

Private Intermediary Innovation and Market Liquidity: Evidence from the Pink Sheets Tiers of the OTC Market

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Abstract

In 2007, OTC Markets Group assigned each Pink Sheets company to a disclosure tier and on its websites affixed a colorful graphic to its stock symbol signifying the company's public disclosure level. This unique innovation allows us to investigate the impact of increased salience of disclosure practices on liquidity. Using a difference-in-difference design, we find evidence that firms that are categorized and labeled as Current Information experience an increase in liquidity while firms categorized and labeled as No Information experience a decrease in liquidity, both relative to other OTC firms. This suggests that increases in the salience of disclosure practices via assignment to disclosure tiers with labels and graphics affects investors' attention, leading to changes in trading behavior that ultimately translate into liquidity changes in the Pink Sheets market. We also provide evidence that some investors anticipated the resulting liquidity changes because stock returns around a key event date leading up to the release of the disclosure tiers are positively associated with subsequent liquidity changes.

1. Introduction

OTC Markets Group Inc., f/k/a Pink Sheets and hereafter referred to as OTCMG, is a publicly traded company that serves as a private intermediary by operating the inter-dealer quotation system for over-the-counter (OTC) securities. OTC securities are generally traded in the OTC Bulletin Board (OTCBB) market and/or the Pink Sheets market. In 2007, OTCMG implemented a classification system for companies traded in the U.S but solely on the Pink Sheets market, which we refer to as *PS* firms. Under this system *PS* firms are classified into three tiers based on the level of the company's existing public disclosures with the following labels: Current Information, Limited Information, and No Information. The labels are displayed by each company's trading symbol on the websites of retail brokers while on OTCMG's website, one of the following colorful graphics is affixed to each company's trading symbol:



, and . In this unique setting we test jointly whether the simple act of assigning *PS* firms to different disclosure tiers and attaching a label or colorful graphic to its trading symbol influences investor behavior.

This setting is particularly fruitful because the clientele of the Pink Sheets market is mostly individual investors (Ang, Shtauber, and Tetlock 2013). Prior to the use of disclosure tiers, individual investors, who have limited attention and processing power (Hirshleifer and Teoh 2003), might not have been fully processing the degree to which each *PS* firm makes public disclosures. This potential for naiveté is supported by numerous archival and laboratory studies that have shown that individual investors' response to publicly available information is

limited (Malmendier and Shanthikumar 2007; Hirshleifer, Lim, and Teoh 2009; Libby, Bloomfield, and Nelson 2002).¹

The initiation of disclosure tiers is expected increase individual investors' attention to disclosure practices for several reasons. First, because investors with limited attention tend to focus more on categories than on firm-specific information (Peng and Xiong 2006; Cooper, Dimitrov, and Rau 2001), individual investors likely pay more attention to disclosure levels once they are categorized. Second, because individuals are sensitive to the salience in which information is disclosed (Maines and McDaniel 2000; Bamber, Jiang, Petroni, and Wang 2010; Barber and Odean 2008; Files, Swanson, and Tse 2009) and individuals pay more attention to simple versus complex messages (Lerman 2011), using simple labels and salient graphics to reveal disclosure levels should attract investor attention. And lastly, given that individuals tend to weigh stimuli that are more easily available (Tversky and Kahneman 1973; Kruschke and Johansen 1999), the introduction of an easily available label and graphic to represent disclosure levels should cause individuals to more heavily consider disclosure practices.

If the salience of disclosure practices increases individual investors' attention to the levels of public disclosures and, consistent with the finding by Lawrence (2013), individual investors prefer to invest more in firms with higher quality disclosures, then upon release of the disclosure tiers we would expect to see a shift in *PS* investors' trading behavior. Specifically, *PS* investors would prefer more trading in current information firms and less trading in no information firms. This shift in trading should result in a shift in liquidity such that stocks of

¹ A growing body of research suggests that the potential for naiveté may also apply to institutional investors because investor inattention has been reflected in stock returns of publicly traded firms on U.S. major stock exchanges. For example, earnings surprises receive weaker market responses and are associated with stronger drift when investors are distracted by same day earnings announcements from other firms (Hirshleifer et al. 2009) or when earnings are announced on Fridays when investors are less attentive (DellaVigna and Pollet 2009). Also there is evidence that the market may respond to a piece of *recycled* news. For example, when news of a potential development of a new cancer-curing drug reappeared in the *New York Times* five months after it was first reported, the market responded with a permanent rise in share prices even though there was no new information (Huberman and Regev 2001).

current information firms become relatively more liquid than stocks of no information firms. On the other hand, investors trading behavior may not change if they already fully consider *PS* firms' disclosure levels in making their trading decisions.² It is also possible that the labels and/or graphics are not salient enough to influence *PS* firm investors. For example, investors only see the colorful graphics if they go to OTCMG's website. We do not know how much investors rely only on their retail broker's website that displays the tier labels without the colorful graphic by each company's trading symbol.³ In addition, investors may not value OTCMG's categorization or choose to ignore *PS* firms' disclosure practices. It remains an empirical question whether or not this OTCMG's innovation has any impact on the *PS* market.

Our tests of changes (a difference-in-difference design) in liquidity over a three-month pre- and three-month post-implementation period of the disclosure classification system for over 2,000 *PS* firms demonstrate a shift in liquidity. We find that relative to unclassified firms (i.e., firms dually quoted on the Pink Sheets and OTCBB markets) the current information firms, which have the highest level of public disclosures, experience a relative increase in liquidity while the no information firms experience a relative decrease in liquidity. We find no notable change in the liquidity of the limited information firms relative to unclassified firms. These results are robust to controlling for ADR status, industry effects, firm size, and time trends in liquidity. The results also do not appear to be driven by the changes in firms' disclosure practices during the sample period or by a flight-to-liquidity driven by the 2008 financial crisis.

² Note that under this alternative, we do not assume that investors have unlimited resources and therefore can fully evaluate *all* obtainable information on *PS* firms. But rather, we believe that even without the disclosure tiers investors could identify the disclosure levels of *PS* firms at a fairly low cost (e.g., it is reasonably easy to determine the filings a firm has on EDGAR).

³ OTCMG's primary website is currently www.otcmkt.com. Their website is designed for retail and institutional investors and serves as the premier source of financial and corporate information for OTC securities. OTCMG reports that it has more than 350,000 unique visitors per month. Back in 2008, this website received over 15 million monthly page views. If an investor searches for any of the smaller OTC companies, OTCMG's website frequently shows up as a top link from Google search.

We also investigate the stock market reactions to four key events related to the announcement and implementation of the disclosure classification system. The event dates include November 6, 2006 (when OTCMG first announced its initial plan to develop a classification system), April 24, 2007 (when OTCMG released a tentative classification system and announced a transition period for the classifications), July 17, 2007 (when OTCMG finalized the classification system and announced the final implementation date), and August 1, 2007 (when OTCMG officially implemented the classification system). Focusing on a five-day window around each event, we find that firms in the no information group experience statistically significant negative abnormal returns in each event window, while firms in the limited information group experience no significant abnormal returns. Firms in the current information group experience positive abnormal returns in each window but they are only significantly different from zero around July 17, 2007. These findings suggest that at least some *PS* investors expected the implementation of the disclosure classification system to have an average positive (negative) impact on the current (no) information firms.

To shed light on whether the observed abnormal returns are the result of some *PS* investors anticipating that the disclosure tiers will cause changes in liquidity, we investigate whether the abnormal returns surrounding July 17, 2007 (the only date that both no information and current information groups exhibit significant abnormal returns) are associated with the subsequent liquidity changes. We find that changes in liquidity between the pre- and post-implementation periods are significantly positively associated with the July 17, 2007 event window abnormal returns.

Our study makes two contributions. First, our evidence exemplifies how a private intermediary innovation can shape a market-wide phenomenon without costly regulation

(Gerakos, Lang, and Maffett, 2012) in an important accounting setting (i.e., the level of financial statement disclosures). Instead of relying on mandatory disclosure or “one-size fits all” regulation, our results demonstrate that market intermediaries can affect investor behavior through simple labels and graphics that draw investors’ attention to a firm’s existing disclosure practice. This is consistent with Daniel, Hirshleifer, and Teoh’s (2002, 193) call for “minimally coercive and relatively low-cost measures to help investors make better choices and make the market more efficient.” Our study also relates more generally to the recent trend of applying the insights of behavioral economics to gently “nudge” people in setting public policies (Congdon, Kling, and Mullainathan 2011; Thaler and Sunstein 2008; Sunstein 2011).⁴

Second, our study contributes to the emerging research on small public companies, especially the Pink Sheets companies. The Pink Sheets companies and the OTC market represent an economically significant portion of publicly traded companies in the U.S. In 2005, the market capitalization of the Pink Sheets and OTCBB reached \$846 billion, more than twice the size of AMEX (\$370 billion). The number of traded Pink Sheets and OTCBB companies is twice the amount in the Nasdaq market (SEC 2006).

Policymakers are particularly interested in how to regulate small public companies and have considered whether small public firms need a separate regulatory framework, including separate accounting standards, corporate governance and reporting requirements, and different processes and requirements for public offerings (SEC 2006). Currently, small companies are

⁴ For example, to enhance people’s awareness of the risks of smoking, starting in September 2012, the Food and Drug Administration (FDA) requires tobacco companies to put larger, more prominent graphic health warnings on all cigarette packages and advertisements. These graphics include pictures of a diseased lung and a sewn-up corpse of a smoker. This is the first time that the U.S. has changed the cigarette warning in more than 25 years. The potential effectiveness of such labeling can be inferred by the fierce resistance by the tobacco companies. Four of the five largest U.S. tobacco companies sued the FDA for violating their free speech rights. As another example of using vivid graphics to change behavior, the Economist reports an experiment in Copenhagen where a series of green footprints leading to trash cans were painted. These colorful signs reduced littering by 46% during a controlled experiment (Economist 2012).

usually exempted or allowed to delay implementing new regulations (e.g., see Iliev (2010) on the internal control requirement of the Sarbanes-Oxley Act). The recent JOBS Act of 2012, introduced a new type of small public company, referred to as an emerging growth company, which has less than \$1 billion in annual revenues. These companies have more lax reporting and auditing requirements. In addition, small public firms are frequent targets of frauds and email spams (Aggarwal and Wu 2006; Nelson, Price and Rountree 2010). Because the SEC carries the responsibility to protect small investors (Zingales 2009), more research focusing on small public firms can help the SEC better assess the costs and benefits of security regulation on these firms, and devise more effective ways to regulate them.

For stock exchanges, it is important to know how they can best attract investor attention. Several exchanges use labels. The NYSE indicates that a listing firm violates the NYSE's listing standards by adding a *BC* suffix to the firms' trading symbol and if a NYSE firm fails to file annual financial statements in a timely manner the NYSE adds a *LF* suffix. The Nasdaq also displays an indicator on a firm's quotation page to identify firms that fail to make timely filings with the SEC, violate the Nasdaq listing standards, or file for bankruptcy. The stock exchanges in China label firms with two consecutive annual losses as ST (special treatment) in front of their trading symbols (Jiang, Lee and Yue, 2010). It would be interesting to assess the relative effectiveness of the act of categorizing and adding labels versus adding colorful graphics to firms' trading symbols but our setting does not allow such an analysis. This is because we cannot determine whether it is the labels associated with the categorization of each firm's disclosure practices displayed on the retail broker's websites, the colorful graphics displayed on the OTCMG websites, or some combination that affects investors' attention.

Lastly, an alternative explanation for our results is that investors in *PS* firms are fully rational (i.e., they are not influenced simply by a categorization, label, and other attention-grabbing tactics) and prior to the release of the disclosure tiers the costs to some investors of discerning *PS* firms' disclosure levels exceeded the benefits. The release of the disclosure tiers lowered the costs of assessing disclosure levels, allowing more investors to incorporate firms' disclosure practices into their trading decisions. We do not favor this alternative because we believe that prior to the release of the disclosure tiers it was a fairly low cost endeavor to assess disclosure levels. There is also ample evidence (much of which we cite in this paper) suggesting that individual investors are not fully rational and the setting we examine includes primarily individual investors who "may be less sophisticated" (Bruggemann, Kaul, Leuz, and Werner 2013, 8). Furthermore, although we argue that the disclosure tiers likely draw more investor attention to disclosure practices, we are not suggesting that this will lead *PS* investors to analyze more financial statements. It is possible that simple knowledge of disclosure levels provides a way to assess a firm's overall quality. In other words, the presence of high disclosure levels (e.g., up-to-date financial statements) may increase investors' perception of the firm's inherent quality and therefore raise investors' comfort levels in a security.

The next section provides details on the institutional setting. Section 3 describes how we measure our variable of interest, liquidity. Section 4 discusses our tests and results on changes in liquidity, while Section 5 discusses our stock return event study tests, and Section 6 concludes.

2. Institutional background

2.1. The history of the Pink Sheets market and the introduction of disclosure tier classification

The Pink Sheets market started in 1913 when the National Quotation Bureau was established and began distributing daily inter-dealer quotes of OTC stocks on pink paper (thus

the name Pink Sheets). In 1999, the daily paper-based quotations were replaced with real-time quotations. Since the switch the Pink Sheets market has grown significantly. As of December 31, 2010, the Pink Sheets market reported a total annual trading volume of over \$95 billion for 5,954 securities, an increase of over 200% since year 2000 and representing the third largest exchange in terms of trading volume behind the Nasdaq and the NYSE (OTCMG 2010 Annual Report).

A unique feature of Pink Sheets companies is that they are publicly traded but not subject to mandated SEC disclosure requirements under the 1934 Securities Exchange Act (e.g., they do not have to provide audited 10-K, 10-Q, or 8-K filings). In general, the SEC only mandates a company to provide periodic reports to disclose important information to investors if the company: 1) is a U.S. company that has at least 500 investors⁵ and at least \$10 million in assets, and 2) lists its securities on the AMEX, Boston Stock Exchange, Chicago Stock Exchange, Cincinnati Stock Exchange, International Securities Exchange, Nasdaq, NYSE, Pacific Exchanges, or Philadelphia Stock Exchange. Prior to 1999, domestic OTCBB firms were also exempt from the reporting requirement under the 1934 Securities Exchange Act. But in 1999, the SEC removed the exemption for OTCBB firms. More than 2,600 firms or 76% of the OTCBB firms not previously filing with the SEC chose to be removed from the OTCBB and only trade in the Pink Sheets, which doubled the number of *PS* firms (Bushee and Leuz 2005). After the 1999 SEC rule changes, the Pink Sheets market is the only trade venue that does not require firms to file reports with the SEC, although these firms may voluntarily register with the SEC and therefore commit themselves to similar reporting requirements (SEC 2004).

The SEC warns investors that it may be hard to find reliable and unbiased information about firms traded in the Pink Sheets market, which “can be among the most risky investments” (<http://www.sec.gov/answers/pink.htm>). The lack of transparency also makes *PS* firms more

⁵ The recent JOBS Act changed this to as many as 2,000 investors.

prone to pump-and-dump schemes and stock spams (Böhme and Holz 2006; Frieder and Zittrain 2007; Krantz 2005; Nelson, Price and Rountree 2010). As early as 1963, the SEC's general counsel, Phillip Loomis Jr., testified that "the overwhelming preponderance of fraud cases before the Commission in past years have involved the securities of companies which have not been subject to the reporting requirements of the Exchange Act" (SEC 1963). More recently, Aggarwal and Wu (2006) find that stocks of OTCBB and *PS* firms account for nearly half (68 out of 142) of the stock market manipulation cases pursued by the SEC from 1989 to 2001. Perhaps not surprisingly, the Pink Sheets website also directly warns investors to "be aware that good information is simply not available for many Pink Sheets traded companies and that there are unscrupulous individuals that will attempt to defraud investors through manipulative schemes in Pink Sheets stocks" (as quoted by Bollen and Christie 2009, 1326).

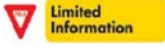

The mission of OTCMG is "to create better informed and more efficient financial marketplaces" (OTCMG 2012 Annual Report). Accordingly, OTCMG encourages issuers to disclose more information to investors, but it cannot mandate it. So it decided to experiment with private innovations to improve the transparency of the Pink Sheets market. In November 2006, OTCMG announced plans to launch a separate market platform, referred to as OTCQX or the "quality controlled marketplace." To be included on this platform firms must file audited U.S. GAAP financial statements and undergo a qualitative review. Only 13 companies appear on OTCQX as of 2007.⁶ Because the sample of OTCQX firms is so small and these firms trade on a different platform (their trades are all electronic and settled and cleared in the U.S. similar to any Nasdaq or NYSE stock) our main analyses exclude the OTCQX *PS* firms. For the remaining *PS* firms, OTCMG intended to categorize them based on their public disclosure levels and timeliness arguing that providing "more transparency to investors on the ability and willingness

⁶ This number was obtained from OTCQX's list of companies in 2007.


of issuers to provide adequate public disclosure in a credible and timely manner” will “greatly enhance the capital formation process” (OTC Markets Group, 2006).

In April 2007, OTCMG announced that in May it will start to assign *PS* firms into one of three disclosure tiers and affix colorful graphics on each firm’s quote page in the Quotes & News section of OTCMG’s website. The three disclosure tiers and their colorful graphics are: 1)

current information, represented by , 2) limited information, represented by a yield

traffic sign , and 3) no information, represented by a stop sign .

The current information tier, which we denote as *CURRENT*, includes both foreign firms that are listed on “qualified exchanges” and domestic firms that file continuous financial statements to the SEC or other regulators or make adequate “filings publicly available through the OTC disclosure & News Service,” but it “is not a designation of quality or investment risk.”⁷ The limited information tier, denoted *LIMITED*, consists of firms that provide at least some information that is not older than six months but not enough information to be considered current as well as firms “with financial reporting problems, economic distress, or in bankruptcy.” The no information tier, denoted *NO*, is for firms “that are not able or willing to provide disclosure to the public markets - either to a regulator, an exchange or OTC Markets Group” that is less than six months old. So the *NO* firms may have publicly available information but it must be stale.

There is an additional tier, represented by  on OTCMG’s website, which includes firms with concerns of “a spam campaign, questionable stock promotion, known investigation of fraudulent activity committed by the company or insiders, regulatory

⁷ Since 2008, OTCMG has added more requirements for firms to be considered *CURRENT*. For example, as of 2010, a *PS* firm that wants to be classified as *CURRENT* must submit a signed attorney letter certifying that the firm’s disclosure materials are prepared following certain rules of the Securities Act of 1933. As of 2012, *PS* firms that provide financial statements audited by a PCAOB approved auditor no longer need to provide the signed attorney letter.

suspensions, or disruptive corporate actions.” When a firm falls in this category, OTCMG suspends quotation for the firm. Given the extreme nature of these firms and the lack of quotation data from OTCMG, we omit them from our analysis.⁸ OTCMG introduced these graphic disclosure tiers to help investors quickly assess a firm’s disclosure level. Their intent was for retail brokers to also display the graphics but OTCMG did not mandate it. So instead retail brokers simply report on their websites the tier label of each *PS* firm by its ticker symbol. Figures 2 and 3 provide further details and examples of these disclosure tiers.

The implementation of the disclosure tiers creates a fruitful setting to examine the impact of investor attention for a couple of reasons. First, this event avoids the problem of self-selection because firms are assigned to disclosures tiers by OTCMG based on their *existing* public disclosures. Thus any observed changes in liquidity around the release of the disclosure tiers should not be attributed to a firm’s *new* disclosure. Second, this event happened quickly, thus minimizing the influence of other confounding events. The OTCMG tentatively added the graphics to a firm’s quotation page in May 2007 and expanded the graphics to a firm’s trading symbol everywhere that it appears on OTCMG’s website by August 1, 2007. Accordingly, for our tests, we consider the pre-implementation period as February through April of 2007 and the post-implementation period as August through October of 2007. We exclude the three-month transition period from May to July of 2007 to get a clean setting and to best isolate the impact of introducing the disclosure tier classification.⁹

2.2. *Prior Research*

⁸ We leave it for future research to investigate how the classification into the Caveat Emptor category affects improper manipulations such as pump-and-dump.

⁹ The OTCMG did not retain records that would allow us to identify the exact date that a given firm’s label was assigned, precluding us from identifying a more accurate implementation date. Our inferences, however, are similar if we consider May to July of 2007 as the pre-implementation period.

Compared to stocks listed on major exchanges such as the NYSE, AMEX, and Nasdaq, stocks traded in the OTC markets (often smaller and less liquid) have received little attention. Inspired by the significant growth in OTC markets, a few studies attempt to broaden our understanding of the OTC market's quality and asset pricing. Macey et al. (2008) examine changes in liquidity and transaction costs for firms involuntarily delisted from the NYSE and subsequently quoted in the Pink Sheets in 2002. They find that spreads increase substantially and liquidity deteriorates. Similarly, Harris et al. (2008) find that firms delisted from Nasdaq during 1999-2002 experience increased spread and volatility when they were subsequently traded in the OTCBB and/or the Pink Sheets. Focusing on asset pricing, Eraker and Ready (2013) document significantly *negative* rates of return (-30% annually) in the OTC market during 2000-2008.

In a recent study of the OTC market from 1977 through 2008, Ang et al. (2013) find that the OTC market relative to other listed markets (i.e., NYSE and Nasdaq) has similar size, value, and volatility return premiums while the premium for return momentum is smaller. But most importantly for our study, they find that the OTC market has a larger return premium for illiquidity relative to other listed markets and more so for OTC stocks that have low disclosure standards (i.e., firms that do not publicly disclose book value of equity). Their results suggest that small changes in liquidity in the OTC market may have a large impact on asset prices and the impact will be amplified for those OTC firms with fewer disclosures. Interestingly, they also observe that OTC firms with fewer disclosures earn lower stock returns than other firms. The authors argue that although this is inconsistent with traditional theories of disclosure, the observed overpricing of low disclosure firms may result from investors failing to appreciate adverse selection in firms' disclosure policies.

Also related to our study, Bruggeman et al. (2013) use proprietary data to provide descriptive evidence on over 10,000 U.S. firms that trade in different venues in the OTC market (OTCBB, PS, and the Grey Market) during the period 2001-2010. They further examine the relation between regulatory regimes and market quality as reflected through liquidity and price efficiency. They find that OTC firms with better disclosures (such as those that provide filings with the SEC, those that provide manual publications or go through stricter merit reviews, or those classified in higher PS disclosure tiers) generally have higher liquidity and higher price efficiency. Our study differs in that we focus on the cross-sectional differences in market liquidity *within the PS market* surrounding the implementation of the disclosure tiers.

Only two studies examine the impact of *mandatory* disclosure changes in the OTC market. Greenstone et al. (2006) investigate the impact of the 1964 Securities Acts Amendments. The 1964 Amendments extended the mandatory disclosure requirement for firms publicly traded on major exchanges to OTC firms that have more than one million dollars in total assets and at least 750 shareholders.¹⁰ They find that investors seem to value the additional disclosure requirements because the OTC firms most affected by the 1964 Amendments experience positive abnormal returns during the period between the initial proposal and the enactment and in the period around the announcement to comply with the new disclosure requirement.

The other study is by Bushee and Leuz (2005). They investigate how the SEC disclosure regulations affect stock returns and liquidity in the OTCBB market. In 1999 the SEC approved the “eligibility rule” that allows only companies that provide current financial information to the SEC or banking or insurance regulators to be quoted on OTCBB, effectively mandating periodic filings of financial reports for all domestic OTCBB firms who previously did not have to provide

¹⁰ Starting in 1966 these thresholds have evolved to the current requirement of 2,000 shareholders and \$10 million in total assets (see for example Owens 1964 and SEC 1996).

SEC filings. Bushee and Leuz (2005) find that the “Noncompliant” firms subsequently experienced significant decreases in liquidity. In contrast, firms who are “Already Compliant” and “Newly Compliant” experience larger positive stock returns around key event dates related to the approval of the eligibility rule and also significant increases in liquidity.

The implementation of the disclosure classification system for *PS* firms introduces a unique opportunity to test whether the simple act of signaling companies’ existing public disclosure levels through categorization, labeling, and colorful graphics can influence investor attention. This setting differs from that in Bushee and Leuz (2005) in which OTCBB firms are required to provide investors with up-to-date disclosures under the eligibility rule.

3. Measuring liquidity

To measure liquidity before and after the official implementation of the disclosure classification system, we obtain proprietary daily data from OTCMG on each *PS* firm’s disclosure tier from August 1, 2007 to October 31, 2007. We also obtain volume, closing price, and best bid and ask price as of 4:00 pm each trading day from October 1, 2006 to October 31, 2007 for all *PS* firms and dually quoted OTCBB firms. Unfortunately we do not have a machine-readable source to systematically collect *PS* firms’ financial statement data, which constrains our ability to analyze these firms. Because the OTCBB firms are not part of the new disclosure classification system, we use the *dually* quoted OTCBB firms as an additional control group, hereafter referred to in italics as *OTCBB*, to filter out any concurrent economic events that might affect the liquidity of all firms traded in the OTC market.

Because our primary focus is on how the introduction of the disclosure tiers affects liquidity, we measure liquidity for each of our sample firms during a pre-implementation and a post-implementation period around August 1, 2007. As stated previously, we consider the pre-

implementation period as February through April of 2007 and the post-implementation period as August through October of 2007. Importantly, none of our sample firms changed disclosure tiers during the three-month post-implementation period.¹¹

As discussed by Amihud, Ho, and Schwartz (1985, 4), liquidity in a market “encompasses many characteristics: low trading costs, the accuracy of price adjustments to new information, price continuity, continuity of trading, depth, and the ease and speed of execution.” Common proxies for liquidity include the percentage bid-ask spread, monthly trading volume, percentage of days traded in a month (Bushee and Leuz 2005; Leuz et al. 2008; Macey et al. 2008; Ang et al. 2013), and price impact (Amihud 2002). Accordingly, we consider each of these four measures and also create one parsimonious measure of liquidity using factor analysis. The benefit of using a common factor, rather than just each of the four correlated variables which capture different aspects of firm liquidity, is that the common factor will be less subject to random measurement errors.¹² Factor analysis isolates these measurement errors from our extracted common factor (Kim and Mueller 1978, p. 68), which we denote as *LIQUIDITY*.

We calculate the three-month average of the daily percentage bid-ask spreads during the pre- and the post-implementation periods, denoted *SPREAD*, as the absolute difference between closing bid and closing ask prices, divided by the mid-point of the bid and ask prices, multiplied by 100. To measure price impact, we calculate the log of the three-month average (during the pre- and the post-implementation periods, respectively) of the absolute value of daily returns divided by daily dollar volume in millions, denoted as *IMPACT*. Amihud (2002) interprets *IMPACT* as the daily price response associated with one dollar of trading volume. Percentage of

¹¹ During the short window around the implementation of the disclosure classification system, our sample firms do not experience any changes in either composition or tier designations. Over the long run the composition of the Pink Sheets population might change. Limited by the nature of our data, we leave it for future research to examine whether the disclosure tiers impact future entry/exit in the Pink Sheets market.

¹² Bartov and Bodnar (1996, 406) discuss the prevalence of measurement errors in bid-ask spreads.

days traded in a month, denoted *TRADEDAYS*, is calculated as the number of days in a month that a firm has actual trading, divided by the number of all potential trading days in the month.¹³ We measure monthly trading volume, denoted *VOLUME*, as the log of daily trading volume (shares traded times the closing price) summed over the month (in thousands of dollars).¹⁴ We further average *TRADEDAYS* and *VOLUME* over the three-month pre- and the three-month post-implementation windows. This is consistent with Bushee and Leuz (2005) because many *PS* securities are thinly traded (SEC 2004) and we want to eliminate any temporary liquidity effects. Finally, we winsorize *SPREAD*, *VOLUME*, and *IMPACT* at the 1% and 99% of their distributions to reduce the influence of extreme values.

Table 1 reports descriptive statistics on *SPREAD*, *VOLUME*, *TRADEDAYS* and *IMPACT*, and the results of the factor analysis using these individual liquidity measures to calculate the common factor, *LIQUIDITY*, for 8,368 sample observations in the three-month pre- and the three-month post-implementation period. Panel A shows that during the pre-implementation period stocks in the OTC market on average trade every other day (51.45%) and monthly trading volume is about \$40,134 (based on translating the log monthly trading volume into a dollar amount). Panel B reports the correlation matrix for the four variables used in the factor analysis. As expected, all four variables are significantly correlated with each other in the predicted directions. *SPREAD* and *IMPACT* are positively and significantly correlated, so are *TRADEDAYS* and *VOLUME*.

Panel C shows the eigenvalues of the correlation matrix. We have four liquidity measures and all measures have one unit of variance, so the sum of the eigenvalues is four. The rule of

¹³ When we measure the numerator of *TRADEDAYS* as the number of days in a month that a firm has more than 100 shares traded (Ang et al. 2013), our inferences remain the same.

¹⁴ Share turnover is another liquidity measure that prior research often uses (Bushee and Leuz 2005; Pownall et al. 2010; Bruggemann et al. 2013). We do not include this measure because data on *PS* firms' shares outstanding are not readily available for our sample period, although OTCMG's current website contains firms' shares outstanding.

thumb for the principal component analysis is to keep any factors that have eigenvalues greater than one (Kaiser 1960). In our sample, only the first factor has an eigenvalue greater than one (i.e., 2.79). This factor explains 70% of the total variances of the four liquidity variables (i.e., $2.79/4=70\%$). We multiply this factor by negative one so that a higher factor indicates more liquidity. Panel D shows that *LIQUIDITY* is highly correlated with the individual liquidity measures, with a correlation of -86% with *SPREAD*, -83% with *IMPACT*, 68% with *TRADEDAYS*, and 96% with *VOLUME*.

4. Tests of Changes in Liquidity

4.1. Main test

To assess whether the implementation of the disclosure tiers is associated with observable changes in liquidity, we use a difference-in-difference research design. Specifically, we estimate a model in the following form:

$$\Delta Liquidity_i = \alpha_0 + \alpha_1 CURRENT_i + \alpha_2 LIMITED_i + \alpha_3 NO_i + \mu_i \quad (1)$$

where:

$\Delta Liquidity_i$ = change in one of our five liquidity measures (*LIQUIDITY*, *SPREAD*, *IMPACT*, *TRADEDAYS*, and *VOLUME*) between the three-month pre-implementation period and the three-month post-implementation period for firm *i*. See the Appendix for detailed definitions for each measure;

$CURRENT_i$ = 1 if firm *i* falls in the “current information” category, and 0 otherwise;

$LIMITED_i$ = 1 if firm *i* falls in the “limited information” category, and 0 otherwise;

NO_i = 1 if firm *i* falls in the “no information” category, and 0 otherwise.

This regression allows us to use each firm as its own control to assess how the change in liquidity for a given category of *PS* firms compares to the change in liquidity for other categories of *PS* firms. We also use the *OTCBB* firms as a control group (the intercept, α_0 , captures the change in liquidity for these dually quoted *OTCBB* firms) to filter out the impact of market-wide concurrent events on liquidity in the OTC markets. So in model (1), α_1 , α_2 , and α_3 measure the difference in the changes in liquidity between *PS CURRENT* firms and *OTCBB* firms, between

PS LIMITED firms and *OTCBB* firms, and between *PS NO* firms and *OTCBB* firms, respectively. We can assess differences across the *PS* categories by testing for differences across the α_1 , α_2 , and α_3 coefficient estimates.

Table 2 reports the results of estimating model (1). We exclude from the regression observations with absolute studentized residuals greater than two and calculate robust standard errors adjusted for heteroskedasticity.¹⁵ Column (1) reports results of the estimation when the dependent variable is the change in our liquidity factor, denoted $\Delta LIQUIDITY$. The coefficient on *CURRENT* is significantly positive and the coefficient on *NO* is significantly negative ($p < 0.01$), while the coefficient on *LIMITED* is insignificantly different from zero. This demonstrates that after the implementation of the disclosure tiers the *PS* current information group experienced a relative increase in liquidity and the *PS* no information group experienced a relative decline in liquidity compared to the *OTCBB* firms, while the change in liquidity of the *PS* limited information group is not different from that of the *OTCBB* firms. The last three rows in Column (1) of Table 2 report tests on the differences across the *PS* disclosure tiers. We find that the coefficients for the three independent variables are all significantly different from one another ($p < 0.01$), suggesting that the relative changes in liquidity across the three tiers are significantly different from each other.

Columns (2) through (5) in Table 2 report results using the change in each individual liquidity measure as the independent variable. For example, Column (5) shows that compared to *OTCBB* firms, firms in the *CURRENT* category experience a relative increase in trading volume ($p < 0.01$) while those in the *NO* category experience a relative decrease in trading volume ($p < 0.01$). The *LIMITED* firms experience no change in trading volume compared to the *OTCBB*

¹⁵ The excluded outliers make up 5% to 7% of the total sample. Our inferences are similar if we do not exclude the outliers. The coefficients on *CURRENT* and *NO* are still significant at 5% levels except when the dependent variable is $\Delta SPREAD$, the p -value of the coefficient on *CURRENT* is 0.13 for a two-tailed test.

firms. The last three rows of Table 2 show the relative changes in trading volume across the three groups are significantly different from each other ($p < 0.01$). Results on changes in the other liquidity measures (i.e., *SPREAD*, *IMPACT*, and *TRADEDAYS*) are largely consistent with those for $\Delta LIQUIDITY$ and $\Delta VOLUME$.¹⁶

The overall conclusion from Table 2 is that liquidity for the *CURRENT (NO)* firms increased (decreased) relative to the *OTCBB* firms, while the liquidity of the *LIMITED* firms is similar to that experienced by the *OTCBB* firms upon the implementation of the disclosure tiers.¹⁷ This suggests that the introduction of the graphic tiers is associated with a relative shift in investors' attention leading to rebalancing their portfolios toward *CURRENT* firms and away from *NO* firms. It could also be the case that the introduction of the graphic tiers caused some investors to enter the *PS* market by buying *CURRENT* firms and to exit by selling *NO* firms.

To assess the magnitude of the changes in the various liquidity measures, we present univariate descriptive statistics in Table 3 that underlie the regression results reported in Table 2. Columns (2) and (3) in Table 3 report the mean, median, and standard deviation of the levels of the liquidity measures in the pre- and post-implementation periods. Column (4) reports statistics on the changes in the liquidity measures for each group of firms. In Column (5) we report the mean and median change in liquidity for each *PS* disclosure tier relative to the *OTCBB* firms as the difference in the changes in liquidity. Column (6) presents the relative changes in percentage

¹⁶ There are two exceptions. For $\Delta SPREAD$, we observe that the bid-ask spread for the *LIMITED* group significantly increases relative to the *OTCBB* firms. Although this relative increase is less than that observed by the *NO* group, the magnitude of the difference between the *LIMITED* and the *NO* groups is not statistically different from zero. Also, with $\Delta IMPACT$ we find that while both the *CURRENT* and the *LIMITED* firms showed a relative decline in price impact compared to the *OTCBB* firms, the relative decline across the *CURRENT* and *LIMITED* firms is not statistically distinguishable.

¹⁷ Untabulated analysis shows that the average liquidity for the overall Pink Sheets market decreased over our sample period. This is mainly driven by the no information group because this group has the largest number of observations and thus contributes the most to the mean liquidity change. When we weigh each firm by its trading volume during the pre-implementation period to calculate volume-weighted average liquidity, we find that the overall liquidity of the Pink Sheets market increased over the sample period.

terms. Because other market-wide economic events may also affect liquidity in the OTC market, it is important to focus on the *relative* percentage change in liquidity measures between the categorized *PS* firms and the *OTCBB* firms, rather than the changes for *PS* firms alone.

Column (2) in Panel A of Table 3 reveals that in the pre-implementation period the mean *LIQUIDITY* for the *CURRENT* firms is 0.935 while the average liquidity for the *LIMITED* firms is 0.192, which exceeds that of the *NO* firms of -0.165. This indicates that even prior to the introduction of the disclosure tiers, some investors' trading decisions were based on disclosure practices. Interestingly, the *CURRENT* firms have higher mean and median liquidity than the *OTCBB* firms (these differences are statistically significant).¹⁸ This is because some well-known foreign corporations such as Adidas AG, Burberry Ltd., Bank of China, Continental AG, Daimler AG, and Nestle S.A. with high levels of liquidity are in the *CURRENT* group.

Column (4) in Panel A of Table 3 reveals that the mean and median Δ *LIQUIDITY* for the *CURRENT* firms is 0.015 and 0.036 while the *OTCBB* firms experienced a mean and median *decline* in *LIQUIDITY* of 0.111 and 0.113 over the same period. The mean and median changes in *LIQUIDITY* for the *CURRENT* firms are 0.126 and 0.149 greater than that of the *OTCBB* firms, respectively ($p < 0.01$). This difference, as reported in Column (6), translates to an incremental 13% increase in the liquidity of the *CURRENT* firms.

Both the *LIMITED* and *NO* firms experienced declines in *LIQUIDITY*. Although the decline for the *LIMITED* firms is not statistically different from that of the *OTCBB* firms, the mean and median decline of the *NO* firms are both significantly greater than the mean and median decline of the *OTCBB* firms. The difference is also likely economically meaningful given that the decline in *LIQUIDITY* for the *NO* firms results in an incremental 65% decrease in

¹⁸ This is also consistent with Bruggemann et al.'s (2013) finding that over time Pink Sheets' market quality has improved and even sometimes exceeds that of the *OTCBB*.

their liquidity. The magnitude of the incremental change in *LIQUIDITY* for the *NO* firms is more than four times greater than the incremental change for the *CURRENT* firms, suggesting that the *NO* firms experienced the biggest impact from the introduction of the disclosure tiers.

Panels B through E of Table 3 provide similar descriptive statistics to those in Panel A for *SPREAD*, *IMPACT*, *TRADEDAYS*, and *VOLUME*. The results are similar to those found on *LIQUIDITY*. In terms of economic significance, we find that the bid-ask spread of the *CURRENT* group decreased an incremental 15%, while the *LIMITED* and *NO* groups' bid-ask spread increased an incremental seven and six percent.¹⁹ The *IMPACT* of the *CURRENT* group decreased an incremental 47%, while the *LIMITED* group's *IMPACT* only decreased an incremental three percent and the *IMPACT* for the *NO* group increased an incremental four percent.²⁰ *TRADEDAYS* for the *CURRENT* group increased an incremental seven percent, while the *LIMITED* group's *TRADEDAYS* only increased an incremental two percent and the *TRADEDAYS* for the *NO* group decreased an incremental three percent. Finally, relative to *OTCBB* firms, the *CURRENT* group experienced a 22.5% increase in monthly trading volume and the *NO* group experienced a 16.2% decrease.

So far, our evidence indicates that the OTCMG's release of the disclosure tiers is associated with contemporaneous changes in the liquidity of *PS* firms, with firms in the higher disclosure categories benefiting from relatively increased liquidity while those in lower disclosure categories suffering from relatively decreased liquidity compared to *OTCBB* firms. This is consistent with the simple act of categorizing and graphically labeling firms based on

¹⁹ The increase in the bid-ask spread in the post-implementation period for the *OTCBB* firms in Table 3 Column (4) is not unique. The smallest decile firms in the NYSE/AMEX/Nasdaq universe also experience significant increases in bid-ask spread in the same period.

²⁰ The large percentage changes in *SPREAD* and *IMPACT* for the *CURRENT* group are due to their lower levels in the pre-implementation period. For example, the absolute change in *SPREAD* relative to *OTCBB* firms is similar between the *CURRENT* group and the *NO* group (Table 3, Panel B, Column (5)), but *SPREAD* in the pre-implementation for the *CURRENT* group is less than 30% of the *NO* group.

their existing disclosure levels causing investors to re-allocate their attention and trading towards firms with higher disclosure levels.

4.2. Robustness tests

The advantages of a difference-in-difference research design lie in its simplicity and its potential to mitigate concerns of endogeneity and establish causality (Bertrand and Mullainathan 2003; Bertrand et al. 2004). However, some internal validity concerns still exist (Meyer 1995). For example, if during the sample period some confounding factors (e.g., industry or macroeconomic conditions) other than the colorful graphics *increase* the *CURRENT* group's liquidity and *decrease* the *NO* group's liquidity, our inference that releasing the disclosure tiers causes the observed liquidity changes would not be valid. Accordingly, we try a battery of robustness tests to rule out alternative explanations. For brevity, we only report results focusing on our common factor measure, *LIQUIDITY*, but the inferences are largely the same using the individual liquidity measures.

4.2.1. Flight-to-liquidity

Because our sample period includes the beginning of the 2007-2008 global financial crisis,²¹ a potential concern is that economic shocks associated with the start of the crisis rather than the introduction of the disclosure classification system drive our sample *PS* firms' liquidity changes. Specifically, the relative increase in liquidity for the *CURRENT* group and the relative decrease in liquidity for the *NO* group may be because of flight-to-liquidity. Flight-to-liquidity occurs during periods of economic distress as investors rebalance their portfolios toward firms with higher liquidity (Longstaff 2004; Beber, Brandt and Kavajecz 2009). In our setting, if high

²¹ Early signs of the financial crisis began in the summer of 2007. Two Bear Stearns hedge funds that invested heavily in collateralized debt obligations collapsed in June 2007 (Pittman 2007) and the TED spread, an indicator of the perceived credit risk in both the banking sector and the general economy, started to drastically increase in July 2007 (Blankespoor et al. 2013).

(low) liquidity stocks became more (less) in demand at the beginning of the financial crisis, we would expect these stocks to become even more (less) liquid. We empirically test whether flight-to-liquidity affects our inferences by controlling for each firm's average liquidity level during the pre-implementation period (*Prior_Liquidity*), February to April 2007, which preceded the beginning of the crisis. Including *Prior_Liquidity* should help capture investors' incentive to shift towards firms with higher liquidity levels at the early onset of the financial crisis. If flight-to-liquidity drives our results, we would expect the coefficient on *Prior_Liquidity* to be positive and the coefficients on our disclosure classification variables to become insignificant.

Table 4 Column (1) shows the results of estimating model (1) including each firm's average liquidity in the pre-implementation period. The coefficient on *Prior_Liquidity* is significantly negative ($p < 0.01$), suggesting a regression towards the mean and that there was no flight-to-liquidity between the pre- and post-implementation periods. This may be because during our sample period, which ended October 2007, the financial crisis was still in its infancy.²² Importantly, we find that the *CURRENT* group still experiences relative liquidity improvements while the *NO* group experiences relative liquidity declines, regardless of firms' prior liquidity levels. The flight-to-liquidity phenomenon does not seem to drive our inferences.

4.2.2. *Disclosure behavior changes*

If firms foresee the impact of the disclosure tiers on liquidity, firms with limited or no information in the pre-implementation period might try to improve their disclosures prior to the introduction of the graphic tiers. If so, the liquidity improvement for the *CURRENT* firms may not be driven by the release of the disclosure tiers but by the firms' recently improved disclosure

²² For example, The National Bureau of Economic Research reports that the resulting recession did not start until December 2007 and the financial market turmoil peaked in the summer of 2008 (Shleifer and Vishny 2011), well after October 2007 when our sample period ends.

behavior. This threat is valid since we do not observe a *PS* firm's disclosure tier in our pre-implementation period (from February to April of 2007).

To understand if firms systematically changed their disclosure levels during the pre- and post-implementation periods, we randomly select 100 firms each from the *CURRENT* and the *NO* groups as of August 2007. We then examine each firm's disclosure levels in the two periods on 1) EDGAR; 2) the OTCMG's OTC Disclosure & News Service; and 3) the firm's own website. We consider a firm to have a change in disclosure if the firm changes its exchange listing or SEC filing status or experiences a noticeable difference in the extent to which it files its financial statements.

Among the 100 *CURRENT* firms, 95 have no discernible differences in their disclosure levels in the pre- and post- implementation periods. Two firms *lowered* their disclosure levels because they stopped making filings on EDGAR during the post-implementation period. For the three remaining firms we were unable to find their pre-implementation period disclosures. Among the 100 *NO* firms, 93 have no discernible changes in their disclosure levels. One firm was delisted and another firm stopped making any filings on EDGAR, while three firms increased their disclosure levels. Two firms with increased disclosures began filing 10-Qs on EDGAR for the first time during the post-implementation period and one firm greatly improved the timeliness of its 10-K filing (specifically, in the pre-implementation period the 10-K was filed 10 months after year-end and in the post-implementation period it was filed within three months after year-end). We could not locate any disclosure history for the remaining two firms in the *NO* group.

Overall, this exercise indicates that the majority of our sample firms maintained similar disclosure levels during the sample period. Therefore, the relative liquidity improvement

(decline) noted for our *CURRENT (NO)* firms does not appear to be driven by a systematic increase (decrease) in disclosure levels between the pre- and post-implementation periods.

4.2.3. Trends in liquidity

In this analysis, we seek to rule out if the increased (decreased) liquidity for the *CURRENT (NO)* group over our pre- and post-implementation sample periods simply reflects an increasing (decreasing) trend in liquidity for firms in the *CURRENT (NO)* group. To account for possible time trends, we explicitly control for changes in *LIQUIDITY* prior to our sample period. Specifically, we construct *LIQUIDITY* using data from the three-month period, November 2006 to January 2007 and we calculate a lagged change in *LIQUIDITY*. We then estimate model (1) including the lagged change in liquidity as an additional control variable.²³ Table 4 Column (2) shows that the coefficient on the lagged change in *LIQUIDITY* is significantly negative, suggesting a mean reversion in liquidity instead of a continuous trend. More importantly, our findings on the coefficients for the *CURRENT* group and *NO* group remain the same.

To further investigate the impact of trends, we also perform a placebo test by pretending that OTCMG began implementing the disclosure tier classification in February 2007 instead of May 2007. We then repeat our main analysis of liquidity change using November 2006 to January 2007 as the pre-event period and February to April 2007 as the post-event period, assuming all *PS* firms had the same tiers in February (when they actually had none) as in May. If something other than the implementation of the disclosure tiers drives our results, we would expect patterns of liquidity changes in this placebo analysis to be similar to those observed around the actual implementation of the disclosure tier classification.

²³ For our robustness tests, we estimate model (1) repeatedly because our sample size would become too small if we perform all of our robustness tests in one regression.

Untabulated results show no increase in overall liquidity ($\Delta LIQUIDITY$) for the current information group around the placebo event. In fact, we observe a negative but insignificant coefficient on *CURRENT* for the $\Delta LIQUIDITY$ regression. We do, however, observe a significantly negative coefficient of -0.048 on *NO*. This implies that there is a downward trend in liquidity for the no information firms leading up to the real event we study (i.e., the implementation of the disclosure tiers). Given that the coefficient on *NO* during the real event (-0.108) is over twice the size of the coefficient on *NO* during the placebo event and we do not find a systematic increase in liquidity for the current information group during the placebo event, we, therefore, believe that a trend, unrelated to the implementation of the disclosure tiers, is not an alternative explanation for our results.

4.2.4. *Industry clustering within disclosure categories*

When different industries experience systematic changes in liquidity and these industries happen to cluster within the various disclosure categories, it is possible that our findings represent an industry level shift in liquidity that is unrelated to the implementation of the disclosure tiers. We do not have readily available industry membership information for each of our sample firm-years. Accordingly, we infer industry membership based on the degree of return covariance of an individual firm's daily returns with the ten industry average daily returns obtained from Ken French's website.²⁴ In particular, we download daily average returns for the ten industry sectors traded on NYSE, AMEX and Nasdaq from November 1, 2006 to April 30, 2007 (i.e., six months prior to the introduction of the disclosure tiers). For each firm in our sample, we regress its daily returns on ten daily industry average returns. The coefficients on the

²⁴ While OTCMG's website currently displays *PS* firms' SIC codes, OTCMG is unable to provide us with historical SIC industry classification data going back to 2007. In untabulated sensitivity analysis, we hand collected each company's SIC code based on a firm's trading symbol and name. We locate SIC codes for 1,962 firms (out of 3,574 firms that enter our change of liquidity analysis in Table 2 Column 1) and form the Fama-French 10 industry sectors. Our inferences remain the same on this subsample of firms.

industry daily average returns signal how closely a *PS* firm's returns co-move with the respective industry returns. We assume the magnitude of the coefficient measures the strength of the return covariance. We assign each firm to the industry with the largest coefficient. To the extent that stock returns capture economic shocks that have a strong industry component (Bhojraj et al. 2003), this approach implicitly captures a *PS* firm's industry membership.

Untabulated analysis suggests that the industries are relatively evenly distributed across the disclosure categories. So it is unlikely that industry clustering drives the observed differences in the changes in liquidity across the various tiers of *PS* firms. Nonetheless, we rerun model (1) after including industry dummy variables based on the implied industry membership. As reported in Table 4 Column (3), the coefficients on *CURRENT*, *LIMITED* and *NO*, which now reflect the average liquidity change of one disclosure category relative to the *OTCBB* firms *after controlling for possible industry effects*, are similar to those reported in Table 2.

4.2.5. *ADR Status*

Besides smaller U.S.-based firms, *PS* firms include foreign firms trading in the form of American Depository Receipts (ADRs). ADR firms are only required to supply to the SEC copies of information that the company makes public in its home country (see Miller 1999 for more discussion). ADR firms tend to be larger and have richer information environments and more institutional investors than a typical *PS* firm. As a result, investors in ADRs may be less influenced by new disclosure classifications than investors in other *PS* firms and including ADR firms in our sample may reduce the power of our tests. Alternatively, given that even sophisticated institutional investors are subject to "home bias" (Lewis 1999) and not all ADR investors are sophisticated, the new disclosure tiers may have an effect on the liquidity of ADR firms. Accordingly, we assess the impact of including ADRs in our sample on our results.

We obtain a list of ADR firms that are traded on the OTC market from J.P. Morgan's ADR analytics (<https://www.adr.com>) and merge it with our sample using trading symbols and firm names. We find that 466 out of 5,629 firms (8%) in our sample are ADRs. Almost all of them (i.e., 462 out of 466) belong to the *CURRENT* group. The clustering of ADRs in the *CURRENT* group makes it unlikely that ADRs affect the inferences on the *NO*, *LIMITED*, and *OTCBB* firms. We split the *CURRENT* group into two subgroups based on whether a firm is an ADR or not. We then rerun model (1) including two indicator variables: $CURRENT_NotADR = 1$ if the firm is not an ADR and $CURRENT_ADR = 1$ if the firm is an ADR.²⁵

Results reported in Table 4, Column (4) confirm that the inferences remain the same. Within the *CURRENT* group, implementing the graphic tiers increases liquidity for both the ADR and non-ADR firms, although the magnitude is smaller in non-ADR firms. This demonstrates that even the ADRs in our sample experienced increased liquidity, suggesting that ADR investors are also influenced by the new disclosure tiers.

4.2.6. Impact of firm size

Firm size tends to affect a firm's disclosure strategy and information environment (Atiase 1985; Diamond and Verrecchia 1991). So we investigate whether there were some common shocks during our sample period that differentially affected the liquidity of firms with different sizes and confounded our analysis of the changes in liquidity across the disclosure categories. In this analysis we explicitly control for the impact of firm size.

Optimally we would use total assets to proxy for firm size because liquidity can have a significant impact on stock prices and therefore on market capitalization (Amihud et al. 2005).

²⁵ Our inferences are similar when we exclude all ADR firms from our analysis except we find that the absolute magnitude of the coefficient on *NO* is greater than the absolute magnitude of the coefficient on *CURRENT*. This is consistent with the disclosure tiers having the largest impact on the no information group when ADRs are omitted from the sample.

However, we are unaware of a database that reports total assets for all *PS* firms. So we measure firm size through market capitalization. From the Compustat Monthly Security files we are able to obtain market capitalization for 49% of our sample firms at the end of April 2007, just before OTCMG introduced the graphic tiers.²⁶ We estimate model (1) including the natural log of a firm's market capitalization (*LOGMV*) at the end of April 2007. We use the natural log to reduce the influence of extreme values. Table 4 Column (5) reports that the *CURRENT* group still experiences relative increases in liquidity and the *NO* group experiences relative decreases in liquidity. The coefficient on *LOGMV* is insignificant, indicating that firm size is not incrementally associated with firms' liquidity changes.²⁷

5. Stock Market Reactions

In this section we examine whether some investors in *PS* firms anticipated the impact of the new disclosure classifications at the announcements of events leading up to the final implementation. If all *PS* investors are naïve to the impact of the impending implementation or if they already fully consider firms' disclosure practices, we expect to observe no systematic stock market reactions. On the other hand, it is possible that some investors in *PS* firms were able to anticipate the liquidity changes. For example, investors of *OTCBB* firms anticipated the liquidity changes that occurred in 1999 when these firms were mandated to start filing annual financial statements with the SEC (Bushee and Leuz 2005).

²⁶We cannot use the data we obtained from OTCMG to calculate market capitalization because it does not include shares outstanding. We do not control for the change in market capitalization during our event window because liquidity changes may be reflected in market prices (Amihud et al. 2005), making the change of market capitalization another outcome variable and inappropriate to use as a control (Angrist and Pischke, 2008, 68).

²⁷ Admittedly, this sample is not representative of the full population and therefore inferences from this robustness test may not generalize to our full sample. For example, we only have market capitalization for 16% of our *CURRENT* firms. For the *CURRENT* firms the median market capitalization is \$1.2 billion. If we exclude ADRs the median market capitalization is only \$19 million, demonstrating the significant size difference between ADRs and other firms in the Pink Sheets market and therefore the importance of our robustness test that allows us to separately analyze ADR firms. The median market capitalization is \$22 million for the *OTCBB* firms, \$9 million for *LIMITED* firms, and \$1.4 million for *NO* firms.

We use an event study methodology to investigate market reactions to four major events: 1) the November 6, 2006 announcement of OTCMG's intention to develop a disclosure classification system;²⁸ 2) the April 24, 2007 announcement of the impending transition period for the classification; 3) the July 17, 2007 announcement of the upcoming final implementation date²⁹; and 4) the final release of the graphic disclosure tiers on August 1, 2007.

Similar to Bushee and Leuz (2005), we measure buy-and-hold raw returns during a five-day window that starts three trading days before and ends one trading day after the event dates, denoted $Return_{i,-3,+1}$. We do not have sufficient data to form the Fama-French three factor portfolios to control for normal returns. Instead, we measure normal returns over a non-event window. Specifically, we calculate five-day buy-and-hold returns around *each* trading day during the period 10/1/2006-8/31/2007. We then take the *average* of the five-day buy-and-hold returns (excluding the event date of interest) to proxy for the normal returns ($Avg_Ret_{i,t}$).³⁰ The abnormal returns for firm i around event t , denoted $AB_RET_{i,t}$, is the five-day buy-and-hold return around event t minus the firm's normal returns. We estimate the following model:

$$AB_RET_{i,t} = \beta_0 + \beta_1 CURRENT_i + \beta_2 LIMITED_i + \beta_3 NO_i + \varepsilon_i \quad (2)$$

where:

$AB_RET_{i,t} = Return_{i,t} - Avg_Ret_{i,t}$, the five-day buy-and-hold returns around event t [$t-3$, $t+1$] for firm i minus its average five-day buy-and-hold returns for all other trading days (except event date t) from October 2006 to August 2007.

²⁸ Litvak (2009) examines the market returns for 22 trading days around November 6, 2006 for 82 "distressed" firms (subsequently classified into the Limited group) and 69 "dark and toxic" firms (subsequently classified into the No and Caveat Emptor groups). She finds some evidence that these low disclosing firms experience negative market returns, suggesting that some investors anticipate the possible impact of the upcoming disclosure classification system. However, she does not separately look at the stock returns of the current group, nor does she investigate market returns around the other event dates that we identify in our study.

²⁹ The news report was dated July 13 but released on July 17, 2007. We use July 17 as the event date so our five-day buy-and-hold return window is from July 12 to July 18, which includes July 13.

³⁰ As a robustness test, we construct abnormal returns by benchmarking off the average same-window buy-and-hold returns of the dually quoted *OTCBB* firms. Under this specification, our results are stronger.

We include the *OTCBB* firms to control for economic movements that affect all OTC securities similarly and to keep the spirit of our difference-in-difference research design. This approach is a conservative approach to capturing the abnormal returns around event dates. We winsorize the stock returns at 1% and 99% of the distribution and exclude outliers with absolute studentized residuals greater than two.³¹ We report robust standard errors adjusted for heteroskedasticity. The intercept β_0 captures the abnormal returns of the *OTCBB* firms. β_1 through β_3 measure the incremental abnormal returns for each of three disclosure tiers relative to those of the *OTCBB* firms.

Table 5 shows that the *LIMITED* group has no significant abnormal returns around any of the event dates. The *NO* group experiences consistently negative abnormal returns (-2.19%, -1.19%, -3.05% and -2.19%) surrounding each of the event dates. The *CURRENT* group experiences positive abnormal returns around all four event dates, although the only date with returns significantly different from zero is July 17, 2007 (1.51%, $p < 0.001$) when OTCMG announced the final implementation date for the graphic disclosure tiers.³² Around this date, the negative market reaction for the *NO* group is also the largest in magnitude (-3.05%). These results suggest that at least some investors anticipated that the disclosure tiers would have valuation implications for the *CURRENT* and *NO* groups, especially for the *NO* group and once the disclosure tier system was finalized with an announced implementation date.

To verify that the observed market reactions indeed reflect investors' expectations of the potential impact of the disclosure tiers, we test whether firms' abnormal returns around July 17, 2007 are associated with the observed liquidity changes after the implementation of disclosure

³¹ We winsorize returns to be consistent with our analyses of liquidity changes. Our inferences remain without winsorization. Our results also hold if we delete observations with returns greater than 500% (following Bushee and Leuz (2005, 249)) or greater than 200% (following Greenstone et al. (2006, 450)).

³² If we use raw returns, results are similar except that the *CURRENT* group experiences significantly abnormal positive returns across the last three of the four event dates rather than just on July 17, 2007.

tiers. We focus on July 17 because it is the event date with the largest stock return reactions for both the *NO* and *CURRENT* groups. We estimate the following model with $\Delta Liquidity_i$ and $AB_RET_{i,July\ 17}$ as defined earlier:

$$\Delta Liquidity_i = \beta_0 + \beta_1 AB_RET_{i,July\ 17} + \varepsilon_i \quad (3)$$

Table 6 reports that the abnormal returns around July 17, 2007 are significantly associated with subsequent changes in liquidity. Firms that experienced greater positive abnormal returns on July 17 experienced greater subsequent increases in the liquidity factor, trading days, and trading volume, and greater subsequent decreases in the bid-ask spread and the price impact. In contrast, firms that experienced greater negative abnormal returns around July 17 subsequently experienced greater decreases in the liquidity factor, trading days and trading volume, and greater increases in bid-ask spread and price impact.

To increase our confidence that the observed abnormal returns around July 17 and their association with subsequent liquidity changes are not spurious, we perform a simulation.³³ We rerun models (2) and (3) for each of the 190 non-event trading days occurring between 10/1/2006 and 8/31/2007,³⁴ assuming that all news in the non-event windows is unrelated to the disclosure tiers. Then we count the number of days with significantly positive (negative) abnormal returns for the *CURRENT* (*NO*) group in model (2) and with abnormal returns that are also significantly associated with subsequent liquidity changes in model (3). If the number of such days during non-event windows is more than expected by chance, then our inferences may not be driven by the disclosure classification tiers. That is, if we observe systematic significant market reactions

³³ We thank Christian Leuz for this helpful suggestion.

³⁴ Besides the event date t , we also exclude four days before and four days after the event date to avoid overlap in returns between non-event and event days. We also exclude the first four days in October 2006 and the last day in August 2007 as non-event days due to the lack of sufficient data to calculate five-day returns.

in non-event windows and those reactions explain firms' subsequent liquidity changes, then we must consider alternative explanations for the results in Tables 5 and 6.

Untabulated analysis shows that there are only three dates on which the *CURRENT* firms experience positive abnormal returns while the *NO* firms experience negative abnormal returns and these abnormal returns are significantly associated with a firm's observed liquidity changes after the introduction of the disclosure tiers ($p < 0.05$). The incidence of significance during the non-event days of 1.6% (3 out of 190) does not exceed the 5% that would be expected by chance. Therefore, this pseudo-event analysis confirms the validity of our inferences on market reactions and their association with subsequent liquidity changes.

Overall, the above results suggest that some *PS* investors anticipated at least some of the impact of the disclosure tiers on liquidity. This finding is consistent with Ang et al.'s (2013) conclusion that OTC stock returns are particularly sensitive to a firm's liquidity. However, the investors' reactions may not be complete because we still observe systematic liquidity shifts around the actual implementation of the disclosure classification tiers.

6. Conclusion

Utilizing a unique setting from the Pink Sheets market, we investigate whether OTCMG's introduction of disclosure tier classification that categorizes and highlights firms' existing disclosure practices via a label or colorful graphic can attract investor attention and impact liquidity. We demonstrate that once OTCMG fully implemented such a system on August 1, 2007, changes in liquidity occurred. Specifically, we find that Pink Sheets firms in the current information category show a marked increase in liquidity while those in the no information category show a marked decrease in liquidity relative to dually quoted *OTCBB* firms between the three-month pre-implementation period and the three-month post-implementation

period. We observe no changes in liquidity for firms in the limited information category relative to the dually quoted *OTCBB* firms. These results suggest that the implementation of the disclosure tiers draws some investors' attention to existing disclosure levels and causes a shift in liquidity, although we cannot attribute the liquidity changes to the disclosure tier labels or the graphics. Our robustness checks confirm that flight-to-liquidity, firms' disclosure behavior, trends in liquidity, industry effects, ADR status, and firm size do not drive our results.

We also examine stock returns around four events leading up to and including the August 1, 2007 official implementation of the disclosure tiers. We find that some investors anticipated that the introduction of the disclosure tiers would have negative valuation implications for the no information firms and some positive valuation implications for the current information firms relative to the dually quoted *OTCBB* firms. Further regression analyses show that the event period abnormal returns around the announcement of the final implementation date for the disclosure tiers are positively associated with the subsequent changes in liquidity among the Pink Sheets firms, suggesting that some investors were aware of disclosure levels and they anticipated liquidity changes resulting from the release of the new disclosure tiers.

This finding is not that surprising because liquidity and disclosure levels are positively correlated even before the introduction of the disclosure tiers, indicating that even before the *OTCMG* started drawing attention to disclosure levels at least some investors were making trading decisions consistent with firms' disclosure levels. Apparently, the introduction of the disclosure tiers served to "nudge" more investors to consider disclosure levels in their trading decisions and there were sufficiently enough additional investors to create fairly large incremental changes in various liquidity measures.

Our study therefore indicates that market intermediaries such as OTCMG can improve market liquidity by categorizing its securities based on existing disclosure levels and highlighting the category via labels and/or colorful graphic. Apparently such tactics direct some investors' attention to existing disclosure levels and hence lead to greater (less) liquidity in Pink Sheets firms with higher (lower) levels of public disclosures.

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Figure 1
Timeline of Events Related to the Implementation of the Disclosure Tiers among the Pink Sheets Firms

The timeline below indicates events related to the implementation of the disclosure tiers and identifies our sample period. On November 6, 2006, OTC Markets Group announced their initial plan to develop a disclosure classification system for all Pink Sheets securities. On April 24, 2007, OTC Markets Group announced that tentative disclosure categories will be assigned in May 2007. On July 17, 2007, OTC Markets group announced that the final disclosure classification system will be officially implemented on August 1, 2007. In our tests of liquidity changes, our pre-implementation period starts on February 1, 2007 and ends on April 30, 2007, and our post-implementation period begins on August 1, 2007 and ends on October 31, 2007.

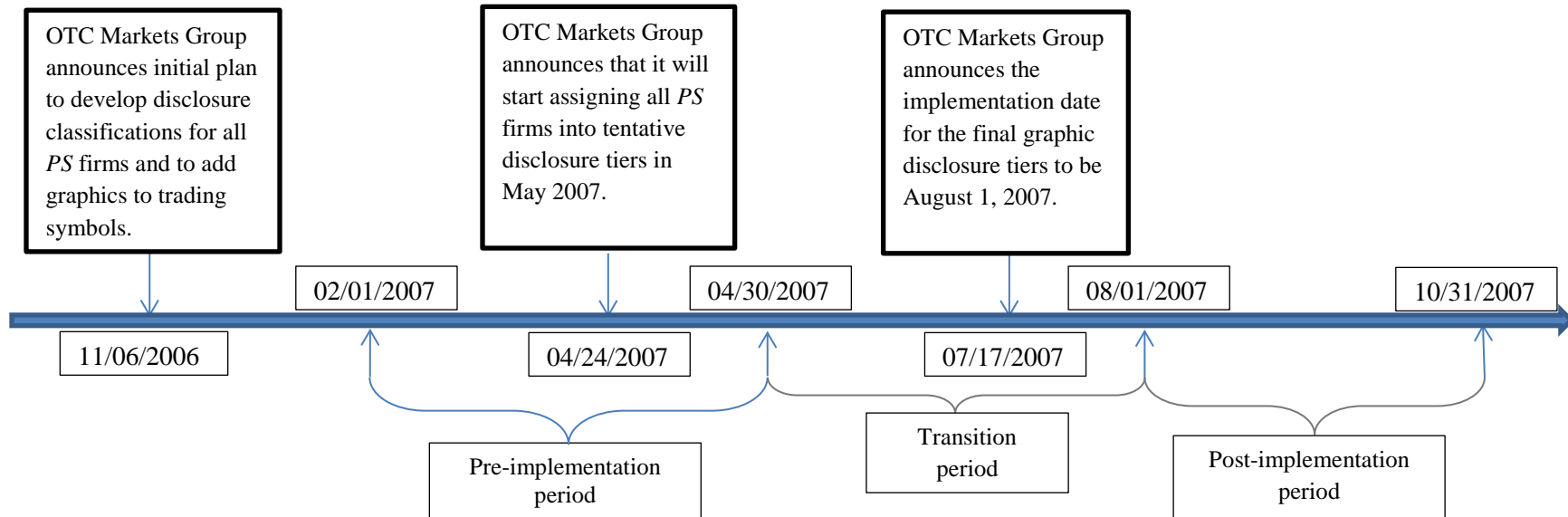


Figure 2
Description of the Disclosure Categories among Pink Sheets Firms

On August 1, 2007, OTC Markets Group Inc. implemented a disclosure classification system that labels listed Pink Sheets securities based on their disclosure levels. The labels and their descriptions are summarized here. These labels were affixed to each Pink Sheets company's trading symbol on OTC Markets Group's website. OTC Markets Group suspends the quoting of firms that are in the "Caveat Emptor" category that includes firms under investigation for spam or fraud.



Categories	Original labels as of 08/01/2007	Descriptions (based on news release from OTC Markets Group on July 13, 2007).
Current information		Firms that have information public available through regulatory filings or through the Pink Sheets News Service.
Limited information		Firms that have no current information available but have limited financial information not older than six months. These firms generally have "financial reporting problems, economically distressed or in bankruptcy."
No information		"Indicates companies that are not able or willing to provide disclosure to the public market-either to a regulator, an exchange or Pink Sheets."
Caveat Emptor		"Buyer Beware. There is a public interest concern associated with the company, which may include a spam campaign, stock promotion or known investigation of fraudulent activity committed by the company or insiders."

Figure 3 Examples of Pink Sheets Firms in Each Disclosure Category

Figure 3.1: Current Information (www.otcmarkets.com/stock, accessed on 12/20/2010)

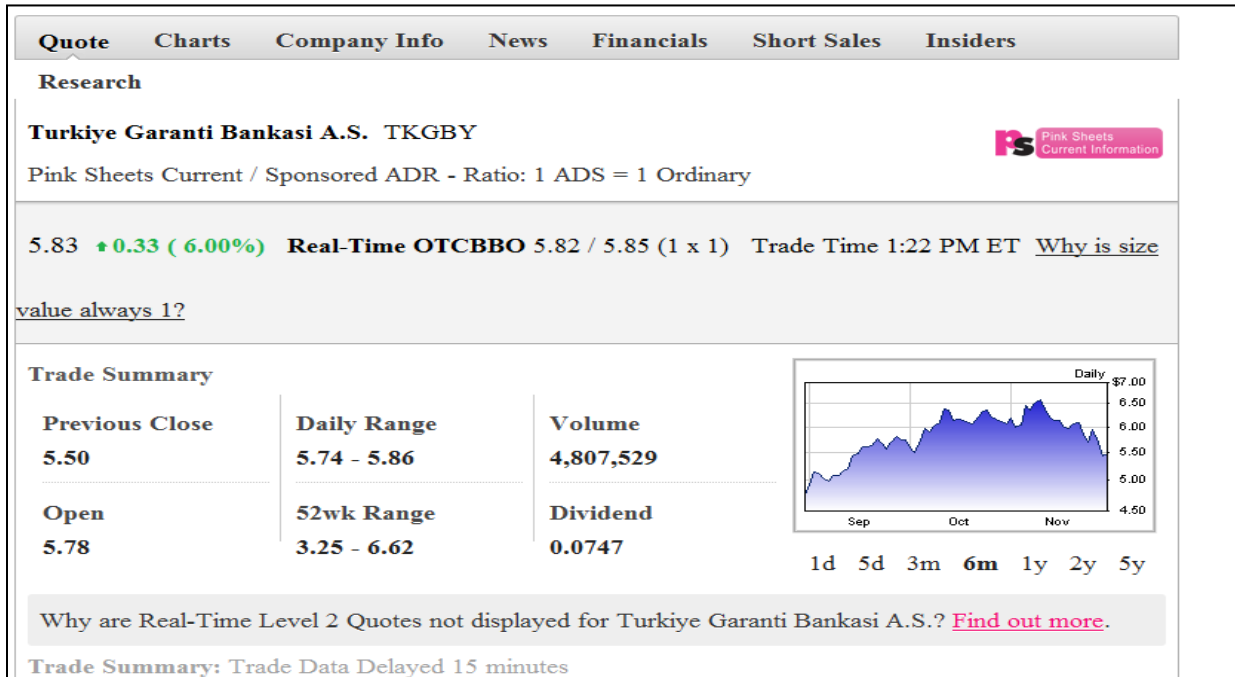


Figure 3.2: Limited Information (www.otcmarkets.com/stock, accessed on 12/20/2010)

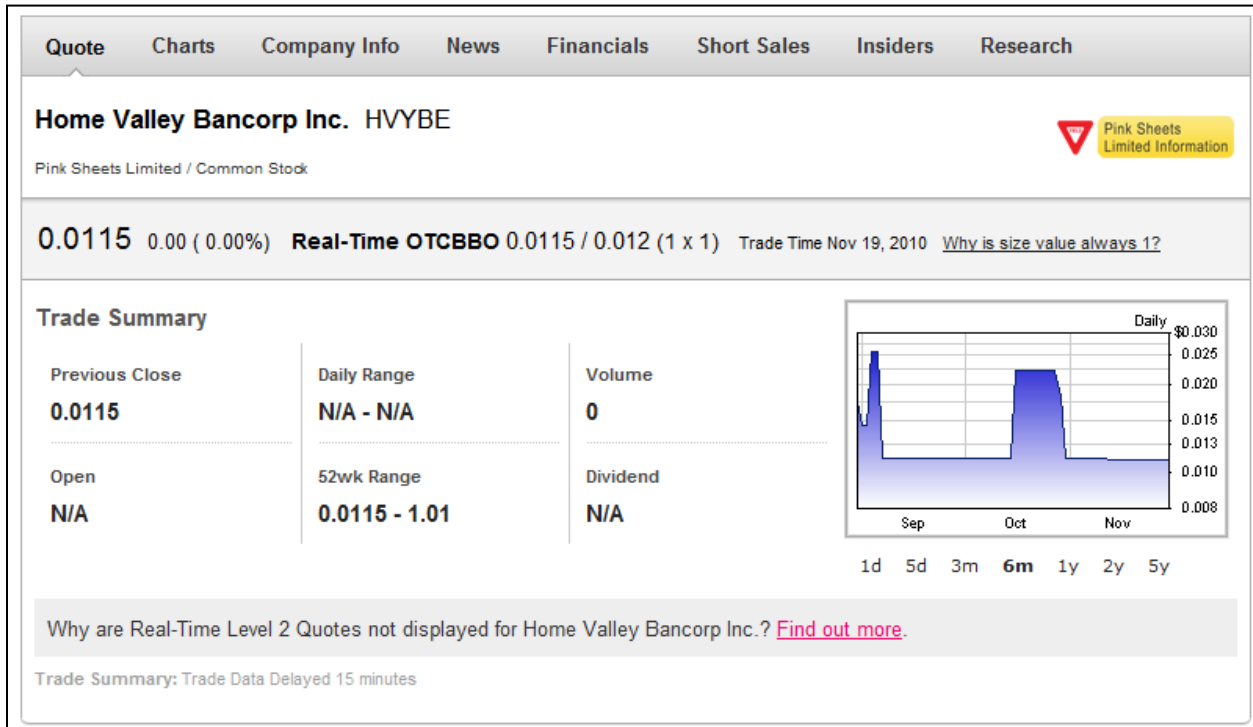


Figure 3.3: No Information (www.otcmarkets.com/stock, accessed on 12/20/2010)

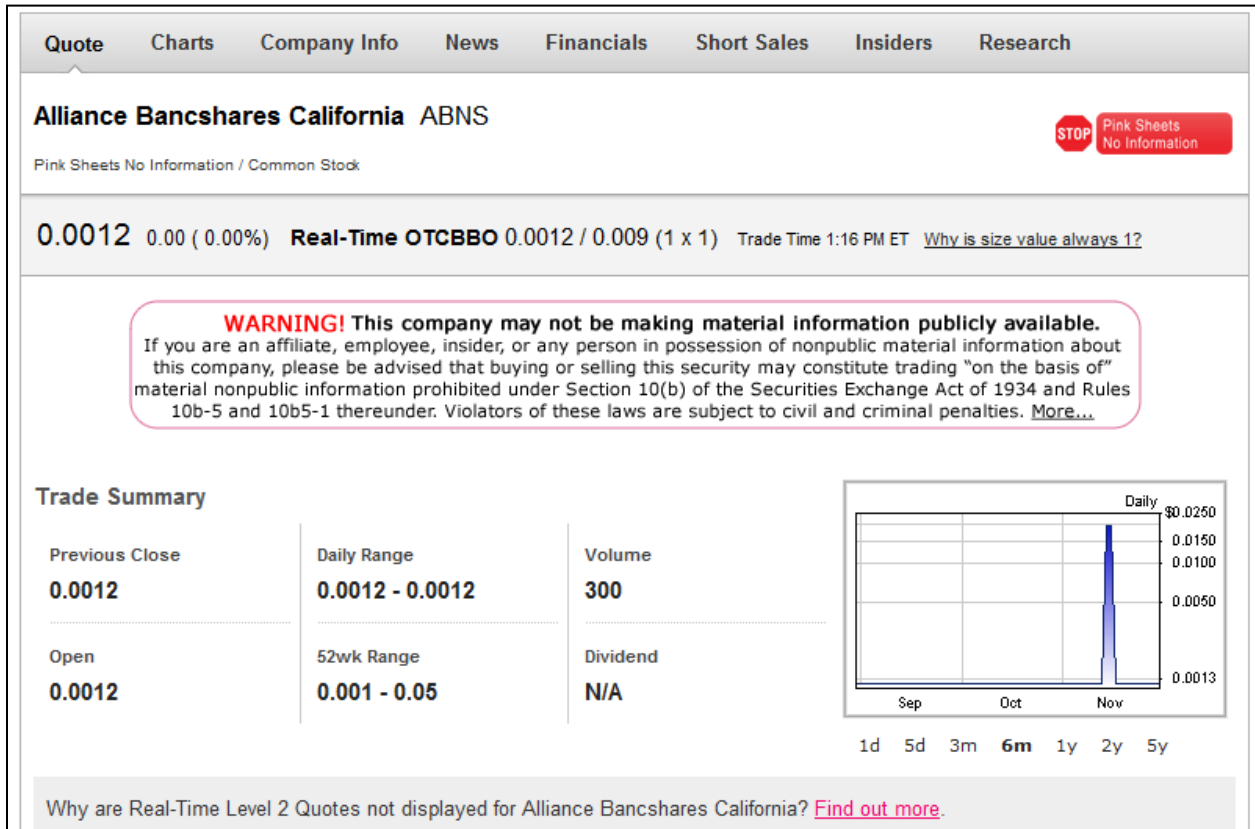


Figure 3.4 No Information (from a retail broker's website, accessed on 3/25/2014)

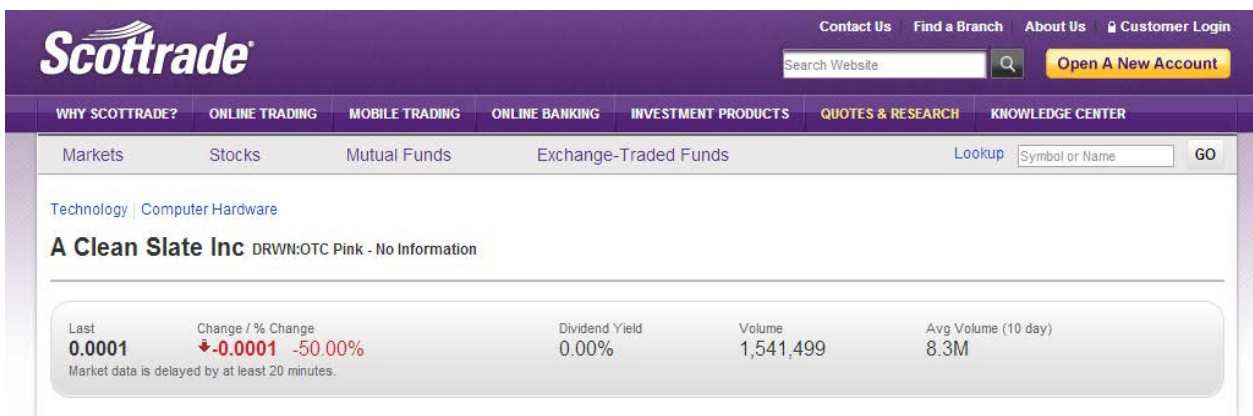

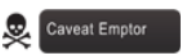


Figure 3.5: Caveat Empotor (www.otcmarkets.com/stock, accessed on 12/20/2010)

[Quote](#) [Charts](#) [Company Info](#) [News](#) [Financials](#) [Short Sales](#) [Insiders](#)

Research

iTokk, Inc. IKTOD  

Pink Sheets Limited / Common Stock

Pink OTC Markets has discontinued the display of quotes on otcmarkets.com for this security because it has been labeled Caveat Empor (Buyer Beware) and because adequate current information has not been made available by the issuer of the securities. It has been labeled Caveat Empor for one of the following reasons:

- **Questionable Promotion** — The security is being promoted to the public, but adequate current information about the issuer has not been made available to the public.
- **Spam** — The security is the subject of spam promotion having the effect of encouraging trading of the issuer's securities.
- **Investigation of Fraud** — There is a known investigation of fraudulent activity involving the company, its securities or insiders.
- **Suspension/Halt** — A Regulatory Authority has halted or suspended trading for public interest concerns (i.e. not a news or earning halt).
- **Disruptive Corporate Actions** — The security or issuer is the subject of corporate actions, such as reverse mergers or serial stocks splits and name changes, without adequate current information being publicly available.
- **Unsolicited Quotes** — The security has only been quoted on an unsolicited basis since it entered the public markets and the issuer has not made adequate current information available to the public.
- **Other Public Interest Concern** — There is, in Pink OTC Markets' view, a public interest concern.

Consequently, Pink OTC Markets has removed the quotes from this website until adequate current information is made available by the issuer pursuant to [Pink OTC Markets Guidelines for Providing Adequate Current Information](#) (PDF) and until Pink OTC Markets believes there is no longer a public interest concern. Investors are encouraged to use care and due diligence in their investment decisions. Please read our [Investor Protection](#) page for more information.

Appendix: Variable Definitions

SPREAD = percentage daily bid-ask spread, calculated as the absolute value of the difference between closing bid and closing ask prices, divided by the mid-point of the bid and ask prices, and multiplied by 100. We winsorize this variable at the top and bottom 1% of the distribution;


IMPACT = Amihud (2002) illiquidity measure, calculated as the log of the three-month average (during the pre- and the post-implementation periods, respectively) of the absolute value of daily returns divided by daily dollar volume (in millions). We winsorize this variable at the top and bottom 1% of the distribution;


TRADEDAYS = percentage of days traded in a month, calculated as the number of days in a month that a firm has actual trading, divided by the number of total potential trading days in the month;

VOLUME = monthly trading volume, measured as the log of daily trading volume (shares traded times the closing price) summed over the month (in thousands of dollars). We winsorize this variable at the top and bottom 1% of the distribution;

LIQUIDITY = factor score extracted from a principle component analysis on the above four measures;

CURRENT = 1 if a firm is assigned to the Pink Sheets category with the  graphic, and zero otherwise;

LIMITED = 1 if a firm is assigned to the Pink Sheets category with the  graphic, and zero otherwise;

NO = 1 if a firm is assigned to the Pink Sheets category with the  graphic, and zero otherwise;

OTCBB = 1 if a firm is dually quoted on the OTCBB and Pink Sheets, and zero otherwise;

AB_RET_{i,t} = *Return_{i,t}* - *Avg_Ret_{i,t}*, the five-day buy-and-hold returns around event *t* [*t*-3, *t*+1] for firm *i* minus its average five-day buy-and-hold returns for all other trading days (except event date *t*) from October 2006 to August 2007. We winsorize this variable at the top and bottom 1% of the distribution. The event *t* includes 1) November 6, 2006; 2) April 24, 2007; 3) July 17, 2007; and 4) August 1, 2007.

Table 1
Descriptive Statistics Related to the Liquidity Factor

This table provides data related to our principal component analysis on four measures of liquidity, *SPREAD*, *IMPACT*, *TRADEDAYS*, and *VOLUME* (defined in Appendix), used to develop a single parsimonious liquidity factor. We include all Pink Sheets firms that were assigned to *CURRENT*, *LIMITED*, or *NO* disclosure categories (defined in the Appendix) and dually quoted *OTCBB* firms that have the four liquidity measures available from two three-month periods from February to April 2007 and from August to October 2007 for a total of 8,368 observations with non-missing values. Panel A shows the correlations among the individual liquidity measures. Panel B shows the eigenvalues of the correlation matrix and demonstrates that one factor explains 70% of the total variances of the four liquidity variables. This factor is multiplied by negative one and used as our overall liquidity measure, denoted as *LIQUIDITY*, so that a larger *LIQUIDITY* measure indicates greater liquidity. Panel C shows that *LIQUIDITY* is highly correlated with each of the individual liquidity measures.

Panel A: Descriptive statistics on the individual liquidity measures during the pre-implementation period

<i>Variable</i>	<i>N</i>	<i>Mean</i>	<i>Std Dev</i>	<i>Lower Quartile</i>	<i>Median</i>	<i>Upper Quartile</i>
<i>SPREAD</i>	4,673	21.74	24.30	4.70	12.42	28.71
<i>IMPACT</i>	4,141	2.48	2.87	0.34	2.43	4.65
<i>TRADEDAYS</i>	5,629	51.45	33.77	18.47	47.78	87.19
<i>VOLUME</i>	5,629	10.60	3.30	8.90	11.17	12.80

Panel B: Correlations among the individual liquidity measures with Pearson (Spearman) correlation is above (below) the diagonal

	<i>SPREAD</i>	<i>IMPACT</i>	<i>TRADEDAYS</i>	<i>VOLUME</i>
<i>SPREAD</i>		0.66 <.0001	-0.44 <.0001	-0.72 <.0001
<i>IMPACT</i>	0.84 <.0001		-0.25 <.0001	-0.78 <.0001
<i>TRADEDAYS</i>	-0.44 <.0001	-0.27 <.0001		0.66 <.0001
<i>VOLUME</i>	-0.81 <.0001	-0.78 <.0001	0.69 <.0001	

Panel C: Eigenvalues of the correlation matrix

<i>Factor #</i>	<i>Eigenvalue</i>	<i>Proportion (=Eigenvalue/4)</i>	<i>Cumulative Proportion</i>
1	2.79	0.70	0.70
2	0.78	0.19	0.89
3	0.34	0.09	0.98
4	0.09	0.02	1.00

Table 1 (continued)

Panel D: Correlations between the liquidity factor and the individual liquidity measures

	<i>LIQUIDITY</i> (Factor #1 × (-1))
<i>SPREAD</i>	-0.86
<i>IMPACT</i>	-0.83
<i>TRADEDAYS</i>	0.68
<i>VOLUME</i>	0.96

Table 2**Regression Analysis of Changes in Liquidity around the Release of the Disclosure Categories**

$$\Delta Liquidity = \alpha_0 + \alpha_1 CURRENT + \alpha_2 LIMITED + \alpha_3 NO + \mu_i \quad (1)$$

This table reports coefficient estimates for equation (1) where $\Delta Liquidity$ denotes the change in liquidity between the three months from February to April 2007 and the three months from August to October 2007 for each of our five measures of liquidity. The intercept in equation (1) captures the average liquidity change for the dually quoted *OTCBB* companies. The coefficient on each of the independent variables measures the liquidity changes for that disclosure category (defined in Appendix) relative to that of the *OTCBB* firms. In the last three rows we report p-values from χ^2 test of a difference in the coefficients across the Pink Sheets disclosure categories. We exclude observations with absolute studentized residuals greater than two. Robust standard errors adjusted for heteroskedasticity are reported in parentheses. Significance at the 1%, 5%, and 10% two-tailed test levels is indicated by ***, **, and *, respectively.

VARIABLES	(1) <i>ΔLIQUIDITY</i>	(2) <i>ΔSPREAD</i>	(3) <i>ΔIMPACT</i>	(4) <i>ΔTRADEDAYS</i>	(5) <i>ΔVOLUME</i>
<i>CURRENT</i>	0.126*** (0.018)	-1.238*** (0.326)	-0.215*** (0.052)	3.889*** (0.455)	0.225*** (0.045)
<i>LIMITED</i>	0.025 (0.026)	1.091** (0.546)	-0.084 (0.086)	1.345* (0.737)	0.040 (0.071)
<i>NO</i>	-0.108*** (0.015)	1.565*** (0.316)	0.163*** (0.049)	-1.379*** (0.356)	-0.162*** (0.039)
<i>OTCBB (Intercept)</i>	-0.111*** (0.009)	1.441*** (0.184)	0.395*** (0.033)	-1.632*** (0.256)	-0.233*** (0.026)
Observations	3,366	4,349	3,907	5,290	5,320
Adjusted R ²	0.038	0.009	0.011	0.026	0.012
p-value from χ^2 Test					
<i>CURRENT = LIMITED</i>	0.00	0.00	0.14	0.00	0.01
<i>NO = LIMITED</i>	0.00	0.41	0.00	0.00	0.01
<i>CURRENT = NO</i>	0.00	0.00	0.00	0.00	0.00

Table 3**Univariate Analysis of Changes in Liquidity around the Release of the Disclosure Tiers**

This table presents univariate statistics on the liquidity measures that underlie the regressions reported in Table 2. Columns (2) and (3) report the mean, median in parentheses, and standard deviation in brackets of the liquidity measures during the pre-implementation period (three months before May 1, 2007), denoted *_PRE*, and during the post-implementation period (three months after August 1, 2007), denoted *_POST*. Column (4) presents tests of whether the changes in sample mean and median are significantly different from zero, based on two-tailed t-test and Wilcoxon signed rank test. Column (5) presents tests of whether the changes in sample mean and median are significantly different from changes for the *OTCBB* group based on two-tailed t-test and Wilcoxon signed rank test. ***, **, and * respectively indicate significance levels at $p < 0.01$, $p < 0.05$ and $p < 0.10$. Column (6) reports the incremental changes in mean liquidity in percentage terms by dividing the mean in Column (5) by the mean in Column (2).

Panel A: Changes in *LIQUIDITY* across Disclosure Tiers

<i>Category</i>	(1) <i>#Firms</i>	(2) <i>LIQUIDITY</i> <i>_PRE</i>	(3) <i>LIQUIDITY</i> <i>_POST</i>	(4) <i>ΔLIQUIDITY</i>	(5) <i>ΔLIQUIDITY</i> <i>relative to OTCBB</i>	(6) <i>%Δ LIQUIDITY relative to LIQUIDITY_PRE</i>
<i>CURRENT</i>	356	0.935 (1.099) [0.86]	0.950 (1.130) [0.89]	0.015 (0.036)* [0.29]	0.126*** (0.150)***	13%
<i>LIMITED</i>	264	0.192 (0.236) [0.83]	0.106 (0.177) [0.87]	-0.086*** (-0.089)*** [0.39]	0.025 (0.025)	13%
<i>NO</i>	1,281	-0.165 (-0.091) [0.91]	-0.383 (-0.379) [0.90]	-0.219*** (-0.222)*** [0.41]	-0.108*** (-0.109)***	-65%
<i>OTCBB</i>	1,465	0.377 (0.448) [0.70]	0.266 (0.328) [0.70]	-0.111*** (-0.113)*** [0.35]	N/A	N/A

Panel B: Changes in *SPREAD* across Disclosure Tiers

<i>Category</i>	(1) <i>#Firms</i>	(2) <i>SPREAD</i> <i>_PRE</i>	(3) <i>SPREAD</i> <i>_POST</i>	(4) <i>Δ SPREAD</i>	(5) <i>Δ SPREAD</i> <i>relative to OTCBB</i>	(6) <i>%Δ SPREAD relative to SPREAD_PRE</i>
<i>CURRENT</i>	407	8.093 (1.913) [15.70]	8.296 (2.131) [15.61]	0.202 (0.034)* [5.43]	-1.238*** (-0.995)***	-15%
<i>LIMITED</i>	303	16.408 (11.261) [17.33]	18.940 (12.761) [18.19]	2.532*** (1.183)*** [8.97]	1.091** (0.153)	7%
<i>NO</i>	1,931	28.203 (20.415) [24.87]	31.208 (24.602) [24.58]	3.005*** (2.149)*** [11.28]	1.565*** (1.119)***	6%
<i>OTCBB</i>	1,708	11.852 (6.933) [14.30]	13.293 (8.271) [14.39]	1.441*** (1.030)*** [7.59]	N/A	N/A

Panel C: Changes in *IMPACT* across Disclosure Tiers

<i>Category</i>	(1) <i>#Firms</i>	(2) <i>IMPACT</i> <i>_PRE</i>	(3) <i>IMPACT</i> <i>_POST</i>	(4) <i>ΔIMPACT</i>	(5) <i>ΔIMPACT relative to</i> <i>OTCBB</i>	(6) <i>%ΔIMPACT relative to</i> <i>IMPACT_PRE</i>
<i>CURRENT</i>	803	0.456 (0.367) [2.49]	0.637 (0.576) [2.51]	0.180*** (0.201)*** [1.14]	-0.215*** (-0.222)***	-47%
<i>LIMITED</i>	255	3.168 (3.431) [2.75]	3.479 (3.781) [2.67]	0.311*** (0.375)*** [1.27]	-0.084 (-0.047)	-3%
<i>NO</i>	1,320	4.156 (4.386) [2.45]	4.715 (5.143) [2.36]	0.559*** (0.512)*** [1.31]	0.163*** (0.090)***	4%
<i>OTCBB</i>	1,529	1.906 (1.732) [2.45]	2.301 (2.117) [2.38]	0.395*** (0.423)*** [1.27]	N/A	N/A

Panel D: Changes in *TRADEDAYS* across Disclosure Tiers

<i>Category</i>	(1) <i>#Firms</i>	(2) <i>TRADEDAYS</i> <i>_PRE</i>	(3) <i>TRADEDAYS</i> <i>_POST</i>	(4) <i>ΔTRADEDAYS</i>	(5) <i>ΔTRADEDAYS</i> <i>relative to OTCBB</i>	(6) <i>%ΔTRADEDAYS</i> <i>relative to</i> <i>TRADEDAYS_PRE</i>
<i>CURRENT</i>	949	56.144 (58.349) [33.89]	58.402 (62.243) [35.27]	2.258*** (2.663)*** [11.60]	3.889*** (3.242)***	7%
<i>LIMITED</i>	308	63.587 (68.864) [31.48]	63.300 (69.642) [33.02]	-0.287 (0.000) [12.14]	1.345* (0.579)*	2%
<i>NO</i>	2,106	46.290 (37.376) [34.08]	43.279 (32.227) [33.62]	-3.011*** (-1.859)*** [11.36]	-1.379*** (-1.279)***	-3%
<i>OTCBB</i>	1,927	53.887 (51.180) [33.30]	52.256 (47.979) [33.66]	-1.632*** (-0.579)*** [11.24]	N/A	N/A

Panel E: Changes in *VOLUME* across Disclosure Tiers

<i>Category</i>	(1) <i>#Firms</i>	(2) <i>VOLUME</i> <i>_PRE</i>	(3) <i>VOLUME</i> <i>_POST</i>	(4) <i>ΔVOLUME</i>	(5) <i>ΔVOLUME relative to</i> <i>OTCBB</i>	(6) <i>%ΔVOLUME relative to</i> <i>OTCBB</i>
<i>CURRENT</i>	970	12.624 (12.620) [2.53]	12.617 (12.573) [2.63]	-0.008 (-0.012) [1.13]	0.225*** (0.241)***	22.5%
<i>LIMITED</i>	314	11.116 (11.343) [2.77]	10.923 (11.089) [2.82]	-0.193*** (-0.218)*** [1.17]	0.040 (0.036)	4.0%
<i>NO</i>	2,091	9.001 (9.417) [3.48]	8.606 (8.901) [3.34]	-0.395*** (-0.431)*** [1.33]	-0.162*** (-0.177)***	-16.2%
<i>OTCBB</i>	1,945	11.667 (11.822) [2.16]	11.434 (11.569) [2.14]	-0.233*** (-0.254)*** [1.14]	N/A	N/A

Table 4
Robustness Tests

$$\Delta Liquidity = \alpha_0 + \alpha_1 CURRENT + \alpha_2 LIMITED + \alpha_3 NO + Controls + \mu_i \quad (1)$$

This table reports coefficient estimates for equation (1) estimated in Table 2 Column (1) after including additional control variables. The dependent variable, $\Delta Liquidity$, denotes the change in liquidity over two three-month periods (from February to April 2007 and from August to October 2007). *Prior_Liquidity* measures each firm's average liquidity level during February to April 2007. *Lag ΔLIQUIDITY* is the changes in liquidity from the three months of November 2006 to January 2007 to that of February 2007 to April 2007. Firms' industry membership is inferred from the degree of return covariance of an individual firm's daily returns with the 10 industry average daily returns over a six-month period. Given that almost all of the ADR firms belong to the current information group, we include a separate indicator variable for firms in the current group that are ADRs. *LOGMV* is the natural log of market capitalization at the end of April 2007, computed from Compustat Monthly Security files. We exclude observations with absolute studentized residuals greater than two. Robust standard errors adjusted for heteroskedasticity are reported in parentheses. Significance at the 1%, 5%, and 10% at the two-tailed test levels is indicated by ***, **, and *, respectively.

VARIABLES	<i>ΔLIQUIDITY</i>				
	(1)	(2)	(3)	(4)	(5)
<i>CURRENT</i>	0.209*** (0.019)	0.133*** (0.018)	0.127*** (0.018)		0.061* (0.033)
<i>LIMITED</i>	-0.002 (0.025)	-0.016 (0.025)	0.019 (0.025)	0.025 (0.026)	0.049 (0.032)
<i>NO</i>	-0.184*** (0.015)	-0.146*** (0.014)	-0.110*** (0.014)	-0.108*** (0.015)	-0.101*** (0.018)
<i>OTCBB (Intercept)</i>	-0.050*** (0.010)	-0.107*** (0.009)	-0.124*** (0.017)	-0.111*** (0.009)	-0.113*** (0.017)
Controls:					
<i>Prior_LIQUIDITY</i>	-0.141*** (0.008)				
<i>Lag_ΔLIQUIDITY</i>		-0.251*** (0.020)			
<i>Industry dummies</i>			yes		
<i>CURRENT_NotADR</i>				0.051* (0.030)	
<i>CURRENT_ADR</i>				0.179*** (0.019)	
<i>LOGMV</i>					0.003 (0.004)
Observations	3,373	3,059	3,355	3,365	1,951
Adjusted R ²	0.126	0.112	0.045	0.041	0.030

Table 5
Stock Returns around the Announcement and Implementation Dates

$$AB_RET_{i,-3,+1} = \beta_0 + \beta_1 CURRENT_i + \beta_2 LIMITED_i + \beta_3 NO_i + \varepsilon_i \quad (2)$$

This table reports regression results for equation (2) where $AB_RET_{i,-3,+1}$ is firm i 's five-day buy-and-hold returns around an event date minus its average five-day buy-and-hold returns around all other trading days (except the event date of interest) from 10/01/2006 to 08/31/2007. The four event dates include: 11/06/2006, when OTC Markets Group first announced their plan to develop a disclosure classification system; 04/24/2007, when OTC Markets Group announced its transition period of assigning firms into different disclosure tiers; 07/17/2007, when OTC Markets Group announced the final implementation date; 08/01/2007, when OTC Markets Group formally released the disclosure tiers. In equation (2) the coefficients β_1 through β_3 capture whether the abnormal returns of firms in respective Pink Sheets categories differ from those of the dually quoted *OTCBB* firms. We winsorize the five-day buy-and-hold returns at 1% and 99% of the distribution. We also exclude outliers with absolute studentized residuals greater than two. Robust standard errors adjusted for heteroskedasticity are reported in parentheses. Significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively.

VARIABLES	$AB_RET_{i,-3,+1}$			
	(1) 11/06/2006	(2) 04/24/2007	(3) 07/17/2007	(4) 08/01/2007
<i>CURRENT</i>	0.79 (0.50)	0.55 (0.42)	1.51*** (0.43)	0.07 (0.44)
<i>LIMITED</i>	-1.13 (1.20)	-0.75 (1.09)	-1.27 (1.04)	-0.47 (0.99)
<i>NO</i>	-2.19*** (0.67)	-1.19* (0.63)	-3.05*** (0.62)	-2.19*** (0.63)
<i>OTCBB (Intercept)</i>	-0.44 (0.37)	-0.85*** (0.33)	-1.12*** (0.33)	-2.21*** (0.33)
Observations	2,541	2,854	2,975	3,037
Adjusted R ²	0.01	0.002	0.02	0.01

Table 6
Event Window Abnormal Returns and Subsequent Liquidity Changes

$$\Delta Liquidity_i = \beta_0 + \beta_1 AB_RET_{i,July,17} + \mu_i \quad (3)$$

This table reports regression results for estimating equation (3) where $\Delta Liquidity_i$ denotes firm i 's liquidity change over the pre-implementation period (February to April 2007) and the post-implementation period (August to October 2007) for each of our five measures of liquidity. $AB_RET_{i,July,17}$ is firm i 's five-day buy-and-hold returns around July 17, 2007 minus its average five-day buy-and-hold returns around all other trading days (except the event date) from 10/01/2006 to 08/31/2007. We exclude outliers with absolute studentized residuals greater than two. Robust standard errors adjusted for heteroskedasticity are reported in parentheses. Significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively.

VARIABLES	(1) <i>ΔLIQUIDITY</i>	(2) <i>ΔSPREAD</i>	(3) <i>ΔIMPACT</i>	(4) <i>ΔTRADEDAYS</i>	(5) <i>ΔVOLUME</i>
<i>AB_RET_{i,July,17}</i>	0.002*** (0.001)	-0.018* (0.010)	-0.007*** (0.002)	0.034* (0.019)	0.005*** (0.002)
<i>Constant</i>	-0.113*** (0.007)	1.673*** (0.126)	0.392*** (0.024)	-0.525** (0.237)	-0.229*** (0.020)
Observations	2,180	2,310	2,539	2,676	2,701
Adjusted R ²	0.006	0.001	0.005	0.001	0.003