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The Effect of Earnings Announcement Timing on Liquidity

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A B S T R A C T

The proportion of after-market-close (AMC) earnings announcements has recently increased to more than 40% of the total number of earnings announcements (Berkman & Truong, 2009). Doyle and Magilke (2009) conclude that managers do not announce AMC to hide bad news; however, they do not directly address other explanations for the AMC announcement increase. Thus, the cause(s) remains an open question. Interestingly, the increase in AMC earnings announcements has coincided with the emergence of a 24/7 news environment and a marked increase in noise trading. We posit that managers are increasingly announcing earnings AMC instead of before-market-open (BMO) to take advantage of this increased noise trading—thereby increasing the liquidity of their stock. We show evidence, after controlling for other factors, that announcing AMC instead of BMO increases liquidity. In addition, the relationship between AMC and liquidity is increasing in analysts' coverage—consistent with the view that AMC announcements generate the largest increase in liquidity for those stocks with high investor interest.

Keywords: AMC Earnings Announcement, BMO Earnings Announcement, Liquidity, Noise Trading

Ⅰ. Introduction

An overwhelming majority of firms announce their quarterly earnings during non-trading hours either shortly after the market closes (AMC) or before the market opens for the day (BMO). Doyle and Magilke (2009) examine the timing of earnings announcements to see if managers bury bad news for strategic reasons. Because of their relative infrequency, they remove from consideration earnings announcements made during trading hours. We follow this convention as well. Doyle and Magilke (2009) conclude that AMC announcements are not an effort to hide bad news. Additionally, they find that AMC earnings announcements are accompanied by higher abnormal trading volume than are those made BMO. However, their study does not address the relative price reactions of AMC vs. BMO announcements. Thus, they are not able to determine whether the timing of earnings announcements can affect price variability in addition to differences in trading volume.

In this paper, we make trading volume-to-price variability comparisons for both AMC and BMO announcements in an effort to assess overall liquidity. The relationship of trading volume to price variability is used in Brennan and Subrahmanyam (1996), who find a significant relation

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between required rates of return and measures of illiquidity. By investigating the volume-to-price variability relationship, we analyze the implications of earnings announcement timing for the liquidity of a firm's stock as a possible explanation for the recent increase in AMC announcements.

Liquidity can be defined as the degree to which an asset or security can be bought or sold in the market without affecting the asset's price. Liquidity is associated with a high level of trading activity per a given change in price. High levels of liquidity provide benefits to a firm, including the positive effect it may ultimately have on a firm's cost of capital (Brennan & Subrahmanyam (1996)). Prior research indicates that managers may already use other methods to help boost liquidity. Heflin, Shaw, and Wild (2005) suggest that enhanced financial disclosure improves market liquidity. Lin et al. (2009) find evidence that managers use stock splits to attract more uninformed trading, improving liquidity and lowering their firm's cost of capital. In January, 2010, Warren Buffett announced that Berkshire Hathaway would split its class B shares. The announced goal was to improve liquidity, and to benefit small shareholders following Berkshire's large investment in Burlington Northern Santa Fe. Soon after, Standard & Poor's announced that Berkshire Hathaway was selected for inclusion in the flagship S&P 500 Index. Previously, lack of liquidity was often cited as the reason for Berkshire's exclusion from the S&P 500 Index－one of many indices whose eligibility criteria include liquidity requirements. S&P (2012) states, "Adequate liquidity and reasonable price － the ratio of annual dollar value traded to float adjusted market capitalization should be 1.00 or greater, and the company should trade a minimum of 250,000 shares in each of the six months leading up to the evaluation date."

If managers are willing to split their stock in an effort to achieve inclusion in an index and a lower cost of capital, they would consider the liquidity implications of the timing of earnings announcements. Jiang et al. (2012) examine trading activity outside of regular market hours and find different levels of price discovery between AMC and BMO announcements. As the authors note, the amount of trading activity conducted outside of regular hours pales in comparison to the amount that occurs during normal market hours. In addition, since noise trader participation in after-hours trading is very limited, the authors suggest that their findings are caused by sophisticated investors instead of noise traders. Since noise-trader behavior is a primary focus of our paper, we choose to examine trading activity during regular market hours in order to capture noise-trader effects. We suggest that our results complement those of Jiang et al. (2012) since multiple factors may help to contribute to managers' decisions to announce AMC.

Assuming that liquidity can be measured as the ratio of trading volume to price variability, AMC announcements may improve liquidity by increasing trading volume without causing a proportionate increase in price variability. The trading hours of U.S. stock exchanges are 9:30 a.m. to 4:00 p.m. Eastern Standard Time. Thus, AMC announcements give investors until the following morning to process news and place an order before trading resumes. This contrasts with the much shorter processing period afforded by BMO announcements, which are normally made within a few hours prior to the market opening. Many non-professional or retail investors lack access to financial news and/or trading capabilities during normal trading hours or choose to concentrate on non-market activity. These non-professionals may first become aware of the information contained in a BMO announcement during evening hours after other investors have had the entire trading day to react. A non-professional investor may not be inclined to trade based on stale news. In contrast, an AMC announcement may allow more non-professionals to begin processing earnings information immediately upon its evening release. These investors may be more likely to trade the following morning in this situation because they may perceive that their access to information is equal to that of other investors. Therefore, one might expect AMC announcements to be associated with greater investor participation because of both the greater sense of the trade's currency as well as the longer time window.

Consistent with this view, Doyle and Magilke (2009) document relatively higher trading volume responses for AMC announcements compared to those of BMO announcements. However, the question remains as to how much additional price variability, if any, is generated by this additional AMC trading volume. Compared with BMO, AMC announcements will have higher liquidity－as measured by the ratio of trading volume to price variability－as long there is not a more-than-commensurate increase in price variability accompanying the AMC announcements.

Several reasons increase the expectancy that the increased AMC trading volume is not accompanied by a substantial increase in price variability. First, the additional AMC processing time available to investors may mitigate the expected increase in price variability associated with earnings announcements or other events containing information content. This proposed effect is similar to that sought by the trading halt that exchanges occasionally enforce in stocks pending important news or after rapid, excessive price movement in an attempt to diffuse market volatility (Corwin & Lipson, 2000). The extra processing

time afforded by AMC announcements may function similarly by enabling investors to form more homogenous beliefs regarding the prospects of the announcing firm. Under this hypothesis, one may expect less price variability following an AMC announcement than if the same announcement had been made BMO. Another reason to expect muted price variability in response to AMC announcements is that the abnormally high trading volume reaction to AMC announcements may be caused by noise traders whose trades generally do not increase price variability (Kyle, 1985), (Hasbrouck, 1991). Noise traders can decrease price variability since the more they take the opposite side of a trade with an informed investor, the less an informed investor's trades will lead to price pressure and reveal private information. As explained above, AMC announcements provide a larger window of opportunity in which a noise trader can place a trade relative to BMO announcements. Thus, we assert that noise traders increase trading volume and, *ceteris paribus*, the liquidity of AMC announcements more than they increase the liquidity of BMO announcements. We further speculate that increased noise trading in an online era characterized by unprecedented access to trading and information provides added incentive for firms interested in greater liquidity to announce AMC.

Consistent with these views, we hypothesize and find that the additional trading volume associated with AMC announcements is not accompanied by a proportional increase in price variability. After controlling for several factors believed to affect liquidity, we show that during the announcement period, there is a greater increase in the trading volume-to-price variability ratio (liquidity) for AMC compared to BMO earnings releases.

Recent evidence suggests that given limits on information processing, noise traders will be more likely to trade stocks that catch their attention (Barber & Odean, 2008). Since noise traders are thought to help drive this increased liquidity for AMC announcements, we hypothesize and find that the liquidity increase associated with an AMC announcement is directly related to our proxy (the number of analysts following a company) for investor interest in a stock. This provides further evidence that stocks with the most appeal to noise traders derive the greatest benefit from announcing AMC. The increased liquidity associated with AMC is consistent with the argument that the recent increase in AMC announcements is a result of the managers' strategic quest for improved liquidity in an era of unparalleled levels of noise (uninformed) trading.

Our study contributes to the disclosure literature by shedding light on the situations in which earnings announcements' timing can help determine the liquidity of a firm's stock around the time of the announcement. While extensive research has shown how the content of an earnings announcement can affect price and volume, far less attention has been paid to the ways in which the timing of an earnings announcement can affect the trading environment of the stock. Our research extends the work of Doyle and Magilke (2009). Whereas they examine trading volume reactions to earnings announcements, we address both trading volume and price variability in the broader context of liquidity. We contribute to the existing literature on liquidity by providing evidence consistent with the view that earnings announcement timing is yet another method being used by managers to increase liquidity. Such information is useful to regulators, management, and market participants.

The theoretical background for the hypotheses we test follows in the next section. Section III consists of a discussion of our research design. We present results in Section IV, and review our conclusions in Section V.

Ⅱ. Hypothesis Development

Ample evidence from the accounting literature demonstrates that both price and trading volume react significantly to earnings announcements (Beaver, 1968; Ball & Brown, 1968; among many others). According to Beaver (1968), the change in price reflects the average change in investors' beliefs whereas trading volume reflects the aggregate differences in investors' reactions to the earnings announcement. Several trading models involving price change and volume have since been constructed (Kim & Verrecchia, 1991a, 1991b, 1994; Abarbanell et al., 1995; Harris & Raviv, 1993; Kandel & Pearson, 1995; among others). An important drawback of many early models of trade in speculative markets was the assumption that agents interpret public information identically. With such an assumption, some models are unable to explain the often-observed phenomenon of heavy trading volume accompanied by little or no price change. Kandel and Pearson (1995) improve upon much of the prior literature by modeling the scenario in which agents are heterogeneous in both their interpretation of news and their prior beliefs. Their model incorporates high volume-low price variability scenarios, and the authors establish empirical support for their model by documenting instances of these situations.

One explanation for the high-volume-low-price-variability scenario described by Kandel and Pearson (1995) is the presence of *noise* or *liquidity* traders whose naïve trading can

cancel out a potential price move that otherwise would be caused by the trading of informed investors (Kyle, 1985; Hasbrouck, 1991). Meanwhile, informed traders have incentives to mask their trades, consistent with the *stealth trading hypothesis* (Chakravarty, 2001). The more that noise traders take the opposite side of a trade with an informed investor, the less an informed investor's trades will change the price of a stock and reveal private information. This results in greater trading volume per unit of price change, thereby increasing liquidity. Ahmed, Schneible, and Stevens (2003) offer empirical evidence of this effect as they find that the association between trading volume and absolute price change around earnings announcements is significantly lower in the online trading period relative to the pre-online trading period where online investors are thought to be less sophisticated and profitable than are professional investors (Barber & Odean, 2002). Besides being profitable to informed traders, this additional liquidity provided by noise trading can benefit the issuing firm through a lower cost of capital since its informed investors will not demand as high a risk premium for holding the stock (Brennan & Subrahmanyam, 1996).

Since noise traders increase liquidity, one would expect, *ceteris paribus,* that liquidity will be greater around earnings announcements with relatively greater noise trader participation. Compared to BMO, it is reasonable to believe that AMC announcements have greater noise trader participation because of the longer time period following the announcement in which to place a trade before trading resumes. In addition to the AMC benefits of a longer time window, non-professionals may also be more motivated to place a trade following an AMC announcement. This is because they may perceive that they are acting on more timely information by trading in the evening immediately following an AMC announcement than if they were to place a trade in the evening following a morning BMO announcement that the market had already processed during that day's trading session.

Doyle and Magilke (2009) find evidence consistent with increased noise trader participation for AMC as they document larger abnormal trading volume for AMC versus BMO announcements. However, the variability of prices also affects the ease of buying or selling a security. Thus, the level of overall liquidity for AMC and BMO announcements remains an empirical question. Prior research (Beaver, 1968; Kiger, 1972; Morse, 1981; Lobo & Tung, 2000; among others) demonstrates that earnings announcements in general are associated with both abnormal trading volume and price variability due to their information content. Therefore, we expect both announcement-period trading volume and announcement-period price variability to be higher relative to non-announcement levels for both AMC and BMO announcers. If the larger abnormal trading volume for AMC announcements documented by Doyle and Magilke (2009) is caused by the price-canceling behavior of noise traders, then we expect that announcing AMC instead of BMO has a positive effect on liquidity. But if this increased trading volume is accompanied by a more-than-proportionate increase in price variability, perhaps because it is due to more volatile non-noise trading: Then announcing AMC will have a negative effect on liquidity. The longer AMC time window may generate more price volatility if, rather than replicating the effects of a trading halt that makes beliefs more homogenous, it instead deepens the convictions of an already heterogeneous group of investors and emboldens them to trade larger positions according to their divergent views.

Though conflicting forces may be at work, we believe that the advantage of the comparatively longer AMC time window to digest the earnings information and place a trade creates a more positive effect on liquidity following the announcement compared to that of BMO. Although we expect earnings announcements to increase liquidity, we cannot rule out the possibility that liquidity levels for both AMC and BMO are lower at the time of the announcement compared to their respective baseline levels. If this is the case, we expect the decrease in liquidity at the time of the announcement to be less for AMC. This leads to the following hypothesis:

H1*: Announcing AMC instead of BMO has a more positive (less negative) effect on liquidity following the earnings announcement.*

This hypothesized AMC liquidity effect will not be the same for all firms. Specifically, we believe the increase in AMC liquidity will be directly related to noise trader participation in the trading of the stock. Evidence suggests that given limits to information processing, noise traders will be more likely to trade stocks that catch their attention (Barber & Odean, 2008). Salience can be measured by analyst coverage since it is reasonable to assume a direct relationship between analyst following and overall investor interest. This direct relationship would exist whether brokerage firms assign their analysts to follow stocks which already interest noise-trading clients or inversely that noise-traders begin to follow stocks for which their brokerage firm disseminate analyst reports. The direction of causality is opposite in these two situations; however, in both situations, one would find a positive relationship between the number of analysts following a stock and the amount of investor interest in that

stock. Therefore, the number of analysts serves as an effective proxy for noise trader participation—which evidence suggests has a positive effect on liquidity. Gleason and Lee (2003) relate analyst coverage to the rapidity of price adjustment, which is consistent with our liquidity hypothesis. Thus, our second hypothesis follows:

***H2**:The effect on liquidity from announcing AMC instead of BMO increases with greater analyst coverage.*

Ⅲ. Research Design

A. Sample

Our study involves a comparison of AMC vs. BMO earnings announcements. Therefore, it is imperative that we properly identify the first trading session after the earnings announcement (Day 0). Currently, the time of day that an announcement is made is not available on common databases such as Compustat. Recent research (Berkman & Truong, 2009; Doyle & Magilke, 2009) uses *Wall Street Journal Online* to collect data that includes the time of day of earnings announcements. Doyle and Magilke (2009) compile a large, hand-collected database of earnings announcement dates and times covering the period from 1999 through 2005. We use this database in our study. Consistent with Doyle and Magilke (2009), we focus on the firms that switched from announcing BMO to announcing AMC (or vice versa) at least once during this time period. By focusing on just switching firms, we eliminate the need to create matched pairs of similar firms. A matched-pair approach would have been one way to control for firm characteristics and isolate the impact of announcement timing. However, creating matched pairs would have been especially difficult given the significant industry clustering of AMC vs. BMO firms that Doyle and Magilke (2009) document. Instead, we are able to allow each firm to serve as its own control. Consistent with Doyle and Magilke (2009), we discard the relatively small number of firms that announce earnings during market hours. Our final sample consists of 1,656 firms and a total of 24,782 earnings announcement observations (12,995 AMC observations. and 11,787 BMO observations).

B. Measuring Price Variation

We measure price change based on the intraday price range. Our price variability measure is distinctly different from the oft-used earnings response coefficient (ERC). The ERC measures the relative share of the market's response to an earnings announcement (see Ahmed, Schneible, & Stevens, 2003). While much of the previous literature has used closing prices during the event window to measure an abnormal return, we use the high and the low price of each day's window. Conceptually, we are measuring the differential interpretation of investors and their lack of consensus following an earnings announcement as opposed to measuring the average change in investors' beliefs (abnormal return) due to the announcement. Examining a firm's intraday price range provides incremental benefits in describing liquidity beyond that obtained by considering only closing prices and/or bid-ask spreads. Bid-ask spreads can also be an inferior measure of liquidity because many trades occur both outside and inside the quoted spread (Lee, 1993; Peterson & Fialkowski, 1994; Brennan & Subrahmanyam, 1996).

Consider, for example, that a stock's price may change drastically due to a large amount of new information contained in an earnings release. This may be accompanied by relatively low volume and intraday price volatility because the announcement may have generated a relatively homogeneous set of beliefs and a general consensus among investors. This situation would contrast sharply with an earnings release that produces a small absolute price change accompanied both by large intraday price volatility and trading volume due to a large number of traders with heterogeneous interpretations of the announcement. Thus, the intraday price range can, at times, be a better method of measuring the actual price volatility that traders encounter.

We measure price variation using the following daily price range metric. (For the sake of brevity, we omit "i" subscripts from the equations that follow. Each ith equation refers to an individual firm's announcement.)

$$PVAR\text{t} = (HighPricet - LowPricet)/(OpenPricet)$$

In the equation for *PVAR*t, *HighPricet* = the high price on day t; *LowPricet* = the low price on day *t;* and *OpenPricet* is the opening price on day t. This price variability measurement is based on that of Lobo and Tung (2000): Whereas they used (*HighPrice*+*LowPrice*)/2) in the denominator, we use the open price). In much the same way that rates of return are calculated using beginning-of-period values as the denominator, we use the opening (beginning of the trading day) price as the denominator in our measure of intraday price volatility. As a robustness check, we re-run all tests using *PVAR* defined as ((high price − low price)/(low price)). Our results are very similar quantitatively and our

conclusions remain identical to those from our original findings.

C. Measuring Trading Volume

Consistent with Doyle and Magilke (2009), we measure trading volume as follows:

$$TVPERCt = TradingVolumet \ / \ SharesOutstandingt$$

In the equation for *TVPERCt*, *TradingVolumet* is the number of shares traded on day *t*, and *SharesOutstandingt* is the number of shares outstanding on day t. We scale the number of shares traded by the number of shares outstanding so that our results are not unduly affected by those companies with the most shares outstanding. Our concept of trading volume, post-announcement, relates to the proportion of a firm's shares traded as opposed to its absolute number of shares.

D. Measuring Liquidity

The level of liquidity on day t is defined as follows:

$$Liquidityt = TVPERCt / PVARt$$

Thus, *Liquidity(day0)* represents the level of liquidity during the first trading session following the announcement. We also compute *Liquidity(days0and1)*, which is the average level of liquidity for the first two trading sessions after the announcement (i.e., (*Liquidity(day0)* + *Liquidity(day1)*) / 2). We use liquidity measures for these two event windows to test whether the liquidity differences are sensitive to the length of the post-announcement measurement window.

BaselineLiquidity is defined as the baseline, non-announcement period level of liquidity. We compute the average level of liquidity over 20 trading sessions starting with the 25th trading session before the announcement and ending with the 6th trading session before the announcement: We use 20 trading periods for the baseline period because there are about 20 trading days in a month, which we propose is a reasonable time horizon for data to estimate baseline liquidity. We do not include the 5 trading sessions (one week) immediately preceding the announcement in our baseline period, because there is evidence to suggest that abnormal trading activity can occur in the period immediately preceding an earnings announcement (Berkman et al., 2009):

$$BaselineLiquidity = (Liquidity(t\text{-}25) + Liquidity(t\text{-}24) \cdots + Liquidity(t\text{-}6)) \ /20$$

To measure the change in liquidity that occurs following the earnings announcement, we define a variable, *LiquidityDifference.* This represents the difference in liquidity between the announcement event window and the baseline, non-announcement 20-session period. We test liquidity differences for both event windows: (1) Day 0 only and (2) Days 0 & 1 combined.

$$LiquidityDifference(Day0) = Liquidity(Day0) - BaselineLiquidity$$
$$LiquidityDifference(Days0and1)=Liquidity(Days0and1) - BaselineLiquidity$$

Differences in our concept of overall liquidity arise from differences in its components, price variability, and trading volume. To enhance our analysis of which underlying factor(s) are primarily responsible for differences in overall liquidity, we define additional variables as follows:

$$PVARDifference(Day0) = ((PVAR(Day0)) - (\text{baseline, non-announcement period } PVAR))$$
$$PVARDifference(Days0and1) = ((PVAR(Day0and1)) - (\text{baseline, non-announcement period } PVAR))$$
$$TVPERCDifference(Day0) = ((TVPERC(Day0)) - (\text{baseline, non-announcement period } TVPERC))$$
$$TVPERCDifference(Days0and1) = ((TVPERC(Day0)) - (\text{baseline, non-announcement period } TVPERC))$$

E. Explanatory Variables

Since we examine the differences in liquidity between AMC and BMO announcements, our main variable of interest is a binary variable defined as follows:

AMC = 1 if the earnings announcement was made after-market-close (= 0 if BMO).

Differences in liquidity surrounding AMC vs. BMO announcements may be due to the underlying characteristics of the firms making the announcements instead of the timing of the announcement. Therefore, when regressing *LiquidityDifference* on AMC and BMO, we control for various firm characteristics. Because our measure of liquidity is composed of both trading volume and price variability, we choose commonly-used control variables that may affect one or both components:

Analysts = number of analysts making an estimate for the firm in the calendar year of the earnings announcement

MTB = Market-to-book ratio (In the calculation, we use the market price of the firm 2 periods before the announcement. If an announcement is AMC, then two periods is defined as the current day's close and the closing price on the prior day. If the announcement is BMO, then we use the closing price on the two days before the announcement. We delete observations that have a book value less than zero. In addition, we delete observations with a MTB greater than 26.25, (the level corresponding to the 99th percentile of all observations.)

Lnassets = natural log of total assets (in millions) of the firm in calendar year of announcement

Lnsegments = natural log of the number of segments of the firm for the calendar year of the announcement

Industry = dummy variable representing inclusion in one of 12 different Fama-French industry categories based on SIC code. To avoid perfect multicollinearity in the regressions, we do not include a dummy variable for the industry category *other.*

The microstructure effects (trade execution procedures, etc.) of different stock exchanges may affect the liquidity levels of a stock (Atkins & Dyl, 1997, and others). Thus, we create the following variables:

NYSE = 1 if the stock trades on the New York Stock Exchange, (= 0 otherwise)

Nasdaq = 1 if the stock trades on Nasdaq, (= 0 otherwise)

Both *NYSE* and *Nasdaq* will capture the incremental effects relative to that of a stock listed on the AMEX.

F. Models

1. Hypothesis 1

To test for differences in liquidity between AMC and BMO announcements, we run the following regression:

$$LiquidityDifference = B0 + B1AMC + B2Analysts + B3MTB + B4Lnassets + B5Lnsegments + B6NYSE + B7Nasdaq + B8\text{-}18Industry + E \quad (1)$$

We test the model using the *LiquidityDifference* measurement for both event windows ((1) *Day 0 only* (2) *Days 0 & 1 combined*). We Winsorize the dependent variable in both regressions at the 1% and 99% levels. We predict that B1 will be positive and significant. This would suggest that after controlling for several factors affecting the trading environment of a firm, announcing AMC instead of BMO leads to relatively greater liquidity.

2. Hypothesis 2

The number of analysts following (from First Call) is our proxy for investor interest. To test for the incremental effect of investor interest on AMC vs. BMO liquidity differences, we add an interaction term *AMC*Analysts* to Model 1. This interaction term should capture the liquidity effect of AMC timing conditional on analyst following. Model 2 is constructed as follows:

$$LiquidityDifference = B0 + B1AMC + B2\ AMC*Analysts + B3Analysts + B4MTB + B5Lnassets + B6Lnsegments + B7NYSE + B8Nasdaq + B9\text{-}19Industry + E \quad (2)$$

We predict that B2 will be positive and significant consistent with the belief that investor interest has a positive incremental effect on the AMC vs. BMO liquidity difference.

Ⅳ. Results

A. Descriptive Statistics

In Table 1, Panel A, we describe the formation of our final sample of 24,782 earnings announcements (12,995 AMC observations, 11,787 BMO observations) from 1999 - 2005 for 1,656 different firms.

Panel B contains the number of AMC vs. BMO observations by year. To be included in the sample, a firm must have switched from announcing AMC to announcing BMO (or vice versa) at least once during the sample period. As shown in Panel B, the number of observations per year across the two groups remains roughly similar through time. The absence of a strong overall migration of observations from one group to the other across time instills confidence that our results are not due to time effects within the sample period.

Panel C provides descriptive statistics of the combined sample. On average, liquidity is higher following the announcement than it is during the non-announcement period. Specifically, the means of both *Liquidity(day0)* (mean =.313) and *Liquidity(day1)* (mean=.287) are larger than that of *BaselineLiquidity* (mean=.225). NYSE and AMEX are

TABLE 1. Sample and Descriptive Statistics

Panel A: Sample Selection

Original sample of earnings announcements from 1999-2005	63,288
Firms that did not switch between AMC and BMO	(34,897)
Switching firm observations	28,391
Announcements with missing Compustat/CRSP data	(3,609)
Earnings announcements used in regressions	***24,782****

**(A total of 1,656 firms are represented in the sample.)*

Panel B: Number of Observations by Year

Year	AMC	BMO
1999	580	602
2000	1,386	1,725
2001	1,754	1,706
2002	2,031	1,821
2003	2,297	1,997
2004	2,620	2,073
2005	2,327	1,863
Total	12,995	11,787

Panel C: Descriptive Statistics of Combined Sample (24,782 observations)

Variable	Mean	Std. Dev.	Q1	Median	Q3
Liquidity(day0)	.313	.429	.086	.189	.377
Liquidity(day1)	.287	.372	.084	.184	.363
BaselineLiquidity	.225	.222	.092	.173	.296
*LiquidityDifference(day0)**	.081	.256	-.041	.010	.116
*LiquidityDifference(days0and1)**	.070	.204	-.032	.016	.111
Analysts	8.988	7.086	4.000	7.000	12.000
MTB	3.167	3.148	1.435	2.141	3.625
Lnassets	6.711	1.742	5.464	6.619	7.835
Lnsegments	.730	.704	0	.693	1.386

NYSE: 12,564 total observ. (5,891 AMC observ.; 6,673 BMO observ.)
Nasdaq: 11,777 total observ. (6,895 AMC observ.; 4,882 BMO observ.)
AMEX: 441 total observ. (176 AMC observ.; 265 BMO observ.)
Dependent Variable in each regression is Winsorized at 1% and 99% levels
*Due to Winsorization, *LiquidityDifference* will not precisely equal the difference between *Liquidity* and *BaselineLiquidity* in Panel C

associated with more BMO observations than AMC. The opposite is true for Nasdaq. Because of this contrast, it is important to control for possible liquidity effects caused by the specific exchange on which a firm is traded.

In Panel D, we present a correlation matrix. The pairwise correlations between the dependent variable *LiquidityDifference (Day0)* and each explanatory variable are significant at the 5% level. The sign of each significant coefficient in our regressions remains the same as that of the pairwise correlation between that variable and *LiquidityDifference (Day0).* The correlation between our main variable of interest, *AMC,* and *LiquidityDifference(Day0)* is .087.

Table 2 provides descriptive statistics of the decomposed sample. In addition, we list p-values from a test of differences in mean between AMC and BMO observations for each variable. AMC announcers tend to be smaller in size (based on assets) and have fewer segments, with both differences being statistically significant (p-value <.0001 for

TABLE 1. Sample and Descriptive Statistics (continued)

Panel D: Pearson Correlation Matrix*

	Liquidity Difference (Day0)	*AMC*	*Analysts*	*MTB*	*Lnassets*	*Lnsegments*	*NYSE*	*Nasdaq*
Liquidity Difference (Day0)	1.00**0**	.087 <.0001	**.134** <.0001	**.070** <.0001	**-.013** .0397	**-.061** <.0001	**-.097** <.0001	**.103** <.0001
AMC		**1.000**	.016 .012	.009 .179	**-.091** <.0001	**-.066** <.0001	**-.113** <.0001	**.119** <.0001
Analysts			**1.000**	.114 <.0001	**.555** <.0001	**.079** <.0001	**.205** <.0001	**-.186** <.0001
MTB				**1.000**	**-.118** <.0001	**-.146** <.0001	**-.119** <.0001	**.117** <.0001
Lnassets					**1.000**	**.424** <.0001	**.624** <.0001	**-.600** <.0001
Lnsegments						**1.000**	**.358** <.0001	**-.354** <.0001
NYSE							**1.000**	-.962 <.0001
Nasdaq								**1.000**

**Correlations in bold are significant at the 5% level*
The numbers below the correlations represent the p-values from a test of the null hypothesis that Rho=0

Variable Definitions:
Liquidity(day0) = TVPERC/ PVAR on the first trading session after the announcement *Liquidity(days0and1) = TVPERC/ PVAR* averaged across the first two trading sessions after the announcement; *BaselineLiquidity* = non-announcement period *Liquidity; LiquidityDifference* = (announcement period *Liquidity) - (BaselineLiquidity); AMC* = 1 if the earnings announcement was made after-market-close, = 0 if BMO; *Analysts* = the number of analysts following the firm; *MTB* = Market-to-book ratio; *Lnassets*= Natural log of total assets (in millions); *Lnsegments* = natural log of the number of segments of the firm; *NYSE* = 1 if the stock trades on the New York Stock Exchange, = 0 otherwise; *Nasdaq* = 1 if the stock trades on Nasdaq, = 0 otherwise.

both). However, despite the smaller size, AMC announcers have a significantly greater analyst following (p-value = .012). While the average market-to-book ratio is higher for AMC announcers, the difference is not significant (p-value =.179).

As discussed, our formula for the difference between announcement period liquidity and non-announcement period liquidity is: *LiquidityDifference(Day0* or *Days0and1) = Liquidity(Day0* or *Days0and1) − BaselineLiquidity.* As displayed in Table 2, the mean for all components of this equation for both event periods (Day0 as well as Days0&1) is higher for AMC and the difference is statistically significant (all p-values <.0001). This not only implies that AMC announcers are associated with a higher non-announcement period liquidity, but also that they experience a bigger increase in liquidity during the announcement period. Further insight into this difference in liquidity is provided by a comparison of *PVARDifference* and *TVPercDifference* for each group. *PVARDifference* is defined as the difference between announcement period and baseline (non-announcement) price variability. *PVARDifference(Day0)* is significantly larger for AMC announcers (mean of .0301 vs. .0280, p-value <.0001). However, *PVARDifference(Days0and1)* is not significantly different across the two groups (mean of .0184 vs. .0183, p-value= .8631). Thus, while AMC announcements are associated with a greater increase in price variability during the first trading session after the announcement, this difference is no longer statistically significant when averaging price variability across the first two periods after the announcement. While AMC announcements are associated with a somewhat larger increase in price variability compared to that of BMO announcements, they are associated with a much larger increase in trading volume. *TVPercDifference* is defined as the difference between announcement period and baseline (non-announcement) trading volume. *TVPercDifference* for both *Day0* (mean of .0158 vs. .0106, p-value <.0001) and *Days0and1* (mean of .0099 vs. .0077, (p-value <.0001) is significantly larger for AMC.

Because earnings announcements have information content, the increase in both price variability and trading volume for both groups following the announcement is to

TABLE 2. Descriptive Statistics of AMC vs. BMO and Test of Differences

	AMC					BMO					
Variable	Mean	Std Dev	Q1	Med.	Q3	Mean	Std Dev	Q1	Med.	Q3	P-val. (diff)*
*Liquidity Difference** (day0)*	.102	.277	-.035	.019	.144	.057	.228	-.047	.0007	.088	<.0001
*Liquidity Difference** (days0and1)*	.083	.216	-.026	.022	.128	.056	.190	-.036	.009	.093	<.0001
Analysts	9.123	7.202	4.000	7.000	12.00	8.896	6.948	4.000	7.000	12.00	.012
MTB	3.193	3.137	1.456	2.170	3.673	3.139	3.159	1.407	2.102	3.589	.179
Lnassets	6.578	1.681	5.350	6.517	7.606	6.894	1.790	5.624	6.777	8.066	<.0001
Lnsegments	.691	.699	0	.693	1.386	.784	.707	0	1.099	1.386	<.0001
PVAR Difference (day0)	.0301	.0479	.0015	.0189	.0477	.0280	.0461	.0007	.0161	.0414	<.0001
PVAR Difference (days0and1)	.0184	.0332	-.0002	.0122	.0314	.0183	.0325	.0004	.0121	.0295	.8631
TVPerc Difference (day0)	.0158	.0372	.0005	.0048	.0166	.0106	.0289	.00003	.0029	.0105	<.0001
TVPerc Difference (days0and1)	.0099	.0230	.0002	.0033	.0110	.0077	.0203	.00001	.0024	.0082	<.0001
Liquidity (day0)	.345	.486	.093	.203	.417	.277	.355	.081	.174	.337	<.0001
Liquidity (day1)	.299	.401	.086	.192	.376	.275	.342	.082	.177	.350	<.0001
Baseline Liquidity	.233	.245	.093	.177	.302	.217	.195	.091	.169	.289	<.0001

*The symbol * represents the p-value from a test of differences in mean for each variable (AMC vs. BMO)*
Dependent Variable in each regression is winsorized at 1% and 99% levels
** Due to winsorization, *LiquidityDifference* will not precisely equal the difference between *Liquidity* and *BaselineLiquidity* in Table 2
Variable Definitions: *PVAR = (HighPrice − LowPrice)/(OpenPrice);* ***PVARDifference*** = (announcement period *PVAR*) − (non-announcement period *PVAR*); ***TVPERC*** = *TradingVolume / SharesOutstanding* ***TVPERCDifference*** = (announcement period *TVPERC*) − (non-announcement period *TVPERC*); ***Liquidity(day0)*** = *TVPERC/ PVAR* on the first trading session after the announcement ***Liquidity(days0and1)*** = *TVPERC/ PVAR* averaged across the first two trading sessions after the announcement; ***BaselineLiquidity***= non-announcement period *Liquidity;* ***LiquidityDifference***= (announcement period *Liquidity*) - (*BaselineLiquidity*); ***Analysts*** = the number of analysts following the firm; ***MTB*** = Market-to-book ratio; ***Lnassets***= Natural log of total assets (in millions); ***Lnsegments*** = natural log of the number of segments of the firm; ***NYSE*** = 1 if the stock trades on the New York Stock Exchange, = 0 otherwise; ***Nasdaq*** = 1 if the stock trades on Nasdaq, = 0 otherwise; ***AMEX*** = 1 if the stock trades on The American Stock Exchange, = 0 otherwise (not included in regression)

be expected. However, while AMC announcements are associated with a somewhat larger increase in price variability compared to that of BMO, they are also associated with a much larger increase in trading volume and, therefore, are also associated with a larger increase in liquidity. This is consistent with the belief that at least some of this increased trading volume is a result of price-change-canceling noise traders. The data so far supports H1 since AMC is associated with a larger increase in liquidity following the announcement. However, it is important to control for other factors that influence liquidity to try to rule out alternative explanations for the greater liquidity increase for AMC announcements.

B. Discussion

1. Testing of H1

In Table 3, we display the results from our regressions of liquidity differences (between the non-announcement and announcement periods) on various factors that influence firm liquidity.

We run these regressions to determine whether the greater liquidity difference for AMC firms found in Table 2 is significant after including control variables that likely influence liquidity. Panel A of Table 3 displays the results of our tests of H1. *AMC* is positive and strongly significant

TABLE 3. Regression of the Difference Between Baseline (non-announcement) and Announcement Period Liquidity

Panel A

MODEL 1: *LiquidityDifference* = B0 + B1*AMC* + B2*Analysts* + B3*MTB* + B4*Lnassets* + B5*Lnsegments* + B6*NYSE* + B7*Nasdaq* + B8-18*Industry* + *E*

Test of Day 0 Only

Variable	Estimate	t-stat	p-value
Intercept	**-.00792**	-.55	.5849
AMC	**.03433**	10.65	<.0001
Analysts	.00574	18.73	<.0001
MTB	**.00294**	5.59	<.0001
Lnassets	**-.00098**	-.60	.5455
Lnsegments	**-.00631**	-2.40	.0162
NYSE	-.00405	-.34	.7368
Nasdaq	.04009	3.38	.0007

F Value of Regression: 75.61; p-value: <.0001; Adj R-Sq .051

Test of Combined Days 0&1

Variable	Estimate	t-stat	p-value
Intercept	**.00171**	.15	.8831
AMC	**.01962**	7.59	<.0001
Analysts	.00415	16.90	<.0001
MTB	**.00251**	5.93	<.0001
Lnassets	**-.00133**	-1.02	.3079
Lnsegments	**-.00257**	-1.22	.2229
NYSE	.01382	1.43	.1529
Nasdaq	.03821	4.02	<.0001

F Value of Regression: 56.42; p-value: <.0001; Adj R-Sq .039
Dependent Variable in each regression is winsorized at 1% and 99% levels

Panel B: Test for the Incremental Effect of Investor Interest on Liquidity Differences for AMC firms

MODEL 2: *LiquidityDifference* = B0 + B1*AMC* + B2 *AMC*Analysts* + *B3Analysts* + B4*MTB* + B5*Lnassets* + B6*Lnsegments* + B7*NYSE* + B8*Nasdaq* + B9-19*Industry* + *E*

Test of Day 0 Only

Variable	Estimate	t-stat	P-Value
Intercept	.00716	.49	.6236
AMC	.00235	.45	.6492
*AMC *Analysts*	.00359	7.94	<.0001
Analysts	.00376	9.53	<.0001
MTB	**.00301**	5.71	<.0001
Lnassets	**-.00092**	-.56	.5723
Lnsegments	**-.00615**	-2.35	.0188
NYSE	-.00181	-.15	.8805
Nasdaq	.04216	3.56	.0004

F Value of Regression: 75.12; p-value: <.0001; Adj R-Sq 0.0538

TABLE 3. Regression of the Difference Between Baseline (non-announcement) and Announcement Period Liquidity (continued)

Test of Combined Days 0&1

Variable	Estimate	t-stat	P-Value
Intercept	.01013	.86	.3875
AMC	.00176	.43	.6707
*AMC *Analysts*	.00200	5.52	<.0001
Analysts	.00305	9.63	<.0001
MTB	**.00254**	6.01	<.0001
Lnassets	**-.00130**	-.99	.3212
Lnsegments	**-.00248**	-1.18	.2385
NYSE	.01507	1.56	.1189
Nasdaq	.03936	4.14	<.0001

F Value of Regression: 55.12; p-value: <.0001; Adj R-Sq 0.0398
Dependent Variable in each regression is winsorized at 1% and 99% levels

Variable Definitions: ***LiquidityDifference***= (announcement period *Liquidity) - (BaselineLiquidity);* ***AMC*** = 1 if the earnings announcement was made after-market-close, = 0 if BMO; *Analysts* = the number of analysts following the firm; ***MTB*** = Market-to-book ratio; ***Lnassets***= Natural log of total assets (in millions); ***Lnsegments*** = natural log of the number of segments of the firm; ***NYSE*** = 1 if the stock trades on the New York Stock Exchange, = 0 otherwise; ***Nasdaq*** = 1 if the stock trades on Nasdaq, = 0 otherwise; ***Industry***= dummy variable representing inclusion in one of 12 different Fama-French industry categories based on SIC code (*untabulated results show 10 of 11 industry variables are significant for Model 1 Day0 regression, 9 of 11 are significant for Model 1 Days0and1 regression. For Model 2, 9 of 11 industry variables are significant for both Day0 and Days0and1 at the 5% level.)*

for both Day0 and Days0and1 (p-values <.0001 for both). This direct relationship between AMC announcements and increased liquidity following the announcement supports H1 and is consistent with the belief that managers can increase liquidity by announcing AMC instead of BMO.

Our proxy for firm size, *Lnassets,* is not statistically significant in either event window (p-values= .5455, .3079). *Lnsegments* is negative and significant for the Day0 event window (p-value = .0162) but not for the combined Days0and1 window (p-value =.2229). Because the number of segments can proxy for the complexity of a firm, it is not surprising to find a negative relationship between announcement period liquidity and *Lnsegments.* This decreased liquidity may be the result of lower trading volume because fewer investors elect to trade in more complex firms; alternatively, the number of segments may increase price variability because it may be directly related to the heterogeneity of beliefs following the announcement. Either effect would decrease liquidity. However, the results suggest that the effect dissipates by the end of the second trading session after the announcement.

MTB is positive and significant for both event periods (both p-values <.0001). The market-to-book ratio is often used as a proxy for growth or "glamour" stocks often popular with non-professional noise traders. These results are consistent with a direct relationship between *MTB* and the amount of price change-canceling noise trader participation.

All observations represent firms that trade on the NYSE, Nasdaq or AMEX. To avoid perfect multicollinearity, we do not include *AMEX* in the regression. Therefore, coefficients on *NYSE* and *Nasdaq* represent the incremental liquidity effect compared to AMEX observations. *NYSE* is not significant for either event window. However, *Nasdaq* is significantly positive for both Day0 and Days0and1 (p-values =.0007, <.0001 respectively). This may be the result of microstructure or other differences among the exchanges. Our results (untabulated here) show that 10 of 11 (9 of 11) industry groups included in the regression are significant for Day0 (Days0and1) at the 5% level. Thus, industry membership has some explanatory power with regard to the difference between announcement and non-announcement period liquidity.

Analysts is strongly positive and significant for both event windows (p-values <.0001 for both), suggesting a direct relationship between analyst following and increased liquidity following an earnings announcement. This is to be expected since a larger analyst following is expected to be positively correlated with the amount of investor interest in the stock and, therefore, the salience and attractiveness of a stock to a price canceling-noise trader. This produces higher liquidity through an increase in trading volume without a commensurate increase in price variability.

Overall, we find support for H1 through the strongly positive coefficient on *AMC.* This is consistent with the belief

that the larger time window between the earnings announcement and the resumption of trading increases noise trader participation (increasing trading volume) without a proportionate increase in price variability. We believe analyst following accentuates the positive relation between AMC and liquidity. As stated in H2, we hypothesize that the AMC vs. BMO liquidity difference is increasing in analyst coverage. This discussion leads to our test of H2.

2. Testing of H2

To test for the conditional effect of analyst/investor interest on AMC/BMO liquidity differences, we add an interaction term, *AMC*Analysts,* to Model 1. The results of these regressions are displayed in Table 3, Panel B. Consistent with H2, *AMC*Analysts* is positive and strongly significant for both Day0 and Days0and1 (p-value <.0001 for both). Similar to the results for the test of H1, *MTB* and *Nasdaq* remain positive and significant for both event periods when testing H2. Our results (untabulated) show that 9 of 11 included industry groups are significant for both Day0 and Days0and1 at the 5% level. *Analysts* is positive and significant incremental to the interaction term for both event periods (p-value < .0001). The main effect for *AMC* is no longer significant after including the interaction with analyst following. This suggests that AMC announcements are not associated with significantly increased liquidity, compared to BMO, when the number of analysts equals zero (following the statistical logic in Aiken and West, 1991, pg. 37). This is consistent with H2, since we suggest that the number of analysts following the stock is directly related to the stock's ability to capture noise trader interest. Since noise traders are helping to drive the liquidity differences we propose that the lack of significant differences in liquidity in the absence of analysts (and, therefore, noise traders) is not surprising. The same reasoning applies to the expected significance of B2, the coefficient of the interaction term AMC*Analysts. We find that B2 is positive and significant, in accordance with our hypothesis that the effect of AMC on the difference in liquidity is increasing in analyst coverage (our proxy for noise trader interest). To provide further insight on this point, we re-estimate Model 2 using mean-adjusted analyst following (i.e., *Analyst* for firm *i* less the sample mean of *Analyst*). In the specification for day 0, we find a significant main effect for *AMC* indicating a significantly positive effect of *AMC* on liquidity given an average (rather than 0) level of analyst following. The coefficient B1 is 0.347 (p-value <.0001), and as expected, the coefficient on the interaction term is identical to that reported in Panel B of Table 3. For the combined day 0 and day 1 window we obtain similar results, i.e., both B1 and B2 are significantly positive.

We find support for H2 through the highly significant coefficient on the interaction term, AMC*Analysts. Our results are consistent with the proposition that AMC vs. BMO liquidity differences are increasing in investor interest (proxied by analyst following).

C. Sensitivity Analysis

Prior literature discusses differences in the way trading volume is traditionally calculated among the NYSE, Nasdaq, and AMEX. These differences may or may not have been eliminated by recent rule changes implemented to create uniformity. Due to the nature of the dealer-oriented market of Nasdaq, compared with the auction-oriented markets of the NYSE and AMEX, Nasdaq has traditionally reported higher trading volume for certain types of transactions. See Atkins and Dyl (1997) for a more complete discussion of this topic. We do not expect this to affect our results because our dependent variable is based on the difference in trading volume between the non-announcement period and announcement period for the same stock. Thus, any under/overstatement of trading volume caused by microstructure differences are consistent in both periods and should not create bias. Nonetheless, we test the sensitivity of our results to this effect in all models by decreasing Nasdaq trading volume by 34%, an amount by which Atkins and Dyl (1997) suggest Nasdaq trading volume may be overstated. After the adjustment, our (untabulated here) results remain quantitatively similar and our qualitative interpretation is unchanged.

V. Conclusion

While AMC earnings announcements are associated with a somewhat larger increase in price variability following the announcement compared to that of BMO, they are also associated with a much larger increase in trading volume and, therefore, are also associated with a larger increase in liquidity. This relationship remains even after controlling for numerous factors that may affect liquidity by way of affecting trading volume and/or price variability. These results suggest that by announcing AMC a manager can, on average, increase the liquidity of the firm's stock. This may be due to a combination of factors resulting from the longer time period for AMC announcers between the announcement

and resumption of trading: 1) more investors having the opportunity/ inclination to trade following the AMC announcement (increasing trading volume) 2) investors who would have traded regardless of the announcement timing having more time to process the information and, perhaps, form a more homogenous set of beliefs (decreasing price variability). It is likely that noise trading is one of the causes of this increased AMC liquidity. Whereas Jiang et al. (2012) find that AMC announcements lead to more price discovery during after-hours trading, we document that AMC announcements have a differential effect on liquidity when the market opens on the following day.

Because the size of both the AMC and BMO time window has stayed constant in recent years, it alone cannot explain the recent increase in AMC announcements. However, the online era has given managers a greater ability to exploit this larger AMC time window for increased liquidity from AMC announcements. Managers likely realize the possible benefits in taking advantage of the around-the-clock news dissemination and unfettered access to trading in the online era. It can be argued that 30 years ago it did not matter as much whether an earnings announcement was made AMC vs. BMO, since many of the comparatively small group of investors intending to trade following an AMC announcement would still need to wait for print journalism to publish the results the following morning. However, the present situation now differs substantially. The ability to gather information and place trades at all hours is one of the factors involved in the increased stock ownership among the general population in recent years.

Presently, a manager who decides to announce BMO instead of AMC is likely reducing the amount of investor participation to a larger degree than he would have in the past. Therefore, it is reasonable to believe that the benefit to announcing AMC has generally increased with the recent proliferation of 24-hour news dissemination and online, low-cost trading—factors that encourage noise trading by non-professionals. These views are strengthened by this paper's results supporting our second hypothesis. Our evidence suggests that AMC vs. BMO liquidity differences are increasing in investor interest (proxied by analyst following). This follows from the belief that managers' ability to exploit the larger AMC time period between announcement and resumption of trading is increasing in the amount of analyst following/investor interest that will disseminate the earnings information. Overall, our results are consistent with the belief that the recent rise in AMC earnings announcements is largely the result of managers' strategic pursuit of higher liquidity. Our study contributes to the literature concerning investor reaction to earnings announcements, a topic that is important to corporate managers, investors and regulators.

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