relatively stable over the past decade, there have been significant changes in enforcement over time, as we demonstrate in this section. Federal insider trading laws may be enforced in several ways. First, the SEC may pursue civil actions and administrative proceedings. Second, private parties may bring civil claims for damages under both state and federal laws. Finally, the DOJ may bring criminal charges.

The SEC may bring civil actions in federal district court against individuals suspected to have violated federal insider trading laws. The civil penalties it may pursue include “disgorgement of profits, correction of misleading statements, disclosure of material information, or other special remedies. Of these, disgorgement of profits to the government is the most commonly used enforcement tool.”¹⁵ The SEC may also initiate administrative proceedings against market professionals, resulting in disciplinary action such as censure, suspension, revocation of registration, etc.¹⁶

¹⁵ Bainbridge, *supra* note 5, at 122.

¹⁶ See *id.*

In the wake of several high-profile insider trading scandals in the 1980s, the Congress increased the monetary penalty exposure of inside traders. In particular, the Insider Trading Sanctions Act of 1984 allowed for treble damages against persons who violate Rule 10b-5 or 14e-3. With the possibility of disgorgement, this means that those who violate insider trading laws face a potential monetary penalty of up to four times their illicit profits (or losses avoided) from engaging in insider trading. The Insider Trading and Securities Fraud Act of 1988 (ITSFA), further increased the array of enforcement measures available to the SEC.¹⁷

Private parties may also bring civil suits against inside traders. USA courts have long interpreted Rule 10b-5 to contain an implied private right of action. In addition, pursuant to Exchange Act § 20A, private parties who traded contemporaneously with inside traders may sue for damages of up to the amount of profits (or loss avoided) by the inside traders. Private suits are, however, quite rare.

Finally, the SEC may request the DOJ to undertake a criminal prosecution against individuals suspected of having engaged in insider trading. Or, the DOJ may decide to prosecute on its own without a referral or request by the SEC. Violation of Rule 10b-5 or 14e-3 is a felony punishable by a fine of up to \$5,000,000 and up to 20 years in prison. Criminal prosecutions have become increasingly frequent since the mid-1980s. The SEC

¹⁷ See *id.*

and DOJ often work together on insider trading investigations, as the recent high profile Galleon case illustrates, and appear to be publicly declaring their commitment to increased levels of cooperation.¹⁸

Over the past two decades, while private actions have seemingly remained relatively rare, public enforcement has increased significantly. Figure 1 presents enforcement actions initiated by the SEC during its fiscal years 1985, and 1990 through 2011.¹⁹ The annual statistics presented in Figure 1 include both civil actions in federal district court and administrative proceedings by the SEC. In most years, however, civil actions constitute the bulk of the SEC's enforcement measures.

¹⁸ Referring to the Galleon hedge fund case, the SEC's Robert Khuzami recently stated that, "Our law enforcement agencies are together much more than the sum of our parts. That is why coordination, of which today's actions [parallel civil and criminal actions in the Galleon case] are a prime example, is critically important to the goal of rooting out fraud and misconduct in our markets." Robert Khuzami, SEC Director of Enforcement at *SEC v. Galleon Management, LP* Press Conference (Oct. 16, 2009), available at <http://www.sec.gov/news/speech/2009/spch101609rk.htm>

¹⁹ An SEC fiscal year begins on Oct. 1 of the prior calendar year. Thus, for example, fiscal year 2012 began on Oct. 1, 2011 and will end on September 30, 2012.

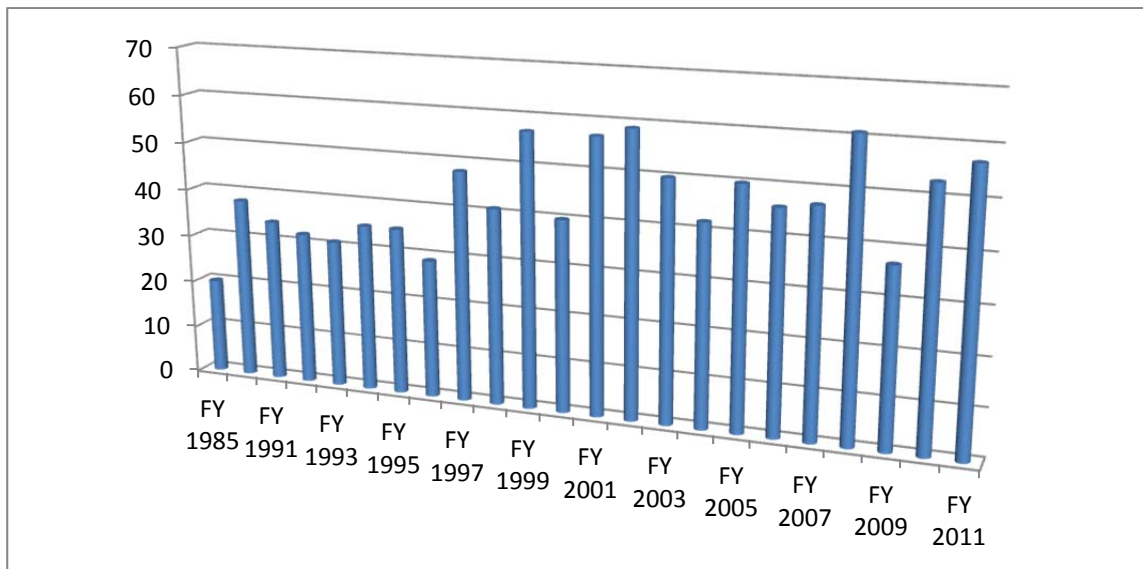


Figure 1: SEC Enforcement Actions Fiscal Years 1985-2011

Source: <http://www.sec.gov>.

As Figure 1 shows, the late 1990s marked a fundamental turning point in the SEC's enforcement intensity. To put this evidence into perspective, in 1980, the SEC initiated a mere 20 insider trading actions. This number nearly doubled by 1990 to 38 enforcement actions. Between 1990 and 1995, the SEC brought an average of 34 enforcement actions per fiscal year, while between 1995 and 2000, the SEC brought an average of 42 enforcement actions per fiscal year. Then, between 2000 and 2005, the SEC brought an average of 49 actions per fiscal year. The enforcement uptick that occurred in the late 1990s, and continued through 2005, does not appear to have been a

transitory, one-off reaction to the dot.com boom and bust and the associated corporate and financial excesses. Indeed, between 2005 and 2010 the SEC continued to launch an average of 49 insider trading enforcement actions annually. Finally in fiscal year 2011, the SEC reports that it “brought 57 insider trading actions against 124 individuals and entities, a nearly 8 percent increase in the number of filed actions from the prior fiscal year.”²⁰

While we do not have corresponding data on the number of criminal investigations or cases initiated by the Justice Department over the past two decades, anecdotal evidence suggests that criminal prosecutions have also increased during this period. For example, a recent study conducted by the New York State Bar Association’s Commercial and Federal Litigation Section finds that the DOJ tends to bring criminal charges against individuals sued by the SEC in New York federal courts.²¹ It would seem

²⁰ Securities and Exchange Commission, SEC Enforcement Actions, Insider Trading Cases. <<http://www.sec.gov/spotlight/insidertrading/cases.shtml>>

²¹

<http://www.nysba.org/Content/ContentFolders4/CommercialandFederalLitigationSection/ComFedReports/CRIMINALPROSECUTORIALDISCRETIONINTHEINSIDERTRADINGCASES.pdf>

to follow, then, that if civil suits have increased so too have criminal prosecutions, which tend to move in tandem (albeit not on a one-to-one basis) with SEC actions.²² Moreover, the increased investigative collaboration between the SEC and the DOJ, as noted above, is likely to reinforce this trend. The use of technology, such as wiretaps and search warrants, has enhanced this collaboration as well as making it easier to secure insider

²² Note, however, that the DOJ does not pursue every individual that the SEC sues for insider trading. U.S. Assistant Attorneys have prosecutorial discretion over whether or not to bring criminal charges. See *id.* Recent evidence suggests that, at least in New York, “licensed professionals stand a greater chance of being prosecuted than others (including officers of public companies); tippers tend to be treated more harshly than tippees; sole actors may be treated more leniently than those who advance a fraudulent scheme by tipping others; clients who made or stood to make less money, or avoid smaller losses, on their unlawful trading may be viewed more favorably than those who enjoy greater gains; those who consent up-front to settlements with the SEC do not tend to be prosecuted by the criminal authorities; and those who commit aggravating or additional stand alone crimes are more likely to find themselves defendants in parallel criminal cases.” *Id.* at 14.

trading convictions and/or guilty pleas.²³ The recent Galleon insider trading case, which entered the public spotlight in 2009, is an interesting example of the helpful role of technology in securing convictions.

Galleon was at one time a prestigious multi-billion dollar hedge fund, founded and controlled by Raj Rajaratnam. The SEC has charged Mr. Rajaratnam and nearly 30 other persons affiliated with Galleon with violating § 10(b) of the Securities Exchange Act of 1934 and Rule 10b-5 thereunder, and § 17(a) of the Securities Act of 1933. The charges allege “widespread and repeated insider trading at numerous hedge funds, including Galleon, and by other professional traders and corporate insiders in the securities of more than 15 companies. The insider trading generated illicit profits totaling

²³ See, e.g., Morrison and Foerster, *Insider Trading, Year-End Review* (2011). Available at <http://www.mofo.com/files/Uploads/Images/2011-Insider-Trading-Review.pdf>. See also Charlie Gasparino and Sital Patel, *Here’s a Tip: Insider Trading Cases Will Pile Up for Years*, FOX Business, February 21, 2012, available at <http://www.foxbusiness.com/industries/2012/02/21/heres-tip-insider-trading-cases-will-pile-up-for-years/#ixzz1tjeqKL3Y>

more than \$90 million.”²⁴ In 2011, Rajaratnam was convicted on all counts and sentenced to 11 years in prison, the longest criminal sentence for insider trading thus far. Many defendants have pled guilty and several are aiding prosecutors in ongoing litigation. The case has involved close cooperation by the SEC’s New York offices and the USA Attorney's Office for the Southern District of New York and the Federal Bureau of Investigation.

Technology has played a critical role in the Galleon complex of cases, especially in enabling the conviction of Mr. Rajaratnam. Using taped conversations between Mr. Rajaratnam and his friends and business associates, the government was able to prove its allegations that he utilized his large network of contacts, including executives at major corporations such as Goldman Sachs, Intel, Proctor and Gamble, etc., to gather non-public information that he subsequently traded on. Without the wiretaps, the government’s case would have been considerably more difficult to prove. The heart of the defense’s legal theory was the mosaic theory. This is the notion that Mr. Rajaratnam gathered public information from various sources to create a trading strategy (and that he

²⁴ Securities and Exchange Commission, SEC Files Insider Trading Charges against Rajat Gupta, SEC Brings New Charges against Raj Rajaratnam, October 26, 2011, available at <http://www.sec.gov/news/press/2011/2011-223.htm>.

was very good at it, a financial wizard) but did not engage in illegal insider trading. Unfortunately for the defense, however, many of Mr. Rajaratnam's taped phone conversations were critical to his conviction.

The government faced similar challenges in making its case in the recent (June 2012) trial of Mr. Rajat Gupta. Mr. Gupta is former head of McKinsey and Company, and a former board member of Goldman Sachs and Proctor and Gamble. The SEC has charged Mr. Gupta with having supplied Mr. Rajaratnam with material non-public information concerning Goldman Sachs and Proctor and Gamble. According to the SEC, Galleon funds traded illegally on the basis of these tips, and made illegal profits (or avoided losses) greater than \$23 million.²⁵ The SEC claimed that Mr. Gupta tipped Mr. Rajaratnam in violation of insider trading laws because of the two men's close personal relationship and extensive business dealings. Yet, Mr. Gupta never traded for his personal benefit. In spite of the fact that the evidence in Gupta's case was largely circumstantial, Mr. Gupta was convicted on three counts of securities fraud and one count of conspiracy for passing information about Goldman to Mr. Rajaratnam.²⁶ Mr. Gupta faces up to 20

²⁵ *Id.*

²⁶ *Id.*

years in prison for each of the fraud charges and up to five years for the conspiracy charge. The expected sentence under Federal guidelines is significantly lower.²⁷

The Galleon case also illuminates USA regulators' increasing scrutiny of so-called "expert network firms." These firms connect financial traders with industry consultants who provide them with industry- or company-specific information. They should only provide public information that can be found out through legal means. However, the SEC is concerned that expert network employees may sometimes be providing material, non-public information to traders in exchange for a fee. In 2010, for example, the SEC charged a French physician for tipping a hedge fund trader about adverse results of a clinical drug trial he had been involved in. According to the SEC, the physician had been providing:

[C]onsulting services to the portfolio manager with whom he had developed a friendship over the years. The portfolio manager, based on the confidential information provided by Benhamou, ordered the sale of the entire position of HGSI stock held by six health care-related hedge funds that he co-managed (approximately 6 million shares). These sales occurred during the six-week period prior to HGSI's public announcement on Jan. 23, 2008, that it was reducing the

²⁷ See Chad Bray et al., *Insider Case Lands Big Catch*, Wall Street Journal, Friday, June 15, 2012.

dosage in one arm of the trial. Two million shares were sold in a block trade just before the markets closed on January 22. HGSI's share price dropped 44 percent by the end of the day on January 23. As a result of the sales, the hedge funds avoided losses of at least \$30 million.”²⁸

The SEC has recently charged or investigated several more employees of expert network firms and hedge funds who use them in separate insider trading cases.²⁹ There are more cases in the pipeline and the impact on the hedge fund industry has been chilling.³⁰

II. Hypotheses and methodology

A. Background

²⁸ Securities and Exchange Commission, SEC Charges Medical Researcher With Tipping Inside Information About Clinical Trial, November 2, 2010, available at <http://www.sec.gov/news/press/2010/2010-209.htm>.

²⁹ See Galleon Trial, Network effects: A massive Insider-Trading Trial Shakes Wall Street, *The Economist*, March 10, 2011.

³⁰ *Id.*

The presence of illegal insider trading can only be inferred. It cannot be directly measured because illegal inside traders typically do not declare their intent in advance nor do they admit to engaging in illegal insider trading after the fact. In this study, we examine price effects on stocks and options around the announcement of tender offers to indirectly detect the presence of illegal insiders.

Tender offers involve the efforts of accounting firms, investment banks, financial advisors, and executives of the bidder and target firms. Consequently, given many people are involved in the takeover, there are potentially many opportunities to illegally share and use the privileged confidential information. As noted above, trading on the basis of non-public information about an upcoming tender offer is explicitly illegal under Rule 14e-3.³¹ Nevertheless, if potential illegal traders think that they can escape detection or prosecution, they are likely to be tempted.

³¹ The Rule provides that:

As a means reasonably designed to prevent fraudulent, deceptive or manipulative acts or practices within the meaning of [§ 14\(e\)](#) of the Act, it shall be unlawful for any person described in paragraph (d)(2) of this section to communicate material, nonpublic information relating to a tender offer to any

Recent developments in technology have created improved opportunities to hide one's transactions. The growth of online brokerage houses has allowed many investors to place trade orders anonymously. Second, many off-shore foreign tax havens are refusing to co-operate with USA enforcement efforts. Given that more transactions can take place

other person under circumstances in which it is reasonably foreseeable that such communication is likely to result in a violation of this section *except* that this paragraph shall not apply to a communication made in good faith,

- i. To the officers, directors, partners or employees of the offering person, to its advisors or to other persons, involved in the planning, financing, preparation or execution of such tender offer;
- ii. To the issuer whose securities are sought or to be sought by such tender offer, to its officers, directors, partners, employees or advisors or to other persons, involved in the planning, financing, preparation or execution of the activities of the issuer with respect to such tender offer; or
- iii. To any person pursuant to a requirement of any statute or rule or regulation promulgated thereunder.

beyond the reach of USA regulators, more people may be tempted to engage in illegal insider trading activities.

Takeovers are lucrative affairs. In a typical tender offer, stock prices rise significantly on the announcement of the tender offer. The increase in stock prices tends to be on the order of 20% to 30%. Evidence indicates that stock prices also tend to drift up prior to the announcement of the tender offer. Hence, corporate takeovers provide a perfect setting to exploit insider information. The large price increases on announcement provide excellent opportunities for illegal insider traders to buy the target shares before the announcement and thus profit illegally from the subsequent price increases.³²

In an early study, Keown and Pinkerton examine stock price movements in 93 stocks that were eventually taken over during the period from 1975 to 1978.³³ They find a 13.25% run-up in stock prices during the 60 days before the takeover announcement.

³² A recent paper by Agrawal and Nasser finds that registered corporate executives and large shareholders refrain from profitable trading immediately before corporate takeovers. Hence, any illegal insider trading activity prior to the tender offers is most likely to come from affiliated persons rather corporate executives. Anup Agrawal & Tareque Nasser, *Insider Trading in Takeover Targets*, *J. Corp. Fin.* (forthcoming 2012).

³³ Arthur J. Keown & John M. Pinkerton, *Merger Announcements and Insider Trading Activity: An Empirical Investigation*, 36 *J. Fin.* 855 (1981).

Most of this run-up occurs during the 20 days immediately preceding the takeover announcement. On announcement, stock prices further increase by another 13%. Hence, about half of the total stock price reaction occurs prior to the public disclosure of the takeover attempt. Keown and Pinkerton also find that the trading volume also abnormally increases during the same 20 days prior to takeover announcements. Keown and Pinkerton interpret their evidence as being consistent with illegal insider trading driving up both stock prices and trading volumes prior to the public announcements.

Subsequent studies also confirm the presence of pre-announcement run-ups in stock prices. For instance, studies by Asquith, Asquith and Mullins, and Dennis and McConnell all find similar stock price run-ups.³⁴ Furthermore, these studies also attribute the pre-announcement run-ups to illegal insider trading activity.

Various subsequent studies have investigated whether these run-ups in stock prices could be explained by alternative hypotheses. One such hypothesis is the presence of public information, such as rumors or 13-D filings, about the possibility of a tender

³⁴ Paul Asquith, *Merger Bids, Uncertainty, and Stockholder Returns*, 11 *J. Fin. Econ.* 51 (1983). Paul Asquith et al., *The Gains to Bidding Firms from Mergers*, 11 *J. Fin. Econ.* 121 (1983); D. Dennis & J. McConnell, *Corporate Mergers and Security Returns*, 16 *J. Fin. Econ.* 143 (1986).

offer, rather than insider trading.³⁵ In a test of the public rumor hypothesis, Jarrell and Poulsen study 172 tender offers from 1981 to 1985.³⁶ They find that the presence of rumors in the news media is the most significant variable that explains the unanticipated premiums and pre-bid stock price run-ups that Keown and Pinkerton documented. Jarrell and Poulsen also find that subsequent illegal insider trading investigations do not explain the pre-bid run-ups. Accordingly, they interpret their evidence as being inconsistent with

³⁵ Schedule 13-D is an SEC filing that must be submitted with 10 days of acquiring a 5% or greater equity stake in any publicly held corporation. The filer must disclose his/her purpose in acquiring this block, including whether the filer intends to launch a takeover bid. Furthermore, 13-D filings must be updated to reflect any material changes, such as subsequent acquisition or disposition of more than 1% of the security for which an earlier filing was made. See, e.g., Michael C. Jensen & Richard S. Ruback, *The Market for Corporate Control: The Scientific Evidence*, 11 *J. Fin. Econ.* 5 (1983). However, John Pound and Richard Zeckhauser find that rumors accurately predict imminent takeover bids less than one-half of the time. John Pound & Richard Zeckhauser, *Clearly Heard on the Street: The Effect of Takeover Rumors on Stock Prices*, 63 *J. Bus.* 291 (1990).

³⁶ G. Jarrell & A. Poulsen, *Stock Trading before the Announcement of Tender Offers: Insider Trading or Market Anticipation?* 8 *J.L., Econ. & Org.* 225 (1989).

illegal insider trading and consistent with the public rumor hypothesis. However, Jarrell and Poulsen do not examine the source of the rumors. If the rumors about the tender offers were planted by those who acquired the information illegally, who took illegal stock positions and then spread the rumors, then pre-bid run-ups and illegal insider trading would be synonymous.

Holding all else constant, traders who obtain illegal insider trading information about a forthcoming takeover would have incentives to surreptitiously plant rumors in the financial press about the upcoming potential takeover. First, once they have taken their positions, any newspaper stories about the takeover result in increases in stock prices and give additional profits to illegal insider traders.³⁷ Second, the presence of rumors in the press gives the illegal insider traders a cover in case of a civil or criminal investigation. Illegal insiders can always point to the stories as to why they took up their stock positions in the target firms. Thus, it is not possible to clearly separate the rumor hypothesis from the illegal trading hypothesis.

³⁷ See G. William Schwert, Markup Pricing in Mergers and Acquisitions, 41 J. Fin. Econ. 153 (1996).

In a cross-country study, Maug et al. examine pre-bid stock price run-ups in 48 countries in almost 19,000 takeover announcements.³⁸ They find that passing of the insider trading legislation affects the pre-bid stock price run-ups. In particular, they find that pre-bid stock price run-ups are significantly lower the more restrictive is a country's insider trading law, other things equal. This finding suggests that at least some of the pre-bid run-ups is due to illegal insider trading, which is reduced by the passing of tougher insider trading laws.

Illegal insider trading prior to takeovers has important public policy and economic consequences. Meulbroek and Hart find that the presence of illegal insider trading prior to takeovers is associated with about 10% higher takeover premiums.³⁹ Hence, illegal insider trading imposes costs on bidder firms' shareholders by increasing the cost of the takeovers. As the costs of successful takeovers increase, we would also expect a

³⁸ Ernst G. Maug et al., *Insider Trading Legislation and Acquisition Announcements: Do Laws Matter?* (2008) available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=868708.

³⁹ Lisa Meulbroek & Carolyn Hart, *The Effect of Illegal Insider Trading on Takeover Premia*, 1 *Eur. Fin. Rev.* 51 (1997).

deleterious effect on the number of takeover attempts, potentially reducing the incidence of value-enhancing changes in corporate control.

B. Hypotheses and methodology

In this study, we test whether illegal insider trading has become increasingly more common over time in the United States. We take two approaches to this question. First, we examine stock price run-ups prior to tender offer announcements over time. We investigate whether the likelihood and magnitude of the pre-bid run-up in target firms' stock prices have increased over time. We also investigate whether bidder firms are more likely to make toehold investments in target firms over time and whether the price run-up can be explained by toehold investments.⁴⁰

⁴⁰ Toehold investments refer to the pre-announcement acquisition of shares by potential bidders. When any potential bidder acquires 5% of the outstanding shares, it needs to file a 13-D statement disclosing its position as well as its intent within 10 days. Public disclosures of toehold investments are associated with positive stock price reactions. Toehold investments also help facilitate change of control. See generally W. Mikkelsen & R. Ruback, *An Empirical Analysis of the Interfirm Equity Investment Process*, 14. *J. Fin. Econ.* 523 (1985); Clifford G. Holderness and Dennis P. Sheehan,

Second, to distinguish between the public rumor and illegal insider trading hypotheses, we examine the pricing of stock options on the target firms. Both hypotheses predict stock price run-ups, as discussed above. However, public information (including rumors) and insider information should have opposite effects on the volatility of the target stock returns. If the observed stock price run-ups are due to publicly known rumors about the possibility of a takeover, then we would expect the implied volatility of the options on the takeover target to decline both prior to the announcement as well as on the announcement date. This is because takeovers are volatility-reducing events.

In some takeovers, the bidder firm announces a fixed price (a cash offer) for the target firm. The fact that the target price is fixed if the offer is successful reduces the volatility of the target firm's stock returns. Alternatively, instead of offering a fixed price, in some takeovers, the bidder firms offer a fixed number of bidder shares for target shares (a stock exchange offer). We expect exchange offers to also reduce the volatility of target stock returns, since the volatility of the target shares is replaced by the volatility of the bidder shares. Bidder firms are typically much larger than target firms and therefore they are less volatile.

Raiders or Saviors? The Evidence on Six Controversial Investors, 14 *J. Fin. Econ.* 555 (1985); D. Choi, Toehold Acquisitions, Shareholder Wealth, and the Market for Corporate Control, 26 *J. Fin. & Quant. Anal.* 391 (1991).

In short, if the pre-bid run-up in stock prices is due to public rumors about a prospective tender offer, we would expect the volatility of the target firms' stock returns to decline uniformly prior to the public announcement of the tender offers. As the run-up increases, volatility should decline more. This is because as the probability of the tender offer increases, there is a greater probability of a reduction in volatility of target returns. Hence, the public rumor hypothesis predicts a negative relation between the pre-bid run-up in stock prices and volatility of the returns to target firms.

In contrast, if illegal insider trading is driving the trading volume and price effects prior to corporate takeovers, then we would expect an increase in the implied volatility of the target firms' stock returns. This is because illegal insiders can exploit their information more efficiently by buying call options on the target firm instead of common stock. Call options typically provide additional leverage given by the elasticity of the option prices. By using call options illegal insiders can further leverage the announcement day returns. Thus, illegal insiders would be willing to bid-up the price of the call options on a target firm in order to establish large options positions that would benefit from a run-up in the target stock price.

Holding current stock price, exercise price and maturity constant, option prices are monotonically and positively related to option volatility. Consequently, holding all else constant, if call option prices increase as a result of the illegal insider trading, then implied option volatilities should also increase.

In summary, the public rumor hypothesis predicts that the implied volatility of target stock returns will decrease prior to takeover announcements. In contrast, the illegal insider trading hypothesis makes the opposite prediction, in particular that the implied volatility of target stock returns will increase prior to takeover announcements. Implied volatility thus provides an excellent framework for investigating our illegal insider trading hypothesis.

To measure the implied volatility of the target returns, we follow Harvey and Whaley.⁴¹ We implement the binomial option pricing model on American options with dividends numerically to compute the implied volatility estimates. We adopt the conventional assumption that any dividend paid on the underlying stock is known in advance. The advantage of the binomial option pricing model is that it can explicitly incorporate the fact that these options are American options subject to early exercise.

⁴¹ See Campbell R. Harvey & Robert E. Whaley, Market Volatility Prediction and the Efficiency of the S&P 100 Index Option Market, 30 *J. Fin. Econ.* 43 (1992); Campbell R. Harvey & Robert E. Whaley, Dividends and S&P 100 Index Option Valuation, 12 *J. Futures Markets* 123 (1992).

Using the Newton-Raphson search procedure similar to the one suggested by Manaster and Koehler,⁴² we calculate the implied volatility for every call option transaction in our sample. More specifically, the following algorithm is employed: given an i th estimate implied volatility, the procedure suggests the $i+1$ th should be:

$$\sigma_{i+1} = \sigma_i - \frac{[C(\sigma_i) - C(\sigma^*)]}{\text{vega}}$$

Where $C(\sigma_i)$ is the price of the option with an implied volatility of σ_i computed from the binomial model, $C(\sigma^*)$ is the observed option price and vega is the partial derivative of the option price with respect to volatility. We iterate on this procedure until the implied volatility has converged and the predicted price is equal to the market price⁴³.

⁴² S. Manaster & G. Koehler, The Calculation of Implied Variances from the Black-Scholes Model: A Note, 37 J. Fin. 227 (1982).

⁴³ We divide days to maturity into 180 intervals. The convergence criterion is set to 0.001%. That is, the algorithm is considered convergent if the estimated price is within 0.001% of the observed price. Ideally, the number of intervals should be dependent on the length of the days to maturity. However, there is a tradeoff in terms of computation

The literature on options valuation has uncovered systematic patterns on implied volatility as a function of the maturity and moneyness of the options.⁴⁴ To avoid confounding takeover related effects with well-known biases in binomial options pricing with respect to maturity and moneyness, we restrict our attention to short-term options that extend beyond the takeover announcement date by no more than 30 days and are near the money. We define near the money options as with exercise prices within a 20% band of the current stock price. Changes in implied volatilities have been used in the literature to estimate price pressures on option prices.⁴⁵

cost. We compare our estimates to the estimates we obtain from Black-Scholes when the underlying stock pays no dividends before expiration. Not surprisingly, they are very close to each other.

⁴⁴ See e.g., Robert E. Whaley, Valuation of American Call Options on Dividend-Paying Stocks: Empirical Tests, 10 *J. Fin. Econ.* 29 (1982); Jeremy Stein, Overreactions in the Options Market, 44 *J. Fin.* 1011 (1989); Gurdip S. Bakshi et al., Empirical Performance of Alternative Option Pricing Models, 52 *J. Fin.* 2003 (1997).

⁴⁵ See, e.g., Kaushik Amin et al., Index Option Prices and Stock Market Momentum, 77 *J. Bus.* 835 (2004); Xuewu Wang, Three Essays in Insider Trading (Sept. 3, 2011) (Ph.D. dissertation); H. Nejat Seyhun & Xuewu Wang, Past Stock Returns and Option Prices, *International Research Journal of Applied Finance* (forthcoming 2012).

C. Data and Results

Our corporate takeover data come from SDC files from the Wharton Research database System (WRDS). Stock return data come from WRDS as well. Our options data come from OptionsMetrics Ivy DB Database. This database contains all exchange-traded options transactions after 1995.

To ensure availability of the options data, we focus on tender offers after 1995. To ensure that the potential stock price reaction on the announcement date is economically important, we also use only tender offers where the bidder firms were eventually successful in obtaining at least 50% of the target shares.

Table 1					
Characteristics of the Tender Offer Sample					
Subsample	Number of tender offers	Percent Acquired	Total Value Acquired*	Initial Toehold Investment*	Probability of Initial Toehold
1996-2000	647	95.9	642.7	279.1	33.6%
2001-2005	259	95.7	800.4	13.9	97.6%
2006-2011	271	94.2	1,392.6	21.7	93.0%
Total	1,177	95.4	850.1	148.8	48.3%

* Millions of dollars.

The sample characteristics of our tender offer database are shown in Table 1. Our database covers 1,177 tender offers from 1996 to 2011. Bidder firms acquired an average of 95.4% of the target firms through the tender offer. The average value of the target shares acquired equals \$850 million.

As noted above, a pre-bid run-up in stock prices may be caused by toehold investments by the bidder firms that can also put upward pressure in target stock prices. Therefore, Table 1 also reports the average toehold investment by bidder firms, as well as the likelihood that a bidder firm made a toehold investment in a target firm. Just under half of the bidder firms bought a toehold in the target over the entire period (1996-2011). However, there is significant intertemporal variation in the probability of a toehold. During Period 1 (1996-2000), only 33.6% of the bidder firms bought a toehold investment in the target firms. During Period 2 (2001-2005), this ratio increased to 97.6%. In Period 3 (2006-2011), the toehold investment proportion declined slightly to 93.0%. As explained below, however, the increased prevalence of toehold investments does not appear to explain the increase in pre-bid stock price run-ups over time.

Next, we compute abnormal returns to target firms. Abnormal returns are computed as the raw return minus the value-weighted market return from 50 days before the takeover announcement to 50 days after the takeover announcement. Implicitly, this approach assumes a Beta of one for all firms. Given the limited explanatory power of Beta, this simple market-adjusted return approach has been used frequently in the finance literature.⁴⁶

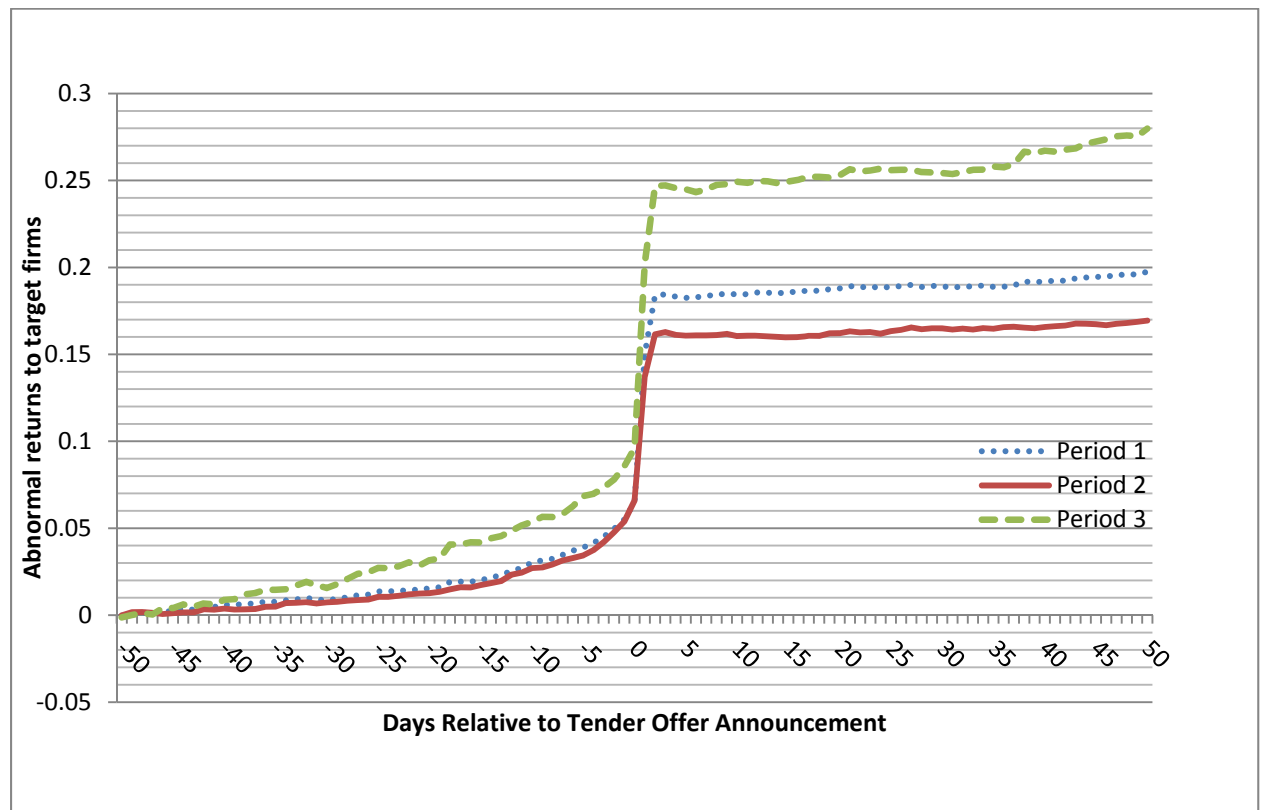
⁴⁶ See, e.g., Gibbons & Hess, *The Day of the Week Effects and Asset Returns*, 54 *J. Bus.* 579 (1981); De Bondt & Thaler, *Does the Stock Market Overreact*, 40 *J. Fin.* 793

Once we find the abnormal returns, we then average them for each event day relative to the takeover announcement date, which is defined as day zero. That is, we average the abnormal returns for each day from 50 days before to 50 days after the takeover announcement date. Finally, we calculate the cumulative average abnormal returns from 50 days before to 50 days after the tender offer announcement date.

Cumulative average abnormal returns to target firms are shown in Figure 2. We compute the cumulative average abnormal returns separately for the three sub-periods. As can be seen, stock prices rise abnormally prior to tender offers. During Period 1 (1996-2000), stock prices rise abnormally by about 20%. Furthermore, approximately one-third of the total run-up or about 7% rise occurs prior to the public announcement of the tender offer.

(1985); Brown, Using the Daily Stock Returns: The Case of Event Studies, 14 J. Fin. Econ. 3 (1985).

Figure 2



In Period 2 (2000-2005), stock prices rise about 17% from 50 days before to one day after the announcement date. Again, about one-third or about 7 percentage points of the rise occurs prior to the public announcement of the tender offer. Finally, during Period 3 (2006-2011), stock prices rise 28% from 50 days before to one-day after the tender offer announcement date. In the most recent sub-period, about 10 percentage points of the rise occurs prior to the public announcement.

Figure 2 shows that the market reaction to tender offers has increased over time. Along with this increase, the incentives to trade on tender offer announcements have also increased since greater stock price movements indicate availability of greater abnormal, albeit illegal trading profits. Our evidence also indicates that instead of declining, the pre-bid run-up has increased over time. Compared to the pre-2006 periods, the pre-bid run-up during the last five years has increased by 50% (10 percentage points versus 7 percentage points). The increase in pre-bid stock price run-up does not appear to be driven by changes in toehold investments over time. While the probability of a toehold investment increases from 33.3% to 97.6% between Periods 1 and 2, this change is not accompanied by a proportionate or even significant increase in the pre-bid run-up. Furthermore, although between Periods 2 and 3 the likelihood of a toehold investment declines slightly, the pre-bid price run-up increases significantly.

In short, the evidence in Figure 2 is consistent with the observation that higher levels of insider trading enforcement correspond to increased illegal insider trading activity, as reflected in a higher pre-bid stock price run up.

We now turn to implied volatility tests. Sample characteristics of our options database are shown in Table 2. Our database contains about 45,000 options trades for firms involved in takeovers. The average remaining time to maturities is around 57

calendar days. The sample options tend to be at-the-money, with the average moneyness measure of the options about 1.0.⁴⁷ Average implied call volatility is about 50%.

Table 2				
Characteristics of the Options Sample				
Subsample	Number of options	Maturity (days)	Moneyness of Call Options	Call Implied Volatility
1996-2000	17,692	55.74	0.992	0.59
2001-2005	6,323	57.76	0.989	0.48
2006-2011	21,916	58.16	0.990	0.41
Total	45,931	57.17	0.991	0.49

We next examine the time series properties of the implied volatilities of call options on target firms around the takeover announcement. Figure 3 shows implied volatilities of call options around the tender offers. Overall, implied volatility of call options rises during the 50 days prior to the takeover announcement. On the takeover

⁴⁷ Moneyness of the options is defined as the stock price divided by the exercise price.

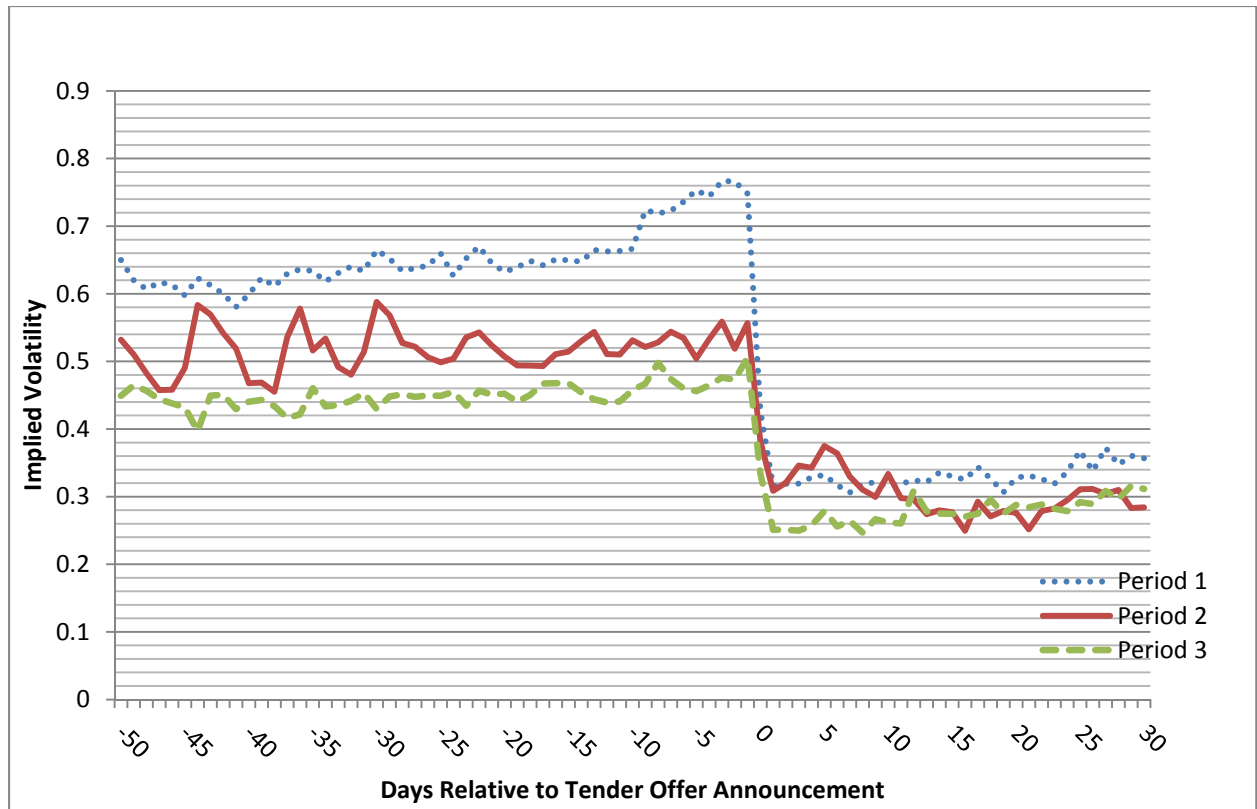
announcement date, the implied volatility falls by about half. Finally, during the subsequent 50 days after the takeover announcement date, the implied volatility rises slightly. In figure 3, there is no evidence of a fall in implied volatility prior to the announcement of the takeovers.

Figure 3



In figure 4, we compute implied volatility for each of the three sub-periods separately. Evidence in figure 4 indicates that in all three sub-periods, implied volatilities of call options of target firms decline on the public announcement of the tender offer. The magnitude of the decline is large and statistically significant. On average, volatility declines by as much as one-half of the pre-announcement day volatility. Hence, our evidence confirms that tender offers reduce volatility of target stocks' returns on announcement.

Figure 4



In contrast with the announcement day reaction, volatility of target stock returns does not decline prior to the announcement in any of the three sub-periods. In fact, volatility typically increases prior to the announcement of the takeovers in each sub-period. This figure is consistent with price pressure on call options, and inconsistent with the public rumor explanation. The public rumor hypothesis predicts a smoothly declining volatility prior to the announcement date as the tender offer is publicly anticipated. The lack of a smoothly declining implied volatility suggests that the tender offer announcement comes as a surprise to the market participants. Instead, consistent with the

price pressure hypothesis, volatility increases prior to the tender offer announcement dates.

While not shown here, we undertook some additional tests. Specifically, the public rumor hypothesis predicts a negative relation between volatility and pre-bid run-up in stock prices. To test this hypothesis, we ran a regression of the changes in implied volatilities against the stock price run-ups. Our evidence suggests weakly positive relation between the two, instead of a negative relation as predicted by the public rumor hypothesis. This finding is inconsistent with the public rumor hypothesis.

Rising implied volatility prior to the public announcement of the takeover implies increasing price pressure on option prices as predicted by illegal insider trading hypothesis. The fact that implied volatilities rise prior to tender offers can be seen from Figure 4. The increasing volatility is evident in all three sub-periods. Overall, Figure 4 is consistent with the presence of illegal insider trading prior to the announcement of the tender offers in all three sub-periods.

III. Conclusions

Recent evidence indicates increasing enforcement action against insider trading by the SEC and the Department of Justice. The SEC has more than doubled its enforcement actions between 2005 and 2010 compared to 1980s. At the same time, the

severity of punishment for insider trading convictions has also increased. The probability of receiving a prison sentence upon conviction has increased almost ten-fold over the past 15 years. Similarly, the length of the median prison sentence upon conviction has more than doubled.

In this study, we investigate whether these increased enforcement actions correspond to increased illegal insider trading activity. We examine the pricing of common stocks and options around the announcement of tender offers to detect the presence of illegal insider trading. Our objective is to determine whether illegal insider trading occurs before tender offers and whether illegal insider trading has become more rampant over time.

Our evidence indicates that the pre-announcement run-up in stock prices has become larger over time. During the 2006-2011 sub-period, the pre-bid run-up is 50% higher than in the pre-2006 period. We also find that toehold investments by bidders do not explain the time-series variation in stock price behavior around takeovers.

The evidence from option pricing is also consistent with illegal insider trading at work. We find that the implied volatility of option prices increases before the announcement of tender offers and decreases on the announcement date. This evidence is consistent with a price pressure on call option prices prior to the announcement of the tender offers. Overall, our evidence suggests that the recent increased insider trading

enforcement intensity in the USA most likely stems from an increased presence of illegal insider trading.

That insider trading has apparently increased over time raises significant legal and policy questions. One such question is whether enforcement efforts and expenses sufficiently deter insider trading. Relatedly, one may wonder whether the potential returns to illegal insider trading have become more lucrative the more stringent insider trading enforcement has become.