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Investor Information Processing and Trading Volume

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ABSTRACT

Examining the impact on NYSE trading volume, using a sample of global cross-listed firms and distinct information sources from the U.S. and primary market countries, I show that investor utilization of information varies significantly with language, distance-to-source, and visibility. Specifically, for firms with greater information processing frictions, such as those in non-English speaking countries, located a greater distance from the trading venue, and with higher information asymmetries, investors rely on news from the firms' home market when making their trading decisions rather than U.S. news, whereas those with fewer information processing frictions utilize both sources of news.

Keywords: Information processing; media; limited attention; trading volume

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1. Introduction

The news media play a key role in the dissemination of firm-specific information to investors. Investors are constrained by limited attention and search costs. Hence, they rely on the news to filter relevant information. Despite a growing body of literature on the influence of the media on trading behaviour, few attempts have been made to empirically evaluate the specific characteristics of news information that affect the way it is processed and utilised by investors. In this paper, we identify three specific channels—language, distance, and visibility—that affect the way investors process information.

Prior research typically investigated the impact of news on investor behaviour. For example, Tetlock (2007) and Tetlock, Saar-Tsechansky, and Macskassy (2008) find that media pessimism predicts downward pressure on stock prices. Barber and Odean (2008) show that investors' buying behaviour is influenced by attention grabbing stocks. Fang and Peress (2009) report that high media coverage lowers the informational risk of stocks. Ferguson et al. (2011) find that investors overreact to highly visible news, while Engelberg and Parsons (2011) and Peress (2012) show that local media coverage predicts local trading activity.

However, investor reaction to news information is not uniform across firms, sources, or information events. Many factors influence the way investors process and utilise information. For example, research has shown that the salience of news information influences trading volume and volatility, and can focus investors' attention such that prices are more sensitive to fundamentals (Klibanoff, Lamont, and Wizman, 1998). Salience can also have a large impact on prices through information discovery (Huberman and Regev, 2001). Other key factors that have been found to influence the attention of investors when processing news information include the credibility of the media outlet, information demand, media bias, and search costs (Dyck, Volchkova, and Zingales, 2008). Information asymmetries and limited attention can

affect the impact of information events (Easley et al., 1996), the speed of reaction to news (Hong and Stein, 1999; Huo, Peng, and Xiong, 2006), and can lead to increased sensitivity to market level information and comovement of assets (Peng and Xiong, 2006; Mondria, 2010).

Several studies have hypothesised that geographical factors, specifically, the informational advantage of local investors can explain the variation in the information sets of investors, which may in turn influence their trading behaviour (Coval and Moskovtiz, 2001; Feng and Seasholes, 2004; Ivkovic and Weisbenner, 2005). However, other studies argue that the familiarity of local investors with local stocks is what influences the investors' decisions rather than their informational advantage (Grinblatt and Keloharju, 2001; Huberman, 2001; Seasholes and Zhu, 2010).

In this paper, we show that despite easy access to global information, significant informational frictions still exist when considering a global investment opportunity set, which lead to differences in investors' trading activity in reaction to news. We use an empirical design that allows us to identify distinct information sources that investors would be more or less likely to utilise in the face of differing information characteristics.

A sample of 108 firms spanning eight countries, five continents, and covering five home market languages was used for this study. The sample firms have a secondary listing on the NYSE; this ensures that the effects of information discovery can be measured from a common base, keeping constant any location-based trading differences. We collected 128,706 firm-specific news articles from 18 news publications using the *Dow Jones Factiva* news database over the period 1997–2007. We then assessed the impact of news information discovery in a market environment using trading volume. If we assume that the news media bring new information to the market or that the media have a causal impact on investor trading behaviour (Engelberg and Parsons, 2011; Peress, 2012), we should see a rise in trading

volume in response to recently published news articles, which would be in line with the findings reported in Kim and Verrecchia (1991).

The approach of using trading volume to measure information discovery that we adopt in this study is in contrast to the approach used by Griffin, Hirschey, and Kelly (2011) who use absolute stock returns.

We formally assess the variation in the impact of news information on investor behaviour due to language, location, and firm visibility. The results of this study contribute to several areas of research—limited attention, the role of the news media, and the debate surrounding the influence of news on trading volume. The paper also contributes to the discussion on the determinants of trading volume and disagreement based models.

The rest of this paper is organised as follows. Section 2 provides a review of the relevant literature. Section 3 provides descriptive statistics of the data and preliminary analysis, and Section 4 outlines the methodology. Section 5 documents the main results of the study, and Section 6 concludes the paper.

2. Literature Review

This paper investigates how investors update their information sets when faced with limited attention constraints due to distinct information characteristics. Since this investigation takes a global perspective and examines information transmission between markets, the study contributes to the existing literature on the role of the news media in financial markets, as well as the relations between information processing and limited attention, and between information processing and geography.

2.1. Information Processing and Limited Attention

The research on limited attention and information processing began with Kahneman (1973) who highlights that limited cognitive resources force agents into a substitutive process,

whereby attention is focused on some task at the expense of others. As attention requires effort, which is also available in a limited capacity, these constraints invariably result in biases in information processing and decision making.

Researchers in the field of behavioural finance have used these biases to explain patterns in stock prices[3] in terms of underreaction and overreaction to news.[4] In order to assess the magnitude of the impact of these informational processing biases in financial markets and their effects on securities pricing, several unique methods have been utilised that have sought to overcome the measurement problem of identifying the investors' information sets that determine investor behaviour.

One such method employed by Klibanoff, Lamont, and Wizman (1998) to determine investor reaction to news on closed-end country funds was to measure the salience of news. As a proxy for salience, they use the column width of country relevant news articles appearing on the front page of *The New York Times*. They find that the short-run elasticity of prices to the net asset value of the funds increased following well-publicised news events. Their results also indicate that the response of prices to changes in fundamentals was quicker in periods of prominent news owing to a greater focus of attention by investors, which resulted in higher trading volume and volatility in returns. Huberman and Regev (2001) is an often-cited example of the role of the prominence of information. They report that an article extolling the benefits of a cancer drug that appeared in *The New York Times* had a dramatic effect on the stock price of the cancer drug's parent company, even though all the information had been made publicly available months before the article was published.

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[3] For example: the size effect (Banz, 1981); the value effect (Basu, 1983; Fama and French 1992); the momentum effect (Jegadeesh and Titman, 1993; Chan, Jegadeesh, and Lakonishok, 1996); and stock market overreaction (De Bondt and Thaler, 1985).

[4] For theoretical models of asset prices utilising behavioural biases, see Barberis, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998, 2001), as well as Hong and Stein (1999). Theoretical studies that specifically examined limited attention include Hirshleifer and Teoh (2003), Peng (2005), Peng and Xiong (2006), and Mondria (2010).

Using a unique brokerage account dataset and the *Dow Jones News Service* data feed, Barber and Odean (2008) show that stocks in the news tend to focus and hence bias individual investors' attention, leading them to be net buyers of these stocks. Using newspaper coverage of U.K. companies, Ferguson et al. (2011) show that investors overreact to the semantic content of news information when media attention is high. Tetlock (2007) and Tetlock, Saar-Tsechansky, and Macskassy (2008) further report that the qualitative information contained in news articles has a significant impact on financial markets. They find that media pessimism predicts downwards pressure on market prices and also predicts higher trading volume. At the firm level, they show that negative content in the media can forecast low earnings and stock returns.

Examining the cross-section of stock returns, Fang and Peress (2009) find a return premium on stocks with no media coverage. This premium was found to be highest for smaller stocks and stocks with low analyst coverage, lending further support to the argument that the investment opportunity sets of investors are dominated by those stocks that have a greater informational flow. Earlier work by Easley et al. (1996) also shows that private information is more important for infrequently traded stocks, and that informational events have a much greater impact due to informational asymmetries. Zhang (2006) attempts to explain short-term price continuation in terms of information uncertainty, finding that greater information uncertainty leads to lower returns after bad news and higher returns after good news. Huo, Peng, and Xiong (2006) show that price continuation increases with investor attention and that the underreaction to earnings news declines with increased investor attention.

Further research analysing the impact of public information on financial markets has shown that the frictions between quantitative and qualitative information may be responsible for some of the post-earnings-announcement drift (PEAD), due to the higher processing costs

of qualitative information (Engelberg, 2008; Demers and Vega, 2008). This is in line with the findings of Hong and Stein (1999) who model the slow diffusion of information. Engelberg, Reed, and Ringgenberg (2012) find that profitable short sellers have a greater ability to process publicly available information than other less-informed traders, which is consistent with other studies that show a variation in news interpretation related to the trader's skill (Rubinstein, 1993; Kandel and Pearson, 1995).

2.2. Information Processing and Geography

Recent research documenting the economic significance of geography in financial markets has been directed towards explaining information asymmetry, the differences in investors' information sets, and investment preferences. This trend developed from earlier work examining the home bias on the international level.[5] Coval and Moskowitz (2001) extend this line of research by arguing that local investors have an informational advantage. They show that active mutual fund managers display a preference for local investments in which they have significant positive abnormal performance.

In an attempt to further determine the reasons behind the preference for local investments, Grinblatt and Keloharju (2001), using a unique dataset of Finnish investors, show that a firm's language, culture, and distance all contribute to the familiarity that may impact the investors' decisions. Feng and Seasholes (2004) find similar results in mainland China, which they attribute to more precise information that is available locally.

Several studies make use of the same dataset from a large U.S. discount brokerage to investigate the local bias of individual investors. Zhu (2003) compares the portfolio returns with differing levels of local bias and finds no performance advantage due to increased local bias. He suggests that information asymmetry is not a central reason for investing locally in

[5] French and Poterba (1991) show that U.S. equity investors allocate approximately 94% of their portfolios to domestic stocks. See also Coval and Moskowitz (1999).

the case of individual investors, which is in contrast to the results reported for institutional investors (Coval and Moskowitz, 1999; 2001). According to Zhu (2003), familiarity—which is unrelated to fundamental financial information—is responsible for the preference for local investments; this view is also espoused by Huberman (2001). Zhu's results are supported by Seasholes and Zhu (2010).

Ivkovic and Weisbenner (2005) measure the geographic distribution of households and firms differently and use various portfolio-sorting methods for robustness to show that local investments outperformed nonlocal ones by 3.2% per annum. They argue that this is the result of local information being value-relevant, and show that the effect is particularly strong for those firms with greater information asymmetry. Another interesting finding is that non-locals could replicate the strategy of local investors by observing local ownership. These results are supported by Massa and Simonov (2006), who observed that investors in Sweden formed information-driven portfolios rather than portfolios driven by behavioural biases.

Engelberg and Parsons (2011) add another dimension to their analysis of the individual brokerage account trading data. They show that local media coverage in the form of a newspaper article is associated with a rise in the local trading volume on the day the article is published. However, when the delivery of newspapers is disrupted due to extreme weather conditions, this relationship is broken. The authors interpret this as strong evidence of a causal relationship between media reporting and trading activity. Similarly, Peress (2012) uses newspaper strikes in several countries to identify a causal relationship between media reporting and financial market reaction.

Gurun and Butler (2011) find evidence that local media bias has a significant effect on firm value; they ascribe this to the local advertising by firms. This is supported by Hong, Kubik, and Stein (2008), who show that in geographic areas with fewer firms, valuations are pushed up in the presence of local bias due to an "only-game-in-town" effect.

Griffin, Hirschey, and Kelly (2011) investigate the influence of the financial media on a global scale, paying particular attention to country-specific variations in stock prices in reaction to news announcements. They show that market responses to news releases are stronger in developed markets than in emerging ones. Their results also show more informed trading in countries with low news reaction, in the form of larger price run ups ahead of mergers, greater pre-earnings announcement news leakage, and fewer reversals following extreme stock price movements. They suggest that news reaction could have important policy implications for identifying informed trading.

The literature surveyed in this section shows that information acquisition in financial markets is a costly activity. With limited attention, investors face constraints and processing frictions when updating their information sets. Public news media are a key source of information for investors, and such media constitute a profitable avenue for researchers attempting to measure investors' information sets.

3. Data and Preliminary Analysis

To investigate the differences in information processing by investors on an international scale, we measure the reaction to news regarding cross-listed firms on a common exchange. This allows inferences to be made according to variations in the sample in terms of information characteristics, such as language and information flow, as well as geographic characteristics, i.e., the distance and time from the common or base exchange.

3.1. Sample Collection

The countries to be included in the sample were selected on the basis of stock market capitalisation, excluding the U.S. stock exchanges. To form the sample, the firms were first filtered by their primary exchange in the following geographic locations: Australia, Brazil,

Canada, Germany, Hong Kong, India, Japan, and the U.K.[6] The firms were then filtered to include only those firms that had their secondary listing on the New York Stock Exchange (NYSE).

The NYSE was selected as the common or base exchange for measurement for several reasons. Firstly, it is the largest stock exchange in the world by market capitalisation, increasing the chances of firms having a secondary listing there. Secondly, strong financial governance practices in the U.S. reduces the opportunity for informed trading, which would hinder the process of information discovery. Thirdly, it is ideally located time-wise, relative to the other countries in the sample. The U.S. is one of the last markets to open on a trading day; therefore, investors can be expected to act upon any news released in the other markets on that same trading day.

Given the increasing globalisation of financial markets, it is important to examine the most recent time period to draw any useful conclusions from a study such as this one. However, to avoid contamination of the results, the time period involving the global financial crisis that began in 2007 was excluded. This is because the sensitivity of individual stocks to macro-level news greatly increased during this period, and it becomes significantly harder to evaluate determinacy in this environment. Therefore, the final sample period selected is 1997 to 2007.

[INSERT TABLE 1 AROUND HERE]

Table 1 displays the characteristics of investor interest in the 108 firms in the sample, and compares them to the Compustat and I/B/E/S universes of stocks over the period 1997–2007. Relative to the Compustat universe, the sample consists of mostly large market capitalisation stocks, with 98% being in the top quintile. The majority of the sample is also in the top

[6] China was not included since the largest Chinese companies are listed in Hong Kong, and are therefore already part of the sample.

quintile when considering debt and book value measures. It is interesting to note that even though the sample firms have their secondary listing in the U.S., many of them are still among the most heavily traded. Although the sample has higher mean analyst coverage than the I/B/E/S universe—which would be expected due to the size characteristics—it is uniformly spread over the quintiles. Interestingly, the sample also has a greater dispersion of analyst opinion, suggesting the presence of variation in the information available about these firms, which is required for this study.

3.2. Information Sources

The news media sources were carefully selected in order to obtain the most relevant firm-specific news and to ensure high visibility to investors; if a news article were to appear in one of the selected publications, there is a high probability the information would be acted upon by investors. This is in contrast to the random sampling approach used in Griffin, Hirschey, and Kelly (2011), as many of the news sources identified will not have large enough readership to produce a measurable trading reaction. Hence, only daily national news publications were considered; the largest newspapers by circulation were chosen as information sources for the purposes of this study. If the country had any business- or finance-specific publications, these were given priority. Table 2 details the selected news media publications, as well as the country and the language of the publications. The company-specific news articles were downloaded from the *Dow Jones Factiva* news database.

[INSERT TABLE 2 AROUND HERE]

3.3. News and Trading Volume

Table 3 provides the descriptive statistics of the sample, organised according to the primary listing country of the firms. Figure 1 presents the incremental effect of news on U.S.

trading volume, calculated as the percentage increase between the average trading volume on days without news and the average trading volume on days with news.

All firm-level data for the sample used in the analysis was downloaded from *Bloomberg*. The sample contains 108 firms from the eight primary listing exchanges; a total of 128,706 news articles were published about them over the 10-year sample period. The dates of the news media articles were matched to the firms' daily trading volume on the NYSE. As each of the news sources in the sample are daily publications—which are released before market opening in their particular market—we measure the reaction according to the U.S. trading volume on the day of publication. Since the U.S. market is one of the last markets to open on a trading day (with the exception of the Brazilian markets that open 30 minutes before the NYSE), we assume that the news information should be acted upon on the same trading day as it is released.

The majority (108,758) of these news articles were published in the firms' home markets. With an average count of 10 articles per month, the firms in the sample could be described as being highly visible to investors, particularly when the news articles were published only in two home market publications and two U.S. market publications. Canadian firms made up the largest portion of the sample in terms of the number of firms as well as media articles; they also had the highest information flow per company, with 14.15 news articles per month.

There were 57,554 distinct days when company-specific news from the home market was published; there were 15,631 such days when company-specific news was published in the U.S. Of the 15,631 U.S. news days, 46.73% occurred on the same day as the home market news was published. 84.59% of the U.S. company-specific news was published in a 2-day window of the home market news being published.

[INSERT TABLE 3 AROUND HERE]

[INSERT FIGURE 1 AROUND HERE]

To measure information discovery in a market environment, the impact on trading volume was examined. Kim and Verrecchia (1991) show that the expected trading volume is an increasing function of the precision of the new information—if the news media publications bring new value-relevant information to the market, we should see an increase in trading volume on the day the news article is published. This finds support from Hong and Stein (2007), who highlight the importance of trading volume to the study of asset prices. They argue that the failure of conventional, rationally founded financial theory to explain the magnitude of observed trading volume leads to a disagreement-based trading explanation stemming from the differences in investors' prior beliefs when the information set is the same. Hong and Stein (2007) also note an alternative view—while trading activity may be caused by disagreement, the individual trades are idiosyncratic, such that the impact on price is negligible.

Table 3 and Figure 1 clearly show the effects of information discovery on trading volume. The differences between trading volume with and without news are significant in all cases, and with the exception of the Canadian firms, there is a positive increase in trading volume on days with news. There is, however, a good deal of variation in the effects of home market-based news and U.S. news on the trading volume of firms from different countries, with the full sample results showing that the average effect of home market news is significantly greater in magnitude than the average effect of U.S. news.

As was mentioned earlier, the approach of using trading volume to measure information discovery is in contrast with the method used in Griffin, Hirschey, and Kelly (2011) who use absolute stock returns. Table 3 shows that the pattern of absolute stock returns from the home markets on days with and without news is inconsistent across countries; further, the overall sample has significant higher absolute stock returns on days without news. This supports a

disagreement-based explanation of information processing by investors (Hong and Stein, 2007). Trading volume appears to capture the news reaction in a much clearer and more defined way than stock returns. Hence, we conclude that trading volume will provide a more effective measure than absolute stock returns when attempting to assess the characteristics of investors' information processing.

4. Methodology

The main focus of this paper is to determine the characteristics that affect investor information processing—and thereby, information discovery—in financial markets. From the preliminary analysis described in the previous section, it is quite evident that there is higher investor trading activity on days with news than on days without news. However, this finding provides no information about the speed or strength of reaction relative to other factors that may affect trading volume; neither does it explain why there is such variation in the reaction to news from different countries and the relative sensitivities to home market or U.S. based news information. To answer these research questions, we utilise several aspects of variation in the sample—language, distance, size, and visibility.

4.1. Identification of Information Discovery

In this investigation, we examine the behaviour of investors based on the observation of multiple information sets. If it is assumed that the local news media have more value-relevant information than the non-local news media (Feng and Seasholes, 2004; Ivkovic and Weisbenner, 2005), and that the local news media face lower fixed costs of collecting information than foreign news media do, the investors should be incentivised to monitor information sources from a firm's home market.

We cannot really observe the information events, i.e., the underlying events reported by the news media. Therefore, the news media coverage of such events is important to investors

as they are constrained by limited attention and they depend on the media to alert them about information events, particularly those involving foreign firms whose operations cannot be observed or have limited information flow. It is also possible that the absence of any information event in the news media may influence the investors' behaviour—it could lead to more trading based on disagreement as investors evaluate their prior beliefs.

A limitation of studies of this kind is that we cannot observe the entire information set available to the investors. Investors have access to 24-hour financial news channels, the Internet, and peers who disseminate information. Information retrieval is associated with costs, particularly for foreign firms that are not heavily covered by the U.S. based media. Therefore, it is likely that a firm's home market news publications will play a prominent role in bringing value-relevant firm-specific information to the attention of investors. Due to such search costs, it is also likely that if value-relevant information is covered in the U.S. news media—which would be associated with higher visibility and salience, and hence, a larger audience—it will impact the trading behaviour of investors.

The empirical setting allows the identification of those firms for which investors are more or less likely to rely on multiple, distinct information sources with varying characteristics, which enables us to determine the key factors that affect information discovery.

4.2 Regression Framework

The main analysis took the form of panel time-series regressions, with the change in logarithm of trading volume between days *t* and *t-1* as the dependent variable. Indicator variables were created for the home market news and the U.S. news—if a news article was published about a company in the geographic location of its primary exchange, this company would receive 1 in the time-series vector for that day. The same methodology applied if a news article was published about a company in the geographic location of its secondary

exchange, i.e., the U.S. The visibility of the news event was also accounted for in these variables—the value recorded was increased by 1 for each additional news media article published about a firm on a specific day.

The regression analysis takes the following form:

$$\Delta Ln(Vol_{i,t}) = \beta_1 H_{i,t} + \beta_2 H_{i,t-1} + \beta_3 US_{i,t} + \beta_4 US_{i,t-1} + Controls$$

where $H_{i,t}$ and $H_{i,t-1}$ are the number of news articles published about a firm *i* in its home market publications on days *t* and *t-1*, respectively. $US_{i,t}$ and $US_{i,t-1}$ are the number of news articles published about a firm *i* in the U.S. news publications on days *t* and *t-1*. The lags of the news variables allowed for the capture of any slow diffusion of news that could be caused by conservative or heterogeneous information.

In the regression analysis, we controlled for firm size (measured using market capitalisation in U.S. dollars), changes in log trading volume from the home market from day *t-1 to t*, and lags in changes in U.S. trading volume. We controlled for the current and the lagged values of the home market's absolute stock returns, which enabled us to identify whether the investors were reacting to news information, or whether they were using price deviations in the home market as a signal to trade without knowing about the news event. We also controlled for firm visibility using average analyst coverage over the sample period, the firms' home market index absolute returns, volatility using the VIX index, and country fixed effects, unless otherwise stated. In all the regressions, clustered standard errors by country and time were used, unless otherwise stated.

5. Results

To answer the research questions regarding the differences in investor information processing, we first examined the variation in the impact of news information for the firms

listed in different primary exchanges. The sample was then split by language, geographic location, and the measures of information asymmetry.

5.1. Investor Information Processing and Trading Volume

Table 4 documents the regression results estimated by ordinary least squares (OLS) for the full sample of firms. The dependent variable is the log change in the trading volume of a firm's secondary listing on the NYSE between days *t* and *t-1*. In the regressions, we controlled for past U.S. trading volume, size (using daily firm-level market equity in U.S. Dollars), the daily trading volume on the firm's primary (home) exchange, the absolute value of the firm's daily returns on the firm's primary (home) exchange, the average analyst coverage (AAC) the firm receives over the sample period, the absolute return of the home stock index on day *t*, and market volatility using the VIX. The results were controlled for country fixed effects.

Looking at the home market news variables (Table 4), the positive coefficients indicate that trading volume rises in response to news on day *t* and falls on the day following the publication of the news, with both home news variables significant at the 1% level. This shows that the predominant reaction to home market news happens on day *t.* However, when comparing the magnitudes of the coefficients on $H_{i,t}$ and $H_{i,t-1}$, they were found to be significantly different, indicating that the trading volume had not completely decreased to the pre-news levels; this could be due to the slow diffusion of news or disagreement-based trading.

[INSERT TABLE 4 AROUND HERE]

In contrast, the reaction to U.S. news was more pronounced. The magnitude of the impact of U.S. news on trading volume on day *t* was significantly greater than that of the

home market news.[7] This could perhaps be due to the greater salience and visibility of high circulation U.S. news sources among investors based in the U.S. (Huberman and Regev, 2001). The same pattern emerged when we considered the impact of the number of U.S. news articles on trading on day *t*. We found that $US_{i,t}$ had a significantly larger magnitude coefficient than $US_{i,t-1}$, which indicates that the trading volume had increased compared to the pre-news volume.

Looking at the control variables, firm size was positively related to changes in trading volume, as were increases in home market trading volume, which was expected. The lags of changes in U.S. trading volume were negatively related to the changes in U.S. trading volume. This was consistent with the lagged values of the news variables, where we saw trading volume decreasing after a rise in response to a news event. The absolute stock return on the firms' home market had a strong positive relationship with U.S. trading volume on day *t*, which is consistent with a limited attention argument, where price moves are proxies for information. It is also consistent with the findings reported in Kim and Verrechia (1991), who show that the variance of the price along with trading volume are increasing functions of the precision of the new information. Trading volume had a negative relationship to the lags of home market absolute stock returns, in line with the fall in trading volume after the significant reaction to the new information on day *t*.[8] Trading volume was also found to have a significant negative relationship to future expected volatility.

Regression (2) in Table 4 contains additional dummies that proxy for whether a news event is positive or negative by using the sign (positive/negative) of the home market return on day *t* as a signal. If the home market return is positive, good news is assumed, and vice versa. There was a positive coefficient on 'good' news but the incremental effect on trading

[7] The *F*-statistic for the restriction $H_{i,t} = US_{i,t}$ was 7.60. Therefore, we rejected the null.
[8] This is consistent with the findings reported in Campbell, Grossman, and Wang (1993)

volume was not significant, whereas the incremental effect of 'negative' news had a significant negative influence on trading volume. This suggests that the positive relationships between the home news and the U.S. news variables and the U.S. trading volume was driven by 'good' news, i.e., the days when the home market stock price increased.[9]

Table 5 presents the regression results according to the primary (home) market of each firm in the sample. The dependent variable is the log change in the trading volume of a firm's secondary listing on the NYSE between days *t* and *t-1*. In the regressions, we controlled for past U.S. trading volume, size (using daily firm-level market equity in U.S. Dollars), the daily trading volume on the firm's primary (home) exchange, the absolute value of the firm's daily returns on the firm's primary (home) exchange, the average analyst coverage (AAC) the firm receives over the sample period, the absolute return of the home stock index on day *t*, and market volatility using the VIX.

[INSERT TABLE 5 AROUND HERE]

The pattern of the impact of the independent variables on U.S. trading volume was found to be similar and consistent across the firms' primary listing countries. Only those firms with a primary listing in Hong Kong had a negative coefficient on U.S. news on day *t*, albeit not a significant one.

These results broadly suggest that the U.S. and international news sources play a significant role in disseminating information to investors. There was a consistently greater magnitude of investor reaction to U.S. news in terms of trading activity. These findings are in line with those of Dyck, Volchkova, and Zingales (2008), who show that the influence of news media is related to the cost of collecting information, which is lower for investors when

[9] In unreported results, when the home news and U.S. news variables were dropped and only the dummies for 'good' and 'bad' news were included in the regression, the dummy for good news was found to be positive and significant while the dummy for bad news was insignificant.

using U.S. news sources. Some of these costs (or frictions) associated with information processing or collecting will be explored further in a later section.

5.2. Information Processing and Language

Next, we formally investigated whether the variation in the way news information impacted trading volume on a firm's primary exchange listing could be accounted for by the language of the home market publications. In order to do this, the sample was split according to language—the firms were categorised according to whether or not their home market publications were in English. In our sample, the countries with English home market publications were Australia, Canada, India, and the U.K., while Brazil, Germany, Hong Kong, and Japan had non-English home market publications.

Table 6 presents the regression results for information processing and language. The dependent variable is the log change in the trading volume of a firm's secondary listing on the NYSE between days *t* and *t-1*. In the regressions, we controlled for past U.S. trading volume, size (using daily firm-level market equity in U.S. Dollars), the daily trading volume on the firm's primary (home) exchange, the absolute value of the firm's daily returns on the firm's primary (home) exchange, the average analyst coverage (AAC) the firm receives over the sample period, the absolute return of the home stock index on day *t*, and market volatility using the VIX. The results were controlled for country fixed effects.

[INSERT TABLE 6 AROUND HERE]

Looking only at those countries with English language news publications, the variables were found to have coefficients whose magnitude, sign, and significance were similar to the full sample results. However, when considering the countries whose home market news sources were not published in the English language, the U.S. news variables were not

significant, although the results were found to be generally consistent with the full sample and English regression results.

The lack of impact of the U.S. news sources on the trading volume of the firms whose home market language is not English has several possible explanations. Firstly, for U.S. news publications, the costs of information discovery are higher for these firms due to higher search and translation costs. These higher costs would also contribute to a time-to-market delay relative to the home market news sources that do not face the same costs. These effects lead to a greater reliance by investors on home market news compared to U.S. news publications. These findings are in line with those reported in Grinblatt and Keloharju (2001) who argue that language contributes significantly to the familiarity that influences the decisions of investors as well as the demand for information related to these firms.

Secondly, there is an information asymmetry argument associated with information discovery costs—U.S. news publications may not be able to retrieve as much value-relevant information as home market news publications are able to, given that many of the information events they discover will be also be announced by the firms in the home market language. This argument supports the findings reported by Feng and Seasholes (2004) and Ivkovic and Weisbenner (2005), who find that more precise information is available locally. Another similar interpretation is that there may be distinct investor groups, given that there is less reliance on U.S. news publications for firms with non-English home markets. These firms may not capture the attention of investors (Barber and Odean, 2008), and therefore, the investors would not include them in their investment opportunity set.

5.3. Information Processing and Geography

The sample was split based on geographic location to further examine the characteristics that would explain the variation in investor information processing. Sample variation in

geographic location captures time, distance, and cultural differences among the firms, which impact investor attention in a way that determines their trading behaviour.

The sample was broken up into three geographic zones. The first zone (Zone 1) covered the Brazilian and the Canadian firms. These were the closest primary market exchanges based on time—the Brazilian stock market opens 30 minutes before the NYSE, and the Canadian market opens at the same time. Zone 2, consisting of Germany and the U.K., covered the European region; both these markets open 6.5 hours before the NYSE. Zone 3 covered the Asian and Australasia regions, which are the furthest ahead in terms of time. This zone consisted of Australia and Japan (which open 14.5 hours before New York), Hong Kong (with a 13.5 hour lead), and India (which is 10.75 hours ahead).

Table 7 documents the regression results of the sample that was split according to geographic region. The dependent variable is the log change in the trading volume of a firms' secondary listing on the NYSE between day's *t* and *t-1*. In the regressions, we controlled for past U.S. trading volume, size (using daily firm-level market equity in U.S. Dollars), the daily trading volume on the firm's primary (home) exchange, the absolute value of the firm's daily returns on the firm's primary (home) exchange, the average analyst coverage (AAC) the firm receives over the sample period, the absolute return of the home stock index on day *t*, and market volatility using the VIX. The results were controlled for country fixed effects.

[INSERT TABLE 7 AROUND HERE]

The first notable aspect of these results is that the impact of home market news on U.S. trading volume on trading days *t* and *t+1* was fairly similar across the geographic regions, although with slighter less significance in Zone 3, which would be expected given that it is the furthest ahead in time. This shows that distance is not a key factor that affects the transmission of home market news information around the world. Due to modern technology,

this result is to be expected as geographical distance should not hinder international news agencies from carrying news related to information events.

The second notable aspect of the geographic variation in the results is that the impact of U.S. news publications on trading volume was found to weaken across the geographic zones on moving further away from the NYSE.[10] Several explanations for this would appear plausible. Firstly, it is quite possible that the news coming out in Zone 3 (which is released earlier) is stale. Therefore, it is likely that some investors would have already incorporated the new information, perhaps trading in the home market instead. Secondly, investors may be less familiar with those firms that are further away and would, therefore, be less attentive to them, causing the weaker reaction due to lower demand for information related to these firms. The familiarity explanation is consistent with the findings of Grinblatt and Keloharju (2001), Huberman (2001), and Zhu (2003).

5.4. Information Processing and Asymmetries

So far, the differences in the investors' information processing related to the characteristics of language and geography were explained through limited attention, familiarity, and the costs of collecting information. To test the strength of these arguments, we split the sample using measures of information asymmetry. While the characteristics of language and geography do come under the general umbrella of information asymmetry, they provide only an incomplete account of the information characteristics that affect investors' investment decisions. Therefore, in order to provide a fuller description of investor reaction to news information, we split the sample by size and average analyst coverage, which would provide greater insight into the visibility and information flow that investors receive about firms.

[10] The Z-statistic of the difference between the coefficient of Zone 1 ($US_{i,t}$) and the coefficient of zone 3 ($US_{i,t}$) was 7.13. Therefore, we rejected the null.

Table 8 documents the regression results of the sample that was split according to size. The dependent variable is the log change in the trading volume of a firms' secondary listing on the NYSE between days *t* and *t-1*. In the regressions, we controlled for past U.S. trading volume, size (using daily firm-level market equity in U.S. Dollars), the daily trading volume on the firm's primary (home) exchange, the absolute value of the firm's daily returns on the firm's primary (home) exchange, the average analyst coverage (AAC) the firm receives over the sample period, the absolute return of the home stock index on day *t*, and market volatility using the VIX. The results were controlled for country fixed effects.

The top third of the sample ranked by market capitalisation were classified as large firms, the second third as medium firms, and the bottom third were classified as small firms (Table 8). We found that the results were somewhat mixed. Firstly, for large and small firms, we found insignificant coefficients on the home market news variables on the day the news articles were published. Consistent with earlier results, however, the coefficients on $H_{i,t-1}$ were negative and significant for medium and small firms.

[INSERT TABLE 8 AROUND HERE]

Secondly, we found insignificant coefficients on U.S. news across all three size categories. This is counterintuitive, since it would be expected that U.S. news plays a greater role in providing investors with information for larger firms, as the demand function for information should increase for firms that have larger payoffs with regard to information (Veldkamp, 2006). Looking at the number of media articles in each sub-sample, it would appear that firm size was positively related to the level of media coverage (or attention). However, there was no significant impact on trading volume that correlated to this. It seems that size or media attention was not a major friction for information processing. Reconciling this finding with the characteristics of the sample from Table 1, 98% of the firms in the sample were in the top quintile according to market capitalisation relative to the Compustat

universe. Since there is little variation in firm size in the sample relative to the possible investment opportunity sets of the investors, it is perhaps not surprising that the results are inconsistent. The results in Table 8 do, however, indicate greater trading volume sensitivity to average analyst coverage (AAC) for small firms.

Splitting the sample by AAC produced a much more interesting picture. This is perhaps because there was much greater variation in the analyst coverage of the sample firms relative to the Compustat universe (see Table 1) than there was in firm size, thereby providing the necessary variation required to arrive at inferences regarding the differences in information processing that affect investors' decisions.

Table 9 documents the regression results of the firms that were split into equal sub-samples based on their ranking according to average analyst coverage (AAC) over the sample time period. The dependent variable is the log change in the trading volume of a firms' secondary listing on the NYSE between days *t* and *t-1*. In the regressions, we controlled for past U.S. trading volume, size (using daily firm-level market equity in U.S. Dollars), the daily trading volume on the firm's primary (home) exchange, the absolute value of the firm's daily returns on the firm's primary (home) exchange, the average analyst coverage (AAC) the firm receives over the sample period, the absolute return of the home stock index on day *t*, and market volatility using the VIX. The results were controlled for country fixed effects.

[INSERT TABLE 9 AROUND HERE]

Looking at the news variables across the sub-samples, the coefficients on firms with low analyst coverage stood out in comparison to the other sub-samples. The coefficients on home market news were consistent with the previous results. However, it was found that U.S. news variables lacked significance for firms that had greater information processing frictions. Interestingly, for firms with low analyst coverage, significant relationships were found with size, whereas there were no significant relationships for firms with medium and high analyst

coverage. Moreover, there were significant positive relationships with average analyst coverage and absolute home market returns. This suggests that when there is higher information processing frictions, investors use other signals while making their trading decisions. Firms with high analyst coverage were the least sensitive to changes in analyst coverage and size, indicating very few information asymmetries.

Looking at the number of media articles published in each sub-sample, it appears that media attention was not the driving factor in determining the differences in investors' information sets. Analyst coverage appeared to be one of the main determinants of investor demand for information. These results enforce the limited attention argument that the characteristics of a firm's information flow significantly affected the demand for particular sources of information.

5.5. Impact of Home Market Information

Next, we examined the impact of news information on investors' trading behaviour in the home market. In the home markets, fewer information asymmetries between investors and the sample firms would be expected. Information flow from media sources would be much higher in the firms' home markets. Therefore, investors with limited attention constraints would have their focus drawn to these firms.

The regression results with home market trading volume as the dependent variable are displayed in Table 10. The dependent variable is the log change in the trading volume of a firms' primary listing in its home market between days *t* and *t-1*. In the regressions, we controlled for past home trading volume, size (using daily firm-level market equity in U.S. Dollars), the daily trading volume on the firm's primary (home) exchange, the absolute value of the firm's daily returns on the firm's primary (home) exchange, the average analyst coverage (AAC) the firm receives over the sample period, the absolute return of the home

stock index on day *t*, and market volatility using the VIX. The results were controlled for country fixed effects.

[INSERT TABLE 10 AROUND HERE]

We found significant positive coefficients on both the home news and the U.S. news variables on day *t* when the news is published. There were also significant negative coefficients on the home news and the U.S news variables on the day following publication, showing a fall in trading volume, with the information being incorporated within one day by the investors. However, the positive relationship between home market trading volume and future expected volatility was found to be inconsistent with the U.S. trading volume results.

Investors in their home markets were found to react quickly to both sets of news. Firstly, this shows a dependence on local information, which is related to limited attention (Kahneman, 1973), familiarity with local firms (Grinblatt and Keloharju, 2001; Huberman, 2001), and search costs. Secondly, this supports the theory put forward by Shiller (2005), which states that U.S. news media—particularly English language news publications—are influential around the world and have a disproportionate effect on the markets of other countries. These effects are due to their high visibility and credibility (Dyck, Volchkova, and Zingales, 2008), and the ease of copying and translating the information by local news sources.

6. Conclusions

This study examines the characteristics of information that influence the trading behaviour of investors. The empirical design allowed for the identification of distinct information sources that investors would be more or less likely to utilise under differing information characteristics. We performed the analysis using a sample of 108 global firms spanning eight countries, five continents, and covering five home market languages. The

sample firms had a secondary listing on the NYSE, making it possible to measure the effects of information discovery from a common base. Following the examination of investor reaction to 128,706 firm-specific news articles from 18 news publications over the period 1997–2007, our main findings show that investor utilisation of information and the particular sources used to update their information sets were significantly influenced by information asymmetries relating to the firm. We showed that the reactions of prices and trading volume to news were not related. This is apparent from a rise in trading volume and a fall in absolute returns on news days in the full sample results.

The results of this study contribute to several areas of research—limited attention, the role of the news media, and the influence of news on trading volume. They add weight to the information asymmetry-based explanation of the variation in investor reactions to the news that was proposed by Easley et al. (1996), and substantiate the claims of Grinblatt and Keloharju (2001) related to familiarity through language and location that could induce a bias towards local investments.

Firstly, we showed that a firm's home market language increased the dependence of investors on local information if the language was not English. This effect is attributed to the translation costs faced by international news agencies, which could cause a delay in information transmission, and also to the fact that local news sources would be able to extract value-relevant information while reporting local news events. Our findings extend the findings of Grinblatt and Keloharju (2001) on a global scale.

Secondly, we found that geographic variation or time lag did not alter the way investors reacted to home market information, which would be expected given the limited constraints on information transmission due to the current advances in technology. However, investor reaction to U.S. news information weakened the further away the firm's home market was from the location of U.S. trading activity. This supports the hypothesis that investors are more

familiar with the firms that are geographically closest to them, and hence, have a higher propensity to react to information regarding these firms. An explanation based on stale information due to time advantages and less familiarity such as what is proposed in Grinblatt and Keloharju (2001), Huberman (2001), and Zhu (2003) would be consistent with our findings.

Thirdly, investor dependence on home news information increased for firms with higher information asymmetries when measured using analyst coverage. This shows that analyst coverage is an important aspect of information flow and firm visibility for investors—it influences investor demand for alternative information sources by inducing variation in the costs associated with information collection.

Finally, investors in their home markets reacted to the news articles that were published in a firm's home market as well as in the U.S. This shows local dependence on local information, which is related to limited attention, familiarity with local firms, and search costs. Our results indicate that local investors process information much more efficiently than non-local investors, consistent with the findings of Ivkovic and Weisbenner (2005). This supports the information asymmetry explanation of the variation in investor reaction to news. These results also highlight the influence and visibility that U.S. news publications have around the world.

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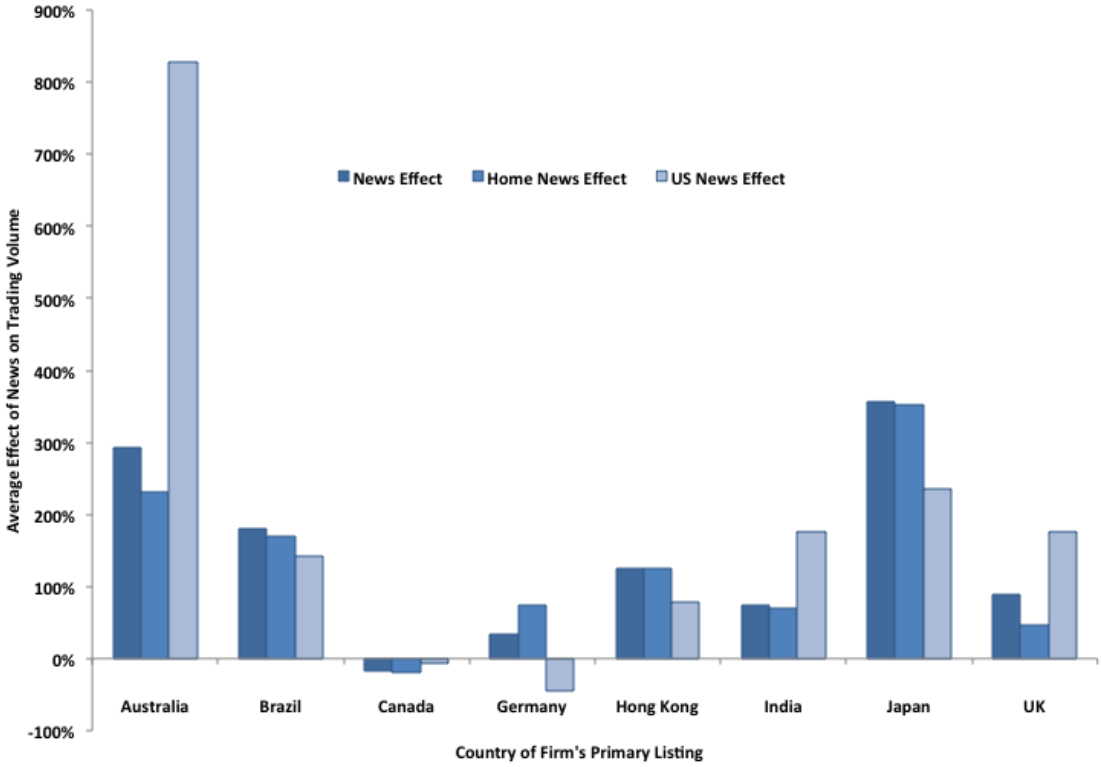
Figure 1: Effect of News on U.S. Trading Volume



Source: The values used are from Table 3.

Table 1: Characteristics of Investor Interest (1997–2007)

	Sample Firm-Year Observations			Compustat & I/B/E/S Universe Firm-Year Observations			Quintiles (%)				
							Low				High
Firm Characteristics	Mean	Median	N	Mean	Median	N	1	2	3	4	5
Total Assets ($m)	100178	16272	1046	5689	167	114947	0	0	1	4	95
Book Value P/S ($)	18.79	14.52	967	16160.36	4.30	110132	1	4	16	22	56
Book/Market	0.52	0.49	247	-4.29	0.46	82981	0	28	42	22	9
Long Term Debt ($m)	9321	2820	1046	948	8	114717	0	4	3	8	84
Market Value ($m)	16442	11684	247	1800	100	82981	0	0	1	0	98
Shares Traded	138645898	47651000	955	96698532	10761300	110850	9	8	15	23	45
Analyst Recommendations	6.87	4	10297	5.80	3	2007131	13	15	30	14	29
Analyst Dispersion	0.71	0.73	10287	0.61	0.70	2007131	21	6	27	27	19

Source: Analyst Recommendations and Analyst Dispersion data: I/B/E/S. Other data: Compustat Fundamentals Annual Database.

Notes: For both of the variables describing analyst coverage, N is the number of total observations. The last five columns report the distribution of the investor interest characteristics for the sample firm-year observations relative to the quintile breakpoints for the covered firm-year observations.

Table 2: News Media Sources Selected for the Study

Country	News Sources	Language
Australia	*The Australian, The Australian Financial Review*	English
Brazil	*Folha de S. Paulo, Valor Econômico*	Portuguese
Canada	*The Globe and Mail, National Post* (*Financial Post*)	English
Germany	*Financial Times Deutschland, Handelsblatt*	German
Hong Kong	*Hong Kong Economic Times, Hong Kong Economic Journal*	Chinese
India	*The Times of India, The Economic Times*	English
Japan	*Yomiuri Shimbun, Nihon Keizai Shimbun*	Japanese
U.K.	*Financial Times, The Times*	English
U.S.	*The Wall Street Journal, The New York Times*	English

Table 3: Descriptive Statistics—The Effect of News on U.S. Trading Volume (1997–2007)

	Firms' Primary Listing Country								
Statistic	Australia	Brazil	Canada	Germany	Hong Kong	India	Japan	U.K.	Full Sample
No. Firms	4	16	27	4	12	8	18	19	108
News Articles Home	3448	13260	42978	3351	4205	7134	12624	21758	108758
News Articles U.S.	311	433	2881	2152	572	130	6737	6732	19948
News Days	2303	7300	21715	3048	3103	4573	9930	13908	65880
Av. News Articles per Company per Month	7.83	7.32	14.15	11.46	3.32	7.56	8.96	12.50	9.93
U.S. Trading Volume									
Average	11619	410930	130631	125601	102335	157357	42917	88086	101198
Average with NO News	8577	306498	139608	112809	90393	135410	28089	72388	83748
Average with News	33603	859966	116261	151765	203411	234919	128229	136579	158402
Diff t-stat (News – NO News)	(29.38)	(38.15)	(-6.17)	(10.01)	(24.26)	(15.42)	(69.61)	(29.68)	(63.86)
Average with Home News *Only*	28492	828369	113048	196246	203545	230193	127004	106119	157186
Average with U.S. News *Only*	79569	739736	129941	63309	162125	374206	94268	199513	125805
Diff t-stat (Home News–U.S. News)	(-3.72)	(2.05)	(-1.39)	(17.02)	(2.31)	(-1.71)	(8.88)	(-11.61)	(-11.07)
Home Market Absolute Stock Returns									
Average with News	1.34%	1.82%	1.35%	1.65%	1.90%	1.96%	1.54%	1.49%	1.53%
Average with NO News	1.27%	1.86%	1.38%	1.66%	2.03%	1.90%	1.87%	1.36%	1.63%
Diff t-stat (News – NO News)	(2.37)	(-2.96)	(-3.59)	(-0.37)	(-1.55)	(2.12)	(-16.53)	(8.01)	(-13.46)

Source: The news articles were downloaded from *Factiva*. All other data is from *Bloomberg*. The sources of home news and U.S news are provided in Table 1.

Notes: Home news is defined as a news article published in a firms' primary listing country; U.S. news is defined as articles published in U.S. news publications. News days are the number of company-specific independent days on which news is published.

Table 4: Investor Information Processing and Trading Volume for Full Sample (1997–2007)

	Full Sample			
Independent Variables	(1)		(2)	
$H_{i,t}$	0.0062	***	0.0075	***
	(0.00)		(0.00)	
$H_{i,t-1}$	-0.0038	***	-0.0037	***
	(0.00)		(0.00)	
$US_{i,t}$	0.0164	***	0.0235	***
	(0.01)		(0.01)	
$US_{i,t-1}$	-0.0066	***	-0.0064	***
	(0.00)		(0.00)	
$Size_{i,t}$	0.0043	**	0.0046	**
	(0.00)		(0.00)	
$H\_VOL_{i,t}$	0.2159	***	0.2158	***
	(0.03)		(0.03)	
$US\_VOL_{i,t-1}$	-0.5311	***	-0.5311	***
	(0.01)		(0.01)	
$US\_VOL_{i,t-2}$	-0.2536	***	-0.2536	***
	(0.01)		(0.01)	
$\lvert R_{i,t}\rvert$	6.2770	***	6.2748	***
	(0.88)		(0.88)	
$\lvert R_{i,t-1}\rvert$	-0.0932		-0.0954	
	(0.47)		(0.47)	
$\lvert R_{i,t-2}\rvert$	-3.0767	***	-3.0777	***
	(0.40)		(0.40)	
AAC_i	-0.0003		-0.0002	
	(0.00)		(0.00)	
$\lvert HmktR_{i,t}\rvert$	0.4789		0.4796	
	(0.46)		(0.46)	
VIX	-0.0015	***	-0.0014	***
	(0.00)		(0.00)	
D=1 if $H_{i,t}\lvert US_{i,t}>0$ & $R_{i,t}>0$			0.0045	
			(0.01)	
D=1 if $H_{i,t}\lvert US_{i,t}>0$ & $R_{i,t}<0$			-0.0202	***
			(0.01)	
Country Fixed Effects	YES		YES	
Adj. R-Squared	0.2791		0.2791	
N	176,617		176,617	

Source: The news media articles were downloaded from the *Factiva* database for firms with a primary listing in Australia, Brazil, Canada, Germany, Hong Kong, India, Japan, or the U.K. and a secondary listing on the NYSE.

Notes: $H_{i,t}$ is the number of news media articles published about a firm i on day t in its primary (home) market. $US_{i,t}$ is the number of news media articles published about a firm i on day t in the U.S., where the firm has its secondary listing. Standard errors clustered by time and country are shown in parentheses, while *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5: Investor Information Processing and Trading Volume—Firms categorised by home market (1997–2007)

Independent Variables	Australia		Brazil		Canada		Germany		Hong Kong		India		Japan		UK	
$H_{i,t}$	0.0037		0.0063		0.0060	**	0.0013		0.0128	***	0.0009		0.0028		0.0037	
	(0.01)		(0.00)		(0.00)		(0.01)		(0.00)		(0.01)		(0.00)		(0.00)	
$H_{i,t-1}$	-0.0221	*	-0.0034		-0.0030		-0.0017		0.0012		-0.0044		-0.0039		-0.0017	
	(0.01)		(0.00)		(0.00)		(0.01)		(0.01)		(0.01)		(0.00)		(0.00)	
$US_{i,t}$	0.0194		0.0610	**	0.0412	***	0.0283		-0.0033		0.0262		0.0069		0.0201	**
	(0.04)		(0.03)		(0.01)		(0.02)		(0.03)		(0.06)		(0.01)		(0.01)	
$US_{i,t-1}$	0.0037		0.0098		-0.0106		-0.0213		0.0019		0.0050		-0.0036		-0.0045	
	(0.04)		(0.03)		(0.01)		(0.02)		(0.03)		(0.06)		(0.01)		(0.01)	
$Size_{i,t}$	-0.0043		-0.0035		-0.0009		0.0046		-0.0011		-0.0060		-0.0017		-0.0016	
	(0.01)		(0.00)		(0.00)		(0.01)		(0.00)		(0.01)		(0.00)		(0.00)	
$H\_VOL_{i,t}$	0.1312	***	0.3937	***	0.2380	***	0.3227	***	0.2339	***	0.0773	***	0.1423	***	0.2089	***
	(0.04)		(0.02)		(0.01)		(0.03)		(0.03)		(0.03)		(0.02)		(0.02)	
$US\_VOL_{i,t-1}$	-0.5860	***	-0.4884	***	-0.4970	***	-0.4973	***	-0.5228	***	-0.5174	***	-0.5619	***	-0.5282	***
	(0.02)		(0.01)		(0.01)		(0.02)		(0.01)		(0.02)		(0.01)		(0.01)	
$US\_VOL_{i,t-2}$	-0.2926	***	-0.2312	***	-0.2401	***	-0.2235	***	-0.2362	***	-0.2669	***	-0.2708	***	-0.2403	***
	(0.01)		(0.01)		(0.01)		(0.02)		(0.01)		(0.02)		(0.01)		(0.01)	
$\lvert R_{i,t}\rvert$	6.9894	***	3.2647	***	8.4201	***	4.8556	***	7.6046	***	4.7017	***	4.6701	***	7.3357	***
	(1.19)		(0.50)		(0.30)		(0.77)		(0.48)		(0.59)		(0.37)		(0.45)	
$\lvert R_{i,t-1}\rvert$	-0.9584		1.8988	***	0.4456		0.5304		-1.2720	***	-0.4948		-1.1038	***	-0.7068	**
	(1.16)		(0.41)		(0.28)		(0.58)		(0.41)		(0.54)		(0.34)		(0.36)	
$\lvert R_{i,t-2}\rvert$	-4.5986	***	-1.9229	***	-4.4500	***	-2.0035	***	-3.5438	***	-3.1279	***	-2.3209	***	-2.7146	***
	(1.06)		(0.40)		(0.29)		(0.55)		(0.39)		(0.57)		(0.34)		(0.36)	
AAC_i	0.0042		-0.0014		-0.0015	*	-0.0011		-0.0006		0.0020		0.0004		0.0002	
	(0.01)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
$\lvert HmktR_{i,t}\rvert$	1.8093		1.4684	**	1.5216	**	0.2662		-0.7400		2.3938	**	0.8357		-1.5284	**
	(2.62)		(0.70)		(0.59)		(1.02)		(0.90)		(1.06)		(0.73)		(0.78)	
VIX	-0.0007		-0.0019	*	-0.0023	***	-0.0034	**	-0.0017		-0.0012		-0.0011		-0.0017	*
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
Country Fixed Effects	NO		NO		NO		NO		NO		NO		NO		NO	
Adj. R-Squared	0.2815		0.318		0.2974		0.2957		0.2908		0.2419		0.2697		0.2667	
N	7,296		20,508		49,991		6,169		17,533		9,484		31,071		34,565	

Source: The news media articles were downloaded from the *Factiva* database for firms with a primary listing in Australia, Brazil, Canada, Germany, Hong Kong, India, Japan, or the U.K. and a secondary listing on the NYSE.

Notes: $H_{i,t}$ is the number of news media articles published about a firm i on day t in its primary (home) market. $US_{i,t}$ is the number of news media articles published about a firm i on day t in the U.S., where the firm has its secondary listing. Standard errors clustered by time and country are shown in parentheses, while *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6: Investor Information Processing and Language (1997–2007)

Independent Variables	English		Non-English	
$H_{i,t}$	0.0053	***	0.0059	***
	(0.00)		(0.00)	
$H_{i,t-1}$	-0.0043	***	-0.0029	***
	(0.00)		(0.00)	
$US_{i,t}$	0.0248	***	0.0062	
	(0.01)		(0.00)	
$US_{i,t-1}$	-0.0055	*	-0.0065	
	(0.00)		(0.00)	
$Size_{i,t}$	0.0061	*	0.0029	*
	(0.00)		(0.00)	
$H\_VOL_{i,t}$	0.1897	***	0.2696	***
	(0.04)		(0.07)	
$US\_VOL_{i,t-1}$	-0.5273	***	-0.5342	***
	(0.02)		(0.02)	
$US\_VOL_{i,t-2}$	-0.2536	***	-0.2516	***
	(0.01)		(0.01)	
$\|R_{i,t}\|$	7.3626	***	4.9661	***
	(0.81)		(1.29)	
$\|R_{i,t-1}\|$	-0.0444		-0.0416	
	(0.46)		(0.88)	
$\|R_{i,t-2}\|$	-3.6057	***	-2.4734	***
	(0.52)		(0.49)	
AAC_i	-0.0005		0.0001	
	(0.00)		(0.00)	
$\|HmktR_{i,t}\|$	0.4959		0.6196	
	(0.99)		(0.60)	
VIX	-0.0014	***	-0.0015	***
	(0.00)		(0.00)	
Country Fixed Effects	YES		YES	
Adj. R-Squared	0.2758		0.2849	
N	101,336		75,281	

Source: The news media articles were downloaded from the *Factiva* database for firms with a primary listing in Australia, Brazil, Canada, Germany, Hong Kong, India, Japan, or the U.K. and a secondary listing on the NYSE.

Notes: The language of each firm's primary listing country splits the sample into English (Australia, Canada, India, and the U.K.) and non-English (Brazil, Germany, Hong Kong, and Japan). $H_{i,t}$ is the number of news media articles published about a firm i on day t in its primary (home) market. $US_{i,t}$ is the number of news media articles published about a firm i on day t in the U.S., where the firm has its secondary listing. Standard errors clustered by time and country are shown in parentheses, while *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7: Investor Information Processing and Geography (1997–2007)

Independent Variables	Zone 1		Zone 2		Zone 3	
$H_{i,t}$	0.0047	***	0.0035	***	0.0053	**
	(0.00)		(0.00)		(0.00)	
$H_{i,t-1}$	-0.0045	***	-0.0017	***	-0.0045	*
	(0.00)		(0.00)		(0.00)	
$US_{i,t}$	0.0422	***	0.0213	***	0.0053	*
	(0.00)		(0.00)		(0.00)	
$US_{i,t-1}$	-0.0095	**	-0.0074	*	-0.0053	***
	(0.00)		(0.00)		(0.00)	
$Size_{i,t}$	0.0084	*	0.0026	***	0.0030	**
	(0.01)		(0.00)		(0.00)	
$H\_VOL_{i,t}$	0.2838	***	0.2118	***	0.1324	***
	(0.07)		(0.03)		(0.04)	
$US\_VOL_{i,t-1}$	-0.4968	***	-0.5283	***	-0.5530	***
	(0.00)		(0.01)		(0.01)	
$US\_VOL_{i,t-2}$	-0.2388	***	-0.2412	***	-0.2686	***
	(0.00)		(0.00)		(0.01)	
$\lvert R_{i,t}\rvert$	6.6243	***	7.0591	***	6.1811	***
	(2.44)		(0.70)		(1.05)	
$\lvert R_{i,t-1}\rvert$	1.1491	*	-0.5132		-1.0613	***
	(0.68)		(0.34)		(0.12)	
$\lvert R_{i,t-2}\rvert$	-3.4014	***	-2.6447	***	-3.0988	***
	(1.17)		(0.14)		(0.44)	
AAC_i	-0.0005		-0.0004	***	0.0008	***
	(0.00)		(0.00)		(0.00)	
$\lvert HmktR_{i,t}\rvert$	1.1051	***	-1.2709	***	0.7222	
	(0.06)		(0.48)		(0.64)	
VIX	-0.0012	***	-0.0018	***	-0.0013	***
	(0.00)		(0.00)		(0.00)	
Country Fixed Effects	YES		YES		YES	
Adj. R-Squared	0.3008		0.2692		0.2718	
N	70,499		40,734		65,384	

Source: The news media articles were downloaded from the *Factiva* database for firms with a primary listing in Australia, Brazil, Canada, Germany, Hong Kong, India, Japan, or the U.K. and a secondary listing on the NYSE.

Notes: The geographic zone of each firm's primary listing country splits the sample into Zone 1 (Brazil, Canada), Zone 2 (Germany, U.K.), and Zone 3 (Australia, Hong Kong, India, and Japan). $H_{i,t}$ is the number of news media articles published about a firm i on day t in its primary (home) market. $US_{i,t}$ is the number of news media articles published about a firm i on day t in the U.S., where the firm has its secondary listing. Standard errors clustered by time and country are shown in parentheses, while *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8: Investor Information Processing and Firm Size (1997–2007)

Independent Variables	Large		Medium		Small	
$H_{i,t}$	0.0029	*	0.0077	**	0.0128	*
	(0.00)		(0.00)		(0.01)	
$H_{i,t-1}$	-0.0019		-0.0061	***	-0.0080	***
	(0.00)		(0.00)		(0.00)	
$US_{i,t}$	0.0139	*	0.0331	*	0.0016	
	(0.01)		(0.02)		(0.02)	
$US_{i,t-1}$	-0.0105	***	0.0089		-0.0262	
	(0.00)		(0.02)		(0.04)	
$Size_{i,t}$	-0.0002		0.0022		0.0027	
	(0.00)		(0.00)		(0.01)	
$H\_VOL_{i,t}$	0.2097	***	0.2321	***	0.2090	***
	(0.02)		(0.03)		(0.06)	
$US\_VOL_{i,t-1}$	-0.5216	***	-0.5343	***	-0.5336	***
	(0.01)		(0.02)		(0.01)	
$US\_VOL_{i,t-2}$	-0.2401	***	-0.2572	***	-0.2580	***
	(0.01)		(0.01)		(0.01)	
$\lvert R_{i,t} \rvert$	5.7216	***	6.6791	***	6.4440	***
	(0.98)		(1.06)		(1.18)	
$\lvert R_{i,t-1} \rvert$	-0.9625	***	0.4505		0.1929	
	(0.34)		(0.56)		(0.58)	
$\lvert R_{i,t-2} \rvert$	-2.3910	***	-3.2591	***	-3.4461	***
	(0.37)		(0.69)		(0.38)	
AAC_i	0.0003		-0.0012	***	0.0012	***
	(0.00)		(0.00)		(0.00)	
$\lvert HmktR_{i,t} \rvert$	0.5568		0.6524		0.1311	
	(0.59)		(0.83)		(0.75)	
VIX	-0.0015	***	-0.0016	***	-0.0015	***
	(0.00)		(0.00)		(0.00)	
Country Fixed Effects	YES		YES		YES	
Adj. R-Squared	0.2666		0.2833		0.2843	
N	63,640		63,825		49,152	
Media Articles	63,884		44,773		20,089	

Source: The news media articles were downloaded from the *Factiva* database for firms with a primary listing in Australia, Brazil, Canada, Germany, Hong Kong, India, Japan, or the U.K. and a secondary listing on the NYSE.

Notes: The sample is split equally based on firm size using average market capitalisation over the sample period. $H_{i,t}$ is the number of news media articles published about a firm i on day t in its primary (home) market. $US_{i,t}$ is the number of news media articles published about a firm i on day t in the U.S., where the firm has its secondary listing. Standard errors clustered by time and country are shown in parentheses, while *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 9: Investor Information Processing and Average Analyst Coverage (1997–2007)

Independent Variables	High		Medium		Low	
$H_{i,t}$	0.0068	***	0.0058	*	0.0047	**
	(0.00)		(0.00)		(0.00)	
$H_{i,t-1}$	-0.0018	**	-0.0044		-0.0061	***
	(0.00)		(0.00)		(0.00)	
$US_{i,t}$	0.0110	**	0.0362	***	0.0125	
	(0.01)		(0.01)		(0.03)	
$US_{i,t-1}$	-0.0099	***	0.0067		0.0002	
	(0.00)		(0.01)		(0.01)	
$Size_{i,t}$	0.0007		0.0020		0.0075	**
	(0.00)		(0.00)		(0.00)	
$H\_VOL_{i,t}$	0.2215	***	0.2074	***	0.2200	***
	(0.03)		(0.05)		(0.05)	
$US\_VOL_{i,t-1}$	-0.5164	***	-0.5318	***	-0.5426	***
	(0.01)		(0.01)		(0.02)	
$US\_VOL_{i,t-2}$	-0.2452	***	-0.2519	***	-0.2698	***
	(0.00)		(0.01)		(0.01)	
$\lvert R_{i,t} \rvert$	6.3947	***	6.6744	***	5.4312	***
	(0.42)		(1.25)		(1.27)	
$\lvert R_{i,t-1} \rvert$	-0.7291		-0.0394		0.5815	*
	(0.46)		(0.65)		(0.33)	
$\lvert R_{i,t-2} \rvert$	-2.7547	***	-3.3394	***	-3.0528	***
	(0.17)		(0.48)		(0.66)	
AAC_i	0.0000		-0.0011	*	0.0004	***
	(0.00)		(0.00)		(0.00)	
$\lvert HmktR_{i,t} \rvert$	0.2411		-0.0256		1.8029	***
	(0.42)		(0.78)		(0.28)	
VIX	-0.0015	***	-0.0016	***	-0.0011	***
	(0.00)		(0.00)		(0.00)	
Country Fixed Effects	YES		YES		YES	
Adj. R-Squared	0.2745		0.2786		0.2802	
N	64,896		59,577		56,747	
Media Articles	53,239		34,151		41,316	

Source: The news media articles were downloaded from the *Factiva* database for firms with a primary listing in Australia, Brazil, Canada, Germany, Hong Kong, India, Japan, or the U.K. and a secondary listing on the NYSE.

Notes: The sample is split based on the average analyst coverage of the firms over the sample period. $H_{i,t}$ is the number of news media articles published about a firm *i* on day *t* in its primary (home) market. $US_{i,t}$ is the number of news media articles published about a firm *i* on day *t* in the U.S., where the firm has its secondary listing. Standard errors clustered by time and country are shown in parentheses, while *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10: Impact of Home Market Trading Volume on Investor Information Processing (1997–2007)

Independent Variables	Full Sample	
$H_{i,t}$	0.0159	***
	(0.00)	
$H_{i,t-1}$	-0.0150	***
	(0.00)	
$US_{i,t}$	0.0225	***
	(0.01)	
$US_{i,t-1}$	-0.0135	**
	(0.01)	
$Size_{i,t}$	-0.0039	*
	(0.00)	
$H\_VOL_{i,t-1}$	-0.4697	***
	(0.02)	
$H\_VOL_{i,t-2}$	-0.2293	***
	(0.01)	
$\|R_{i,t-1}\|$	0.5701	**
	(0.27)	
$\|R_{i,t-2}\|$	-3.1106	***
	(0.19)	
AAC_i	0.0002	
	(0.00)	
VIX	0.0012	**
	(0.00)	
Country Fixed Effects	YES	
Adj. R-Squared	0.1974	
N	176,617	

Source: The news media articles were downloaded from the *Factiva* database for firms with a primary listing in Australia, Brazil, Canada, Germany, Hong Kong, India, Japan, or the U.K. and a secondary listing on the NYSE.

Notes: $H_{i,t}$ is the number of news media articles published about a firm i on day t in its primary (home) market. $US_{i,t}$ is the number of news media articles published about a firm i on day t in the U.S., where the firm has its secondary listing. Standard errors clustered by time and country are shown in parentheses, while *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.