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There and Back Again: A Stock's Tale

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The October 2, 2007 delisting of Maxim Integrated Products (MXIM), a $9 billion S&P 500 company affords a singular perspective on delisting and the determinants of market quality. Since investors expect MXIM to relist after expensing (improperly backdated) executive options, its return dynamics are largely unaffected by delisting–despite trading on the Pink Sheets and the delisting of its options. 3.5 months after delisting management warns that compliance with SEC requirements will be delayed. Following this announcement the stock's market quality declines significantly. The stock and options are relisted in October 2008 and market quality largely returns to pre-listing norms.

Key Words: Investor attention; price pressure; Pink Sheets

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1. Introduction

A stock's market quality broadly refers to trading costs in that stock. Measures of market quality include: the size of the bid-ask spread, the presence of price reversals, squared stock return scaled by trading volume, and the speed of information assimilation. Market quality varies across stocks, and recent research in finance focuses on institutional differences and constraints on investor attention as drivers of these cross-sectional differences. Both institutional differences and limited investor attention are related to research on the limits of arbitrage which recognizes that (dealer) risk capital is in limited supply and slow moving.

While many studies have identified variables that are correlated with measures of market quality, determining causality is elusive because most of these variables are determined simultaneously. Roll, Schwartz, and Subrahmaniam (2009) and Kumar, Sarin, and Shastri (1998) show that stocks with traded options react more quickly to information than those without. Hong, Lim, and Stein (2000) show that analyst coverage is related to the speed of information assimilation. Hou and Moskowitz (2005) show that analyst coverage, percentage of shares owned by institutions, number of shareholders, number of employees, and advertising expenses are all related to the speed of information assimilation.[1] In this paper I consider a case study that affords insights into the relationships between institutional structures, trading dynamics, and investor inattention.

On October 2, 2007, Nasdaq delisted the stock of Maxim Integrated Products (MXIM) and the options exchanges followed suit because the company was out of compliance with the Securities and Exchange Commission's (SEC) timely filing and proxy requirements, as a result of the backdating of executive stock options.[2] Consequently the stock traded on the lowest tier of the Pink Sheets (OTC PINK) for over a year before relisting on Nasdaq and the options exchanges on October 8, 2008.[3] At the time of delisting MXIM was an S&P 500 company with a market capitalization of $9.4 billion. The company was sound financially: the book value of its assets was $3.6 billion, it had no long-term debt, and the book value of its current liabilities was $0.4 billion. While its stock traded on the Pink Sheets MXIM's senior management: continued to hold quarterly conference calls which were attended by many buy-side analysts following the industry;

[1] Hirshleifer and Teoh (2003) and Peng and Xiong (2006) discuss how limited attention can affect return dynamics. Hou and Moskowitz (2005) show that there is significant cross-sectional variation in the speed at which stock prices react to information. They find that firms that react slower have higher rates of return. Additional studies that document a gradual diffusion of information in some stocks relative to others include: Hou (2007), Cohen and Lou (2012), Menzly and Ozbas (2010), and Chordia, Sarkar, and Subrahmanyam (2011). Boguth, Carlson, Fisher, and Simutin (2015) show that cross-sectional differences in the speed with which information becomes impounded in price are important for measuring risk and return in asset pricing studies. Even the timing of information releases is endogenous. In a study on the limits of investor attention, Dellavigna and Pollet (2009) show that the market takes longer to assimilate news releases on Fridays than on the other days of the week. They also show that companies that release earnings news on Fridays are smaller than other firms.

[2] Appendix A contains a timeline of events around MXIM's delisting.

[3] Appendix B contains details on the organization of the Pink Sheets.

engaged in several acquisitions; and continued to pay its $60.3 million quarterly dividend–even raising this by 6%. Furthermore, all of the executives involved in the backdating scandal had been dismissed from the company more than a year before delisting. In sum, the reasons for the delisting had nothing to do with the current or future prospects of the company. As such this regulatory intervention is a unique exogenous shock to the trading institutions.

Three and one-half months after delisting, on January 17, 2008, MXIM announced that its restatements and resultant SEC compliance would be delayed an expected three months, possibly longer. This is news to the market as the stock lost 27% of its value over the next three days and 49% of outstanding shares are traded over the 16 days following this announcement. MXIM continues to trade on the Pink Sheets through October 8, 2008, when it is relisted on Nasdaq, and its options are also relisted.

I analyze the effects of these events on MXIM's share ownership, measures of market quality and trading dynamics. The time frame for my analysis is January 3, 2006 through December 31, 2009. This is divided into five subperiods: (1) Pre-delisting, January 3, 2006 - August 31, 2007, (419 trading days); (2) Phase 1 on the Pink Sheets (PS1), October 2, 2007 - January 16, 2008, (74 trading days); (3) Adjustment phase on the Pink Sheets, January 17, 2008 - February 8, 2008, (16 trading days); (4) Phase 2 on the Pink Sheets (PS2), February 11, 2008 - October 7, 2008, (168 trading days); and (5) Post-delisting, November 3, 2008 - December 31, 2009, (293 trading days). I use differences-in-differences to evaluate the effect of the two "treatments:" delisting per se in Phase 1 of Pink Sheets trading; and reduced clarity about future relisting in Phase 2 of Pink Sheets trading, on MXIM's trading dynamics.

I find that most measures of market quality, including the speed and efficiency of information assimilation, are not affected by delisting per se. This means that having listed options does not cause a measurable increase in market quality. Similarly, moving from an organized exchange to an electronic bulletin board requiring phone-based transactions does not cause a measurable decrease in market quality.[4] Contrary to perceptions that the Pink Sheets is dominated by retail traders, mutual fund ownership does not decline after delisting. A likely reason for these results is that market participants expected that the company would relist in a timely manner. There is no evidence of a drop in investor attention or a reduction in dealer risk capital dedicated to market making in MXIM pursuant to its delisting.

Supporting the hypothesis that investor attention–not the institutional setting–is a first-order driver of market quality, I document a significant decline in market quality in Phase 2 of Pink Sheets trading, as there is a significant two-day price reversal pattern. Furthermore, it also takes

[4]Bollen and Christie (2009); Harris, Panchapagesan and Werner (2008); and Macy, O'Hara, and Pompilio (2008) document that trading on the Pink Sheets is quite orderly.

two days for MXIM's price to fully react to market and industry information in this period. The link between these results and a drop in investor attention is provided by Hirshleifer, Lim, and Teoh (2009, p. 2290): "a comparative statics prediction of limited attention models is that when the amount of attention investors direct toward a firm decreases, there should be more severe underreaction to news about the firm." Further evidence of a drop in investor attention is provided by media following. I find that there is no change in media and analyst coverage in Phase 1 of Pink Sheets trading, but both of these measures drop significantly in Phase 2 of Pink Sheets trading.[5] Limits of arbitrage and disagreement models (following the taxonomy of Hong and Stein 2007) are well suited to evaluate this situation because they have implications for trading volume and media coverage in addition to return dynamics, and we see changes in all three dimensions during MXIM's second phase of Pink Sheets trading.

Hendershott, Li, Menkveld, and Seasholes (2013) note that there are two channels through which investor inattention can impact market outcomes. First, is a misinformation channel. The storied cases studies by Rashes (2001) and Huberman and Regev (2001) provide examples of the misinformation channel.[6] The MXIM case provides an example of the second channel–reduced risk sharing. Investor attention drops, and correspondingly trading volume, media coverage, and analyst following decline. In Hendershott, Li, Menkveld, and Seasholes a drop in retail traders' attention means that institutional investors (those whose attention is not diminished) are forced to trade with dealers. Dealer capital is slow moving and dealers are risk-averse. This gives rise to the heightened price pressure and reversals. Corwin and Coughenour (2008) provide a link between dealer capital allocation and attention. They examine New York Stock Exchange specialist behavior in three months of 2002, and find that when trading activity in one of the specialist's assigned stocks spikes that specialist lowers liquidity provision in his other stocks. They infer that, "limited attention influences the provision of liquidity in financial markets," (p. 3064). Further evidence in support of this channel is provided by analyzing trading throughout the day. The underreaction to news and price reversal both occur only during the traditional trading session. Neither occurs in close-to-open returns, when all Pink Sheets trading is institutional, (as shown by Ang, Shtauber, and Tetlock 2013).

I find that the bid-ask spread does not increase following delisting or the subsequent drop in

[5]Peress (2014) notes, it is difficult to establish a causal link between media coverage and trading activity. Journalists may be disinclined to follow a stock because it trades less actively. On the other hand traders may trade less because there are fewer news stories. Studies which document a correlation between media coverage and trading activity include: Klibanoff Lamont, and Wizman (1998), Tetlock (2007), Fang and Peress (2009), Engelberg and Parsons (2011), and Dougal, Engelberg, Garcia, and Parsons (2012).

[6]Huberman and Regev (2001) show that there is a large market reaction in Entremed stock when the *New York Times* published a favorable story about a new drug. There was nothing new in this story in light of an article in *Nature* six months earlier. Rashes (2001) shows that shares of the closed-end fund Massmutual Corporate Investors react to news about MCI corporation. He attributes this to confusion about the two stocks' ticker symbols.

investor attention. This is consistent with Grossman and Miller's (1988) and Hendershott and Menkveld's (2014) models that treat the spread and price pressure as distinct components of liquidity. For example, in Hendershott and Menkveld, a drop in dealer risk capital allocated to market making in the stock can result in increased price pressure, but unchanged spread.

At the time its shares and options were delisted, MXIM was also removed from the S&P 500 Index, the Nasdaq 100 Index, and the Philadelphia Semiconductor Index (SOX). As a result the number of institutions that own the stock drops. Nevertheless, the percentage of shares owned by institutions rises through the time that MXIM trades on the Pink Sheets. This belies the notion that the Pink Sheets are primarily for retail traders. Immediately upon delisting there is a statistically significant drop in MXIM's short interest. This result is anticipated by D'Avolio (2002) who finds that passive indexed investors are more likely to participate in securities lending than other types of institutions. Another possible cause for the drop in short interest is options delisting, which might reduce the demand for shorting. Hou (2009) shows that binding short selling constraints give rise to an asymmetry in the market's reaction to information, with more delays following negative news.[7] However I show that the underreaction in MXIM's price following the drop in investor attention is symmetric with respect to good and bad news, suggesting that short selling constraints are not the reason for the reduced speed of information flow. This is also supported by the fact that the drop in short interest occurs immediately after delisting and there is no delay in information assimilation or persistent reversals in Phase 1 of Pink Sheets trading.

The paper is organized as follows. I describe the data and institutional settings in Section 2. I summarize the results, including the differences-in-differences analysis, in Section 3. Section 4 concludes the paper. Appendix A contains a timeline of the relevant events in MXIM's history. I provide additional technical aspects of the Pink Sheets in Appendix B. Appendix C contains MXIM's January 17, 2008 press release on the delay in SEC compliance. Appendix D contains additional technical details about my data.

2. Data and Institutional Setting

2.1 Data

The control group for the differences-in-differences analysis consists of the stocks of six companies in MXIM's niche within the semiconductor industry. In addition to MXIM, this subindustry comprises the following six companies that develop and manufacture linear (analog) and

[7] Nagel (2005), Boehmer and Kelley (2009), and Boehmer and Wu (2010) argue that institutional ownership facilitates securities lending and short selling. Chen, Hong, and Stein (2002) use the number of mutual funds that own a stock–as a percentage of all mutual funds, as their *breadth* variable, which they argue proxies for short selling constraints. Ang, Shtauber, and Tetlock (2013) conjecture that limits on short sales of Pink Sheets stocks may give rise to temporary overpricing.

mixed-signal integrated circuits: Analog Devices, Fairchild Semiconductor, Linear Technologies, National Semiconductor, ON Semiconductor, and Texas Instruments. Table 1 contains summary information about these seven stocks on two dates: the quarter-end just prior to MXIM's delisting (September 2017), and the first quarter-end following relisting (December 2008). This table shows all seven companies' market capitalization: Texas Instruments is the largest, with equity market capitalization of $49.6 billion on September 14, 2007. MXIM's equity value is $9.3 billion–between Analog Devices whose market capitalization is $10.9 billion and Linear Technologies with a market capitalization of $7.8 billion. The table also reports the percentage of shares owned by 13(f) institutions on the two dates. Texas Instruments has the lowest percentage of institutional holdings of the six benchmark stocks during the period. Institutions own only 74% of Texas Instruments' outstanding shares on September 30, 2008. The average institutional ownership rate for the benchmark stocks is 95% on September 30, 2007 and 89% on December 31, 2008.[8]

I collect open and closing prices, trading volume, and dividend information on all seven companies from CRSP. I collect intraday data on trading activity after market close and during trading hours from TAQ. While MXIM trades on the Pink Sheets there is no data available on either TAQ or CRSP, so I collect price and volume data from Bloomberg. Appendix D provides a discussion of this data. I obtain daily option trading volume and open interest for all seven stocks from Bloomberg.

The SEC removed MXIM from its 13(f) list as soon as the stock was delisted. Therefore these reports cannot be used to measure institutional holdings on MXIM while it is delisted. By contrast, mutual funds are required to file their holdings on a quarterly basis (Form N-Q) and are not affected by the 13(f) list. However (and unlike the 13(f) reports), there is flexibility as to when (within the quarter) this report is filed. To identify quarterly mutual fund holdings, I start with the Thompson Reuters Spectrum 1-2 Master File and remove all records from a single fund with the same report date. Next, I eliminate multiple report dates from a single fund in the same calendar quarter–keeping the latest. Then I aggregate across all funds with a report date in that calendar quarter.

[8] A curiosity in Table 3 is that several of the reported percentages owned by 13(f) institutions exceed 100%. There are several possible explanations for this. First, institutions do not report short positions, and the total shares owned equals the shares outstanding plus the short interest. Even this number is a lower bound in light of dealer trading facilitation (i.e., naked shorting). In the case of ON Semiconductor, for example, some 12% of its shares are sold short so its 1.12 ratio on September 30, 2007, is technically possible. A second possibility is reporting error. The employee filling out the 13(f) report may be looking at a portfolio report that is not up-to-date, and may make a clerical error. In fact, a review by the SEC's Office of Inspector General, Office of Audits of the SEC's Section 13(f) reporting requirements, presented on September 27, 2010, explicitly states, "There is no mechanism by which the SEC scans for obvious errors in Forms 13F, resulting in these forms being uploaded in EDGAR with errors." The report is available on the Internet: www.sec.gov/oig/reportspubs/480.pdf. A final possibility is that the Thompson Reuters database, which does not report options holdings although these are reported on 13(f) reports, incorrectly includes some option positions as shares.

Institutions that file 13(f) forms include long positions in put and call options, although this data is not reported in the Thompson Reuters Spectrum database. The only meaningful number in this report is the number of contracts, since (curiously) the value of the position is reported as the stock price times the number of contracts, and no other information about the options is provided. I obtain this data from the 13(f) filing via Bloomberg.

Exchanges and the Pink Sheets must file short interest reports with FINRA (the Financial Industry Regulatory Authority, the US exchanges' self-regulatory organization). Prior to September 2007 these reports were filed on a monthly basis–showing short interest as of the 15th day of the month along with average daily trading volume in the month preceding that date. Beginning in September 2007, reports are made twice monthly–on the 15th and last day of the month. These reports contain average daily trading volume for the period since the preceding report.

Either as a result of its failure to file with the SEC or not being listed on an exchange for much of the period, MXIM is not covered by the IBES database while it trades on the Pink Sheets. The financial blog *SeekingAlpha* has warehoused the transcripts and participants of the quarterly conference calls between management and analysts. I collect information about conference calls from all seven stocks from IBES, and use *SeekingAlpha* for MXIM while it is delisted. I measure media coverage by the number of stories that include the company in Bloomberg News, from all sources in English. Appendix D lists some of the news services included in the Bloomberg news feed.

2.2 Institutional setting

Figure 1 shows the cumulative returns for MXIM, the Philadelphia Exchange Semiconductor Index (SOX), and the benchmark (subindustry) portfolio. Appendix A provides a timeline of events that are material to MXIM's delisting from, and subsequent relisting on Nasdaq. As noted in the introduction, unlike most cases of delisting from Nasdaq to the Pink Sheets, MXIM's business proceeds apace while it trades on the Pink Sheets. In a *Wall Street Journal MarketWatch* report from September 25, 2007, reporter Matt Andrejczak notes: "Delisting issues aside, most Wall Street analysts are confident about MXIM's business. The company makes analog chips used in cars, computers, portable electronics and mobile phones. MXIM, according to Bear Stearns, should benefit from ongoing growth trends in laptop computers, high-end mobile phones and other portable digital electronics."

The inset of Figure 1 shows MXIM's returns along with the two benchmarks, over the 9-(trading) day period September 25 through October 4, 2007. The -3% return on September 25, when Standard & Poor's announced that MXIM was to be deleted from the S&P 500 Index

on September 26, was fully reversed by September 27. Similarly, the -3% return on October 1, was fully reversed by October 4. The inset shows that both of these negative returns were idiosyncratic, and the reversals went against the industry trends on those days. These two **V**-shaped return patterns in the inset are consistent with Duffie's (2010) discussion of price reversals resulting from slow-moving capital. He uses index deletion as a motivating example of this phenomenon. MXIM is much larger and more actively-traded than most index deletions, and both of these reversals are complete within two days–the first on Nasdaq and the second on the Pink Sheets. By contrast the reversals that Duffie describes span 30 trading days, and only recover 95% of the loss.

In its "Options Scorecard," last updated on September 4, 2007, The *Wall Street Journal* lists 142 publicly traded companies, including Apple, Microsoft, and MXIM, which were involved in the options backdating scandals of that time. Many of these companies were under investigation by the SEC and/or the US Justice Department. Many experienced departures of corporate executives and/or directors, and many restated earnings and took charges as a result of the practice of strategically choosing measurement dates for option grants. Bickley and Shorter (2008) provide a comprehensive review of the context and the legal and regulatory actions in this episode. While Apple and many other companies were threatened with delisting by Nasdaq, actual delisting was rare. Mercury Interactive was delisted on January 4, 2006, and acquired by Hewlett-Packard on July 25, 2006. Nyfix was delisted on November 1, 2005, and Power Integrations was delisted twice, on August 2, 2006 (relisted on October 28, 2006) and December 9, 2006. MXIM is the largest company to be delisted as a result of options backdating.

Bernile and Jarrell (2009) note that the revelation of stock options backdating has virtually no direct effect on future cash flows. However various plaintiffs brought law suits against MXIM and its officers. One such example is Case 5:08-cv-00832-JW (2009), which serves as a useful source of historical information on this episode.[9] MXIM and its officers were involved in two settlements. The first settlement on January 2, 2009 was for $28.5 million, of which MXIM's insurers paid $21 million with the rest paid by individuals who no longer worked at MXIM. The second settlement was on May 5, 2010, under which MXIM paid $173 million, representing a $110 million after-tax cash impact.[10]

Figure 1 also shows that over the entire 2.5 year period, $1 invested in MXIM, SOX, and the benchmark fell to $0.4335, $0.4695, and $0.5612, respectively. Appendix A shows that on

[9]Case 5:08-cv-00832-JW, 2009, United States District Court for the Northern District of California, San Jose Division, filed July 16.

[10]This represents the third highest out-of-court settlement of the options backdating episode, behind United Healthcare, which paid $900 million on December 6, 2007, and Comverse Technology, which paid $225 million on December 17, 2009. LaCroix (2014) maintains a comprehensive website of the settlements, dismissals, and denials of option backdating related lawsuits.

January 17, 2008, MXIM announced that its restatements and resultant SEC compliance would be delayed an expected three months, possibly longer. Figure 1 reveals the large negative market reaction to this announcement. On January 16, MXIM closed at $23.63, its closing prices over the next three trading days were: $20.80, $19.33, and $18.07, respectively (for a cumulative three-day loss of 27%).[11] Appendix C contains MXIM's January 17, 2008 press release.

Prior to its delisting from Nasdaq, MXIM's last ordinary filing with the SEC was on May 3, 2006–a 10-Q form for the quarter ending March 25, 2006 (18 months prior to delisting). Between this date and September 30, 2008, MXIM did not file financial reports with the SEC. Nevertheless, during this period the company continued to hold quarterly conference calls, and release financial information on the same schedule as required by the SEC. These releases included the following caveat (from MXIM's January 31, 2008 conference call):

> I want to remind you of the contents of our January 31, 2007 press release, which reported that due to stock option accounting matters, Maxim expects to restate its financial statements. Since the Company has not yet issued restated financial statements, we are unable to provide detailed GAAP or non-GAAP financials for the quarter ended December 29, 2007. As a result, all numbers contained in our press release and discussed on this call exclude all stock-based compensation. These numbers should be treated as estimates only and are subject to change.

Table 2 contains information from these conference calls before, during, and after MXIM's banishment to the Pink Sheets. Panel A shows the dates of the quarterly conference calls and the number of analysts participating in each call for MXIM and its six industry peers. The first tabulated call for each company occurs between July 19, and September 25, 2007, when the number of analysts ranges from a minimum of nine for Fairchild Semiconductor to a maximum of 17 for both Linear Technologies and MXIM. Panel B shows the firms for which participating analysts work in all six of MXIM's calls over this period. Of the 17 firms following MXIM prior to delisting, only one (Morgan Stanley) stops following the company immediately after delisting. Indeed, the number of analysts at MXIM's first conference call after delisting is one more than at the previous call, as RBC Capital Markets and William Blair analysts participate. There is a significant drop in analyst participation from the November 1 call to the Jan 31, 2008 call, at which only ten analysts participate. None of the benchmark firms experience a sequential drop of this magnitude over the period.

There are a number of analyst recommendations on MXIM in both phases of its Pink Sheets exile. For example, AmTech Research, whose analyst, Doug Freedman, participated in both the August and November 2007 conference calls, started MXIM with a buy recommendation on

[11] While not the focus of this paper, this represents a $1.8 billion drop in MXIM's value. Bernile and Jarrell (2009) suggest that one explanation for the large market effect of options backdating revelations is fear of delisting costs. These fears do not apply in this case as the company had been delisted for almost four months at this point. Adding the tax savings to the settlement, the total cash flow consequences of this episode are a net *inflow* of approximately $90 million.

November 2, 2007, the day after the November conference call. Zacks.com listed MXIM as a buy opportunity on May 8, 2008. *SeekingAlpha* surveyed analysts immediately after the August 7, 2008 call, and reports that J.P. Morgan and Thomas Weisel's analysts have overweight ratings, while William Blair and Canaccord Adams' analysts have market perform (hold) ratings on MXIM.

3. Results

3.1 Institutional ownership

Table 3 provides information on institutional owners of MXIM shares before, during, and after its delisting. Table 1 shows that in September 2007 – immediately prior to delisting – MXIM has over 320 million shares outstanding, and 336 institutions own 88.5% of its outstanding shares. Three institutions, Capital Research and Management, Fidelity, and Wellington own more than 25 million shares each. Although 13(f) filers are not required to report their holdings in MXIM while it is delisted, some funds continue to do so. Table 3 shows a hedge fund, Kensico Capital Management that buys almost 7 million MXIM shares while it trades on the Pink Sheets. Since we cannot observe all 13(f) holdings while MXIM is delisted I focus on mutual fund holdings. Table 3 shows that several funds that hold large positions prior to delisting increase their holdings after MXIM is delisted, and maintain these holdings through MXIM's exile on the Pink Sheets. Examples of funds following this pattern include Growth Fund of America, which owns over 15 millions shares prior to delisting, buys 2 million shares after delisting and holds over 17 million shares through the next year. Dodge & Cox has no position in MXIM in the three quarters prior to delisting, buys over 12 million shares in the quarter following delisting, and another 7 million shares in the following quarter. The largest position reduction in MXIM while it is delisted, in Table 3, is by Columbia Seligman Communications and Information Fund which adds 1.2 million shares immediately after delisting, and then sells its entire position of over 4 million shares in the second quarter of delisting.

Table 4 shows the percentage of outstanding shares owned by mutual funds and the number of funds that own at least one share of the seven firms in MXIM's industry over the study period. There is no evidence that in aggregate mutual funds are averse to owning a stock that trades (only) on the Pink Sheets. In fact, mutual fund holdings increase by over 36%, or 31 million shares during the year that MXIM trades on the Pink Sheets. Also, mutual funds do not reduce their holdings following management's January 17 announcement. Mutual funds increase their holdings relative to other institutions significantly from the quarter immediately before delisting to the quarter immediately following relisting. In the quarter prior to delisting, mutual funds hold 42% of total institutional holdings. One quarter after relisting mutual funds' share of the

institutional holdings is 59%.

Although the percentage of shares owned by mutual funds rises while MXIM trades on the Pink Sheets, Table 4 also shows that the number of institutional owners is much smaller in December 2008 (at 210)–after MXIM relists than in September 2007 (336)–just prior to delisting.[12] There is a 44% drop in the number of institutions that own MXIM from September 30, 2007 to December 31, 2008, the next date for which this information is available. Similarly, the number of mutual funds that own MXIM declines from 435 to 245 (a drop of 57%) over the same period. The first quarter of 2008, (the second quarter after delisting), exhibits the largest decline in the number of mutual funds that own MXIM, from 359 to 213. All of the benchmark stocks experience large drops in the number of funds in this quarter. The decline in the number of mutual funds that own MXIM shares, in the face of increasing mutual fund share ownership is likely the result of MXIM's removal from the S&P 500 Index, and to a lesser extent the Nasdaq 100, Russell, and SOX Indices. In the second quarter of 2007, 63 mutual funds of the 641 that own MXIM are identified by name as either S&P 500 or Nasdaq 100 index funds. These passive index funds own 8.2 million shares of MXIM. None of these funds own MXIM while it is delisted. MXIM was added back to the Nasdaq 100 on December 22, 2008, the Russell 1000 in 2009, and the SOX Index in September 23, 2013. The stock has not been (re-)added to the S&P 500 Index as of this paper's date.

3.2 Trading activity and media following

Table 5 reports the total daily trading volume, pre-session (4:00 am - 9:30 am, primarily from 8:00 - 9:30 am Eastern time) volume, and post-session (4:00 pm - 8:00 pm, primarily from 4:00 - 5:30 pm Eastern time) volume for MXIM and its industry benchmark over the five periods in the study.[13] MXIM's total trading volume in the first phase of Pink Sheets trading is largely in line with the pre- and post-delisting benchmark. MXIM's volume is unusually high during the sixteen day transition period following its January 17 announcement, 49% of outstanding shares trade hands during this period. Because of the short duration of this period, it is not included in the differences-in-differences analysis. Bollen and Christie (2008) note that there is very little trading activity for most Pink Sheets stocks during the pre-open and post-session

[12]It may seem odd that the number of mutual fund owners reported in Table 4.B exceeds the number of 13(f) institutional owners reported in Table 1. The number of 13(f) institutions reported in Table 1 is based on firm-level holdings as reported on the 13(f) form. By contrast, the number of mutual funds reported in Table 4 is based on the fund-level as reported on the N-Q form. Suppose that 14 different mutual funds managed by Fidelity Investments (which comprises 567 funds) own MXIM. This would show up as 14 unique funds in Form N-Q (and in Table 4), but one institution in the 13(f) filings (and in Table 1).

[13]Because trading volume is highly skewed, I report quantiles of its distribution in Table 5 and use the natural log of volume in the differences-in differences analyses reported in Table 6.

periods.[14] Nevertheless there is unusually heavy volume in MXIM in the pre- and post-session periods, during this transition phase. This table shows that while trading volume is much lower in the second phase of Pink Sheets trading than in the other periods, median volume exceeds 1.5 million shares per day.

Table 6 presents the results of the difference-in-differences analysis of whether MXIM's behavior–relative to its peers–changes during each of the two phases of Pink Sheets trading. Difference-in-differences has been criticized for failing to account for lack of independence and sphericality in the residuals (Bertrand, Duflo, and Mullainathan 2004). Therefore I use a Newey-West variance-covariance matrix, and compute the lag length to use in adjusting for serial dependence using the method of Andrews (1991). Cases where the treatment effect of MXIM in PS1 and MXIM in PS2 are statistically significant are in bold type in the table. Panels A – J of Table 6 report the results of the difference-in-differences regressions with 6,685 (daily) observations on the seven stocks. Table 6.A analyzes the treatment effects on daily squared returns. Overall, this Panel shows that MXIM's squared returns are statistically significantly lower than those of the other six stocks. Table 6.A also shows that the differences-in-differences of daily squared (close-to-close) returns in the two treatment periods, while the stock is trading on the Pink Sheets, are not statistically significantly different from zero.

In Panels B and C I decompose the 24-hour day into close-to-open (16:00 - 9:30) and open-to-close (9:30 - 16:00) periods. Panel B shows that overall and in PS1, MXIM's close-to-open squared returns are not significantly different from its industry peers'. The difference-in-difference of MXIM's scale of close-to-open returns is significantly lower in PS2. Panel C shows that the scale of MXIM's open-to-close returns is significantly lower overall than peer stocks'. As with the close-to-close returns in Panel A, there is no statistically significant difference-in-difference in either of the two treatment periods.

I measure the daily range as the log-difference between the high and low prices within the day. Panel D of Table 6 reports the difference-in-difference regressions on the range. It shows that MXIM's range overall is not significantly different from its peers, and also that there is no treatment effect from either phase of Pink Sheets trading on the intraday price range.

Table 6.E considers the effect of the different regimes on daily trading volume. The difference between MXIM's daily log-trading volume and its peers is significantly lower in PS2, than in the other three periods–including the first phase of Pink Sheets trading. This effect is also evident in the raw data in Table 5. MXIM's average daily trading volume in PS2 is less than half of what

[14]Retail brokers will not execute customer orders on Pink Sheets stocks outside of the 9:30 - 4:00 trading day. Pink Sheet regulations specify that trading may take place on Monday through Friday from 6:00 am to 5:00 pm. The majority of quoting and trading occurs between the open market hours of 9:30 AM to 4:00 PM (Eastern); however, market participants are free to quote and trade at any time as long as they comply with current regulations (e.g., FINRA best execution rules).

it is in the other periods.[15]

Panels F and G in Table 6 report the differences-in-differences regressions on the Corwin and Schultz (2012) (CS) measures of (proportional) daily bid-ask spreads and spread-adjusted return volatility.[16] Panel F shows that the spread-adjusted return variance is significantly higher in PS2, the second phase of Pink Sheets trading. There is no significant treatment effect on the bid-ask spread in either PS1 or PS2.

Table 6.H considers the treatment effects on daily squared return scaled by trading volume. The results of this difference-in-differences regression are not surprising in light of the fact that in PS2 MXIM's volatility adjusted for the spread is significantly higher and trading volume is significantly lower. As expected, the treatment effect of PS2 on the ratio of the squared return to volume is statistically significantly positive. Price is more responsive to volume during MXIM's second phase of Pink Sheets trading (there is heightened price pressure).

Panels I and J consider trading activity in the pre-session and post-session periods. Since I evaluate the natural logarithm of volume, I substitute 50 shares for 0 in both Panel I and J regressions. Panel I shows that there is a significant negative treatment effect on pre-session volume in PS2, the second phase of Pink Sheets trading. There is no significant difference-in-difference attributable to PS1, the pre-announcement Pink Sheets period, in pre-session volume. There is a significant positive treatment effect of PS1 on post-session trading volume. This confirms the earlier evidence concerning significant institutional trading while MXIM trades on the Pink Sheets.

Figure 2 and Tables 1 and 6.K provide information about short interest on MXIM and its peers. Figure 2 shows that MXIM's short interest declines from March 2007 through September 2008, and then it rises steadily after relisting on Nasdaq. It also shows that there is significant variation over time in average industry short interest, but MXIM's deep drop while trading on the Pink Sheets is not matched by its industry. Table 6.K shows that MXIM's industry-benchmarked short interest is significantly lower while the stock is delisted, (in both Pink Sheets periods). Here

[15]There are potential concerns when comparing volume across venues. The most important of these is the well-known double counting of principal transactions on Nasdaq, prior to 2001. By 2006, when this sample starts, none of these concerns apply to "Nasdaq-listed" stocks in light of the riskless principal trade-reporting rules implemented on February 1, 2001. This rule also applies to the Pink Sheets. While it is listed on Nasdaq, MXIM trades through the National Market System on a variety of electronic networks. While trading on the Pink Sheets it can not trade through any of these alternative venues. There is no reason to expect that trading volume on one market is distorted relative to the other market. This is borne out by the data since volume in the first phase of Pink Sheets trading is very close to volume in the pre-Pink Sheets period on Nasdaq.

[16]Corwin and Schultz (2012) develop a non-linear system of equations that rely on the daily high and low prices only. As they note, the spread between daily high and low prices depends on both the bid-ask spread and the variance. They separate these two components by recognizing that the spread between the high and low over a two-day period will increase roughly linearly over the daily range in the variance, but not in the bid-ask spread. This model is especially useful in analyzing MXIM's behavior on the Pink Sheets as daily high and low prices are available but not bid-ask spreads.

the decline in the level of short selling cannot be attributed to a decline in institutional holding, per se. Delisting has the potential to affect both the supply and demand of loanable shares for the purpose of shorting. As noted in the introduction, D'Avolio (2002) argues that passive index funds are an important supplier of securities lending. Options trading is likely a source of demand for securities lending, as options market makers use short positions in the stock to hedge open option positions. Arbitrageurs trading in both markets may also shift out the demand for loanable shares.

Figure 2 and Table 4.L also consider the short interest ratio, that is short interest divided by average daily volume over the preceding period (since the last measurement of short interest). Not surprisingly, this shows a significant drop in PS1 since volume remains robust during this first phase of Pink Sheets trading whereas the drop in short interest is contemporaneous with delisting. The spike in this ratio, which is evident in Figure 2 is on the three short interest measurement dates prior to management's January 17 announcement (December 14, 2007; December 31, 2007; and January 15, 2008). There is no difference in the difference between MXIM's ratio of short interest to volume and that of peer stocks in PS2 relative to the control periods.

Panels M and N of Table 6, and Table 7 evaluate the news environment for MXIM and its industry peers over the period January 2006 through December 2009. Table 7 shows the number of stories per month in the Bloomberg news feed (in English) for each of the seven companies. The average number of news stories that mention MXIM in the second phase of its Pink Sheets period is 34.8. This is lower than in any of the other periods: 65.1 in the pre-Pink Sheets period, 58.5 in the period when MXIM trades on the Pink Sheets before its charge announcement (PS1), and 44.8 in the post-Pink Sheets period. Table 7 also shows that this variable is not highly volatile across the four periods for the six control stocks. However, there is a high degree of cross-sectional heterogeneity in this metric. In the pre-Pink Sheets period Texas Instruments has an average of 200.5 stories per month, whereas Fairchild Semiconductor has an average of 24.0 stories per month. Tables 6.M, and 6.N show the results of differences-in-differences regressions on the news coverage that address this heterogeneity in different ways. The regression in Panel M includes MXIM along with Analog Devices, Linear Technologies, and ON Semiconductor–excluding the two companies with the most stories (Texas Instruments and National Semiconductor) and the one with the fewest stories (Fairchild Semiconductor). The regression in Panel N uses all 7 stocks and includes an indicator variable for each (accommodating a firm fixed effect). The inference is the same from both: the number of news stories on MXIM–controlling for its peer group–is lower in PS2, the second phase of Pink Sheets trading, than in the pre- and post-Pink Sheets periods. By contrast, there is no treatment effect in PS1.

3.3 Gradual adjustment to information

Table 8 reports the results from daily market model regressions in the pre- and post-Pink Sheets eras as well as the two phases of Pink Sheets trading, PS1 and PS2. The dependent variable in the Table 8 regressions is the daily (close-to-close) return on MXIM. The regressors in Panel A are the one- and two-day lagged open-to-close and close-to-open returns on MXIM, the contemporaneous (close-to-close) return on the equally-weighted industry portfolio, and the 2-day cumulative close-to-open and open-to-close returns on the equally-weighted industry portfolio. Since the coefficients on all four lagged MXIM returns are statistically insignificant in each of these regressions there is no evidence of return reversals in MXIM at the daily frequency in the pre-Pink Sheets period and in PS1. By contrast, there is evidence of reversal of the two-day lagged open-to-close return in the second phase of Pink Sheets trading, PS2.

The coefficients on the lagged index returns in both the close-to-open and open-to-close periods are insignificantly different from zero in the pre- and post-Pink Sheets periods and first phase of Pink Sheets trading. However, the coefficient on the lagged open-to-close industry return is positive and statistically significant in the second phase of Pink Sheets trading. The table also provides evidence that in the post-delisting period, while MXIM trades on Nasdaq, the price overreacts to information in post-session trading, as the coefficient on the one-day lagged close-to-open return is significantly negative.

Table 8.A also shows that the r^2 from the market model regressions is also much lower while the stock trades on the Pink Sheets than pre- and post-delisting. It is 59% both pre- and post-delisting, but only 24% in the first phase of Pink Sheets trading and 32% in the second phase. This reflects the importance of company-specific news about the timeliness of its SEC compliance while MXIM is delisted. This table also shows that some price pressure remains after re-listing. There is evidence of price pressure in the close-to-open period, since this is reversed in the next day's trading. Table 5 shows that trading volume in the pre-open period post-Pink Sheets is significantly lower than in the pre-Pink Sheets period. Also a two-sample $t-$test of the null hypothesis that the number of news stories post-Pink Sheets equals or exceeds the number of stories in the pre-Pink Sheets period (shown in Table 7) is rejected at the 1% significance level. In general the evidence suggests that relisting does not restore all measures of market quality to their pre-delisting levels.

The next set of regressions is designed to assess whether MXIM's delayed reaction to industry information in the second phase of Pink Sheets trading can be attributed to more costly short selling while MXIM trades on the Pink Sheets. We know that MXIM's short interest is significantly lower in both phases of Pink Sheets trading. To test this I interact a negative return dummy variable with the lagged index return. If the underreaction to industry news is the result

of costlier short selling while MXIM trades on the Pink Sheets then it should be concentrated in bad news and the coefficient on this interaction term should be positive. Panel B shows that the interaction term is statistically insignificant.

Table 8.C reports the results of MXIM's return on the lagged daily close-to-open and open-to-close returns from the previous three days. This shows that the delayed reaction to industry news is due equally to both of the previous two days. There is no delayed reaction to close-to-open returns on any of the days, and the three-day lagged index return is not significantly related to MXIM's return on day t. In the second phase of Pink Sheets trading MXIM reacts with a two-day lag to market information during the trading session. There is no evidence of any underreactions in the pre- and post-Pink Sheets trading periods, or in the first phase of Pink Sheets trading.

3.4 Options

Once the SEC forced Nasdaq to delist MXIM the options exchanges also prohibited the opening of new options contracts on the stock.[17] Table 9 contains average and median daily trading volume for call (Panel A) and put (Panel B) options, by quarter, over the period January 3, 2006 through December 30, 2009 for MXIM and the six stocks in its subindustry. MXIM and all benchmark companies except Fairchild Semiconductor have positive options trading volume *every day* from January 3, 2007 through October 1, 2007. The average (median) daily options volume (summing over puts and calls of all strikes and maturities) for MXIM from August 1, 2007 through delisting on October 1, 2007 is 6,950 (4,401) contracts. The median daily call volume is 2,852 contracts and the median daily put volume is 1,549 contracts. The average total option volume across the six benchmark firms for the same period is 5,454 contracts. The average median call (put) volume of the benchmark stocks is 2,591 (1,363) contracts in the same quarter. Prior to delisting trading in MXIM's options is robust. The median daily volume statistics show that MXIM's option trading does not return to these pre-delisting levels even a year after relisting. There are some high volume days, but the trading activity is more varied through the post-delisting quarters in both put and call options than it was prior to delisting. The trading activity in the four quarters that MXIM is delisted involves contracts that were opened prior to delisting. The table shows that options trading continues apace in the benchmark stocks while MXIM trades on the Pink Sheets.

[17] Trade in extant contracts could still take place on the exchanges; only trades closing previously open positions were permitted. The Securities Act of 1933 (as amended) states that in order to be eligible for options trading a security must be a "covered security" as defined in the Act. A stock must be listed on NYSE, AMEX or NMS in order to be a "covered security," and hence have exchange-traded options. This restriction is also included in the OCC's bylaws, and in each of the options exchanges' own rules.

These data suggest that the option delisting had an immediate and large effect on trading in MXIM's call and put options. It is not the case that there was little interest in MXIM options prior to delisting. Furthermore, consistent with the evidence on the presence of lagged close-to-open reversals after relisting (in Table 8.A), investor attention may not be restored to pre-PS2 levels as the median volumes of call and put options remain significantly below pre-delisting levels following relisting.

4. Conclusion

A case study can disprove a hypothesis by providing a counterexample. Maxim was delisted, had its options delisted, and was removed from the S&P 500 Index and other indices yet it did not experience a measurable decline in market quality. Specifically the following metrics-benchmarked to peers-were not affected: bid-ask spread; return serial independence (no price reversals); speed of information assimilation; squared return scaled by trading volume; percentage of shares owned by mutual funds; media following; analyst coverage, and return variance-ex the bid-ask spread. Therefore, we can reject the hypothesis that having listed options causes an increase in these metrics of market quality. We can reject the hypothesis that trading on an organized exchange (and being "listed") causes an increase in these metrics of market quality. We can reject the hypothesis that being included in a major index or indices including the S&P 500 causes an increase in these metrics of market quality.

The market's reactions to MXIM's management's January 2008 announcement show that the likely reason that market quality did not decline in the four months following delisting is that major market participants believed that the stock and options would relist in a timely manner. This belief was shaken by the company's announcement that its compliance with SEC requirements would be delayed. After this announcement there is measurable degradation in most of these measures of market quality. Of the seven metrics in the preceding paragraph, only the bid-ask spread and the percentage of outstanding shares owned by mutual funds are not adversely affected for the remaining eight months that MXIM trades on the Pink Sheets. We can reject institutional change as being the cause of this decline in market quality. A decline in investor attention in the spirit of Hirshleifer, Lim, and Teoh (2009) and Hendershott, Li, Menkveld, and Seasholes (2013) is consistent with the entire set of results. MXIM's overall experience suggests that investor attention is a first-order driver of market quality. Institutional features, such as whether a stock has traded options, are not first-order drivers of market quality.

Appendices.

A. Maxim Integrated Products Timeline

Date	Event
April 1983	Maxim founded by Jack Gifford–formerly of Fairchild Semiconductor.
February 29, 1988	Maxim goes public: selling 10,865,000 shares for $6 each.
December 18, 1995	Maxim is added to the Nasdaq 100 Index.
May 2, 2000	Standard & Poor's announces that Maxim will be added to the S&P 500 Index on May 9.
February 22, 2002	Maxim is added to The Philadelphia Semiconductor Index (SOX).
May 22, 2006	Merrill Lynch analyst includes Maxim in a list of companies with consistent excess returns on executive stock options.
June 7, 2006	Maxim announces that it had received notice that the SEC is conducting an informal inquiry into Maxim's stock option backdating.
July 3, 2006	Maxim announces that it had 'received a subpoena from the US Attorney for the Northern District of California asking for documents relating to its stock option grants and practices.'
September 28, 2006	Maxim announces that it had received a letter from Nasdaq regarding its failure to file its 10-K report for its fiscal year ending June 24, 2006.
December 19, 2006	Maxim announces that Jack Gifford is retiring as CEO.
July 3, 2007	Maxim receives staff determination letter from Nasdaq stating that it is in violation of numerous Nasdaq requirements–threatening delisting.
July 9, 2007	Maxim's Board of Directors requests a stay from Nasdaq (to allow continued listing).
August 21, 2007	Maxim pays regular $0.188 cash dividend.
September 25, 2007	Standard & Poor's announces that Maxim will be removed from the S&P 500 Index after the close of trading on September 26.
October 2, 2007	**Maxim is delisted from Nasdaq and options markets, and deleted from the Nasdaq 100 Index and the SOX Index.**
November 13, 2007	Maxim pays regular $0.188 cash dividend.
December 2007	SEC files civil charges against Jack Gifford and former CFO Carl Jasper.
January 17, 2008	Maxim announces that it will be restating historical financial statements to record between $550 million and $650 million of additional stock-based compensation expense, and that its restatement will be delayed an expected three months.
February 12, 2008	Maxim pays regular $0.188 cash dividend.
May 13, 2008	Maxim pays regular $0.188 cash dividend.
August 20, 2008	Maxim pays $0.20 cash dividend.
September 30, 2008	Maxim files all delayed and missing 10-Q and 10-K reports with the SEC.
October 6, 2008	Maxim files form 8-A(12b) to register its common and preferred shares, "in connection with the transfer of the quotation of its common stock from the 'pink sheet' service to the listing of its common stock on Nasdaq."
October 8, 2008	**Maxim is listed on Nasdaq and options markets.**
November 19, 2008	Maxim pays $0.20 cash dividend.
December 12, 2008	Nasdaq announces that Maxim will be added to the Nasdaq 100 Index effective with the market open on December 22, 2008.
January 11, 2009	Jack Gifford dies of an apparent heart attack.

B. The Pink Sheets

When MXIM was delisted, on October 2, 2007, the "Pink Sheets" markets were very different from the days when dealers sent pink sheets of paper to brokers with indications of interest to trade in over-the-counter stocks. The over-the-counter market now has three tiers. Companies whose stocks trade on the first two tiers, OTCQX and OTCQB (formerly the OTC Bulletin Boards), conform to SEC filing requirements or are listed on foreign exchanges. MXIM was delisted from Nasdaq because it was in violation of SEC filing and proxy requirements. As such it was not eligible for trading in either of these tiers. Instead it traded on OTC Pink, the lowest tier of the over-the-counter markets. Specifically, while it was delisted, Maxim traded under the ticker symbol MXIM.pk on OTC-Link, an electronic messaging and inter-dealer trade negotiation system. OTC-Link distributes its quotation and trading data on the Internet at OTCMarkets.com.[18] Transactions can be executed over this system or over the phone. SEC Rule 15c2-11 (of the Securities Exchange Act of 1934) governs broker/dealer behavior of securities of companies that do not conform to the SEC's disclosure requirements.

C. Maxim's January 17, 2008 Press Release

Press Release:

SUNNYVALE, CA-January 17, 2008-Maxim Integrated Products, Inc., (Pink Sheets: MXIM) issued the following statement today.

On January 31, 2007, Maxim Integrated Products, Inc. announced that it would need to restate certain historical financial statements to record additional stock-based compensation charges and that such financial statements should no longer be relied upon. At this time, Maxim expects to restate its financial statements from Fiscal 1997 through Fiscal 2005 and the related interim periods through March 25, 2006, and to record additional non-cash compensation expense during Fiscal 1997 through Fiscal 2006 in the estimated range of $550 to $650 million on a pre-tax basis and $360 to $425 million on an after-tax basis.

Maxim also announced that its estimated completion date of the restatement will be delayed from the first calendar quarter of 2008. The Company recently determined that the scope of the project must expand to include a review of stock options granted in years 1995 and 1996, and to conduct further analysis of certain aspects of stock option activity such as employees who either terminated their employ or changed their employment status. Based on these new requirements and the overall complexity of the project, Maxim currently estimates that the restatement will be completed in June 2008, but it cannot give assurances that it will meet this targeted completion date.

[18] In 2012, OTC Markets Group joined FINRA and on June 1, 2012 it began operating as an SEC-registered broker-dealer and Alternative Trading System.

D. Data

I checked the integrity of Bloomberg stock price and volume information by comparing these with CRSP data. Bloomberg rounds prices to the penny, while CRSP reports transaction prices to the hundredth of a penny. For my sample between 1 and 2% of the transaction prices on CRSP are reported as sub-pennies. Aside from rounding differences, Bloomberg does not include data from the Midwest (Chicago) Exchange. This can occasionally result in a difference in the daily high or low price. Consider for example benchmark company Linear Technologies. CRSP and TAQ report the high price for LLTC on December 29, 2006, as $34.42, whereas Bloomberg reports this as $30.72. The former is the price stamp on a 100-share trade that crossed on the Midwest Exchange at 15:57:56 ET. The $30.72 value is also the highest price on TAQ excluding this single reported transaction from the Midwest Exchange (that appears to be in error).

There is generally a difference in the volume data between CRSP and Bloomberg due to the fact that CRSP and TAQ include a regional exchange that Bloomberg does not. Over the 774 trading days from September 21, 2006 through October 16, 2009, the mean log difference in Linear Technologies' volume between CRSP and Bloomberg is -0.8%, with a standard deviation of 1.4%. Bloomberg's reported volume on Linear Technologies exceeds that on CRSP on 257 of the 774 days. All price and volume data on the six competitors and MXIM pre- and post-Pink Sheets come from CRSP and TAQ. I verify dividend payments while MXIM trades on the Pink Sheets from the company's website.

In the period January 1, 2006 through December 31, 2009 for the seven companies in this industry, the Bloomberg news feed includes stories in English from the following sources: The US Federal News Service (acquired in August 2010 by The Dolan Company), PR Newswire, CNW Group, Bloomberg News, Bloomberg Legal News, Business Wire, Bloomberg Transcripts, Worldwide Computer Products News, Gerson Lehrman Group, Marketwire, Briefing.Com, Market News Publishing, Washington Service, Comtex News Service, GlobeNewswire, Associated Press, and M2 Presswire; general webcontent from sources such as: *The Dallas Morning News*, *Circuits Assembly*, *Manila Bulletin*, *Investors Business Daily*, and National Reference Sources in the UK; media syndication and news aggregators such as: Voxant and TheFly; as well as ratings and analyst firms such as: JP Morgan, Interactive Brokers, First Global, InsiderScore.Com, Vermilion Capital Management, Trading Central, Recognia, and Fitch.

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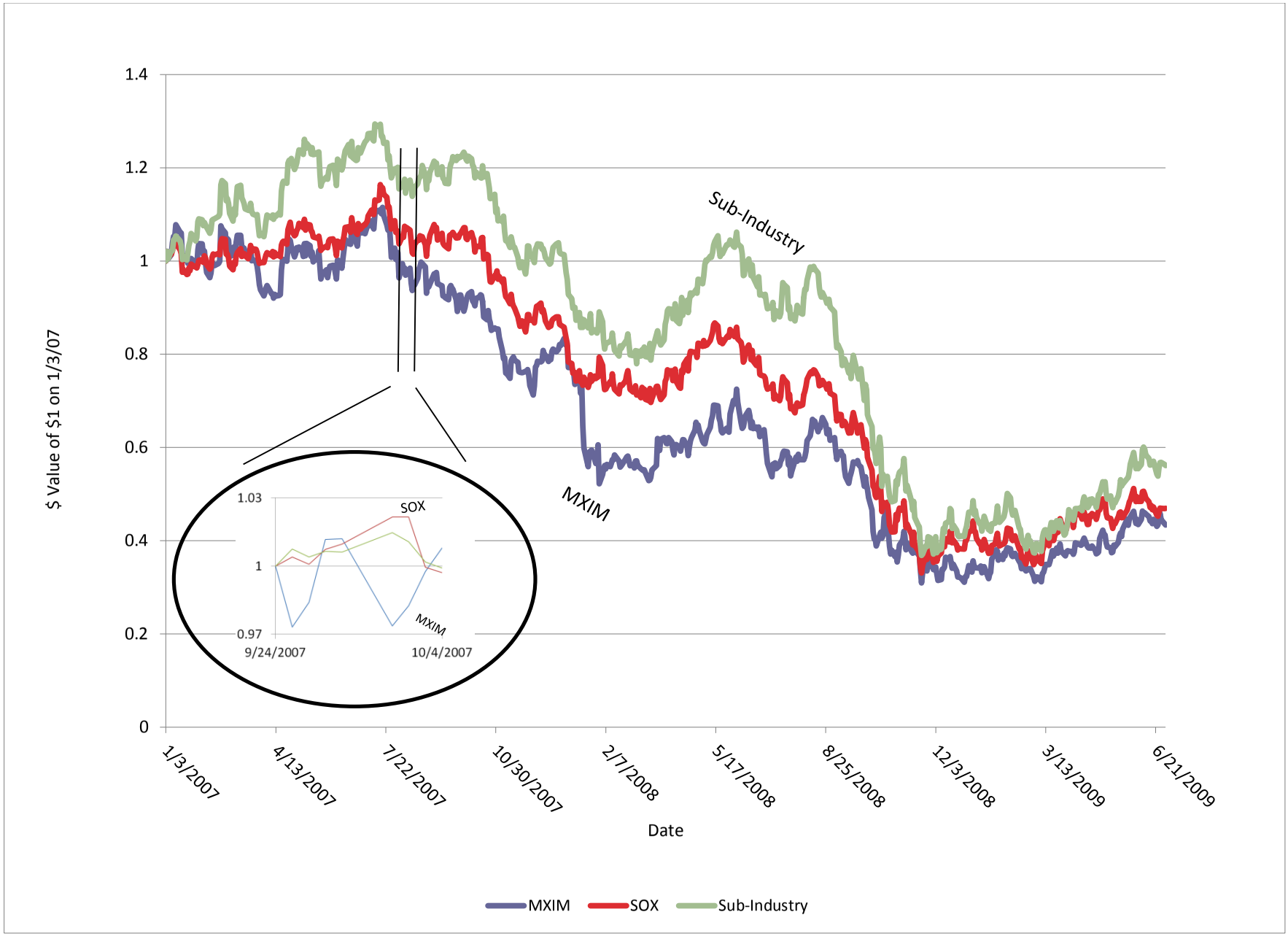

Figure 1. Cumulative Returns on MXIM, SOX, and the 6-stock index.
The main plot shows the value of $1 invested on January 3, 2007 through June 30, 2009 on Maxim Integrated Products (MXIM), the Philadelphia Stock Exchange Semiconductor Index (SOX), and an equally-weighted index of six stocks in the mixed signal processing semiconductor industry. The inset shows the same for $1 invested on September 24, 2007 through October 4, 2007.

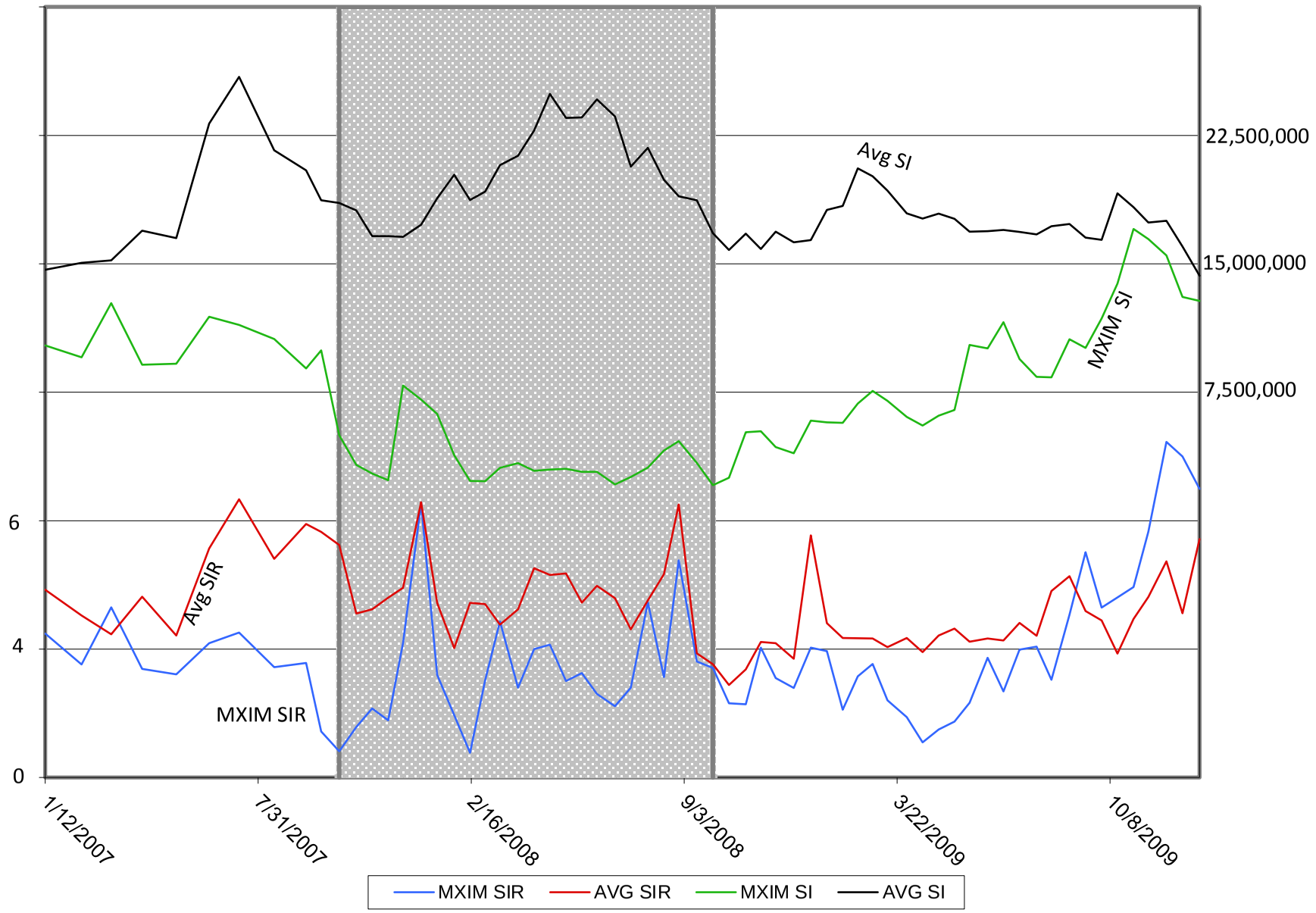

Figure 2. Short Interest and Short Interest Ratio for MXIM and equally-weighted Industry Portfolio.
Short interest (SI) is reported in number of shares on the right-hand axis. The short interest ratio (SIR) is defined as the ratio of short interest on the reporting date to the average daily trading volume in the pre-reporting date period. This ratio is measured on the left-hand axis. The period in which MXIM trades on the Pink Sheets is shaded. The data cover the period January 12, 2007 through December 31, 2009. Prior to 2007 short interest is reported monthly–at mid-month. Starting in September 2007, short interest is reported twice per month–at mid-month and month-end.

Table 1

Trading Activity and Ownership Profile for MXIM and Benchmark Firms: Pre- and Post- Pink Sheets

Company Name	Ticker Symbol	Exchange	Shares Outstanding (000's)	Price	Market Capitalization ($ Millions)	Average Daily Volume (000's shares)	Short Interest (000's shares)	% Owned by 13(f) Institutions	Number of 13(f) Institutions
				September 2007 (Pre-Pink Sheets)					
Maxim Integrated Products	MXIM	Nasdaq	320,533	$29.12	9,334	4,982	8,884	88.5	359
Analog Devices	ADI	NYSE	311,186	$35.17	10,944	3,363	5,673	82.0	393
Linear Technology	LLTC	Nasdaq	226,838	$34.53	7,833	4,832	12,962	106.6	384
Fairchild Semiconductor	FCS	NYSE	124,242	$18.01	2,238	901	3,493	102.2	181
National Semiconductor	NSM	NYSE	270,113	$25.43	6,869	5,715	38,902	91.2	319
ON Semiconductor	ONNN	Nasdaq	290,045	$11.49	3,333	5,180	35,147	112.3	282
Texas Instruments	TXN	NYSE	1,429,085	$34.68	49,561	14,418	26,595	75.5	918

Ticker Symbol	Exchange	Shares Outstanding (000's)	Price	Market Capitalization ($ Millions)	Average Daily Volume (000's shares)	Short Interest (000's shares)	% Owned by 13(f) Institutions	Number of 13(f) Institutions
			December 31, 2008 (Post-Pink Sheets)					
MXIM	Nasdaq	304,123	$11.42	3,473	2,886	5,842	86.6	230
ADI	NYSE	291,193	$19.02	5,538	3,668	7,404	83.0	384
LLTC	Nasdaq	221,762	$22.12	4,905	3,021	21,808	101.9	354
FCS	NYSE	124,132	$4.89	607	1,259	1,803	87.1	154
NSM	NYSE	229,369	$10.07	2,310	4,502	15,597	88.3	277
ONNN	Nasdaq	411,675	$3.40	1,400	3,378	19,273	93.8	219
TXN	NYSE	1,296,425	$15.52	20,120	11,666	32,439	77.3	742

Notes:

Snapshots of Maxim Integrated Products, which trades on Nasdaq prior to October 2, 2007, and after October 8, 2008; and six benchmark companies that comprised the analog/mixed semiconductor industry in this period.

This table reports price, outstanding shares, and short interest on September 14, 2007, and average daily volume in the two weeks ending September 14, 2007; and information from the 13(f) filings for September 28, 2007 for September 2007; and price, outstanding shares, and short interest on December 31, 2008 and average daily volume in the two weeks ending December 31, 2008, for December 31, 2008.

Table 2

Maxim Integrated Products and Benchmark Stocks:
Analyst Following around Maxim's Delisting

Panel A. Number of Analysts Participating at Conference Calls

	Pre-Delisting		Pink Sheets			Post-Delisting
MXIM	8/2/2007	11/1/2007	1/31/2008	5/1/2008	8/7/2008	10/29/2008
	17	18	10	11	12	15
ADI	8/21/2007	11/27/07	2/20/2008	5/20/2008	8/19/2008	11/25/2008
	14	11	14	10	8	13
FCS	7/19/2007	10/18/2007	1/24/2008	4/17/2008	7/17/2008	10/16/2008
	9	7	8	8	10	10
LLTC	7/25/2007	10/15/2008	1/16/2008	4/16/2008	7/23/2008	10/15/2008
	17	19	17	15	16	19
NSM	9/25/2007	12/6/2007	3/6/2008	6/5/2008	9/5/2008	12/8/2008
	10	10	7	11	8	7
ONNN	7/31/2007	10/30/2007	1/31/2008	5/16/2008	8/6/2008	10/30/2008
	12	11	9	8	12	12
TXN	7/23/2007	10/22/2007	1/22/2008	4/21/2008	7/21/2008	10/20/2008
	16	22	18	17	21	17
Panel B. Firms attending MXIM's Conference Calls:						
AmTech Research	X	X	X	X		X
BofA Securities	X	X	X	X	X	
Barclays Capital						X
Bear Stearns	X	X				
Citigroup	X	X	X	X	X	X
Charter Eqty Rsch					X	X
Consumer Equity	X	X				
Cowen & Company						X
Credit Suisse	X	X	X	X		X
DeutscheBank	X	X	X	X	X	X
FBR Capital					X	
Global Crown Capital	X	X		X	X	X
Goldman Sachs	X	X	X	X	X	X
Greenleaf Capital	X	X				
J.P. Morgan	X	X		X		X
JMP Securities						X
Lehman Bros	X	X	X		X	
Morgan Stanley	X					
Pacific Crest Securities	X	X	X		X	
Raymond James	X	X			X	X
RBC Capital Mkts		X				X
TIAA-CREF					X	
Thomas Weisel Partners			X	X		X
UBS	X	X		X	X	X
Wachovia Securities	X	X				
William Blair		X	X	X		

Table 2 (Continued)

Maxim Integrated Products and Benchmark Stocks:
Analyst Following around Maxim's Delisting

Notes:

The information in this table is collected from seekingalpha.com.

Panel A reports the dates of the scheduled quarterly conference calls between management and investors over the period July 2007 through November 2008. Maxim Integrated Products (MXIM) trades on Nasdaq on the first and last dates, and on the Pink Sheets during the middle four dates.

The date is the date of the conference call. Below the date the number of analysts participating at the conference (and identified by name and firm on SeekingAlpha) is reported.

The benchmark firms are: ADI, Analog Devices (NYSE); LLTC, Linear Technologies, (Nasdaq); FCS, Fairchild Semiconductor, (NYSE); NSM, National Semiconductor (NYSE); ONNN, ON Semiconductor (Nasdaq); and TXN, Texas Instruments, (NYSE).

Panel B indicates the presence of an investment firm's analyst at each of MXIM's quarterly conference calls at the top dates in Panel A. If an analyst from the firm attended a particular conference call, an X is placed in that column.

This data is used in lieu of traditional sources of analyst following as MXIM is not included in the IBES database (or regularly in other sources, such as Bloomberg), since it does not file reports with the Securities and Exchange Commission while it trades on the Pink Sheets.

Table 3

Maxim Integrated Products

Number of Shares Owned by Specific Institutional Owners (from Mutual Fund and 13(f) filings)

	2007 I	2007 II	2007 III	2007 IV	2008 I	2008 II	2008 III	2008 IV
Mutual Funds:								
Growth Fund of America	20,840,000	15,140,000	15,140,000	17,025,000	17,025,000	17,025,000	17,025,000	17,025,000
Fidelity Low Priced	9,400,000	7,700,000	7,000,000	10,000,000	10,000,000	13,000,000	11,000,000	9,000,500
Fidelity Magellan	3,245,404	3,245,404	0	0	0	0	0	0
Dodge & Cox Stock Fund	0	0	0	12,167,100	19,200,000	19,200,000	19,434,400	24,360,200
New Economy Fund	3,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
T. Rowe Price Growth	5,107,200	5,107,200	5,107,200	2,601,700	0	0	0	0
T. Rowe Price Sci Tech.	2,300,000	800,000	1,000,000	3,000,000	3,500,000	3,300,000	3,300,000	3,000,000
Oppenheimer Global Fund	4,350,655	4,350,655	4,964,155	4,964,155	4,964,155	4,964,155	4,964,155	4,964,155
Amcap Fund	3,375,000	3,045,000	3,045,000	3,045,000	4,645,000	4,645,000	4,645,000	4,645,000
Seligman Comm & Info.	0	769,600	2,805,100	4,003,000	0	838,100	311,900	0
First Eagle Global	1,278,660	2,141,250	2,141,250	2,580,720	5,470,010	4,957,770	4,753,140	0
Investment Co of America	14,995,000	13,195,000	13,195,000	14,795,000	14,795,000	14,795,000	14,795,000	13,195,000
Income Fund of America	0	0	0	0	0	0	15,190,000	12,045,000
13(f) Funds:								
Times Sqr (Inst.M.M.)	0	0	0	1,222,100	1,576,500	1,607,800	1,852,450	0
Kensico (Hedge Fund)	0	0	370,000	3,390,000	7,264,286	7,207,586	7,041,780	2,331,557

Notes:

Maxim Integrated Products was delisted from Nasdaq on October 2, 2007, and re-listed on Nasdaq on October 8, 2008.

Mutual Fund holdings are obtained from quarterly Form N-Q filings. Holdings of Times Square Capital Management, LLC, an institutional money manager, and Kensico Capital Management, a hedge fund, are from quarter-end 13(f) filings. Upon delisting MXIM was removed from the 13(f) list, so most managers do not report MXIM holdings on 13(f) filings, while it trades on the Pink Sheets. The 13(f) list is not relevant for mutual fund reports. N-Q reports are filed on a quarterly basis. I use the last filing in each calendar quarter in this table.

Table 4

Mutual Fund Ownership Profile for MXIM and Benchmark Firms

Panel A. Percentage of Outstanding Shares Owned by Mutual Funds

	Pre-Pink Sheets			Pink Sheets-1	Pink Sheets-2			Post-Pink Sheets
Ticker	2007 I	2007 II	2007 III	2007 IV	2008 I	2008 II	2008 III	2008 IV
MXIM	**38.2**	36.9	36.9	40.2	**44.2**	**39.9**	**46.5**	**50.8**
ADI	29.2	31.8	32.1	27.7	27.9	26.4	30.8	28.3
LLTC	33.4	44.9	39.9	37.9	41.9	41.7	41.9	41.0
FCS	40.3	48.3	50.7	46.7	45.9	30.7	42.5	39.4
NSM	25.7	27.4	28.4	29.8	29.1	25.3	28.1	26.0
ONNN	36.0	53.7	46.9	61.0	39.9	42.7	47.0	43.2
TXN	19.7	27.1	25.7	23.3	27.8	27.1	30.5	25.8
Benchmark average	30.7	38.8	37.3	37.8	35.4	32.3	36.8	33.9
–Standard error	3.0	4.7	4.2	5.8	3.3	3.2	3.2	3.3

Panel B. Number of Mutual Funds that Own

MXIM	486	641	435	359	**213**	**237**	**196**	**245**
ADI	476	632	476	654	523	651	602	600
LLTC	548	628	472	573	476	597	561	561
FCS	211	229	224	261	221	277	237	228
NSM	439	594	495	549	464	545	505	502
ONNN	234	409	369	454	343	402	374	350
TXN	983	1409	1082	1345	1004	1283	1009	1028
Benchmark average	481.8	650.2	519.7	639.3	505.2	625.8	548.0	544.8
–Standard error	114.3	164.9	119.9	151.5	109.4	142.8	107.2	112.1

Notes:

Mutual Fund holdings of Maxim Integrated Products, which trades on Nasdaq prior to October 2, 2007, and after October 8, 2008; and six benchmark companies: ADI, Analog Devices (NYSE); LLTC, Linear Technologies, (Nasdaq); FCS, Fairchild Semiconductor, (NYSE); NSM, National Semiconductor (NYSE); ONNN, ON Semiconductor (Nasdaq); and TXN, Texas Instruments, (NYSE).

The data is obtained by aggregating across Forms N-Q which all mutual funds must file on a quarterly basis. I aggregate all filings (after removing redundancies), within each calendar quarter.

Table 5

Total, Pre-Session and Post-Session Trading Volume
Maxim and its Industry Benchmark: Pre-Pink Sheets, Pink Sheets I, Pink Sheets Transition, Pink Sheets II, and Post-Pink Sheets Periods

Panel A
Pre-Pink Sheets (January 4, 2006 - August 31, 2007, 419 Trading Days)

	25%ile	Median	75%ile
Total Volume Industry Average	5,019,784	5,927,755	7,112,727
Total Volume MXIM	3,764,804	4,747,507	6,164,408
Daily Ratio: MXIM/Industry Average	0.64	0.79	1.01
Pre-Open Industry Avg	1,459	4,717	16,608
Pre-Open MXIM	1,100	2,901	11,238
Daily Ratio: MXIM/Industry Average	0.14	0.72	3.13
Post-Session Industry Avg	9,569	26,688	96,483
Post-Session MXIM	7,420	25,200	82,566
Daily Ratio: MXIM/Industry Average	0.30	0.78	2.24

Panel B
Pink Sheets I (October 2, 2007 - January 16, 2008, 74 Trading Days)

	25%ile	Median	75%ile
Total Volume Industry Average	5,137,679	6,162,132	7,299,328
Total Volume MXIM	2,412,227	3,363,542	4,791,299
Daily Ratio: MXIM/Industry Average	0.38	0.54	0.77
Pre-Open Industry Avg	1,000	2,732	11,115
Pre-Open MXIM	0	2,100	10,271
Daily Ratio: MXIM/Industry Average	0.00	0.40	3.89
Post-Session Industry Avg	10,604	46,772	100,593
Post-Session MXIM	60,823	112,748	230,619
Daily Ratio: MXIM/Industry Average	1.14	2.94	10.78

Panel C
Pink Sheets Transition (January 17, 2008 - February 8, 2008, 16 Trading Days)

	25%ile	Median	75%ile
Total Volume Industry Average	5,955,024	7,931,409	8,558,756
Total Volume MXIM	6,281,457	7,875,366	11,654,865
Daily Ratio: MXIM/Industry Average	0.85	1.04	1.42
Pre-Open Industry Avg	700	2,841	7,677
Pre-Open MXIM	2,1000	9,500	15,200
Daily Ratio: MXIM/Industry Average	0.06	3.00	8.41
Post-Session Industry Avg	16,176	26,794	61,010
Post-Session MXIM	123,644	208,111	360,917
Daily Ratio: MXIM/Industry Average	1.13	6.03	7.96

Table 5 (Continued)
Total, Pre-Session and Post-Session Trading Volume
Maxim and its Industry Benchmark: Pre-Pink Sheets, Pink Sheets I, Pink Sheets Transition, Pink Sheets II, and Post-Pink Sheets Periods

Panel D
Pink Sheets II (February 11, 2008 - October 7, 2008, 168 Trading Days)

	25%ile	Median	75%ile
Total Volume Industry Average	6,241,118	7,416,539	9,082,007
Total Volume MXIM	1,133,461	1,530,498	2,280,551
Daily Ratio: MXIM/Industry Average	0.14	0.20	0.30
Pre-Open Industry Avg	467	1,804	6,602
Pre-Open MXIM	0	0	1,200
Daily Ratio: MXIM/Industry Average	0.00	0.00	0.83
Post-Session Industry Avg	45,338	85,517	146,356
Post-Session MXIM	15,236	39,793	88,231
Daily Ratio: MXIM/Industry Average	0.12	0.47	1.71

Panel E
Post-Pink Sheets (November 3, 2008 - December 31, 2009, 293 Trading Days)

	25%ile	Median	75%ile
Total Volume Industry Average	6,462,937	7,731,310	8,966,858
Total Volume MXIM	3,011,023	4,181,045	5,857,482
Daily Ratio: MXIM/Industry Average	0.41	0.56	0.74
Pre-Open Industry Avg	698	2,350	7,775
Pre-Open MXIM	0	300	1,100
Daily Ratio: MXIM/Industry Average	0.00	0.10	0.76
Post-Session Industry Avg	49,113	78,711	122,239
Post-Session MXIM	18,747	49,138	103,364
Daily Ratio: MXIM/Industry Average	0.25	0.64	1.40

Notes: The industry average is obtained by taking the equally-weighted average of the trading volume on the six stocks that comprise the benchmark. The empirical percentiles are from the indicated time series.

Total volume includes trading volume during the pre-open, open-to-close, and post-close sessions.

Table 6
Trading Activity and Dynamics
Differences-in-Differences Results

Pre-Pink Sheets	Pink Sheets I	Pink Sheets II	Post-Pink Sheets	MXIM	MXIM in PSI	MXIM in PSII	M $r^2(\%)$
Panel A: Daily squared returns ($\times 10,000$)							
4.56	5.04	8.19	12.45	-2.48	1.30	1.67	8
(17.54)	(5.45)	(9.68)	(12.91)	(-3.72)	(0.96)	(1.04)	3.20
Panel B: Daily close-to-open squared returns ($\times 10,000$)							
1.02	2.22	2.28	2.48	-0.24	-1.41	**-1.32**	2
(10.08)	(2.44)	(5.73)	(13.54)	(-1.36)	(-1.51)	(-2.81)	0.66
Panel C: Daily open-to-close squared returns ($\times 10,000$)							
3.49	3.50	6.48	10.85	-1.65	1.47	2.48	9
(17.64)	(7.95)	(8.26)	(10.55)	(-2.10)	(1.36)	(1.44)	3.48
Panel D: Daily range ($\times 100$)							
2.88	2.98	3.85	4.74	-0.30	0.61	0.70	30
(34.33)	(15.69)	(20.24)	(17.51)	(-1.26)	(1.40)	(1.71)	13.00
Panel E: Ln(Daily trading volume) (number of shares)							
15.36	15.32	15.55	15.56	-0.10	-0.16	**-1.11**	73
(141.8)	(65.1)	(80.2)	(127.3)	(-0.9)	(-0.6)	(-4.9)	13.00
Panel F: Corwin-Schultz daily return standard deviation ($\times 100$)							
1.92	1.97	2.50	3.17	-0.32	-0.48	**0.60**	15
(38.43)	(13.97)	(22.72)	(22.32)	(-2.78)	(1.55)	(2.45)	5.87
Panel G: Corwin-Schultz daily proportional bid-ask spread ($\times 100$)							
0.72	0.72	1.05	1.16	0.03	0.01	-0.10	4
(37.14)	(16.53)	(23.74)	(28.43)	(0.56)	(0.09)	(-0.85)	2.75
Panel H: Squared return divided by volume*							
1.04	1.20	1.64	3.26	-0.82	0.49	**3.31**	12
(12.2)	(3.9)	(6.9)	(5.2)	(-2.5)	(1.0)	(4.2)	2.03
Panel I: Ln(Pre-session trading volume) (number of shares)**							
6.43	5.94	5.73	5.74	1.07	0.46	**-1.30**	20
(39.90)	(16.83)	(27.69)	(35.91)	(5.37)	(0.82)	(-3.74)	4.17
Panel J: Ln(Post-session trading volume) (number of shares)**							
8.16	7.82	9.18	9.60	1.52	**2.29**	-0.37	69
(21.32)	(10.46)	(14.06)	(20.20)	(3.87)	(2.73)	(-0.49)	8.61
Panel K: Ln(Short interest)***							
16.33	16.41	16.49	16.40	-0.37	**-0.72**	**-1.23**	55
(89.0)	(53.2)	(45.0)	(59.9)	(-1.9)	(-2.7)	(-4.8)	14.57

Table 6 (Continued)
Trading Activity and Dynamics
Differences-in-Differences Results

Pre-Pink Sheets	Pink Sheets I	Pink Sheets II	Post-Pink Sheets	MXIM	MXIM in PSI	MXIM in PSII	M $r^2(\%)$
Panel L: Ratio of short interest to lagged average volume**							
2.69	3.08	2.80	2.47	-0.50	**-0.99**	-0.55	15
(13.0)	(9.4)	(8.2)	(10.3)	(-1.4)	(-1.8)	(-1.1)	6.29
Panel M: Number of news stories per month***							
57.9	76.9	58.6	55.5	-0.3	-18.1	**-23.6**	3
(13.1)	(5.2)	(7.1)	(9.4)	(-0.0)	(-1.1)	(-2.2)	5.43
Panel N: Number of news stories per month****							
172.1	168.4	179.1	174.9	-116.6	6.7	**-27.7**	5
(30.6)	(14.0)	(24.7)	(29.6)	(-13.5)	(0.5)	(-3.2)	80.1

Notes:

This table reports regressions of the respective dependent variables on the following indicator variables: $X_1 = 1$ if the observation occurs in the pre-Pink Sheets period, January 4, 2006 through August 31, 2007 (418 days); $X_2 = 1$ if the observation occurs in the first 76 days of MXIM's Pink Sheets trading, October 2, 2007 – January 16, 2008 (76 days) (this period ends prior to MXIM's announcement of its estimate of the options-related charges); $X_3 = 1$ if the observation occurs in the second phase of MXIM's Pink Sheets trading, February 11, 2008 through October 7, 2008 (168 days); $X_4 = 1$ if the observation occurs in the post-Pink Sheets period, November 3, 2008 – December 31, 2009 (293 days); $X_5 = 1$ if the observation applies to MXIM; $X_6 = 1$ if the observation applies to MXIM in the first 76 days of MXIM's Pink Sheets trading; and $X_7 = 1$ if the observation applies to MXIM in the second phase of MXIM's Pink Sheets trading.

Newey-West t-statistics are reported in parentheses below the coefficient estimators. The lag-length (M) is selected using the Andrews' (1991) bandwidth criterion.

The sample consists of daily observations on each of the seven stocks–MXIM and the six stocks of companies in the analog/digital semiconductor industry. Each of the regressions in Panels A – J has 6,685 observations.

*Daily squared returns are multiplied by 10^9 and divided by daily volume (in number of shares).

**When pre-session or post-session trading volume is 0, I set it to 50 (shares) before taking logs.

***Short interest is measured monthly prior to September 2007, and twice monthly thereafter. There are 497 observations in the short interest regressions.

****Volume in the denominator of this ratio is average daily volume since the last reported short interest on each stock.

*****The number of news stories that mention each of the following stocks per month: Analog Devices, On Semiconductor, Linear Technologies, and Maxim. There are 192 observations in the regression in Panel M. The raw data used in this regression is in Table 7.

******The number of news stories that mention each of the 7 stocks in the linear semiconductor industry. This regression includes a fixed effect for each stock. National Semiconductor is the "base case." The coefficients on the other 5 stocks' indicator variables are not reported. There are 336 observations in the regression in Panel N.

Table 7
Number of news stories that mention each company

This table reports the total number of news stories that mention each publicly traded company in the linear signal processor industry on a monthly basis from January 2006 through December 2009. The count is from Bloomberg, using *All* information sources in the English language.

Month	TXN	LLTC	ADI	ONNN	FSC	NSM	MXIM
Pre-Pink Sheets							
Jan 2006	229	34	30	29	29	119	50
Feb 2006	196	44	75	39	13	151	41
Mar 2006	243	30	51	38	29	175	34
Apr 2006	172	24	21	54	19	126	24
May 2006	153	50	101	52	27	218	58
Jun 2006	186	49	62	61	27	129	73
Jul 2006	179	38	39	42	11	111	40
Aug 2006	183	54	111	66	18	238	71
Sep 2006	234	33	70	51	31	172	62
Oct 2006	228	38	58	38	25	167	64
Nov 2006	195	33	88	41	20	146	72
Dec 2006	189	33	49	67	20	112	62
Jan 2007	215	42	42	40	23	143	57
Feb 2007	216	36	102	58	38	258	85
Mar 2007	284	32	93	49	26	209	52
Apr 2007	207	65	56	35	22	153	78
May 2007	199	66	169	92	40	164	83
Jun 2007	250	38	74	63	41	281	84
Jul 2007	145	47	38	49	30	139	79
Aug 2007	116	55	152	54	9	173	116
Sep 2007	192	33	80	39	5	145	82
Mean	200.5	41.6	74.3	50.3	24.0	168.0	65.1
Std Dev	38.0	11.4	37.9	14.4	9.7	47.5	21.0
Pink Sheets - I							
Oct 2007	208	67	59	78	50	165	73
Nov 2007	123	51	123	72	22	158	44
Dec 2007	105	14	194	86	26	109	56
Jan 2008	151	44	61	74	29	117	61
Mean	146.8	44.0	109.2	77.5	31.8	137.2	58.5
Std Dev	45.0	22.2	63.8	6.2	12.5	28.3	12.0

Table 7 (Continued)
Number of news stories that mention each company

This table reports the total number of news stories that mention each publicly traded company in the linear signal processor industry on a monthly basis from January 2006 through December 2009. The count is from Bloomberg, using *All* information sources in the English language.

Month	TXN	LLTC	ADI	ONNN	FSC	NSM	MXIM
Pink Sheets - II							
Feb 2008	181	30	82	55	25	237	37
Mar 2008	298	30	117	64	25	254	31
Apr 2008	216	37	36	29	32	187	37
May 2008	170	43	143	87	55	202	35
Jun 2008	230	14	64	33	8	213	18
Jul 2008	191	54	76	54	27	177	34
Aug 2008	158	66	92	67	13	191	39
Sep 2008	217	44	65	25	24	146	47
Mean	207.6	39.8	84.4	51.8	26.1	200.9	34.8
Std Dev	44.2	16.0	33.3	21.5	14.0	34.1	8.2
Post-Pink Sheets							
Oct 2008	241	77	72	122	45	196	118
Nov 2008	146	32	101	85	40	213	35
Dec 2008	224	10	66	45	69	201	41
Jan 2009	263	78	53	78	37	144	61
Feb 2009	176	42	100	58	29	165	37
Mar 2009	249	23	64	71	39	238	31
Apr 2009	256	69	75	30	76	186	37
May 2009	180	45	132	58	21	197	35
Jun 2009	242	17	97	29	22	186	18
Jul 2009	273	51	86	33	43	209	34
Aug 2009	59	9	21	16	4	48	39
Sep 2009	225	16	60	56	11	188	43
Oct 2009	276	84	71	29	42	190	49
Nov 2009	179	27	123	57	14	171	46
Dec 2009	164	22	102	62	24	126	48
Mean	210.2	40.1	81.5	55.3	34.4	177.2	44.8
Std Dev	59.3	26.1	28.5	27.2	20.0	45.0	22.4

Table 8

Regression Results

Daily Return regressions: Pre-Pink Sheets, Pink Sheets, and Post-Pink Sheets Periods

Panel A: Evidence of gradual information flow in PS2

	Intercept	Coefficient on:							r^2(%)
Period	(×100)	r^{o-c}_{t-1}	r^{c-o}_{t-1}	r^{o-c}_{t-2}	r^{c-o}_{t-2}	$r^{c-c}_{I,t}$	$r^{2(c-o)}_{I,t-2}$	$r^{2(o-c)}_{I,t-2}$	M
Pre-PS	-0.08	0.01	-0.01	-0.10	-0.01	0.91	0.05	0.00	0
$T = 416$	(-1.3)	(0.1)	(-0.2)	(-1.1)	(-0.3)	(19.4)	(0.5)	(0.0)	59.1
PS1	0.05	-0.02	0.03	-0.01	0.01	0.61	-0.14	0.08	0
$T = 72$	(0.2)	(-0.1)	(0.2)	(0.0)	(0.1)	(3.6)	(-0.7)	(0.6)	24.1
PS2	-0.01	0.32	0.05	**-0.44**	-0.05	0.63	0.16	**0.19**	1
$T = 166$	(-0.0)	(1.3)	(0.7)	(-2.0)	(-0.7)	(7.7)	(1.0)	(2.7)	32.1
Post-PS	0.07	-0.14	**-0.17**	-0.13	-0.08	0.71	0.03	0.08	1
$T = 291$	(0.7)	(-1.7)	(-2.4)	(-1.3)	(-1.4)	(16.1)	(0.4)	(1.6)	58.6

Panel B: No asymmetry based on sign

	Intercept	Coefficient on:					M
Period	(×100)	$r^{c-c}_{I,t}$	$r^{2(c-o)}_{I,t-2}$	$r^{2(o-c)}_{I,t-2}$	$D_1 \cdot r^{2(c-o)}_{I,t-2}$	$D_2 \cdot r^{2(o-c)}_{I,t-2}$	r^2(%)
PS2	-0.39	0.62	0.35	0.32	-0.44	-0.17	1
$T = 166$	(-1.2)	(7.0)	(1.8)	(2.2)	(-1.2)	(-0.8)	30.5

Panel C: Day-by-day

	Intercept	Coefficient on:							M
Period	(×100)	$r^{c-c}_{I,t}$	$r^{o-c}_{I,t-1}$	$r^{c-o}_{I,t-1}$	$r^{o-c}_{I,t-2}$	$r^{c-o}_{I,t-2}$	$r^{o-c}_{I,t-3}$	$r^{c-o}_{I,t-3}$	r^2(%)
PS2	0.00	0.60	0.20	0.11	0.22	0.17	-0.01	-0.11	1
$T = 165$	(0.0)	(6.6)	(2.4)	(0.5)	(2.4)	(1.0)	(-0.1)	(-0.7)	29.5

Notes:

The dependent variable in all regressions is the daily (close-to-close) return on MXIM on day t.

r^{o-c}_{t-1} is MXIM's open-to-close return on day $t-1$.

r^{c-o}_{t-1} is MXIM's close-to-open return on day $t-1$.

$r^{c-c}_{I,t}$ is the equally-weighted 6-stock industry (close-to-close) return on day t.

$r^{2(c-o)}_{I,t-2}$ is the compounded return of the previous two days' close-to-open on the equally-weighted 6-stock industry, on days $t-1$ and $t-2$.

Table 8 (Continued)
Regression Results
Daily Return regressions: Pre-Pink Sheets, Pink Sheets, and Post-Pink Sheets Periods

$r_{I,t-2}^{2(o-c)}$ is the compounded return of the previous two days' open-to-close on the equally-weighted 6-stock industry, on days $t-1$ and $t-2$.

$r_{I,t-1}^{o-c}$ is the equally-weighted 6-stock industry open-to-close return on day t-1.

$r_{I,t-1}^{c-o}$ is the equally-weighted 6-stock industry close-to-open return on day t-1.

$$D_1 = \begin{cases} 1 & \text{if } r_{I,t-2}^{2(c-o)} < 0 \\ 0 & \text{otherwise} \end{cases}$$

$$D_2 = \begin{cases} 1 & \text{if } r_{I,t-2}^{2(o-c)} < 0 \\ 0 & \text{otherwise} \end{cases}$$

Pre-PS refers to the period January 4, 2006 through August 31, 2007. Prior to the delisting of MXIM on October 2, 2007.

PS1 refers to the period October 2, 2007 through January 16, 2008. MXIM trades on the Pink Sheets during this period that precedes management's January 17, 2008 announcement that creates uncertainty as to when MXIM will comply with SEC accounting requirements.

PS2 refers to the period February 11, 2008 through October 7, 2008. MXIM trades on the Pink Sheets during this period which follows a three-week adjustment period following management's January 17, 2008 announcement. MXIM relists on Nasdaq on October 8, 2008.

Post-PS refers to the period November 3, 2008 through December 31, 2009.

Table 9

Daily Options Trading Volume
Maxim Integrated Products and Benchmark Stocks

This table reports the average and median number of options contracts traded on a daily basis–by quarter–for 7 companies in the mixed analog/digital processor industry over the period January 3, 2006 through December 30, 2009. MXIM was delisted from Nasdaq on October 2, 2007, and it was no longer possible to write options on MXIM between October 2, 2007 and October 8, 2008, during which time MXIM shares trade on the Pink Sheets.

Panel A. Call Options

Calendar Quarter	MXIM	ADI	LLTC	NSM	TXN	FCS	ONNN	EW Benchmark Average	Ratio of MXIM to Benchmark (%)
2006-I Mean	2,874.2	1,524.9	2,340.5	2,211.9	15,149.9	356.4	181.2	3,627.5	79.2
Median	2,304.5	412.0	726.5	1,023.5	8,959.0	107.5	10.0	3,014.6	76.4
2006-II Mean	2,120.5	1,417.8	2,247.7	1,812.3	14,945.0	246.9	137.8	3,467.9	61.1
Median	1,398.0	654.0	1,311.0	1,305.0	10,387.0	138.0	73.0	2,311.3	60.5
2006-III Mean	4,254.2	1,384.6	2,658.2	2,077.5	12,099.2	391.5	69.6	3,113.4	136.6
Median	2,492.0	902.0	2,241.0	1,254.0	8,613.0	182.0	33.0	2,204.2	113.1
2006-IV Mean	4,844.3	1,344.3	2,299.6	1,637.8	13,665.2	397.3	199.1	3,257.2	148.7
Median	2,096.0	483.0	1,682.0	1,069.0	10,512.0	136.0	48.5	2,321.8	90.3
2007-I Mean	2,676.7	1,872.2	3,094.2	1,683.1	14,648.8	256.7	670.3	3,704.2	72.3
Median	1,831.0	763.0	2,012.0	1,111.0	12,730.0	134.0	256.0	2,834.3	64.6
2007-II Mean	5,409.9	4,061.1	2,854.6	2,079.1	15,673.3	463.3	514.6	4,274.4	126.6
Median	3,537.0	2,306.0	1,077.0	1,056.0	12,292.0	171.0	125.0	2,837.8	124.6
2007-III* Mean	4,324.5	1,484.3	2,069.1	2,152.4	13,609.7	254.9	518.5	3,348.1	129.2
Median	2,851.5	786.5	1,294.0	1,232.5	11,950.0	132.0	152.0	2,591.2	99.6
2007-IV** Mean	247.9	943.3	2,142.4	2,184.1	12,983.1	161.1	253.8	3,111.3	8.0
Median	67.0	644.0	1,160.0	814.0	8,447.0	90.0	119.0	1,879.0	3.6
2008-I Mean	13.7	1,283.2	1,628.3	1,653.4	11,719.7	103.0	806.3	2,865.6	0.5
Median	0.0	655.0	1,256.0	755.0	9,284.0	56.0	153.0	2,026.5	0.0
2008-II Mean	5.6	2,170.0	7,635.9	5,373.4	13,518.0	304.3	996.6	4,999.7	0.1
Median	0.0	1,155.0	1,404.0	2,026.0	9,421.5	113.5	297.0	2,404.5	0.0
2008-III Mean	4.2	1,017.8	2,388.7	2,334.6	11,930.1	131.7	2,125.6	3,321.4	0.1
Median	0.0	667.5	680.5	1,387.0	8,892.0	48.5	610.0	2,047.6	0.0
2008-IV Mean	188.0	1,379.0	2,189.2	2,153.4	9,227.2	48.2	266.6	2,543.9	7.4
Median	13.0	878.0	1,402.5	943.5	6,809.5	19.5	73.5	1,687.8	0.8
2009-I Mean	1,466.3	1,527.3	3,120.3	2,075.0	7,649.5	14.2	251.5	2,439.6	60.1
Median	282.0	960.0	2,229.0	1,139.0	5,369.0	2.0	62.0	1,671.8	16.9
2009-II Mean	1,829.8	3,836.6	2,154.5	3,118.3	11,379.4	274.5	2,131.2	3,815.8	48.0
Median	734.0	1,073.0	958.0	1,120.0	9,917.0	63.0	783.0	2,319.0	31.7
2009-III Mean	3,643.8	1,132.6	2,506.5	3,984.9	8,339.4	433.9	2,211.5	3,101.5	117.5
Median	511.0	482.0	896.0	2,502.0	6,074.5	174.0	1,236.5	1,894.2	27.0
2009-IV Mean	2,055.5	1,546.7	2,062.8	2,348.2	11,281.2	528.6	1,099.2	3,144.5	65.4
Median	525.5	779.0	777.0	1,699.0	9,105.5	201.0	988.0	2,258.3	23.3

Table 9 (Continued)
Daily Options Trading Volume
Maxim Integrated Products and Benchmark Stocks

This table reports the average and median number of options contracts traded on a daily basis–by quarter–for 7 companies in the mixed analog/digital processor industry over the period January 3, 2006 through December 30, 2009. MXIM was delisted from Nasdaq on October 2, 2007, and it was no longer possible to write options on MXIM between October 2, 2007 and October 8, 2008, during which time MXIM shares trade on the Pink Sheets.

Panel B. Put Options

Calendar Quarter	MXIM	ADI	LLTC	NSM	TXN	FCS	ONNN	EW Benchmark Average	Ratio of MXIM to Benchmark (%) (%)
2006-I Mean	1,422.2	802.5	1,299.2	1,431.6	11,140.7	171.4	47.1	2,482.1	57.3
Median	1,057.5	412.0	726.5	1,023.5	8,959.0	107.5	100.5	1,873.1	56.5
2006-II Mean	1,461.1	889.0	1,893.4	1,710.6	8,919.4	332.4	27.3	2,295.4	63.6
Median	1,016.0	318.0	1,302.0	709.0	6,492.0	105.0	4.0	1,488.3	68.3
2006-III Mean	1,728.5	994.0	1,886.9	2,573.6	10,241.4	550.3	7.2	2,708.9	63.8
Median	1,264.0	547.0	1,662.0	1,136.0	8,203.0	148.0	0.0	1,949.3	64.8
2006-IV Mean	1,954.7	691.9	2,893.2	1,865.5	16,568.4	541.8	109.9	3,778.5	51.7
Median	1,299.0	433.0	1,669.0	1,353.0	10,215.0	139.0	3.0	2,302.0	56.4
2007-I Mean	1,671.2	1,290.2	2,008.5	1,544.9	14,674.4	492.5	224.9	3,372.6	49.6
Median	1,290.0	728.0	1,141.0	1,127.0	12,882.0	137.0	86.0	2,683.5	48.1
2007-II Mean	1,692.8	1,720.2	2,323.3	1,318.6	10,532.4	605.8	628.5	2,854.8	59.3
Median	1,163.0	1,070.0	1,095.0	702.0	6,703.0	161.0	83.0	1,635.7	71.1
2007-III* Mean	2,626.0	1,020.8	2,200.3	2,508.2	7,488.8	335.1	189.8	2,290.5	114.6
Median	1,549.0	623.5	1,240.5	857.0	5,230.5	161.5	60.0	1,362.2	113.7
2007-IV** Mean	66.2	790.6	2,103.4	1,410.6	11,581.6	285.3	312.8	2,747.4	6.0
Median	30.0	433.0	783.0	901.0	9,332.0	75.0	44.0	1,928.0	1.6
2008-I Mean	13.6	805.0	1,724.8	1,586.3	11,838.8	154.4	532.3	2,773.6	0.5
Median	0.0	540.0	1,198.0	691.0	9,683.0	31.0	86.0	2,038.2	0.0
2008-II Mean	1.5	1,366.0	2,572.9	3,477.9	12,976.0	203.0	547.8	3,523.9	0.0
Median	0.0	744.5	1,295.5	1,491.5	8,782.5	40.5	89.5	2,074.0	0.0
2008-III Mean	1.2	709.1	1,867.1	3,113.9	8,535.4	112.3	836.9	2,529.1	0.0
Median	0.0	491.5	1,090.0	1,627.0	6,025.0	41.0	164.5	1,573.2	0.0
2008-IV Mean	128.9	1,156.6	3,101.4	1,583.3	6,523.8	43.2	139.1	2,091.2	6.2
Median	5.0	632.5	1,589.5	688.0	5,595.0	20.0	16.0	1,423.5	0.4
2009-I Mean	2,866.6	1,217.5	3,855.5	2,459.0	9,184.8	35.1	395.4	2,857.9	100.3
Median	315.0	732.0	2,896.0	738.0	7,730.0	7.0	7.0	2,018.3	15.6
2009-II Mean	2,374.3	1,566.3	1,732.7	1,403.5	12,629.5	156.2	1,760.8	3,208.2	74.0
Median	666.0	939.0	987.0	870.0	8,668.0	20.5	215.0	1,949.9	34.2
2009-III Mean	580.5	588.5	1,419.8	4,218.5	8,902.4	179.0	905.5	2,702.3	21.5
Median	217.0	348.5	728.5	1,752.5	7,689.5	64.0	197.0	1,796.7	12.1
2009-IV Mean	737.3	827.7	1,272.7	1,818.6	8,781.7	441.5	352.4	2,249.1	32.8
Median	227.5	390.0	469.5	1,033.0	7,029.5	183.0	160.0	1,544.2	14.7

* This quarter covers July 2, 2007 - October 1, 2007 (the last day MXIM trades on Nasdaq before delisting).
** This quarter covers October 2, 2007 - December 31, 2007.