

Do the frequencies of analyst coverage and conference calls influence stock market trading? Evidence from Taiwan

分析師關注度和法說會的頻率會影響股市交易嗎？以台灣為例

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Abstract: This research investigates whether the frequencies of analyst coverage and conference calls affect stock trading by using a sample of Taiwanese listed companies over the period 2009-2015. The results show that analyst coverage has a greater impact on stock turnover and price range than conference calls have. In particular, domestic analyst coverage has a significantly positive impact on stock turnover and price range. Involuntary conference calls have significant effects on stock market trading, but voluntary calls do not. Furthermore, the frequencies of analyst coverage and involuntary conference calls affect stock market trading by influencing institutional investor trading. Firms with analyst coverage or conference calls have higher institutional investor stock trades than firms without analyst coverage or conference calls do. Finally, analyst coverage has a mediating effect on the correlation between conference calls and stock trading.

Keywords: Analyst coverage, conference calls, stock turnover rate, stock price range, institutional investors.

摘要：本研究探討分析師關注度和法說會的頻率對股票交易的影響，並以

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2009-2015 年台灣上市櫃公司為研究對象。研究發現，分析師關注度對股票週轉率和股價區間的影響高於法說會的影響，其中國內分析師關注度的影響更為明顯。非自願性法說會對該股票交易有顯著影響，但自願性法說會則並沒有顯著影響。另外，分析師報導和非自願性法說會的頻率透過影響機構投資人交易來影響股票市場，有分析師關注或法說會的公司比沒有分析師關注或法說會的公司有更高的機構投資人股票交易。最後，本研究亦發現分析師關注度對法說會和股票交易之間的相關性存在中介影響效果。

關鍵詞：分析師關注度、法說會、股票週轉率、股價區間、機構投資人

1. Introduction

Investors in financial markets often do not fully understand what a company's current earnings mean for its future performance (Bernard and Thomas, 1990; Sloan, 1996). In practice, investors may experience severe information asymmetry and thus often use analyst reports (e.g., investment recommendations, earnings forecasts, and target prices) as important references for evaluating a firm's performance and value (Call *et al.*, 2013; Guagliano *et al.*, 2013). As an information intermediary between managers and investors, sell-side securities analysts are among the most influential information providers in financial markets. Analyst reports have been proven informative to market participants (Brown *et al.*, 2015; Kadan *et al.*, 2012). Indeed, increased analyst coverage is positively associated with future changes in a firm's fundamentals and stock trading (Jung *et al.*, 2015).

In addition to analyst reports, numerous studies have shown that conference calls are a vital platform for managers to disseminate information or to provide supplemental disclosures to capital markets (Balakrishnan *et al.*, 2014; Robin and Wu, 2015; Shiri *et al.*, 2016). Research presents that conference calls can inform various market participants, because they allow the transmission of hard and soft information (Brochet *et al.*, 2016; Davis *et al.*, 2015) that may help to reduce information asymmetry (Brown *et al.*, 2004) and analyst forecast errors (Bassemir *et al.*, 2013; Siougle *et al.*, 2014). Therefore, conference calls are regarded as an

important channel for shareholders, securities analysts, and investors to obtain information about firms' value and can lead to reactions in stock prices (Matsumoto *et al.*, 2011) and liquidity (Bloomfield and Wilks, 2000). The literature shows that some companies provide false information or hide true information in conference calls, and so having analysts on the calls can improve information dissemination (Cicon, 2017; Mayew *et al.*, 2013). Moreover, conference calls are associated with significantly lower analyst optimism and forecast dispersion (Lee, 2016; Tsao *et al.*, 2018), and firms with high analyst coverage could be more economically relevant and indicate a higher degree of information transparency than firms without analyst coverage do (Brochet *et al.*, 2018; Hilary and Shen, 2013).

Rather than analyzing the information content or announcement effects of analyst reports and conference calls, in this paper we examine whether high frequencies of analyst coverage and conference calls attract investors' attention and thereby affect stock liquidity and price movements. We take stock turnover rate and price range as two proxy variables for stock market trading and analyze the impact of analyst reports and conference calls on the two. In Taiwan, sell-side analyst reports from foreign securities firms are closely watched by foreign institutional investors. Moreover, the stock trading behavior of these investors has an important influence on domestic investors. A comparison of the information advantages of foreign securities firms and domestic securities firms indicates that the former have the advantage of possessing more resources and information from multinational companies, whereas the latter have superior access to obtain information from domestic companies due to their securities underwriting, indirect shareholding or geographical proximity.

Several studies find that, relative to foreign analysts, local analysts are closer to companies, provide more accurate analysis (Malloy, 2005), and have a local advantage (Bae *et al.*, 2008; Bolliger, 2004; Conroy *et al.*, 1997). However, some studies suggest that investment recommendations from local analysts are systematically more optimistic than those from foreign analysts in emerging markets (Lai and Teo, 2008), and that the accuracy of analyst forecasts varies by

countries (Hope, 2003). The literature indicates that the market response is influenced by the quality of information from sell-side analyst reports and the number of reports issued on the day (Ishigami and Takeda, 2018). Therefore, we expect that the accuracy of the target price and that of earnings forecasts of foreign and domestic securities firms' analysts are different, and so their analysts' coverage should have different effects on stock market trading. Moreover, in Taiwan the conference calls held by securities firms (referred to herein as involuntary conference calls) are one of their many business activities. Providing stock information to customers through these calls can expand their business and increase profitability. Regular conference calls held of a firm's own accord (referred to herein as voluntary conference calls) are usually for performance presentations (e.g., earnings call) or financing purposes.

The two conference calls have various intentions and should have different implications for stock market trading. Therefore, we examine whether these types of analyst coverage and conference calls affect stock market trading differently. Furthermore, analyst reports and conference calls influencing stock market trading through institutional investors are a common phenomenon in emerging markets. In Taiwan, individual investors (also known as retail investors) often follow the trading behavior of institutional investors. Whether analyst reports and conference calls have an impact on stock market trading through institutional investors' trading deserves further discussion. Consequently, we explore how institutional investors that facilitate analyst coverage and conference calls correlate to stock market trading. Studies indicate that conference calls provide unique information (Doran *et al.*, 2012; Matsumoto *et al.*, 2011) and can increase more analysts covering firms (Bloomfield and Wilks, 2000). The information of firms is disseminated to analysts via conference calls, and so analysts provide investors with clear explanations through reports, which help reduce information asymmetry (Bushee *et al.*, 2003). Therefore, whether the relationship between conference calls and stock market trading is mediated by analyst coverage is also an important issue for further discussion.

This study contributes to the literature by examining the roles of sell-side

securities analysts and conference calls in capital markets. First, compared with Western capital markets, the information environment of Asian capital markets is relatively opaque and shareholder protection is weak. Analyst reports and conference calls are important channels for market participants to obtain public information about a firm. Our results provide evidence that firms with high analyst coverage and conference calls have greater stock liquidity than firms with low analyst coverage and conference calls have.

Second, there is scant literature on the impact of different types of analyst coverage and conference calls on stock market trading. We discuss this issue and find that different types of analyst coverage and conference calls have varying effects on stock market trading. In general, domestic analyst coverage has a significantly positive impact on stock turnover rate and price range. Moreover, involuntary calls have a significant impact on stock market trading, while voluntary calls do not.

Third, in emerging markets, institutional investors (especially foreign ones) typically dominate stock market trading, because they account for a large percentage of the stock trades. They also often refer to analyst reports and their own forecasts and analysis to make investment decisions. Our findings suggest that the frequencies of analyst coverage and conference calls affect the stock market by influencing institutional investors' stock trading.

Fourth, the results herein also show that analyst coverage has a mediating effect on the relationship between conference calls and stock market trading. Thus, the indirect effect of conference calls on stock market trading caused by analyst coverage should not be ignored in future studies.

The remainder of this paper runs as follows. Section 2 reviews prior research on analyst coverage and conference calls. Section 3 describes the data, variables, and models. Section 4 illustrates and discusses the empirical results. Section 5 provides the conclusions.

2. Literature review

2.1 Analyst coverage

Sell-side securities analysts play an important role in collecting, processing, and disseminating information in the stock market (Das *et al.*, 1998). Analyst coverage affects a firm's market price through three mechanisms: information, monitoring, and investor recognition. For example, Kosaiyakanont (2013) reveals that firms with high analyst coverage helps mitigate information asymmetry between managers and investors and leads to increased stock liquidity. Jung (2015) finds that analyst forecasts provide valuable information and can improve the quality of public information. Chen *et al.* (2015) and Jung *et al.* (2012) argue that analyst coverage is an external mechanism for monitoring managers that can improve a firm's future operating performance.

Analysts closely watch firms, thus significantly reducing the moral hazard problem that investors face. As such, analyst coverage affects stock returns (Demiroglu and Ryngaert, 2010; Hacibedel, 2014; Kelly and Ljungqvist, 2012) and liquidity (Irvine, 2001; Kosaiyakanont, 2013; Wang *et al.*, 2018). Mora *et al.* (2013) state that a reduction in analyst coverage of a firm leads to a decrease in the number of institutional shareholders of the firm. Research shows that an increase in analyst coverage of a firm attracts investor attention, which coincides with observed significant changes in the firm's stock price (Da *et al.*, 2011; Drake *et al.*, 2012; Hacibedel, 2014; Li and You, 2015). The literature shows that analysts' investment recommendation revisions have important informativeness about the firm's future stock returns (Jiang *et al.*, 2014), and thus analyst coverage is an early indicator of its future fundamentals and stock performance (Jung *et al.*, 2015).

Several studies reveal that analysts' investment recommendations influence institutional investors' trading decisions (Frey and Herbst, 2014; Rebello and Wei, 2014) and subsequent stock returns (Asquith *et al.*, 2005; Farooq, 2017; Kerl, 2011; Kerl and Walter, 2008). Wang *et al.* (2018) find that firms with excellent financial performance, higher stock liquidity, and good corporate governance can attract foreign analyst coverage. Easley *et al.* (1988) and Brown *et al.* (2004) show that the frequency of analyst reports correlates to a firm's information asymmetry.

Ishigami and Takeda (2018) reveal that the information quality of sell-side analyst reports and the number of reports issued on the day affect the stock market response. Chen *et al.* (2018) denote that manager–analyst information exchanges evolve during earnings calls, which indicates that analysts who participate in earnings calls could lead to stock price movements during this period.

Jung *et al.* (2018) note that institutional investors trade a greater amount of a firm's stock in the quarters in which buy-side analysts participate in such calls than they do in quarters in which buy-side analysts are absent from such calls. Milian and Smith (2017) indicate that the amount of analysts' praise on an earnings call is strongly associated with the market's reaction to the call.

In brief, analyst coverage reduces information asymmetry and increases investors' attention. In addition, analysts' investment recommendations also influence investors' trading decisions. Therefore, the quality and frequency of sell-side analyst reports affect a firm's stock liquidity and returns.

2.2 Conference calls

A conference call is a unique information disclosure mechanism, and the quantity and quality of information released during it have attracted the interest of investors, managers, and academia (Doran *et al.*, 2012; Price *et al.*, 2012). During question-and-answer sessions, participants can ask for information that may not have been disclosed in the firm's financial statements or that may have been disclosed in an unclear manner, which can be informative for investors (Hollander *et al.*, 2010; Matsumoto *et al.*, 2011). Studies demonstrate that conference calls contain important information about stock prices and future prospects and denote that new information is released during conference calls that reduces analysts' earnings forecast errors (Bassemir *et al.*, 2013; Bowen *et al.*, 2002; Siougle *et al.*, 2014). Numerous studies claim that firms with negative news (e.g., they fail to meet analysts' earnings expectations or have unsustainable positive earnings trend) provide more information during conference calls than firms with positive news do (Matsumoto *et al.*, 2011; Moreira *et al.*, 2016).

The literature indicates that high trading activity and return volatility during

conference calls (Bushee *et al.*, 2003), as well as additional information released during the question-and-answer session, highly correlate with the market's post-call reactions (Matsumoto *et al.*, 2011; Mayew and Venkatachalam, 2012). Matsumoto *et al.* (2011) find that a large number of investors conduct real-time transactions based on the information disclosed in a conference call, which has a great impact on stock trading. Brown *et al.* (2004) state that a high frequency of conference calls reduces the information asymmetry between outsiders and insiders. Kimbrough and Louis (2011) posit that prospective information disclosure in conference calls elicits a positive response from investors. Bushee *et al.* (2003, 2004) denote that firms participating in open calls have more shareholders and higher average stock turnover than firms participating in closed calls do.² Moreover, firm with open calls are associated with higher price volatility compared to those with closed calls. They also find that the type of calls has no effect on trading volume in the pre-Regulation Fair Disclosure (Reg FD) period. However, a significant difference exists in the information provided by open and closed calls during the post-Reg FD period.

Conference calls are an important communication channel between firms and investors. The additional information conveyed during them can be quite informative for investors. Therefore, the quality and frequency of conference calls held by the listed companies or securities firms may have different effects on the former's stock liquidity and returns.

3. Data and methodology

3.1 Data

The sample examined in our study includes publicly listed companies on the

² Bushee *et al.* (2003, 2004) divide the conference calls of the U.S. stock market into two types: open calls and closed calls. Open calls provide information to all interested parties, whereas closed calls limit access to invited professionals. In Taiwan, firms holding voluntary conference calls must disclose the same information on the TWSE's MOPS or on the firms' websites. Therefore, firms that hold regular conference calls after disclosing their financial statements (voluntary calls) are similar to firms that hold open calls, and firms invited to participate in calls held by securities firms for their customers are similar to closed calls.

Taipei Exchange (TPEX) and Taiwan Stock Exchange (TWSE). Foreign analysts' reports are taken from the Eikon database of Thomson Reuters. The Eikon database contains data on foreign analyst reports from 45 foreign securities firms. We download the original text PDF files of the analyst reports and manually organize and create data files one by one. Domestic analyst reports provided by 60 securities firms are obtained from the Taiwan Economic Journal (TEJ). The data of conference calls are collected from the Market Observation Post System (MOPS) of TWSE and the websites of domestic securities firms and the listed companies. The conference calls are irregular, and thus the number of involuntary and voluntary calls per firm is counted annually. We choose January 1, 2009 to December 31, 2015 as the study period due to the constraints of the Thomson Reuters database contract and the labor-intensive work required to create the data files. Data on firms' financial statements, stock market trading, and institutional investors' stock trading are all from the TEJ database. The sample excludes the financial industry and firms that have been listed for less than three years. There are 9,443 firm-year observations from 1,453 listed companies in total after removing firms with missing data.

Table 1 summarizes the distribution of the number of firms in the three industries³ by year. The average percentage of sampled firms in the IT, traditional and biotechnology industries are 55%, 40%, and 5%, respectively. Our sample structure is similar to the industry distribution that influences the trading activities of the Taiwan stock market.⁴

³ We divide the samples into three categories based on the industrial classification defined by the TWSE. The traditional industries include cement, food, plastic, textile, electrical machinery, electronic appliance, cable, glass and ceramic, paper and pulp, steel and iron, rubber, automotive, construction, transportation, tourism, and wholesale and retail trade. The IT industries include semiconductor, computer and peripheral equipment, optoelectronics, communications and the Internet, electronic parts or components, electronic product distribution, information service, and other electronics. The biotechnology industries include food biotech, medical biotech, and medical instruments and supply.

⁴ During the study period, the average stock trading value of the IT industry as a percentage of the market's total turnover was 62.52%, during which IT companies accounted for 47.71% of all listed companies in Taiwan.

Table 1
Distribution of the sample by industry

Industry sector	2009	2010	2011	2012	2013	2014	2015	Observation
Traditional	470 ^a	503	524	550	568	567	561	3743 ^b (39.64) ^c
Information technology (IT)	651	704	753	772	797	790	787	5254 (55.64)
Biotechnology	41	46	56	67	78	78	80	446 (4.72)
Number of total firms	1162	1253	1333	1389	1443	1435	1428	9443 (100.00)

Notes: Traditional industries include cement, food, plastic, textile, electrical machinery, electronic appliance, cable, glass and ceramic, paper and pulp, steel and iron, rubber, automotive, construction, transportation, tourism, and wholesale and retail trade. IT industries include semiconductor, computer and peripheral equipment, optoelectronics, communications and the Internet, electronic parts or components, electronic product distribution, information service, and other electronics. Biotechnology industries include food biotech, medical biotech, and medical instruments and supply. “a” is the number of firms. “b” is the number of observations. “c” is the ratio of observations for the industry to total observations.

Table 2 summarizes the distribution of analyst reports and conference calls by year and by industry. In Panel A of Table 2 the total number of domestic and foreign analyst reports is the highest in 2014. The percentages of domestic and foreign analysts’ reports are 55.94% and 44.06%, respectively. During the period of 2009-2015, the number of involuntary calls ranges from 538 to 767, while the number of voluntary calls increases significantly after 2012. We also find that the percentages of involuntary and voluntary calls are 73.29% and 26.71%, respectively.

In Panel B of Table 2 we see IT firms have more analyst reports and conference calls than the other two industries over the period 2009-2015. IT firms have 37,997 analyst reports (about 67.8% of the total number of reports) and 4,408 conference calls (about 70.74% of the total number of calls). These results show that IT firms are favored by analysts and institutional investors, and their numbers of analyst reports and conference calls are higher than those of the other two industries.

Table 3 summarizes the distribution of the number of firms with analyst coverage or conference calls. The average percentages of firms with analyst reports or conference calls are 39.09% and 12.52%, respectively. Among them,

Table 2
Distribution of analyst reports and conferences

Panel A: Number of analyst reports and conference calls by year

Year	Analyst reports			Conference calls		
	Foreign	Domestic	Total	Involuntary	Voluntary	Total
2009	4548	3153	7701	538	174	712
2010	5204	3284	8488	654	191	845
2011	6269	2227	8496	767	216	983
2012	2154	1559	3713	654	286	940
2013	2882	1754	4636	669	270	939
2014	7242	5368	12610	653	272	925
2015	3052	7344	10396	632	255	887
Total	31351	24689	56040	4567	1664	6231
	(55.94)	(44.06)	(100.00)	(73.29)	(26.71)	(100.00)

Panel B: Number of analyst reports and conference calls by industry

Year	Traditional industries		Information technology industries		Biotechnology industries	
	Analyst reports	Conference calls	Analyst Reports	Conference calls	Analyst reports	Conference calls
2009	2040	187	5540	513	121	12
2010	2412	215	5873	619	203	11
2011	2581	293	5725	664	190	26
2012	1015	256	2634	675	64	9
2013	1273	274	3205	649	158	16
2014	3803	252	8320	656	487	17
2015	3182	231	6700	632	514	24
Total	16306	1708	37997	4408	1737	115
	(29.10)	(27.41)	(67.80)	(70.74)	(3.10)	(1.85)

Notes: Panel A divides analyst reports into two types: reports issued by foreign securities firms and reports issued by domestic securities firms. There are two types of conference calls: one is an involuntary conference call, in which the firm participates in a conference call hosted by a securities firm, and the other is a voluntary conference call hosted by the firm itself. In Panel A the value in parentheses is the ratio of the number of foreign (or domestic) analyst reports to the total number of analyst reports and the ratio of the number of involuntary (or voluntary) calls to the total number of conference calls. In Panel B the value in parentheses is the ratio of the number of analyst reports (or conference calls) for the industry to the total number of analyst reports (or total conference calls).

the average percentage of firms with both analyst reports and conference calls is 11.93%, and the average percentages of firms with analyst coverage only or conference calls only are 27.97% and 0.58%, respectively. The average percentage of firms with neither analyst reports nor conference calls is 59.51%.

Table 3**Distribution of number of firms with analyst coverage or conference calls**

Year	2009	2010	2011	2012	2013	2014	2015
Number of total firms	1162	1253	1333	1389	1443	1435	1428
Number of firms with analyst coverage	453 (38.98) ^a	569 (45.41)	526 (39.46)	404 (29.09)	472 (32.71)	691 (48.15)	650 (45.52)
Number of firms with conference calls	159 (13.68) ^a	169 (13.49)	182 (13.65)	161 (11.59)	154 (10.67)	175 (12.20)	176 (12.32)
Number of firms with neither analyst coverage nor conference calls	704 (60.59) ^a	681 (54.35)	800 (60.02)	965 (69.47)	958 (66.39)	741 (51.64)	773 (54.13)
Number of firms with analyst coverage only	299 (25.73) ^a	403 (32.16)	351 (26.33)	263 (18.93)	331 (22.94)	519 (36.17)	479 (33.54)
Number of firms holding conference calls only	5 (0.43) ^a	3 (0.24)	7 (0.53)	20 (1.44)	13 (0.90)	3 (0.21)	5 (0.35)
Number of firms with both analyst coverage and conference calls	154 (13.25) ^a (34.00) ^b (96.86) ^c	166 (13.25)	175 (13.13)	141 (10.15)	141 (9.77)	172 (11.99)	171 (11.97)

Notes: “a” is the ratio of the number of firms for the type to the total number of firms. b” is the ratio of the number of firms with both analyst coverage and conference calls to the number of firms with analyst coverage. “c” is the ratio of the number of firms with both analyst coverage and conference to the number of firms with conference calls.

We also find that the average percentage of having conference calls in firms with analyst coverage is 34.67%, and the average percentage of having analyst coverage in firms with conference calls is 95.23%. This suggests that firms having conference calls attract more analysts’ attention, and there could be some correlation between the two.

During the study period, it was not mandatory for firms to hold conference calls. Most of the firms having conference calls are large companies or in the IT industries, which attract greater attention of investors. In addition, the IT industries dominate the trading turnover of Taiwan stock market and receive more attention from institutional investors and analysts. Our sample also shows a similar result that is, IT firms have a great number of conference calls and analyst reports.

3.2 Variables

Our study investigates analyst reports issued by 60 domestic securities firms and 45 foreign securities firms, divided according to the nationality of the issuing securities firm, so as to explore whether the frequencies of foreign and domestic analyst reports have different effects on the Taiwan stock market. In addition, we control the number of analysts (i.e., traditional analyst coverage) to mitigate the impact of interference caused by listed companies that are covered by a great number of analysts and therefore have a great number of analyst reports. Thus, the average number of analyst reports issued by securities firms is a proxy for analyst coverage (Wang, 2018; Wang *et al.*, 2018), which indicates the average frequency of analyst coverage. The variables of analyst coverage include average total analyst coverage, average foreign analyst coverage, and average domestic analyst coverage (hereinafter referred to as total analyst coverage, foreign analyst coverage, and domestic analyst coverage, respectively). Total analyst coverage is the total number of analyst reports (i.e., the total number of reports issued by both foreign and domestic securities firms) divided by the total number of securities firms following a corporate for the year (*aveTotalreport*). Foreign analyst coverage is the number of foreign analyst reports divided by the number of foreign securities firms following a corporate for the year (*aveForeport*). Domestic analyst coverage is the number of domestic analyst reports divided by the number of domestic securities firms following a corporate for the year (*aveDomreport*).

Conference calls are divided into two types: voluntary and involuntary. The calls held by listed companies are classified as voluntary calls, whereas calls held by a securities firm are classified as involuntary calls. The variables of conference call include the total number of conference calls, the number of involuntary conference calls, and the number of voluntary conference calls (hereinafter referred to as total calls, involuntary calls, and voluntary calls, respectively). Total calls are the total number of both involuntary and voluntary calls of a corporate for the year (*totalcall*). Involuntary calls are the number of involuntary calls of a

corporate for the year (*involuntarycall*). Voluntary calls are the number of voluntary calls of a corporate for the year (*voluntarycall*).

Studies indicate that high frequencies of analyst coverage and conference calls increase public information availability and transparency (Brown *et al.*, 2004; Easley *et al.*, 1988; Hollander *et al.*, 2010; Jung, 2015; Kosaiyakanont, 2013; Matsumoto *et al.*, 2011), which leads to greater investor attention (Da *et al.*, 2011; Drake *et al.*, 2012; Hacibedel, 2014; Li and You, 2015) and influences stock trading (Chen *et al.* 2018; Irvine, 2001; Jung *et al.*, 2018; Kosaiyakanont, 2013; Matsumoto *et al.*, 2011; Milian and Smith, 2017; Wang *et al.*, 2018). Thus, a stock's price can be influenced by investor attention, analyst coverage, and the information released in conference calls. However, investors might overreact to analysts' investment recommendations and the information released in conference calls, which lead to higher stock price volatility. Our study measures stock market trading by two variables: one is the stock turnover rate (an indicator of stock liquidity or investor attention) and the other is the stock price range (an indicator of price volatility or investor overreaction, hereinafter referred to as stock price range). The stock turnover rate is measured by the stock's annual trading volume divided by its outstanding shares at the end of year (*turnover*), and the stock price range is measured by the highest stock price minus the lowest stock price for the year (*pricerange*).⁵

In 2015 the percentages of domestic individual investors' stock trading value to total stock trading value in the TPEX and TWSE markets were 80.3% and 53.3%, respectively. This shows that domestic individual investors (or retail investors) are the major investors in the Taiwan stock market. In general, domestic individual investors often follow the trading behaviors of institutional investors, and those with weak information are vulnerable to misleading disclosures and market sentiment. In 2015 the stock trading value of the three major institutional

⁵ The frequency and number of analyst reports and conference calls of each firm are irregular. During the study period, some firms had few analyst reports and conference calls and sometimes only once in seven years. It is hard to accurately capture the immediate impact of analyst coverage or conference calls on price volatility. Therefore, we use the range between the highest stock price and the lowest stock price (i.e., stock price range) instead of price volatility.

investors⁶ accounted for 15.5% and 37.7% of total trading value of the TWSE and TPEX markets, respectively. Therefore, the influence of these three institutional investors' stock trading on Taiwan stock market cannot be neglected. Wang *et al.* (2018) state that analyst coverage affects the trading behavior of Taiwanese institutional investors and also suggest an endogenous relationship between foreign analyst coverage and foreign institutional shareholdings.

We further explore the impact of the frequency of analyst reports and conference calls on the stock trading of the three major institutional investors. Multiple variables proxy for the stock trading of the three major institutional investors, including total number of shares bought or sold by institutional investors (hereinafter referred to as institutional buy or sell), institutional turnover rate, and institutional shareholding ratio. The total institutional buy (sell) includes the three major institutional buy (sell) (*totalbuy* and *totalsell*), foreign institutional buy (sell) (*FINIbuy* and *FINIsell*), domestic investment trust companies buy (sell) (hereinafter referred to as investment trust buy (sell)) (*trustbuy* and *trustsell*), and domestic securities dealers buy (sell) (hereinafter referred to as dealer buy (sell)) (*dealerbuy* and *dealersell*). Institutional turnover rates include the total turnover rate of the three major institutional investors (*totalover*), the turnover rate of foreign institutional investors (*FINIover*), the turnover rate of investment trusts (*trustover*), and the turnover rate of dealers (*dealerover*). Institutional shareholding ratios include the total shareholding ratio of the three major institutional investors (*totalholding*), the shareholding ratio of foreign institutional investors (*FINIholding*), the shareholding ratio of investment trusts (*trustholding*), and the shareholding ratio of dealers (*dealerholding*).

We also control for several other firm-specific characteristics that the literature suggests could influence stock trading, including stock return measured by ex-rights stock return (*stockreturn*) (Al-Jafari and Tliti, 2013; Sun and Li, 2015), firm size measured by the natural logarithm of total assets (*lna*) (Levi and Zhang, 2015; Tourani-Rad *et al.*, 2016), and growth measured by the price-to-book ratio

⁶ The three major institutional investors in Taiwan are categorized as foreign institutional investors, investment trust companies, and securities dealers, according to their sources of funds.

(*PBratio*) (Fosu *et al.*, 2016; Robin and Wu, 2015). The industry heterogeneity effect is also controlled (Wang, 2018; Wang *et al.*, 2018). Our sample is divided into three industries - traditional industry, IT industry, and biotechnology industry - based on the industry classification of the Taiwan stock market and uses dummy variables to control for the effect of the industry. Table 4 lists the variable definitions. All continuous variables are winsorized at the 1st and 99th percentiles to mitigate the potential effects of extreme values.

3.3 Model

The study employs the two-way random-effects panel data regression model⁷ to explore whether the frequencies of analyst coverage and conference calls influence stock trading and whether different types of analyst coverage and conference calls have different effects on stock trading. The baseline empirical model takes the following equation:

$$trading_{it} = \beta_0 + \beta_1 coverage_{it} + \beta_2 calls_{it} + \sum \beta_k Z_{it} + u_i + \gamma_t + e_{it} \quad (1)$$

In equation (1), *trading* is stock trading, measured by stock turnover rate (*turnover*) and stock price range (*pricerange*). The stock trading of the three major institutional investors includes institutional total buy (*FINIbuy*, *trustbuy*, and *dealerbuy*), institutional total sell (*FINIsell*, *trustsell*, and *dealersell*), institutional turnover rate (*FINIover*, *trustover*, and *dealerover*), and institutional shareholding ratio (*FINIholding*, *trustholding*, and *dealerholding*), and all are independent variables. *Coverage* is analyst coverage and includes total analyst coverage (*aveTotalreport*), foreign analyst coverage (*aveForeport*), and domestic analyst coverage (*aveDomreport*). *Calls* is the number of conference calls and includes total calls (*totalcall*), involuntary calls (*involuntarycall*), and voluntary calls (*voluntarycall*). The parameter *Z* is other firm-specific characteristic variables,

⁷ The two-way effects panel data model comprises time effect and firm effect. The rationale for using a random-effects model is to assume that inter-firm variation is random and uncorrelated with independent variables. An advantage of a random-effects model is that it allows the inclusion of time-invariant variables (i.e., industry). In fixed-effects models, these variables are implied in the intercept term.

Table 4
Variable definitions

Variable	Symbol	Description
Analyst coverage	<i>aveTotalreport</i>	Total number of reports issued by foreign and domestic analysts divided by the total number of securities firms following a corporate for the year.
	<i>aveForeport</i>	Number of foreign analyst reports divided by the number of foreign securities firms following a corporate for the year.
	<i>aveDomreport</i>	Number of domestic analyst reports divided by the number of domestic securities firms following a corporate for the year.
Conference calls	<i>Totalcall</i>	Total number of a corporate's involuntary and voluntary calls for the year.
	<i>Involuntarycall</i>	Number of a corporate's involuntary calls for the year.
	<i>Voluntarycall</i>	Number of a corporate's voluntary calls for the year.
Stock turnover rate (%)	<i>Turnover</i>	(Stock trading volume/outstanding shares) × 100.
Stock price range	<i>Pricerange</i>	Highest stock price (<i>maxprice</i>) for the year – lowest stock price (<i>minprice</i>) for the year.
Institutional buy (sell) (1000 shares)	<i>Totalbuy (totalsell)</i>	<i>Totalbuy (totalsell)</i> is the total number of shares bought (sold) by the three major institutional investors.
	<i>FINbuy (FINIsell)</i>	<i>FINbuy (FINIsell)</i> is the total number of shares bought (sold) by foreign institutional investors.
	<i>Trustbuy (trustsell)</i>	<i>Trustbuy (trustsell)</i> is the total number of shares bought (sold) by investment trusts.
	<i>Dealerbuy (dealersell)</i>	<i>Dealerbuy (dealersell)</i> is the total number of shares bought (sold) by dealers.
Institutional turnover rate (%)	<i>Totalover</i>	<i>FINlover + Trustover + Dealerover</i> .
	<i>FINlover</i>	$((\text{Foreign institutional buy} + \text{foreign institutional sell}) / 2) / \text{outstanding shares} \times 100$.
	<i>Trustover</i>	$((\text{Investment trust buy} + \text{investment trust sell}) / 2) / \text{outstanding shares} \times 100$.
	<i>Dealerover</i>	$((\text{Dealer buy} + \text{dealer sell}) / 2) / \text{outstanding shares} \times 100$.
Institutional shareholding ratio (%)	<i>Totalholding</i>	<i>FINholding + Trustholding + Dealerholding</i> .
	<i>FINholding</i>	(Foreign institutional shareholdings / outstanding shares) × 100.
	<i>Trustholding</i>	(Investment trust shareholdings / outstanding shares) × 100.
Ex-rights stock return (%)	<i>Stockreturn</i>	(Dealer shareholdings / outstanding shares) × 100.
		$(\text{Closing price in year } t \times (1 + \text{purchase rate (ex-rights) in year } t) + \text{stock dividend (ex-rights) in year } t) + \text{cash dividend paid in year } t) / (\text{closing price in year } t - 1 + \text{purchase rate (ex-rights) in year } t \times \text{buy price (ex-rights) in year } t) - 1) \times 100$.
Firm size	<i>Lnta</i>	Natural logarithm of total assets at the end of the fiscal year.
Price-to-book ratio	<i>PBratio</i>	Stock price per share at the end of the year divided by the book value of shareholders' equity per share at the end of the year.
Industry	<i>Ind</i>	The sample is divided into three industry sectors including traditional, IT, and biotechnology, and measured by dummy variables.

including stock return (*stockreturn*), growth (*PBratio*), firm size (*lna*), and industry (*ind*); u_i denotes the heterogeneous firm effect; γ_t represents the heterogeneous year effect; and e_{it} is the disturbance term. Table 4 exhibits the variable definitions.

4. Results

4.1 Descriptive statistics analysis

Table 5 presents the descriptive statistics for the variables of the 1,453 listed firms. The means of the average analyst reports (hereinafter referred to as the average frequency of analyst coverage) for foreign analysts and domestic analysts are 0.465 and 0.654, respectively, and the maximum values are 15.72 and 18.00, respectively. The mean of the number of securities firms that cover a corporate is 2.349, and the maximum value is 41. It shows that securities firms have high interest in the some of the same listed companies. The means of involuntary and voluntary calls are 0.483 and 0.176, respectively, and the maximum values are 23 and 19, respectively. These results indicate that the frequency of average domestic analyst reports is greater than that of average foreign analyst reports. It also shows that involuntary calls account for the majority of the total number of calls during the study period. The mean of stock turnover rate is 162.207, and the minimum and maximum values are 2.95 and 798.03, respectively. The mean of the stock price range is 17.944, and the minimum and maximum values are 0 and 282.52, respectively. Finally, in descending order of the means of institutional total buy (sell) and shareholdings, foreign institutional investors are the highest, dealers are the second, and investment trusts are the smallest.

The study classifies the sample of 1,453 firms into four groups, including 993 firms with analyst coverage or conference calls (3,821 firm-year observations, 40.46% of total observations) and 460 firms with neither analyst coverage nor conference calls (5,622 firm-year observations, 59.54% of total observations). A firm with analyst coverage but without conference calls is classified as “analyst-only” (2,645 firm-year observations, 28.01% of total observations). A firm with

Table 5
Descriptive statistics of the variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
<i>aveForeport</i>	9443	0.465	1.261	0	15.72
<i>aveDomreport</i>	9443	0.654	1.155	0	18.00
<i>Totalbroker</i>	9443	2.349	4.81	0	41.00
<i>Involuntarycall</i>	9443	0.483	1.963	0	23.00
<i>Voluntarycall</i>	9443	0.176	0.908	0	19.00
<i>Turnover</i>	9443	162.207	162.631	2.95	798.03
<i>Maxprice</i>	9443	39.683	45.939	6.08	303.13
<i>Minprice</i>	9443	21.738	24.779	2.54	162.02
<i>Pricerange</i>	9443	17.944	24.744	0	282.52
<i>FINIbuy</i>	9443	132.621	462.216	0	3325.00
<i>FINIsell</i>	9443	100.610	356.883	0	2591.00
<i>Trustbuy</i>	9443	23.354	106.324	0	777.00
<i>Trustsell</i>	9443	21.513	101.692	0	767.00
<i>Dealerbuy</i>	9443	34.443	122.179	0	866.00
<i>Dealersell</i>	9443	35.038	123.852	0	879.00
<i>FINIhold</i>	9443	9.534	14.461	0	69.36
<i>Trusthold</i>	9443	0.886	2.173	0	12.23
<i>Dealerhold</i>	9443	0.093	0.277	0	1.78
<i>FINIover</i>	9443	0.018	0.037	0	0.22
<i>Trustover</i>	9443	0.008	0.034	0	0.24
<i>Dealerover</i>	9443	0.009	0.027	0	0.17
<i>Stockreturn</i>	9443	25.382	74.538	-62.07	379.37
<i>Total assets</i> (millions NTD)	9443	1768.859	5216.058	26.44	39144.05
<i>PBratio</i>	9443	1.785	1.453	0.42	9.59

Notes: *aveForeport* is the number of foreign analyst reports divided by the number of foreign securities firms following a corporate. *aveDomreport* is the number of domestic analyst reports divided by the number of domestic securities firms following a corporate. *Totalbroker* is the total number of securities firms following a corporate. *Involuntarycall* is the number of a firm's involuntary calls. *Voluntarycall* is the number of a firm's voluntary calls. Turnover is the stock turnover rate. *Maxprice* is the highest stock price for the year. *Minprice* is the lowest stock price for the year. *Pricerange* is the range of the stock's highest and lowest prices for the year. *FINIbuy* (*FINIsell*) is foreign institutional buy (sell). *Trustbuy* (*trustsell*) is investment trust buy (sell). *Dealerbuy* (*dealersell*) is dealer buy (sell). *FINIhold* is the foreign institutional shareholding ratio. *Trusthold* is the investment trust shareholding ratio. *Dealerhold* is the dealer shareholding ratio. *FINIover* is the foreign institutional turnover rate. *Trustover* is the investment trust turnover rate. *Dealerover* is the dealer turnover rate. *Stockreturn* is the stock return. Total assets are the total amount of a firm's assets at the end of the fiscal year. *PBratio* is the price-to-book ratio. Table 4 lists the variable definitions in detail.

conference calls but without analyst coverage is classified as “calls-only” (56 firm-year observations, 0.59% of total observations). A firm with both analyst coverage and conference calls is classified as “both” (1,120 firm-year observations, 11.86% of total observations). A firm with neither analyst coverage nor conference calls is

classified as “none” (5,622 firm-year observations, 59.54% of total observations).

Table 6 presents T-test results for the mean difference between the four groups. We find that the “both” group has higher frequencies of analyst coverage and conference calls than the “analyst-only” and “calls-only” groups do. The “both” and “analyst-only” groups have higher stock turnover rates, resulting in greater stock turnover and stockholdings from the three major institutional investors, and the two groups have a wider stock price range than the “none” group does. The “analyst-only” group has a higher stock turnover rate and wider stock price range than the “calls-only” group. In addition, except for investment trust shareholdings and dealer turnover rate, there is no significant difference in stock trading among the major three institutional investors between the “analysts-only” and “calls-only” groups. The “calls-only” group has greater stock turnover and stockholdings of the three major institutional investors than the “none” group does; however, the turnover rate and stock price range exhibit no significant difference between the two groups. We also find that the stock return of the “calls-only” group is the lowest among the four groups. For firm-specific characteristic variables, the means of total assets for the “analyst-only,” “calls-only,” and “both” groups are all larger than the “none” group. “Analyst-only” and “both” groups have higher price-to-book ratio and stock return than the other two groups, indicating that securities firms favor large size and high-growth listed companies.

Analyst coverage has a greater impact on stock turnover and price range than conference calls. In addition, stock turnover and shareholdings of the three major institutional investors for firms with analyst coverage or conference calls are higher than for firms with neither analyst coverage nor conference calls.

4.2 Impact of analyst coverage and conference calls on stock trading

Table 7 presents the correlation matrix of variables. Except for the stock trading variables of the three major institutional investors, the correlation coefficients of all other variables are in the range of -0.0009 to 0.5 . Overall, most

Table 6
T-test results for difference in means

Variable	Analyst-only	Calls-only	Both	None	Mean difference T-test			
	(1)	(2)	(3)	(4)	(1)vs.(2)	(1)vs.(4)	(2)vs.(4)	(3)vs.(4)
<i>aveForeport</i>	1.856	0	23.607	0				
<i>aveDomreport</i>	4.621	0	11.129	0				
<i>Involuntarycall</i>	0	0.839	4.035	0				
<i>Voluntarycall</i>	0	1.089	1.431	0				
<i>Turnover</i>	221.116	146.907	190.493	132.477	74.209***	88.639***	14.43	58.016***
<i>Maxprice</i>	56.416	26.157	75.497	29.062	30.259***	27.354***	-2.905	46.435***
<i>Minprice</i>	30.720	16.016	43.520	15.304	14.704***	15.416***	0.712	28.216***
<i>Pricerange</i>	25.695	10.140	31.976	13.757	15.555***	11.938***	-3.617	18.219***
<i>FINIbuy</i>	151.662	248.142	961.968	29.143	-96.48	122.519***	218.999***	932.825***
<i>FINIsell</i>	124.287	121.053	664.773	24.051	3.234	100.236***	97.002***	640.722***
<i>Trustbuy</i>	46.469	52.553	110.873	6.7860	-6.084	39.683***	45.767***	104.087***
<i>Trustsell</i>	34.278	46.375	142.825	4.2867	-12.097	29.9913***	42.0883***	138.538***
<i>Dealerbuy</i>	57.669	57.071	162.867	12.183	0.598	45.486***	44.888***	150.684***
<i>Dealersell</i>	56.854	84.535	178.592	10.620	-27.681	46.234***	73.915	167.972***
<i>FINIhold</i>	11.833	10.770	23.804	5.7627	1.063	6.0703***	5.0073***	18.0413***
<i>Trusthold</i>	1.729	0.866	2.444	0.251	0.863***	1.478***	0.615***	2.193***
<i>Dealerhold</i>	0.183	0.107	0.186	0.056	0.076	0.127***	0.051	0.13***
<i>FINIover</i>	0.030	0.021	0.054	0.009	0.009	0.021***	0.012***	0.045***
<i>Trustover</i>	0.019	0.008	0.023	0.003	0.011	0.016***	0.005*	0.02***
<i>Dealerover</i>	0.018	0.007	0.021	0.004	0.011*	0.014***	0.003	0.017***
<i>Stockreturn</i>	30.877	11.691	26.630	24.838	19.186***	6.039***	-13.147	1.792
<i>Total assets</i>	2084.349	3010.207	8703.873	678.309	-925.86	1406.04***	2331.9***	8025.56
<i>PBratio</i>	2.110	1.271	2.434	1.684	0.839***	0.426***	-0.413	0.75
Obs.	2,645	56	1,120	5,622				
	(28.01)	(0.59)	(11.86)	(59.54)				

Notes: The “analyst-only” group is firms with analyst coverage but without conference calls; the “calls-only” group is firms with conference calls but without analyst coverage; the “both” group is firms with both analyst coverage and conference calls; and the “none” group is firms with neither analyst coverage nor conference calls. *aveForeport* is the number of foreign analyst reports divided by the number of foreign securities firms following a corporate. *aveDomreport* is the number of foreign analyst reports divided by the number of domestic securities firms following a corporate. *Involuntarycall* is the number of a firm’s involuntary calls. *Voluntarycall* is the number of a firm’s voluntary calls. *Turnover* is the stock turnover rate. *Maxprice* is the highest stock price for the year. *Minprice* is the lowest stock price for the year. *Pricerange* is the range of the stock’s highest and lowest prices for the year. *FINIbuy* (*FINIsell*) is foreign institutional buy (sell). *Trustbuy* (*trustsell*) is investment trust buy (sell). *Dealerbuy* (*dealersell*) is dealer buy (sell). *FINIhold* is the foreign institutional shareholding ratio. *Trusthold* is the investment trust shareholding ratio. *Dealerhold* is the dealer shareholding ratio. *FINIover* is the foreign institutional turnover rate. *Trustover* is the investment trust turnover rate. *Dealerover* is the dealer turnover rate. *Stockreturn* is the stock return. Total assets are the total amount of a firm’s assets at the end of the fiscal year. *PBratio* is the price-to-book ratio. Table 4 lists the variable definitions in detail. The values in parentheses are the proportion of observations for each group to the total observations. The asterisks ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

Table 7
Correlation matrix of variables

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1) <i>aveForeport</i>	1																				
(2) <i>aveDomreport</i>	0.5676	1																			
(3) <i>Involuntarycall</i>	0.5655	0.4521	1																		
(4) <i>Voluntarycall</i>	0.4049	0.3477	0.3098	1																	
(5) <i>Turnover</i>	0.0751	0.1777	0.0286	0.0160	1																
(6) <i>Pricerange</i>	0.1682	0.2959	0.1610	0.0903	0.3061	1															
(7) <i>FINbuy</i>	0.4847	0.4713	0.4452	0.3023	0.0069	0.0395	1														
(8) <i>FINsell</i>	0.4507	0.4453	0.4104	0.2900	0.0276	0.0454	0.7377	1													
(9) <i>Trustbuy</i>	0.2073	0.2446	0.1377	0.1022	0.1717	0.0754	0.2679	0.2793	1												
(10) <i>Trustsell</i>	0.2895	0.2727	0.2324	0.1605	0.1117	0.0672	0.3615	0.3333	0.1851	1											
(11) <i>Dealerbuy</i>	0.3213	0.3043	0.2402	0.1622	0.1727	0.0568	0.4757	0.4781	0.3665	0.2647	1										
(12) <i>Dealersell</i>	0.3484	0.3335	0.2735	0.1992	0.1624	0.0543	0.5229	0.5053	0.375	0.2928	0.6580	1									
(13) <i>FINhold</i>	0.3805	0.4083	0.3902	0.2410	-0.0348	0.2606	0.3837	0.3567	0.1409	0.2053	0.2010	0.2285	1								
(14) <i>Trusthold</i>	0.2468	0.3320	0.1684	0.1152	0.3814	0.2961	0.0972	0.1047	0.385	0.2611	0.2197	0.2137	0.1736	1							
(15) <i>Dealerhold</i>	0.1220	0.1681	0.0686	0.0601	0.2612	0.1819	0.0665	0.0900	0.1498	0.1260	0.2588	0.2042	0.1170	0.3254	1						
(16) <i>FINlover</i>	0.3385	0.4063	0.2952	0.2092	0.2982	0.2805	0.4614	0.4971	0.2836	0.2358	0.3359	0.3187	0.3519	0.3555	0.2621	1					
(17) <i>Trustover</i>	0.1076	0.1708	0.0632	0.0474	0.2765	0.1835	0.0408	0.0533	0.5938	0.4528	0.1673	0.1542	0.0779	0.5586	0.2205	0.2672	1				
(18) <i>Dealerover</i>	0.1291	0.2005	0.0842	0.0733	0.3728	0.2282	0.1037	0.1238	0.3117	0.1628	0.5803	0.5150	0.0929	0.4435	0.4140	0.3647	0.3709	1			
(19) <i>Stockreturn</i>	-0.0009	0.0292	-0.0035	-0.0164	0.312	0.1741	0.0180	0.0158	0.1374	0.0914	0.1230	0.1071	-0.0132	0.2606	0.1241	0.1494	0.2118	0.2615	1		
(20) <i>Lnta</i>	0.5012	0.5036	0.3852	0.2966	0.0084	0.0353	0.5544	0.5241	0.2227	0.2786	0.3918	0.4192	0.4105	0.1532	0.1545	0.3449	0.0682	0.1484	-0.0447	1	
(21) <i>PBratio</i>	0.1353	0.2272	0.1439	0.0949	0.1716	0.5984	0.0166	0.0267	0.0839	0.0756	0.0446	0.0273	0.1859	0.3204	0.1500	0.2013	0.2024	0.2140	0.3319	-0.0889	1

Notes: *Turnover* is the stock turnover rate. *Pricerange* is the range of the stock's highest and lowest prices for the year. *aveForeport* is the average number of foreign analyst reports. *aveDomreport* is the average number of domestic analyst reports. *Involuntarycall* is the number of involuntary calls. *Voluntarycall* is the number of voluntary calls. *FINbuy* (*FINsell*) is foreign institutional buy (sell). *Trustbuy* (*trustsell*) is investment trust buy (sell). *Dealerbuy* (*dealersell*) is dealer buy (sell). *FINhold* is the foreign institutional shareholding ratio. *Trusthold* is the investment trust shareholding ratio. *Dealerhold* is the dealer shareholding ratio. *FINlover* is the foreign institutional turnover rate. *Trustover* is the investment trust turnover rate. *Dealerover* is the dealer turnover rate. *Stockreturn* is the stock return. *Lnta* is the natural logarithm of total assets. *PBratio* is the price-to-book ratio. Table 4 lists the variable definitions in detail.

variables show low linear correlations.⁸ The correlation coefficient of foreign and domestic analyst coverage is 0.5676, indicating that foreign and domestic securities firms follow the same stocks. The correlation coefficient between analyst coverage and involuntary calls is 0.5655 for foreign analysts and 0.4521 for domestic analysts, suggesting that involuntary calls could attract more analyst attention than voluntary calls do. Moreover, foreign institutional buy (sell) positively correlates with analyst coverage (foreign or domestic analysts) and involuntary calls, indicating that analyst coverage and involuntary conference calls affect institutional investors' stock trading.

Table 8 shows the results of the impact of analyst coverage and conference calls on stock market trading. The results denote that analyst coverage (especially domestic analyst coverage) has a significantly positive impact on stock turnover rate and stock price range, suggesting that firms highly watched by domestic analysts can see increased stock liquidity. However, higher analyst coverage may also prompt investors to overreact, leading to a wider share price range.⁹ A reasonable explanation is that the investment recommendations of domestic analysts may have an optimistic bias (Huyghebaert and Xu, 2016; Lai and Teo, 2008; Zhou and Wu, 2015) or investors believe that domestic securities firms closely relate to domestic listed companies and can accurately estimate the latter's target share price (Bae *et al.*, 2008; Bolliger, 2004; Conroy *et al.*, 1997; Malloy, 2005).

Voluntary calls have a negative influence on stock turnover rate, while involuntary calls have a positive impact on stock price range. In Taiwan, firms regularly hold voluntary calls after disclosing their financial statements. These

⁸ The correlation between two variables can be classified into three levels: $|\rho| \leq 0.3$ implies low linear correlation, $0.3 < |\rho| \leq 0.7$ indicates a significant linear correlation, and $|\rho| > 0.7$ indicates a high linear correlation.

⁹ We also examine the endogeneity between the stock turnover rate and stock price range by using the 2SLS two-way random-effects regression. The results of the first stage show that analyst coverage and conference calls positively relate with the stock turnover rate, and the results of the second stage show that the stock turnover rate has a significantly positive impact on the stock price range.

Table 8
Results of the impact of analyst reports and conference calls on stock trading

Variable	All sample (9443 obs.)				Subsample (3821 obs.)			
	Turnover		Pricerange		Turnover		Pricerange	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>aveTotalreport</i>	9.8421*** (1.0523)		0.7179*** (0.1328)		4.2487*** (1.2527)		0.2833* (0.1626)	
<i>Totalcall</i>	-2.6704*** (0.9494)		0.3547*** (0.1235)		1.1627*** (1.0296)		0.3241** (0.1361)	
<i>aveForeport</i>		-1,3581 (1,5927)		-0.2487 (0.1997)		-0.7993 (1.7243)		-0.2961 (0.2242)
<i>aveDomreport</i>		21.7740*** (1.6470)		1.7501*** (0.2064)		10.9510*** (2.0183)		1.0546*** (0.2619)
<i>Involuntarycall</i>		-0.6714 (1,0439)		0.5371*** (0.1344)		2.5477** (1.1090)		0.4532*** (0.1459)
<i>Voluntarycall</i>		-7.2418*** (2.1221)		-0.1758 (0.2753)		-4.0445* (2.2620)		-0.1971 (0.2985)
<i>Stockreturn</i>	0.5257*** (0.0245)	0.5197*** (0.0244)	0.0220*** (0.0030)	0.0213*** (0.0030)	0.5701*** (0.0412)	0.5659*** (0.0411)	0.0126** (0.0053)	0.0122** (0.0053)
<i>PBratio</i>	11.1793*** (1.3380)	10.3337*** (1.3340)	7.5655*** (0.1724)	7.5132*** (0.1722)	6.5132*** (2.1207)	6.0233*** (2.1177)	10.9367*** (0.2832)	10.8941*** (0.2828)
<i>Lnta</i>	8.2709*** (1.9917)	7.7455*** (1.9867)	2.9832*** (0.2842)	2.9143*** (0.2832)	-13.3313*** (3.2320)	-12.2998*** (3.2356)	1.8569*** (0.4566)	1.9465*** (0.4551)
Constant	34.8093*** (13.7981)	38.3002*** (13.7634)	-20.4947*** (1.9506)	-20.0889*** (1.9438)	250.5100*** (24.2499)	239.3633*** (24.3053)	-20.2361*** (3.3830)	-21.3621*** (3.3781)
Industry-effect	yes	yes	yes	yes	yes	yes	yes	yes
Firm-effect	yes	yes	yes	yes	yes	yes	yes	yes
Time-effect	yes	yes	yes	yes	yes	yes	yes	yes
Adjusted R ²	0.2108	0.2199	0.3705	0.3783	0.2529	0.2575	0.4561	0.4627
Wald χ^2	3020.72***	3146.48***	3689.91***	3765.73***	1349.20***	1383.46***	2348.43***	2383.04***

Notes: The all sample covers 1,453 firms, including 993 firms with analyst coverage or conference calls (3,821 firm-year observations) and 460 firms with neither analyst coverage nor conference calls (5,622 firm-year observations). The subsample is 993 firms with analyst coverage or conference calls (3,821 firm-year observations). *Turnover* is the stock turnover rate. *Pricerange* is the range of the stock's highest and lowest prices for the year. *aveTotalreport* is the average total number of foreign and domestic analyst reports. *Totalcall* is the total number of involuntary and voluntary calls. *aveForeport* is the average number of foreign analyst reports. *aveDomreport* is the average number of domestic analyst reports. *Involuntarycall* is the number of involuntary calls. *Voluntarycall* is the number of voluntary calls. *Stockreturn* is the stock return. *PBratio* is the price-to-book ratio. *Lnta* is the natural logarithm of total assets. Table 4 lists the variable definitions in detail. The standard errors of the coefficient estimates are reported in parentheses. The asterisks ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

calls are usually routine calls such as performance presentation (earnings announcements or corrections) or for financing purposes. As a result, the information provided by firms is often limited or insufficient. Therefore, voluntary calls are not found to have a positive effect on stock turnover. However, corporates that are invited to conference calls held by securities firms usually have some distinguishing characteristics, such as high market capitalization, high trading volume, earnings surprises, or the occurrence of special events. Information delivered through involuntary calls increases investor attention to these firms. The more new information that is released on involuntary calls, the higher impacts that stock valuations and price volatility have.

The results of the subsample for 993 firms with analyst coverage or conference calls show that analyst coverage and conference calls (*totalcall*) increase a firm's stock liquidity and widen its stock price range. However, the results of all samples show that conference calls (*totalcall*) negatively correlate with stock turnover rate. This result does not clearly verify whether conference calls do promote stock market liquidity.

Table 9 shows the results for the impacts of analyst coverage and conference calls on stock trading for the "analyst-only", "calls-only", and "both" groups. Overall, involuntary calls and domestic analyst coverage have a greater impact on stock trading than voluntary calls and foreign analyst coverage do. Furthermore, foreign and domestic analyst coverage have an opposite effect on stock price range for the "analyst-only" group. For the "both" group, conference calls have a higher impact on stock turnover than analyst coverage; conversely, the impact of conference calls on stock price range is lower than the impact of analyst reports.¹⁰

Our results overall are consistent with prior research in that higher analyst coverage attracts investor attention (Da *et al.*, 2011; Drake *et al.*, 2012; Hacibedel,

¹⁰ We also analyze the impact of conference call and analyst coverage on stock turnover rate and price range in IT and traditional industries. Overall, analyst coverage and conference calls have a significantly positive impact on stock turnover rate and price range of the two industries. The impact on the IT industries is higher than that of the traditional industries. For the IT industries, involuntary calls increase stock liquidity, and voluntary calls will widen the price range. For the traditional industries, involuntary calls increase stock liquidity.

Table 9

Results of the impact of analyst coverage and conference calls on stock trading for the “analyst-only”, “calls-only”, and “both” groups

Variable	Analyst-only				Calls-only				Both			
	Turnover		Pricerange		Turnover		Pricerange		Turnover		Pricerange	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>aveTotalreport</i>	9.5994*** (2.1859)		0.0182 (0.2710)						1.0065 (1.3583)		0.9455*** (0.2273)	
<i>Totalcall</i>					1.2447 (15.6792)		0.9394 (1.1412)		4.6029*** (0.9660)		0.5833*** (0.1611)	
<i>aveForeport</i>		2.5768 (3.1003)		-1.2086*** (0.3861)						-1.2253 (1.8907)		0.9021*** (0.3176)
<i>aveDomreport</i>		16.9096*** (3.1656)		1.2673*** (0.3897)						4.2204* (2.3211)		1.0140*** (0.3899)
<i>Involuntarycall</i>						48.9687*** (16.7105)		3.7664*** (1.2785)		5.0521*** (0.9953)		0.6534*** (0.1664)
<i>Voluntarycall</i>						-19.2195 (14.2041)		-0.3917 (1.0766)		1.5506 (1.9974)		0.0948 (0.3329)
<i>Stockreturn</i>	0.6167*** (0.0524)	0.6142*** (0.0523)	0.0121* (0.0064)	0.0115* (0.0064)	1.4929** (0.6284)	1.5238*** (0.5389)	0.0122 (0.0468)	0.0251 (0.0416)	0.5169*** (0.0647)	0.5149*** (0.0646)	0.0177 (0.0108)	0.0175 (0.0108)
<i>PBratio</i>	4.3316 (2.7047)	3.6648 (2.7067)	11.7442*** (0.3421)	11.6543*** (0.3415)	94.4356** (39.5197)	69.43331** (32.7602)	6.5178** (2.7826)	5.5555** (2.4666)	3.8232 (3.0355)	3.6354 (3.0315)	9.4583*** (0.5001)	9.4571*** (0.5002)
<i>Lnta</i>	-7.4747* (3.9538)	-6.7568* (3.9499)	2.4891*** (0.5218)	2.6159*** (0.5194)	30.0602 (24.9483)	21.0239 (20.1055)	0.0869 (1.6941)	-0.2371 (1.4933)	-34.7247*** (5.3106)	-34.5258*** (5.3160)	0.6095 (0.8462)	0.6929 (0.8482)
Constant	193.5568*** (29.4604)	184.7889*** (29.5212)	-26.4239*** (3.8392)	-28.006*** (3.8348)	-191.2458 (195.2728)	-160.0686 (160.5960)	-5.2601 (13.7361)	-6.6632 (12.1309)	437.7443*** (43.55)	435.7506*** (43.6236)	-13.1649* (6.9619)	-13.9489** (6.9838)
Industry-effect	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes
Firm-effect	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes
Time-effect	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes
Adjusted R ²	0.2524	0.02561	0.858	0.4962	0.4570	0.6441	0.3422	0.4987	0.3254	0.3288	0.4557	0.4588
Wald χ^2	817.55***	830.73***	1706.79***	1742.93***	84.32***	112.37***	24.36***	43.80***	670.87***	679.31***	717.65***	721.36***

Notes: This table is the result of 993 firms with analyst coverage or conference calls (3,821 firm-year observations). *Turnover* is the stock turnover rate. *Pricerange* is the range of the stock's highest and lowest prices for the year. *aveTotalreport* is the average total number of foreign and domestic analyst reports. *Totalcall* is the total number of involuntary and voluntary calls. *aveForeport* is the average number of foreign analyst reports. *aveDomreport* is the average number of domestic analyst reports. *Involuntarycall* is the number of involuntary calls. *Voluntarycall* is the number of voluntary calls. *Stockreturn* is the stock return. *PBratio* is the price-to-book ratio. *Lnta* is the natural logarithm of total assets. Table 4 lists the variable definitions in detail. The standard errors of coefficient estimates are reported in parentheses. The asterisks ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

2014; Li and You, 2015) and affects stock market liquidity (Irvine, 2001; Kosaiyakanont, 2013; Wang *et al.*, 2018). The market's reaction to the listed firm is also influenced by the number of analyst reports (Ishigami and Takeda, 2018). In addition, conference calls provide information for investors, resulting in a stock price reaction (Hollander *et al.*, 2010; Kimbrough and Louis, 2011; Matsumoto *et al.*, 2011). However, our study does not find a significant relationship between voluntary subscription and stock turnover, which is different from the findings of Bushee *et al.* (2003).

This research employs the Arellano-Bover/Blundell-Bond dynamic panel data system (i.e., dynamic GMM)¹¹ (Arellano and Bover, 1995; Blundell and Bond, 1998) for robustness testing, which takes into account the endogeneity between analyst coverage (and conference calls) and stock market trading. Table 10 presents the results of the dynamic GMM, which show that stock turnover rate positively correlates with analyst coverage (both foreign and domestic), but negatively correlated with voluntary calls. Stock price range positively correlates with analyst coverage and involuntary calls, but negatively correlates with voluntary calls. In conclusion, the results in Table 9 are similar to those of Table 8 after controlling for endogeneity, suggesting that more frequencies of analyst coverage and conference calls increase stock liquidity and widen stock price range.

4.3 Interaction between analyst coverage and conference calls

This section uses indicator variables to estimate the interaction effects of analyst coverage and conference calls on stock trading. Three indicator variables

¹¹ The Arellano-Bover/Blundell-Bond dynamic GMM accommodates large autoregressive parameters and a high ratio of variance for the panel-level effect to the variance of the idiosyncratic error. Arellano and Bover (1995) and Blundell and Bond (1998) find that lagged levels are weak instruments if the autoregressive process shows persistence. They propose the use of additional moment conditions, where the lagged differences of the dependent variable are orthogonal to the disturbance levels. The panel-level effect is unrelated to the first difference of the dependent variable when determining these additional moment conditions. The Arellano-Bover/Blundell-Bond dynamic GMM assumes that no autocorrelation exists in the idiosyncratic errors and requires that the panel-level effects be uncorrelated with the first difference of the dependent variable.

Table 10
Results of the Arellano–Bover/Blundell–Bond dynamic GMM

Variable	Turnover		Pricerange	
	(1)	(2)	(1)	(2)
<i>Turnover</i> _(t-1)	0.4787*** (0.0230)	0.4720*** (0.0238)		
<i>Pricerange</i> _(t-1)			0.3268*** (0.0340)	0.3212*** (0.0351)
<i>aveTotalreport</i> _(t)	23.6848* (4.4091)		0.6554* (0.8325)	
<i>aveTotalreport</i> _(t-1)	-6.2972* (3.2565)		0.4684 (0.6775)	
<i>Totalcall</i> _(t)	0.1641 (5.0101)		4.2671*** (1.0267)	
<i>Totalcall</i> _(t-1)	-10.4198*** (4.0479)		-3.8749*** (0.8493)	
<i>aveForeport</i> _(t)		13.5442*** (5.2510)		0.1606 (0.8099)
<i>aveForeport</i> _(t-1)		-11.7007** (5.6994)		1.1358 (0.7978)
<i>aveDomreport</i> _(t)		57.3201*** (11.1663)		1.3073 (1.5450)
<i>aveDomreport</i> _(t-1)		-31.9602*** (6.8130)		0.4345 (1.1214)
<i>Involuntarycall</i> _(t)		-2.2199 (5.9704)		3.6706*** (1.2025)
<i>Involuntarycall</i> _(t-1)		-5.9611 (5.2482)		-3.3522*** (1.1037)
<i>Voluntarycall</i> _(t)		-30.0053** (13.8514)		-3.7128* (2.2434)
<i>Voluntarycall</i> _(t-1)		18.0118 (13.0134)		2.1162 (2.1267)
Wald χ^2	1231.90***	1162.73***	343.83***	415.07***

Notes: This table is the result of 1,453 firms. Only coefficients for analyst coverage and conference call variables are listed in this table, while coefficients for control variables are omitted. *Turnover* is the stock turnover rate. *Pricerange* is the range of the stock's highest and lowest prices for the year. *aveTotalreport* is the average total number of foreign and domestic analyst reports. *Totalcall* is the total number of involuntary and voluntary calls. *aveForeport* is the average number of foreign analyst reports. *aveDomreport* is the average number of domestic analyst reports. *Involuntarycall* is the number of involuntary calls. *Voluntarycall* is the number of voluntary calls. Table 4 lists the variable definitions in detail. The standard errors of the coefficient estimates are reported in parentheses. The asterisks ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

represent different characteristics of analyst coverage: *onlyfor* is 1 for firms covered only by foreign analysts; *onlylocal* is 1 for firms covered only by domestic analysts; and *bothforlocal* is 1 for firms covered by both foreign and domestic analysts. In addition, two indicator variables represent conference calls:

involcall is 1 for firms participating in an involuntary call and *volcall* is 1 for firms participating in a voluntary call. The interaction effects model is as follows:

$$\begin{aligned} trading_{it} = & \beta_0 + \beta_1 bothforlocal_{it} \times volcall_{it} + \beta_2 bothforlocal_{it} \times \\ & involcall_{it} + \beta_3 onlyfor_{it} \times volcall_{it} + \beta_4 onlyfor_{it} \times \\ & involcall_{it} + \beta_5 onlylocal_{it} \times volcall_{it} + \beta_6 onlylocal_{it} \times \\ & involcall_{it} + \sum \beta_k Z_{it} + u_i + \gamma_t + e_{it} \end{aligned} \quad (2)$$

In equation (2), *trading* is the stock market trading measured by two variables: stock turnover rate (*turnover*) and stock price range (*lnpricerange*). The parameter *Z* represents other firm-specific characteristic variables, as in equation (1). The term u_i denotes the heterogeneous firm effect, γ_t represents the heterogeneous year effect, and e_{it} is the disturbance term.

Table 11 presents the coefficients of interaction term between analyst coverage and conference calls. The results reveal that the stock turnover rate is higher for firms with involuntary calls and followed by both types of analysts versus firms with voluntary calls and followed by both types of analysts or covered only by foreign analysts. Moreover, compared to firms with voluntary calls and followed only by foreign or domestic analysts, firms with involuntary calls and followed by both types of analysts or covered only by domestic analysts have a wider share price range. A firm that participates in an involuntary call and is followed by both types of analysts attracts more investor attention, thereby resulting in high stock liquidity and a wide stock price range. Conversely, firms participating in voluntary calls and covered only by foreign or domestic analysts have low stock liquidity and a narrow stock price range. The results in Table 10 also confirm the findings in Table 8.

4.4 The impact of analyst coverage and conference calls on stock trading for the three major institutional investors

Several studies find that analyst investment recommendations influence institutional investors' trading decisions (Frey and Herbst, 2014; Rebello and Wei, 2014) and subsequent stock returns (Asquith *et al.*, 2005; Farooq, 2017; Kerl, 2011;

Table 11

Results of interaction effect between analyst coverage and conference calls

Variable	Turnover	Pricerange
<i>bothforlocal</i> × <i>volcall</i>	-25.0151*** (9.1132)	0.5970 (1.1649)
<i>bothforlocal</i> × <i>involcall</i>	15.8549** (6.6786)	1.3983* (0.8446)
<i>onlyfor</i> × <i>volcall</i>	-254.1676* (32.7984)	-6.2179** (4.0285)
<i>onlyfor</i> × <i>involcall</i>	-11.7532 (22.8421)	-2.3016 (2.8026)
<i>onlylocal</i> × <i>volcall</i>	-22.7287 (19.3182)	-4.9876** (2.3856)
<i>onlylocal</i> × <i>involcall</i>	11.4358 (13.2736)	3.0320* (1.6345)
Industry-effect	yes	yes
Firm-effect	yes	yes
Time-effect	yes	yes
Adjusted R ²	0.2038	0.3655
Wald χ^2	2928.74***	3631.12***

Notes: This table is the result of 1,453 firms. Only interaction coefficients for analyst coverage and conference call variables are listed in this table, while coefficients for control variables are omitted. *Turnover* is the stock turnover rate. *Pricerange* is the range of the stock's highest and lowest prices for the year. *Bothforlocal* is 1 for firms covered by both foreign and domestic analysts, *onlyfor* is 1 for firms covered by only foreign analysts, and *onlylocal* is 1 for firms covered only by domestic analysts. *Involcall* is 1 for firms participating in an involuntary call, and *volcall* is 1 for firms participating in a voluntary call. Table 4 lists the variable definitions in detail. The standard errors of the coefficient estimates are reported in parentheses. The asterisks ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

Kerl and Walter, 2008). Domestic individual investors in Taiwan account for the majority of stock trading volume, and they often follow institutional investors' stock trades. Wang *et al.* (2018) state that analyst coverage affects the trading behaviors of institutional investors in the Taiwan stock market. In addition, considering that institutional investors are the major users of analyst reports and conference calls, in this section we examine the impacts of analyst coverage and conference calls on the stock trading of the three major institutional investors.

Table 12 presents the results of the impacts of analyst coverage and conference calls on buy (sell), turnover rate, and shareholding ratio for the three

Table 12
Results of the impacts of analyst coverage and conference calls on the stock trading of the three major institutional investors

Panel A. Buy

Variable	Totalbuy		FINIbuy		Trustbuy		Dealerbuy	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>aveTotalreport</i>	40.3166*** (3.0114)		28.6971*** (2.4034)		7.8196*** (0.7588)		7.7526*** (0.8415)	
<i>Totalcall</i>	30.1039*** (2.7642)		28.2583*** (2.2270)		-1.2870** (0.6112)		1.9117*** (0.7076)	
<i>aveForeport</i>		29.3724*** (4.5534)		24.5760*** (3.6255)		4.2726*** (1.2112)		7.5684*** (1.3139)
<i>aveDomreport</i>		51.9760*** (4.7072)		33.1155*** (3.7471)		11.5580** (1.2538)		8.0493*** (1.3594)
<i>Involuntarycall</i>		32.5508 (3.0311)		29.9963*** (2.4334)		-0.8747 (0.7068)		2.4327*** (0.8034)
<i>Voluntarycall</i>		22.9559*** (6.1881)		21.7233*** (4.9788)		-1.2440 (1.3890)		-0.0321 (1.6011)
<i>Stockreturn</i>	0.5171*** (0.0694)	0.51106*** (0.0694)	0.1776*** (0.0551)	0.1752*** (0.0551)	0.2187*** (0.0202)	0.2169*** (0.0202)	0.1477*** (0.0211)	0.1474*** (0.0211)
<i>PBratio</i>	4.5778 (3.8737)	3.7722 (3.8788)	0.0967 (3.1111)	-0.2379 (3.1160)	1.8752** (0.9941)	1.5478* (0.8983)	0.2780 (1.0193)	0.2401 (1.0212)
<i>Lnta</i>	157.7959*** (6.0811)	157.4629*** (6.0956)	119.3166*** (5.0471)	119.4610*** (50.599)	11.9699** (1.0523)	11.7193*** (1.0559)	25.8681*** (1.2918)	25.9382*** (1.2904)
Constant	-871.6473*** (41.8834)	-869.5434*** (41.9796)	-660.9012*** (34.6725)	-661.9496*** (34.7562)	-81.6821*** (7.8537)	-79.7120*** (7.8810)	-129.0511*** (9.2911)	-129.5958*** (9.2905)
Industry-effect	yes	yes	yes	yes	yes	yes	yes	yes
Firm-effect	yes	yes	yes	yes	yes	yes	yes	yes
Time-effect	yes	yes	yes	yes	yes	yes	yes	yes
Adjusted R ²	0.4281	0.4284	0.4047	0.4051	0.1025	0.1034	0.2064	0.2067
Wald χ^2	2184.38***	2198.85***	1753.47***	1759.66***	971.44***	885.06***	1483.03***	1496.84***

Panel B. Sell

Variable	Totalsell		FINIsell		Trustsell		Dealersell	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>aveTotalreport</i>	31.1808*** (2.6644)		21.7898*** (2.1290)		7.3954*** (0.7168)		7.0649*** (0.8338)	
<i>Totalcall</i>	30.8611*** (2.4013)		23.7683*** (1.8881)		3.2677*** (0.5801)		3.5648*** (0.7221)	
<i>aveForeport</i>		25.3879*** (4.0536)		15.0878*** (3.2661)		8.9763*** (1.1414)		6.2349*** (1.2868)
<i>aveDomreport</i>		37.3175*** (4.1919)		28.8612*** (3.3678)		5.7475*** (1.1814)		7.9717*** (1.3312)
<i>Involuntarycall</i>		31.2706*** (2.6545)		23.8642*** (2.1008)		3.4009** (0.6699)		3.7919*** (0.8113)
<i>Voluntarycall</i>		31.2097*** (5.3952)		25.8966*** (4.2522)		2.1148 (1.3186)		2.9823*** (1.6315)
<i>Stockreturn</i>	0.5134***	0.5104***	0.2164***	0.2132***	0.1319***	0.1323***	0.1844***	0.1840***

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	(0.0623)	(0.0623)	(0.0504)	(0.0504)	(0.0190)	(0.0190)	(0.0202)	(0.0202)
<i>PBratio</i>	2.0923 (3.3851)	1.6755 (3.3921)	-0.36863 (2.6751)	-0.8839 (2.6809)	1.2016 (0.8469)	1.3550 (0.8512)	-1.4435 (1.0305)	-1.5168 (1.0333)
<i>Lnta</i>	130.2320*** (5.0237)	129.7944*** (5.0382)	90.3284*** (0.0452)	89.7321*** (3.8122)	11.7246*** (1.0047)	11.8803*** (1.0082)	27.8989*** (1.3851)	27.8687*** (1.3881)
Constant	-760.1431*** (34.8170)	-757.1803*** (34.9162)	-535.8785*** (26.5264)	-531.7469*** (26.5989)	-70.8617*** (7.4615)	-72.0628*** (7.4891)	-155.4686** (9.7807)	-155.2664*** (9.8035)
Industry-effect	yes	yes	yes	yes	yes	yes	yes	yes
Firm-effect	yes	yes	yes	yes	yes	yes	yes	yes
Time-effect	yes	yes	yes	yes	yes	yes	yes	yes
Adjusted R ²	0.4113	0.4113	0.3603	0.3604	0.1305	0.1307	0.2314	0.2313
Wald χ^2	2308.90***	2312.50***	1950.61***	1958.74***	1064.28***	1066.95***	1379.42***	1382.84***

Panel C. Turnover rate

Variable	<i>Totalover</i>		<i>FINover</i>		<i>Trustover</i>		<i>Dealerover</i>	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>aveTotalreport</i>	0.0057*** (0.0004)		0.0035*** (0.0002)		0.0016*** (0.0003)		0.0009*** (0.0002)	
<i>Totalcall</i>	0.0002 (0.0004)		0.0011*** (0.0002)		-0.0006*** (0.0002)		-0.0004*** (0.0001)	
<i>aveForeport</i>		0.0016** (0.0007)		0.0015*** (0.0004)		0.0005 (0.0003)		-0.0002 (0.0003)
<i>aveDomreport</i>		0.0101*** (0.0008)		0.0056*** (0.0004)		0.0028*** (0.0004)		0.0021*** (0.0003)
<i>Involuntarycall</i>		0.0008* (0.0004)		0.0014*** (0.0002)		-0.0004* (0.0002)		-0.0003* (0.0002)
<i>Voluntarycall</i>		-0.0004 (0.0009)		0.0005 (0.0004)		-0.0006 (0.0004)		-0.0003 (0.0004)
<i>Stockreturn</i>	0.0002*** (0.0001)	0.0002*** (0.0001)	0.0001*** (0.0001)	0.0001*** (0.0001)	0.0001*** (0.0001)	0.0001*** (0.0001)	0.0001*** (0.0001)	0.0001*** (0.0001)
<i>PBratio</i>	0.0092*** (0.0061)	0.0088*** (0.0006)	0.0032*** (0.0003)	0.0030*** (0.0003)	0.0031*** (0.0003)	0.0031*** (0.0003)	0.0027*** (0.0002)	0.0026*** (0.0002)
<i>Lnta</i>	0.0111*** (0.0008)	0.1087*** (0.0007)	0.0062*** (0.0003)	0.0061*** (0.0003)	0.0014*** (0.0003)	0.0013*** (0.0003)	0.0031*** (0.0003)	0.0031*** (0.0002)
Constant	-0.0799*** (0.0029)	-0.0780*** (0.055)	-0.0430*** (0.0027)	-0.0421*** (0.0027)	-0.0145*** (0.0027)	-0.0139*** (0.0027)	-0.0215*** (0.0021)	-0.0209*** (0.0021)
Industry-effect	yes	yes	yes	yes	yes	yes	yes	yes
Firm-effect	yes	yes	yes	yes	yes	yes	yes	yes
Time-effect	yes	yes	yes	yes	yes	yes	yes	yes
Adjusted R ²	0.2461	0.2505	0.2478	0.2514	0.0930	0.0946	0.346	0.1369
Wald χ^2	2276.36***	2344.40***	2114.52***	2170.12***	832.76***	847.60***	1299.31***	1325.26***

Panel D. Shareholding ratio

Variable	<i>Totalhold</i>		<i>FINhold</i>		<i>Trusthold</i>		<i>Dealerhold</i>	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>aveTotalreport</i>	0.5375*** (0.0496)		0.3638*** (0.0462)		0.2076*** (0.0145)		0.0084*** (0.0021)	
<i>Totalcall</i>	0.7716*** (0.0492)		0.7711*** (0.0458)		-0.0067 (0.0129)		-0.0039** (0.0017)	
<i>aveForeport</i>		0.5667*** (0.0736)		0.4888*** (0.0684)		0.1102*** (0.0221)		0.0034 (0.0031)

institutional investors' trading decisions are influenced by analyst investment recommendations (Frey and Herbst, 2014; Rebello and Wei, 2014). Their stock trades for firms with high analyst coverage are higher than for firms with low analyst coverage (Jung *et al.*, 2018). Our findings demonstrate that stock trading of the three major institutional investors is influenced by the frequencies of analyst coverage and conference calls.

We also use a two-stage least squares (2SLS) two-way random effects regression to examine whether the three major institutional investors affect the correlation between analyst coverage (or conference calls) and stock market trading. The first- and second-stage system equation models are equations (3) and (4), respectively:

$$insttrading_{it} = \alpha_0 + \alpha_1 coverage_{it} + \alpha_2 calls_{it} + \sum \alpha_k Z_{it} + u_i + \gamma_t + e_{it} \quad (3)$$

$$trading_{it} = \beta_0 + \beta_1 insttrading_{it} + \sum \beta_k Z_{it} + u_i + \gamma_t + e_{it} \quad (4)$$

In equations (3) and (4), *insttrading* is the stock trading variables of the three major institutional investors, including buy (*FINIbuy*, *trustbuy*, *dealerbuy*), sell (*FINIsell*, *trustsell*, *dealersell*), turnover rate (*FINIover*, *trustover*, *dealerover*), and shareholding ratio (*FINIholding*, *trustholding*, *dealerholding*). *Trading* is the stock market trading measured by stock turnover rate (*turnover*) and stock price range (*pricerange*). *Coverage* is the average number of analyst reports issued by each securities firm following a corporate (*aveTotalreport*). *Calls* is the total number of conference calls (*totalcall*). The parameter *Z* represents other firm-specific characteristic variables, as in equation (1). The term u_i represents the heterogeneous firm effect, γ_t denotes the heterogeneous year effect, and e_{it} is the disturbance term. The variable definitions are in Table 4.

Table 13 presents the results of 2SLS. The first stage shows that analyst coverage highly correlates with all the stock trading variables of the three major institutional investors, and the effect of the conference calls on the stock trading

Table 13
Results of the impact of institutional investors on the correlation between analyst coverage (conference calls) and stock market trading

Panel A: Turnover

A1. First-stage				
Variable	Totalbuy	Totalsell	Totalover	Totalhold
<i>aveTotalreport</i>	49.5513*** (3.0326)	35.1913*** (2,6546)	0.0065*** (0.0004)	0.8821*** (0.0675)
<i>Totalcall</i>	33.9655*** (2.6196)	31,7055*** (2.3212)	-0.0002 (0.0003)	0.9212*** (0.0605)
A2. Second-stage				
<i>Insttrading</i>	0.0711*** (0.0135)	0.0813*** (0.0170)	1264.65*** (144.8125)	3.2280*** (0.6624)
Adjusted R ²	0.1751	0.1799	0.2842	0.1491
Wald χ^2	2731.06***	2771.69***	2737.02***	2784.28***

Panel B: Price range

B1. First-stage				
Variable	Totalbuy	Totalsell	Totalover	Totalhold
<i>aveTotalreport</i>	43.4159*** (3.0173)	31.4922*** (2.6636)	0.0051*** (0.0005)	0.7923*** (0.0630)
<i>Totalcall</i>	31.7006*** (2.7118)	30.9451*** (2.3948)	0.0006 (0.0004)	0.8960*** (0.0580)
B2. Second-stage				
<i>Insttrading</i>	0.0141*** (0.0021)	0.0163*** (0.0025)	181.1493*** (27.0078)	0.6036*** (0.0907)
Adjusted R ²	0.2951	0.3005	0.3075	0.3557
Wald χ^2	3611.03***	3614.09***	3281.47***	3758.81***

Notes: This table is the result of 1,453 firms. Only coefficients for analyst coverage, conference call and stock trading of the three major institutional investors are listed in this table, while coefficients for control variables are omitted. *Turnover* is the stock turnover rate. *Pricerange* is the range of the stock's highest and lowest prices for the year. *Totalbuy* (or *totalsell*) is the three major institutional investors' buy (sell). *Totalover* is the three major institutional investors' turnover rates. *Totalhold* is the three major institutional investors' shareholding ratio. *aveTotalreport* is the average total number of foreign and domestic analyst reports. *Totalcall* is the total number of the involuntary and voluntary calls. Table 4 lists the variable definitions in detail. The standard errors of the coefficient estimates are reported in parentheses. The asterisk *** indicates a significance levels of 1%.

variables of the three major institutional investors is the same as the results of analyst coverage, except that the effect of conference call on stock turnover is not significant. The second stage denotes that the stock trading of the three major institutional investors highly correlates with a listed firm's stock turnover rate and

price range. These results indicate that analyst coverage and conference calls affect the stock trading of the three major institutional investors, which in turn affects overall trading in the Taiwan stock market.

4.5 The mediation of analyst coverage in the correlation between conference calls and stock trading

As discussed in previous sections, analyst coverage closely relates to stock market trading. Prior research concludes that any required information obtained from the question-and-answer session of conference calls provides a unique advantage over using management forecasts to measure disclosure quality (Doran *et al.*, 2012; Matsumoto *et al.*, 2011). Moreover, conference calls can reduce errors in analysts' earnings forecasts (Bassemir *et al.*, 2013; Lee, 2016). Therefore, conference calls help firms improve information transparency and increase analyst coverage (Bloomfield and Wilks, 2000). We further examine the relationship between conference calls and analyst coverage using the following equation:

$$coverage_{it} = \beta_0 + \beta_1 involuntarycall_{it} + \beta_2 voluntarycall_{it} + \sum \beta_k Z_{it} + u_i + \gamma_t + e_{it} \quad (5)$$

In equation (5), *coverage* is the analyst coverage measured by the average total number of foreign and domestic analyst reports (*aveTotalreport*), average number of foreign analyst reports (*aveForereport*), and average number of domestic analyst reports (*aveDomreport*). *Involuntarycall* is the number of involuntary calls, and *Voluntarycall* is the number of voluntary calls. The parameter *Z* represents other firm-specific characteristic variables, as in equation (1). The term u_i denotes the heterogeneous firm effect, γ_t represents the heterogeneous year effect, and e_{it} is the disturbance term.

Table 14 presents the results of impacts of conference calls on analyst coverage. They show that conference calls significantly positively correlate with analyst coverage. As for whether analyst reports have a mediating effect in the relationship between conference calls and stock trading, further analysis is needed.

Structural equation models (SEMs), including random intercepts in each

Table 14
Results of the impacts of conference calls on analyst coverage

Variable	<i>aveTotalreport</i>	<i>aveForeport</i>	<i>aveDomreport</i>
<i>Involuntarycall</i>	0.2660*** (0.0099)	0.1795*** (0.0064)	0.1033*** (0.0062)
<i>Voluntarycall</i>	0.2865*** (0.0207)	0.2028*** (0.0135)	0.1101*** (0.0131)
<i>Stockreturn</i>	-0.0011*** (0.0002)	-0.0008*** (0.0001)	-0.0002*** (0.0001)
<i>PBratio</i>	0.2313*** (0.0129)	0.0856*** (0.0084)	0.1511*** (0.0082)
<i>Lnta</i>	0.6396*** (0.0189)	0.2913*** (0.0115)	0.3465*** (0.0112)
Constant	-3.2666*** (0.1345)	-1.4289*** (0.0829)	-1.8395*** (0.0808)
Industry- effect	yes	yes	yes
Firm-effect	yes	yes	yes
Time-effect	yes	yes	yes
Adjusted R ²	0.5433	0.4677	0.4094
Wald χ^2	3855.95***	3133.75***	2593.59***

Notes: This table is the result of 1,453 firms. *aveTotalreport* is the average total number of foreign and domestic analyst reports. *aveForeport* is the average number of foreign analyst reports. *aveDomreport* is the average number of domestic analyst reports. *Involuntarycall* is the number of involuntary calls. *Voluntarycall* is the number of voluntary calls. *Turnover* is the stock turnover rate. *Stockreturn* is the stock return. *PBratio* is the price-to-book ratio. *Lnta* is the natural logarithm of total assets. Table 4 lists the variable definitions in detail. The standard errors of the coefficient estimates are reported in parentheses. The asterisks ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

equation at the individual firm level (i.e., a two-level mediation model) (Krull and MacKinnon, 2001; Preacher *et al.*, 2010), help examine whether analyst coverage mediates the relationship between conference calls and stock trading.¹² The mediating effect of analyst coverage is examined using coefficients obtained from the following equations (MacKinnon and Dwyer, 1993):

¹² The primary advantage of incorporating random effects models into SEMs is that the ability to test for error variance allows for time-varying effects across entities for longitudinal data (Bollen and Brand, 2008). Referring to the approach proposed by Bollen and Brand (2008), Krull and MacKinnon (2001), and Preacher *et al.* (2010), we draw a path diagram corresponding to the observed and latent variables and fit the linear equations to indicate the variances and between-variable correlations. Random intercepts for individual firm and year effects are included in each linear equation. Finally, the direct and indirect impacts are calculated using the regression coefficients of the SEM equation.

$$trading_{it} = \alpha_0 + \beta_1 totalcall_{it} + \sum \beta_k Z_{it} + u_i + \gamma_t + e_{it} \quad (6)$$

$$trading_{it} = \alpha_0 + \tau_1 totalcall_{it} + \tau_2 aveTotalreport_{it} + \sum \gamma_k Z_{it} + u_i + \gamma_t + e_{it} \quad (7)$$

$$aveTotalreport_{it} = \alpha_0 + \theta_1 totalcall_{it} + \sum \theta_k Z_{it} + u_i + \gamma_t + e_{it} \quad (8)$$

In equations (6)-(8), the dependent variable *trading* is the stock turnover rate, stock price range, and three major institutional investors' stock trading (including buy (sell), turnover rate, and shareholding ratio), respectively. The independent variable *totalcall* is the total number of conference calls. The mediator variable *aveTotalreport* is the average total number of foreign and domestic analyst reports. The control variable *Z* is other firm-specific characteristic variables, as in equation (1). The parameter β_1 denotes the total effect of *totalcall* (the independent variable) on *trading* (the dependent variable); τ_1 represents the effect of *totalcall* on *trading* after controlling for *aveTotalreport* (the mediating variable); γ_2 denotes the effect of the mediating variable on *trading*; and θ_1 represents the impact of *totalcall* on *aveTotalreport* (the mediator). The total effect of *totalcall* on *trading* (β_1) is decomposed into two effects: the indirect effect of *totalcall* on *trading*, which is quantified by $\theta_1 \times \tau_2$, and the direct effect of *totalcall* on *trading*, which is quantified by τ_1 . Finally, the total effect of *totalcall* on *trading* is quantified by $\beta_1 = \theta_1 \times \tau_2 + \tau_1$.

Table 15 presents the direct, indirect, and total effects of conference calls on stock market trading. The results show that conference calls have a significantly indirect effect on all the stock trading variables. This indicates that analyst coverage mediates the relationship between conference calls and stock trading.

5. Conclusions

Analyst reports can reduce information asymmetry and provide investors with information about a firm's future profitability, and so analyst coverage affects stock returns and liquidity. In addition, conference calls are an important medium for conveying a firm's value and an effective channel for investors to know the

Table 15
Direct effect, indirect effect, and total effect of conference calls on stock market trading

	<i>Turnover</i>	<i>Pricerange</i>	<i>Totalbuy</i>	<i>Totalsell</i>	<i>Totalover</i>	<i>Totalhold</i>
Direct effect	-2.4699*** (0.9637)	0.3413*** (0.1251)	27.5763*** (2.7935)	28.9286*** (2.4187)	0.0002 (0.0004)	0.7476*** (0.0489)
Indirect effect	2.5686*** (0.3153)	0.1251*** (0.0376)	7.0491*** (0.8899)	4.6874*** (0.7799)	0.0009*** (0.0001)	0.1225*** (0.0137)
Total effect	0.0986 (0.9436)	0.4664*** (0.1232)	34.6255*** (2.7693)	33.6161*** (2.3839)	0.0011*** (0.0004)	0.8701*** (0.0489)
Log likelihood	-74553.76	-54990.52	-84422.10	-83279.72	-2545.07	-46352.71

Notes: This table is the result of 1,453 firms. *Turnover* is the stock turnover rate. *Return* is the stock return. *Pricerange* is the range of the stock's highest and lowest prices for the year. *Totalbuy* (or *totalsell*) is the three major institutional investors' buy (sell). *Totalover* is the three major institutional investors' turnover rate. *Totalhold* is the three major institutional investors' shareholding ratio. Table 4 lists the variable definitions in detail. The standard errors of the coefficient estimates are reported in parentheses. The asterisks ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

firm's performance and vision. Compared with Western capital markets, the information environment is relatively opaque and shareholder protection is weak in Asian capital markets. Analyst reports and conference calls are clearly an important channel for market participants to obtain more public information about a firm.

This research examines the role of sell-side securities analysts and conference calls in capital markets using panel data of Taiwan-listed companies from 2009 to 2015. Our study explores whether the frequencies of analyst coverage and conference calls affect stock trading. The findings show that stock liquidity is higher for firms with higher analyst coverage and conference calls than for firms with limited analyst coverage and less conference calls. We also find that analyst coverage has a greater impact on stock turnover and price range than conference calls do. These findings are consistent with prior literature that suggests high analyst coverage increases investor attention (Da *et al.*, 2011; Drake *et al.*, 2012; Hacibedel, 2014; Li and You, 2015) and improves stock liquidity (Irvine, 2001; Kosaiyakanont, 2013; Wang *et al.*, 2018). The information released in conference calls does affect the listed firm's stock trading in the market (Brown *et al.*, 2004; Kimbrough and Louis, 2011; Matsumoto *et al.*, 2011; Mayew and Venkatachalam,

2012). Overall, our findings state that analyst coverage and conference calls are one of the important channels for improving corporate transparency and boosting stock trading activity.

There is limited literature on the impacts of different types of analyst coverage and conference calls on stock market trading. Our findings indicate that domestic analyst coverage has a significantly positive impact on stock turnover and share price range. A reasonable explanation is that a firm is highly followed by domestic analysts, which can attract investors' attention and thereby increase the turnover of the firm's stock, but it can also lead to a wider share price range. Furthermore, we see that involuntary calls have significant effects on stock market trading, whereas voluntary calls do not. Since involuntary calls are initiated by securities firms, such calls are motivated by their business activities. Generally, firms with high investor attention, large firm size, high profitability, and high growth are the targets invited by securities firms for conference calls. Therefore, a firm with involuntary calls and covered by both foreign and domestic analysts has more informativeness, and such a firm also has relatively high stock liquidity and price volatility. Our results differ from those of Bushee *et al.* (2003, 2004), who present that open calls (similar to voluntary calls) have a greater impact on the stock market than closed calls (similar to involuntary calls).

Institutional investors often play a predominant role in emerging stock markets, and they refer to sell-side analyst reports as well as their own forecasts and analysis to make investment decisions. We examine the impact of Taiwan's three major institutional investors on the relationship between analyst coverage and conference calls and stock trading. Institutional investors are major consumers of analyst reports, as well as important participants in calls. Retail investors often follow the trading behavior of institutional investors. Our findings suggest that analyst coverage and involuntary conference calls influence institutional investors' stock trading. This result is consistent with prior literature, whereby changes in the frequencies of analyst coverage and conference calls affect the stock trading activity of institutional investors (Frey and Herbst, 2014; Mola *et al.*, 2013; Rebello and Wei, 2014).

We finally examine the mediating effect of analyst coverage between conference calls and stock market trading. Our findings highlight that a high frequency of conference calls attracts analysts' attention, and analyst coverage is a significant mediator in the relationship between conference calls and stock market trading. This result means that conference calls are one of the important channels for analysts to obtain firms' information. The information released over conference calls influence analyst coverage, which in turn affect investors' stock trading. Our results are consistent with prior literature that analysts' participation in conference calls impact institutional investors' trading activity (Jung *et al.*, 2018; Milian and Smith, 2017). Therefore, the indirect effect of conference calls on stock market trading caused by analyst coverage should not be ignored and is particularly significant for stock markets dominated by institutional investors.

There is presently no agency in Taiwan to completely and systematically collect and organize analyst reports. The study period is limited, because the data required for our research must be obtained from foreign databases, and much manpower is required for data processing. We are continuing to seek financial support to extend the research scope. In the future, analysis shall be carried out to discover more in-depth findings and contribute to research in this field.

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