Does ownership structure matter for overshooting manipulation of hospitality and tourism stocks?

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1. Introduction

Instead of instantly pricing all publicly known information according to the efficient market hypothesis, investors may be influenced by emotional biases such as greed or fear, resulting in stock price overshooting phenomena such as stock price overbought (oversold). Furthermore, we argue that stock price overshooting may not be beneficial to investors. Investors buying stocks with overbought phenomena (i.e., buying stocks at rising prices due to investors' optimistic sentiment likely triggered by further rising higher prices expected) may suffer losses; similarly, investors selling stocks with oversold phenomena (i.e., selling stocks at falling prices due to investors' pessimistic sentiment likely expecting further falling share prices) may suffer losses (Al Janabi et al., 2019). Furthermore, stakeholders and even insiders may profit from such phenomena by selling at an overestimated price or buying at an underestimated price (Cao et al., 2021; Clarke, 2022; Xiao et al., 2022).

Since the number of tourists from Mainland China increased significantly between 2009 and 2015, share prices have risen (e.g., stock price overbought phenomenon), stock price volatility has increased, and the trading volume of tourism and hospitality stocks in Taiwan has increased. Following that, we observed that some of these companies may manipulate their stock prices in order to profit from the occurrence of stock price overbought phenomena, resulting in increased stock price volatility and falling share prices after selling shares at overbought prices as measured by technical indicators such as SOI and RSI (Day et al., 2022; Kamalov, 2020; Ni et al., 2022; Pramudya and Ichsani, 2020).

The phenomena observed above serve as the primary motivation in this study. As a result, we investigate whether the ownership structure of tourism and hospitality companies listed on the Taiwan Stock Exchange (TWSE) influences stock price overreaction manipulation, as share price overshooting frequently occurs for these firms after Chinese authorities relax restrictions on tourists visiting Taiwan. In addition, given that ownership structure plays an important role in corporate governance (Jiang and Kim, 2020; Kyere and Ausloos, 2021), the theoretical framework for corporate governance is primarily based on agency theory (Amis et al., 2020; Kyere and Ausloos, 2021) to protect investors (Garcia Sanchez and Meca, 2018). As a result, corporate governance cannot be overemphasized by any relevant parties (e.g., enterprises, authorities, and investors) today in order to protect the interests of investors.

Furthermore, stock price overshooting can be detected using a variety of technical indicators, including stochastic oscillator indicators (SOI) and the relative strength index (RSI). Thus, we investigate whether overbought (oversold) phenomena defined by SOI and RSI as our proxies, abbreviated as OB-SOI (OS-SOI) and OB-RSI (OS-RSI), all of which are defined in detail in Table 2, occur frequently or rarely in tourism and hospitality firms. Furthermore, the higher the values for these proxies,
the greater the overshooting phenomenon experienced by TWSE-listed tourism and hospitality firms. As a result, we are curious about how the function of the ownership structure affects these proxies. Because stocks of tourism and hospitality firms listed on the TWSE exhibit stock price overshooting phenomena more frequently than large-cap stocks, we investigate whether stock price overshooting phenomena as measured by technical indicators, SOI and RSI, for Taiwan hospitalization and tourism firms are influenced by the function of ownership structure for such firms. In other words, we attempt to link whether stock price overshooting phenomena are related to corporate governance, which is likely beneficial for selecting tourism firms focusing on the tourism business rather than stock price manipulation, which appears to be rarely explored in relevant studies.

In terms of Taiwan’s tourism and hospitality industry, we argue that it is one of the most forward-thinking industries because Taiwan, which is located on the western edge of the Pacific Ocean, has 9 national parks and 13 national scenic areas to preserve Taiwan’s best natural ecological environment and cultural sites. Taiwan had a record tourist footfall of 11.1 million in 2018, according to the Taiwan Tourism Bureau, and the industry’s growth rate of 3.1% was higher than the Taiwanese economy’s. Moreover, an increase in the number of tourists visiting Taiwan from China (i.e., inbound tourism), particularly Chinese tourists, and Taiwanese tourists visiting other countries would benefit the tourism and hospitality enterprises (i.e., outbound tourism). The number of visitors to Taiwan reaches 10.44 million in 2015, according to Table 1 of the Taiwan Tourism Bureau report, while the number of outbound tourists from Taiwan rises to 13.18 million.

Moreover, the tourism and hospitality industry has great prospects in the Asia Pacific region (Singh, 1997), with potential economic values (Chan et al., 2012; Hassan, 2000; Helgadóttir and Sigurardóttir, 2008; Koh and Kwok, 2017; Lee et al., 2017), and its economic value may not be less than other industries in many countries (Cranmer et al., 2020; Eeckels et al., 2012; Kontogeorgopoulos, 1998; Sugden, 2007). Many countries regard it as a star industry in the twenty-first century. As a result, the TWSE-listed tourism and hospitality firms serve as our investigated targets because we find that share price overreaction occurs frequently for the stocks of such firms, which may be due to an increase in tourists visiting Taiwan from China following the resolution of political tensions after 2008. Furthermore, because share price informativeness, such as stock price overreaction, can be influenced by the function of ownership structure, we investigate whether our new overreaction proxies would be influenced by the ownership structure of such companies in this study.

Table 1. Taiwan inbound and outbound tourists from 2009 to 2015.

| Year  | Inbound tourists (million) | YOY growth |
|-------|----------------------------|------------|
| 2009  | 4.40                       | 14.3%      |
| 2010  | 5.57                       | 26.7%      |
| 2011  | 6.09                       | 9.3%       |
| 2012  | 7.31                       | 20.1%      |
| 2013  | 8.02                       | 9.6%       |
| 2014  | 9.91                       | 23.6%      |
| 2015  | 10.44                      | 5.3%       |

Panel B: Taiwan outbound tourists

| Year  | Outbound tourists (million) | YOY growth |
|-------|----------------------------|------------|
| 2009  | 8.14                       | -3.8%      |
| 2010  | 9.42                       | 15.6%      |
| 2011  | 9.58                       | 1.8%       |
| 2012  | 10.24                      | 6.8%       |
| 2013  | 11.05                      | 7.9%       |
| 2014  | 11.48                      | 7.2%       |
| 2015  | 13.18                      | 11.3%      |

Source: Taiwan Tourism Bureau

This research may contribute to the body of knowledge in the following ways. To begin, different from other proxies of firm performance, such as return on asset (ROA), return on equity (ROE), and Tobin’s q that are released quarterly or annually, our proxies would be updated as soon as share prices were released. Because our new proxies for TWSE-listed tourism and hospitality firms are being updated quickly, we may be able to gauge the function of ownership structure quickly. Second, contrary to our perception, we reveal that stock price overbought phenomena may be manipulated by some tourists visiting Taiwan following the resolution of political tensions after 2008. Furthermore, because share price informativeness, such as stock price overreaction, can be influenced by the function of ownership structure, we investigate whether our new overreaction proxies would be influenced by the ownership structure of such companies in this study.

Table 2. Definition of variables.

| Variables | Definition |
|-----------|------------|
| Proxies for overshooting |
| OB-SOI    | OB-SOI is the proportion of a year’s trading days that fall into K ≧ 80. |
| OS-SOI    | OS-SOI is the proportion of a year’s trading days that fall into K ≤ 20 |
| OB-RSI    | OB-RSI is the proportion of a year’s trading days that fall into RSI ≧ 70. |
| OS-RSI    | OS-RSI is the proportion of a year’s trading days that fall into RSI ≤ 30. |
| Ownership structure |
| Directors’ shareholding | Directors’ shareholdings/Outstanding shares |
| Top ten shareholding | Top ten shareholdings/Outstanding shares |
| Managers’ shareholding | Managers’ shareholdings/Outstanding shares |
| Directors’ pledge | Directors’ pledged shareholdings/Directors’ shareholdings |
| Board size | Total board directors |
| CEO duality DM | If a company’s chairman is also its CEO, set to 1; otherwise, 0. |
| Financial statements and others |
| Leverage | Debts/Assets |
| Net profit | Net profit/Revenue |
| Asset turnover | Sales/Assets |
| Firm size | In (market value) |

2. Literature review

We review the relevant literature, including share price informativeness, ownership structure, and financial statements, as well as stock price manipulation and stock price overshooting, and then leave room for further investigation.

2.1. Share price informativeness, ownership structure, and financial statements

The relationship between share price informativeness and ownership structure has been extensively researched in relevant studies, including tourism and hospitality studies. For example, firms with large ownership would increase their firm value (Huang and Kang, 2017); board independence is positively associated with firm performance (Chou, Hamill, and Yeh, 2016); Chinese firms with smaller boards use debt financing more conservatively (Huang and Wang, 2015); and earnings management occurs frequently for firms with CEO duality (Chi et al., 2015). In terms of tourism and hospitality research, Al-Najjar (2014) discovers that...
board independence positively affects stock price performance, Ozdemir and Upneja (2012) finds that firms with high outside board members frequently have high CEO compensation, and Ozdemir (2020) reveals that firms with board diversification would improve their firm performance. Furthermore, Yeh (2018) reveals that tourism and hospitality firms with a smaller board and higher director ownership have a higher foreign institutional shareholding. Zheng and Tsai (2019) show that small boards benefit tourism and hospitality firms in China. Besides, Yeh (2019) finds that firms with higher cash flows have a positive effect on ROA and Tobin’s q, whereas firms with a disparity in ownership have a negative effect on Tobin’s q. Yeh (2020) demonstrates that a high foreign institution holding ratio and a low director pledge ratio have a significant positive impact on a company’s performance.

Moreover, we propose that financial performance factors be considered as controlling variables, as financial performance is likely to influence the informativeness of stock prices. Thus, based on ROE being regarded as an important indicator for gauging firm performance, we classify ROE into net profit ratio as a measure of profitability, asset turnover ratio as a measure of asset management ability, and equity multiplier, allowing investors to better understand the components of ROE. Cai and Zhang (2011) show that a high-leverage firm is harmful to the firm’s share value. Firms with high profitability outperform their competitors (Linsmeier, 2016). According to Barton and Simko (2002), companies with better asset management have higher share prices. What’s more, enterprises with highly volatile share prices will have lower company value (Atanasov and Nitschka, 2017).

After reviewing the relevant studies, we investigate whether our stock overreaction proxies are influenced by ownership structure variables (e.g., the shareholding of directors, that of top ten shareholders, that of managers, directors’ shareholding pledged, CEO duality, and board size), financial statements (e.g., asset turnover, leverage, and net profit), and other variables such as firm size.

2.2. Stock price manipulation and stock price overshooting

Regarding the association between ownership structure and stock price overshooting manipulation in recent studies, Cheng et al. (2021) argue that some investors holding speculative stocks without solid fundamentals may be unaware that these stock prices may be manipulated by investors with market forces and inside information, such as stakeholders and insiders. Furthermore, firms with poor corporate governance are associated with stock price overshooting manipulation (Kim and Kim, 2022; Shah et al., 2019). Furthermore, because foreign investment institutions prefer stocks with a large market capitalization and a larger free float (Badhani et al., 2022), Taiwanese tourism stocks are almost small-cap stocks that may not be preferred by foreign investors. Moreover, based on the characteristics (e.g., limited outstanding shares for small-cap tourism stocks in Taiwan), some tourism firms with corporate governance issues may manipulate share prices (i.e., these tourism firms may sell their share at overbought prices to exploit profits). Besides, these firms that profit by manipulating their share prices may not appeal to foreign investors because small-cap stocks may not attract foreign investors due to liquidity concerns (Jung and Choi, 2021).

As previously stated, several technical indicators, such as the SOI and RSI, can detect stock price overshooting, including overbought (over-sold) conditions (Dey et al., 2022; Kamalov, 2020; Ni et al., 2022; Pramudya and Ichsani, 2020). Furthermore, professional investors are primarily concerned with technical and fundamental information (Bonenkamp, 2010), as well as undisclosed information (Ahern, 2017; Hambusch et al., 2021). In fact, professional investors frequently use technical information such as moving averages (Arajo et al., 2018; Metghalchi et al., 2019), relative strength indexes (Cohen, 2020; Vo and Yost-Bremm, 2020), and stochastic oscillator indicators (Tas and Gürsoy, 2016; Vo and Yost-Bremm, 2020). Because stock prices are regarded as leading indicators in the relevant studies (Broome, 2004; Auret and Golding, 2012), we argue that RSI and SOI updated by stock prices may also be regarded as leading indicators. Furthermore, these technical indicators are available on a variety of well-known financial websites (e.g., Bloomberg, CNN Markets, MarketWatch, etc.). As a result, we conclude that these technical indicators (RSI and SOI) may be useful for predicting share prices and even share price manipulation.

Ni et al. (2022) find that momentum trading may be appropriate for China stock markets prior to 2016, as individual investors account for more than 80% of the trading volume in China stock markets. In other words, their findings suggest that the stock price overshooting phenomenon may be caused by individual investors’ herding behavior, which may benefit relative parties (e.g., institutional investors and insiders) seeking to profit by manipulating stock prices because individual investors may be regarded as uninformed investors (Chiou et al., 2022). However, momentum trading may not be appropriate for China stock markets after 2015, as the weight of China stock markets has been lifted since 2015, resulting in markets dominated primarily by financial institutions. Furthermore, Wu et al. (2020) revealed that price limit regulation in Taiwan may lead to opportunities for financial institutions, stakeholders, and insiders to manipulate share prices, indicating that from the perspectives of trading systems, an inappropriate trading system (e.g., a narrow price limit range) may provide the opportunity for these relevant parties to manipulate the stock price.

2.3. Room for further investigation

Following a review of the literature, we state that stock price over-shooting phenomena can be gauged by the SOI and RSI, and such phenomena may be related to stock price manipulation and even corporate governance issues for these tourism firms, as we observe rising share prices to appeal investors pursuing higher prices for tourism firms over the data period 2009–2015. As a result, we may find a research gap because our investigated issue, which includes stock price overshooting phenomena, corporate governance issues, the political factor of relaxing Chinese tourists visiting Taiwan, and the suspicion of stock price manipulation, may be missing from relevant studies. As a result of bridging this research gap, this study would be valuable for future research.

3. Data and methodologies

3.1. Data

Despite the fact that Taiwan has many tourism and hospitality firms, the majority of them are not listed on the TWSE because firms that do not meet several required standards (e.g., a certain amount of company capital, equity dispersion) may not be able to list on the TWSE. In other words, the firms on the TWSE with the highest market capitalization and free float are high-tech firms, banking firms, and large firms in a variety of traditional industries (e.g., plastic, steel, cement, food, construction, shipping, and so on). As a result, the TWSE listing firms in the hospitality and tourism category are small-cap firms, which may provide stock market manipulation for some hospitality and tourism firms with corporate governance issues.

Because political tensions between Taiwan and China eased after 2008, we use data from 2009 to 2015, when political tensions between Taiwan and China increased at the start of 2016. As previously stated, we observed that some of these firms may manipulate their share prices in order to profit by selling their shares when the stock price is overbought, resulting in increased stock price volatility and falling share prices after selling shares at overbought prices as measured by the SOI and RSI. We then chose and collected TWSE-listed tourism and hospitality companies as our sample because their board structure and financial statements are publicly available. As a result, we can investigate whether ownership structure influences stock price overshooting manipulation in hospitality and tourism stocks in this study.
Following that, we collect 165 firm-year observations from Taiwan Economic Journal over the data period. We then introduce these variables used in Table 2 by examining whether our overshooting proxies would be influenced by ownership structure and financial statements variables due to the suspicion of stock price manipulation.

3.2. Methodologies

We first introduce SOI and RSI, which are technical indicators used to measure stock price overshooting.

3.2.1. Trading signals triggered by SOI

K value (i.e. SOI) is quite sensitive because stock prices change, resulting in K value that is modified because of the lowest and highest prices changing during the data period.

\[
CL_t = SP_t - \min(SP_t, SP_{t-1}, SP_{t-2}, \ldots, SP_{t-n})
\]

\[
HL_t = \max(SP_t, SP_{t-1}, SP_{t-2}, \ldots, SP_{t-n}) - \min(SP_t, SP_{t-1}, SP_{t-2}, \ldots, SP_{t-n})
\]

\[
RSV_t = \frac{CL_t}{HL_t} \times 100
\]

\[
K_t = \frac{2}{3} K_{t-1} + \frac{1}{3} RSV_t
\]

where \(CL_t\) is the difference between the highest and lowest share price in 9 days deducted from the current share price; \(HL_t\) is the difference between the highest and lowest share price in 9 days; \(RSV_t\) is derived by dividing \(CL_t\) by \(HL_t\); \(K_t\) is equal to 1/3 of \(RSV_t\) and 2/3 of \(K_{t-1}\). Overbought (overbought) stock prices are \(K_t \leq 20 \ (K_t \geq 80)\).

Previous research indicates that adopting the trading signals generated by the SOI might provide superior performance in forecasting stock prices (Chiang et al., 2012); investment institutions frequently trade stocks using the SOI trading rule (Wang et al., 2012).

3.2.2. Trading signals triggered by RSI

These basic components of the RSI (Relative Strength Index) are defined below: RS (Relative Strength), AG (Average Gain), and AL (Average Loss).

\[
RSI = 100 \left(1 - \frac{1}{(1 + RS)}\right)
\]

\[
RS = AG/AL
\]

The initial measurement for AG (Average Gain), and AL (Average Loss) is a 14-day average:

\[
Initial AG = \text{Gains over the last } 14 \text{ days}/14
\]

\[
Initial AL = \text{Losses over the last } 14 \text{ days}/14
\]

The following measures are affected by the preceding AG (AL) and current gain (CG) (current loss (CL)):

\[
AG = \left(\frac{\text{previous AG}}{13 + CG}\right) / 14
\]

\[
AL = \left(\frac{\text{previous AL}}{13 + CL}\right) / 14
\]

When the RSI is equal to 100 (0), it indicates no downward (upward) price movements in 14 days. Thus, when the RSI is close to 100, stock prices are overbought, and when it is close to 0, they are oversold. The phenomenon of stock price overbought (oversold) is defined as RSI\(\leq 20\) (RSI\(\geq 80\)) over 14 days.

Previous research indicates that RSI trading rules can produce positive risk-adjusted returns in currency markets (Shik and Chong, 2007); London Stock Exchange investors could earn higher returns by using RSI trading signals (Chong and Ng, 2008).

3.2.3. Method

The model below investigates how our proxies are impacted by ownership structure, financial statements, and other variables.

\[
Y_{ik,t} = \gamma_0 + \gamma_1 \text{directors' shareholding}_{k,t} + \gamma_2 \text{top ten shareholding}_{k,t} + \gamma_3 \text{managers' shareholding}_{k,t} + \gamma_4 \text{pledge}_{k,t} + \gamma_5 \text{CEO duality dummy}_{k,t} + \gamma_6 \text{board size}_{k,t} + \gamma_7 \text{leverage}_{k,t} + \gamma_8 \text{net profit}_{k,t} + \gamma_9 \text{asset turnover}_{k,t} + \gamma_{10} \text{firm size}_{k,t} + \epsilon_{i,k,t}
\]

where \(Y_{ik,t}\) presents OB-SOI as \(i = 1, 2, 3\), and \(4\); \(Y_{3k,t}\) presents OB-RSI as \(i = 3\); and \(Y_{4k,t}\) presents OS-SOI as \(i = 4\).

Because the range of several variables is rather broad, we also examine our models using data that excludes outliers to avoid having our empirical results skewed by these outliers. Panel data models may be more appropriate than regression models due to the use of firm-year data. Nonetheless, Petersen (2009) claims that panel data models are insufficient for identifying clusters in firm-year observations. Petersen (2009) proposes a model to better understand the structure of panel data because residuals can be cross-firm or cross-time, resulting in biased results when using panel data models. As a result, we employ the Petersen regression model. In terms of robustness, we use censored panel data models in addition to panel data models since the range of dependent variables (OB-SOI, OB-RSI, OS-SOI, and OS-RSI) is between 0 and 1.

In other words, despite the fact that panel data models are commonly used for analyzing panel data sets in finance, Petersen (2009) addressed possible biases in the standard errors, which vary widely and in many cases are incorrect, for using panel data models. In addition, a variety of methods used to estimate standard errors in panel data sets are frequently flawed. As a result, in order to address the aforementioned issue, Petersen proposes modified models adopted by subsequent studies (Bartov et al., 2018; Bolton et al., 2016; Faulkender et al., 2019; Malm et al., 2022; Yeon et al., 2021). The Petersen models are utilized in this study.

4. Empirical results and analyses

4.1. Descriptive statistics

The mean values of OB-SOI and OS-SOI are 19.94% and 21.36%, respectively, as shown in Table 3, indicating that the number of firms falling into overbought days, as measured by K value, is marginally less than the number of firms falling into oversold days during the time period. As for OB-RSI and OS-RSI, the averages of OB-RSI and OS-RSI are 12.7% and 11.82%, respectively, indicating that overbought days falling into overbought days, as measured by K value, is marginally less than the number of days falling into oversold days during the time period. As for OB-RSI and OS-RSI, the averages of OB-RSI and OS-RSI are 12.7% and 11.82%, respectively, indicating that overbought days falling into overbought days, as measured by K value, is marginally less than the number of oversold days measured by RSI during the data period.

Table 3 also reveals that the minimum director shareholding is only 5.32%, the maximum director pledge is nearly 100%, and the maximum leverage is 97.62%. These results suggest that some tourism and hospitality firms may have corporate governance problems. Besides, the maximum and minimum ranges for net profit and asset turnover are quite large, indicating that firm performance, such as profitability and asset management ability, may vary greatly among these tourism and hospitality enterprises.

4.2. Empirical results

Initially, we use the variance inflation factor (VIF) test to test multicollinearity issues and find that no VIF values are more than 3, representing that multicollinearity issues do not exist among independent variables for this study. Because the ranges of several financial variables are quite broad, we examine our models using data with and without excluding outliers, as shown in Columns (Ia)–(Iva) and Columns...
Based on insignificant estimates by the 2SLS or GMM and concludes that our proxies are interact. This study uses instrument proxies (e.g., OB-SOI, OS-SOI, OB-RSI, OS-RSI) and ownership structure.

Table 3. Summary statistics displays descriptive statistics for the dependent and independent variables introduced in Table 2.

| Variable | Obs | Mean | Median | Std. Dev. | Min | Max |
|----------|-----|------|--------|-----------|-----|-----|
| OB-SOI   | 165 | 0.1994 | 0.1967 | 0.0641 | 0.0488 | 0.4382 |
| OS-SOI   | 165 | 0.2136 | 0.2146 | 0.0655 | 0.0447 | 0.3831 |
| OB-RSI   | 165 | 0.127 | 0.1215 | 0.0582 | 0.0162 | 0.3992 |
| OS-RSI   | 165 | 0.1182 | 0.1155 | 0.0572 | 0.008 | 0.2621 |
| Directors’ shareholding | 165 | 0.2455 | 0.2194 | 0.1302 | 0.0552 | 0.5425 |
| Top ten shareholding | 165 | 0.2802 | 0.2433 | 0.1505 | 0 | 0.6434 |
| Managers’ shareholding | 165 | 0.0121 | 0.0009 | 0.0231 | 0 | 0.1452 |
| Directors’ pledge | 165 | 0.1441 | 0.024 | 0.2048 | 0 | 0.9997 |
| CEO duality | 165 | 0.2667 | 0 | 0.4436 | 0 | 1 |
| Board size | 165 | 7.2727 | 7 | 2.4504 | 5 | 15 |
| Leverage | 165 | 0.4434 | 0.4608 | 0.2296 | 0.1216 | 0.9762 |
| Net profit | 165 | 0.1554 | 0.0589 | 0.3046 | −1.166 | 1.2631 |
| Asset turnover | 165 | 0.6998 | 0.5 | 0.6644 | 0.04 | 4.35 |
| Firm size | 165 | 15.9126 | 15.78 | 1.1913 | 13.47 | 19.35 |

Table 4. Results of SOI-defined overreaction proxies.

| Dep. Var. | OB-SOI | OS-SOI |
|-----------|--------|--------|
|           | (Ia)   | (Ib)   | (Ic)   | (IIa)  | (IIb)  | (IIc)  |
| Directors’ shareholding | −0.0988*** | −0.1024*** | −0.126*** | 0.0026 | 0.0217 | 0.0398 |
|            | (0.0502) | (0.0525) | (0.0538) | (0.0448) | (0.0458) | (0.0539) |
| Top ten shareholding | −0.0695** | −0.0655* | −0.0502 | 0.0444 | 0.0422 | 0.0122 |
|            | (0.0339) | (0.0346) | (0.0454) | (0.0341) | (0.0343) | (0.0161) |
| Managers’ shareholding | −0.3518** | −0.38*** | −0.4902*** | 0.4509 | 0.4508 | 0.4827*** |
|            | (0.1737) | (0.1731) | (0.035) | (0.2806) | (0.2841) | (0.1231) |
| Directors’ pledge | −0.0195 | −0.0193 | −0.0349 | −0.0202 | −0.0192 | 0.0073 |
|            | (0.0227) | (0.0231) | (0.0403) | (0.0279) | (0.028) | (0.0151) |
| CEO duality | −0.0145 | −0.0151 | −0.0198* | 0.0109 | 0.0121 | 0.0139 |
|            | (0.0115) | (0.0115) | (0.0101) | (0.0131) | (0.013) | (0.0086) |
| Board size | 0.0002 | 0.0001 | 0.0024 | −0.0018 | −0.0025 | −0.0052 |
|            | (0.0023) | (0.0025) | (0.004) | (0.0023) | (0.0023) | (0.0042) |
| Leverage | 0.0661*** | 0.0668*** | 0.1139*** | −0.0351 | −0.0491 | −0.0851* |
|            | (0.0317) | (0.0346) | (0.0423) | (0.0321) | (0.0336) | (0.0455) |
| Net profit | −0.0007 | 0.0023 | 0.0293 | 0.0094 | −0.0195 | −0.0399 |
|            | (0.0203) | (0.0295) | (0.0337) | (0.0222) | (0.0274) | (0.0361) |
| Asset turnover | −0.0103 | −0.0144 | −0.0122*** | 0.0154* | 0.0104 | 0.0123 |
|            | (0.0071) | (0.0098) | (0.0062) | (0.0081) | (0.0114) | (0.0118) |
| Firm size | −0.0192*** | −0.0201*** | −0.0298*** | 0.0215*** | 0.0255*** | 0.0311*** |
|            | (0.0065) | (0.0069) | (0.0047) | (0.0067) | (0.0067) | (0.0064) |
| Const. | 0.57*** | 0.5906*** | 0.6844*** | −0.1379 | −0.1869* | −0.246*** |
|            | (0.0912) | (0.0943) | (0.0586) | (0.094) | (0.095) | (0.0814) |
| yearly dummies | Y | Y | N | Y | Y | N |
| Outliers excluded | N | Y | Y | N | Y | Y |
| Adj R² | 0.3863 | 0.3974 | 0.1995 | 0.3095 | 0.3198 | 0.1801 |
| Coeff. Est. | GLS | GLS | Petersen | GLS | GLS | Petersen |
| Std. Err. | White | White | Cluster F&T | White | White | Cluster F&T |

This could be attributed to stock prices, which are leading indicators, rather than ownership structure variables, which are more likely to be coincidental and even lagging indicators.

\[ Y_{ik,t} = \gamma_0 + \gamma_1 \text{directors’ shareholding} + \gamma_2 \text{top ten shareholding} + \gamma_3 \text{managers’ shareholding} + \gamma_4 \text{directors’ pledge} + \gamma_5 \text{CEO duality} + \gamma_6 \text{board size} + \gamma_7 \text{leverage} + \gamma_8 \text{net profit} + \gamma_9 \text{asset turnover} + \gamma_{10} \text{firm size} + \varepsilon_{i,k,t} i = 1 \text{and} 2, \]

In Table 4, Columns (Ia) and (Ib) and Columns (Ib) and (Ib) show the outcomes of regression models including and excluding outliers (adjusting standard error suggested by White (1980)). Columns (Ic) and (Ic) show the results of the Petersen models (adjusted standard error suggested by Petersen (2009)). Below the computed coefficients are the standard errors. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

In Table 5, Columns (Ia) and (Ia) and Columns (Ib) and (Ib) show the outcomes of regression models including and excluding outliers (adjusting standard error suggested by White (1980)). Columns (Ic) and (Ic) show the results of the Petersen models (adjusted standard error suggested by Petersen (2009)).

In terms of regression models, Column (Ia) shows that firms with lower directors’ shareholding, lower managers’ shareholding, higher leverage, and smaller firm size would enhance OB-SOI. The results differ from our expectations in that firms with higher OB-SOI may not have a well-functioning ownership structure. Because the ranges between maximum and minimum values for some variables are rather broad, as

(IIa)-(IVb) of Tables 4 and 5, to see if we can avoid having our results skewed by these outliers. Because of the shortcomings of panel data models mentioned above, this study shows the outcomes of Petersen regression models in Tables 4 and 5, Columns (Ic)-(IVc).

Furthermore, our models may have endogenous concerns if our proxies (e.g., OB-SOI, OS-SOI, OB-RSI, OS-RSI) and ownership structure (e.g., directors’ shareholding) interact. This study uses instrument variables estimated by the 2SLS or GMM and concludes that our proxies are exogenous variables based on insignificant statistics from Hausman tests.
shown in Table 3, we display the results without including outliers. The results in Column (Ib) without outliers are similar to those in Column (Ia) with outliers. Following that, the Petersen model (i.e., Column (Ic)) demonstrates that firms with lower directors’ shareholding, lower managers’ shareholding, higher leverage, and small firm size positively affect the OB-SOI. In other words, the results shown in either Petersen regression models or multiple regression models are nearly identical, representing that our outcomes are robust after using diverse models.

In Table 4, Columns (Iia)–(Iic) show that firms with higher OS-SOI have high firm size after employing the model without excluding outliers (i.e., Column (Iia)), the model with excluding outliers (i.e., Column (Iib)), and the Petersen model with excluding outliers (i.e., Column (Iic)), indicating that tourism and hospitality firms with large firm size may not have better share price performance Table 5 also shows that companies with either lower directors’ shareholding or lower asset turnover have higher OB-RSI, implying that companies with higher OB-RSI may not have well-functioning ownership structure. Because the revealed results in Tables 4 and 5 differ from our perception, we conclude that because overbought phenomena frequently result from rising share prices, these overbought phenomena may be manipulated by tourism and hospitality firms, resulting in directors and managers reducing their shareholdings. As a result, we argue that these tourism and hospitality firms may have corporate governance issues.¹

¹ We also collected data from 2016 to 2021. However, our findings revealed in this paper (using the data from 2009 to 2015) are not shown for employing the data after 2016 (i.e., using the data from 2016 to 2021). Due to the many tables (i.e., seven tables) shown in this paper (some of which are for robustness concerns), we then explain them here in order to save space in the context. In addition, we further deduce that since the ruling party was changed to a party disliked by Mainland China, political tensions between Taiwan and China have intensified since the beginning of 2016. As a result, the hospitality and tourism stocks might not appeal to many investors, resulting in declining share prices, especially shrinking trading volume significantly.

When compared to previous studies, we find that firms with well-functioning ownership structures not only have better corporate governance but also perform better. Previous research indicates that tourism firms with better corporate governance demonstrated well-functioning ownership structure characteristics such as board independence (Al-Najjar, 2014; Chou et al., 2016), lower leverage (Cai and Zhang, 2011), higher directors shareholding (Huang and Kang, 2017; Yeh, 2018), lower director pledge (Yeh, 2020), high foreign institutional shareholding (Yeh, 2020), and small board size Yeh (2018); Zheng & Tsai Furthermore, Imisiker and Tas (2013) demonstrate that small firms, firms with a lower free float rate that may have illiquidity and asymmetric information issues, and firms with higher leverage that may have corporate governance issues are more prone to stock price manipulation, indicating that stock price manipulation may occur frequently for firms with asymmetric information (Chiu et al., 2007), illiquidity (Horst and Naujokat, 2011), and corporate governance issues (Cai and Zhang, 2011; Kim and Kim, 2022; Shah et al., 2019). Given that the majority of tourism and hospitality stocks in Taiwan are small-cap stocks, these companies are likely to have issues with information asymmetry, illiquidity, and even corporate governance. As a result, some of these firms are likely to manipulate share prices in order to profit from individual investors, implying that investors should place more emphasis on firms with better corporate governance in order to avoid investment losses.

Furthermore, contrary to the findings of Irani et al. (2021), foreign investors flock to Turkey during times of uncertainty, raising the overall stock market price. Due to the high trading volume of foreign investment institutions, Taiwanese stocks with high market capitalization and free floats, such as high-tech and banking stocks, would be preferred over tourism stocks, which have a market capitalization of less than 3% in Taiwan. As a result, similar events that occurred in Turkey may not have

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### Table 5. Results of RSI-defined overreaction proxies.

| Dep. Var. | OB-RSI | OS-RSI |
|-----------|--------|--------|
|            | (Ia)   | (Ib)   | (Ic)   | (Ia)   | (Ib)   | (Ic)   |
| Ind. Var.  |        |        |        |        |        |        |
| Directors’ shareholding | –0.1277*** | –0.1072** | –0.1081*** | –0.008 | –0.0148 | –0.0196 |
| Top ten shareholding | 0.004 | 0.0101 | 0.0228 | 0.0229 | 0.0194 | 0.0126 |
| Managers’ shareholding | –0.1078 | –0.1652 | –0.0381 | 0.0183 | 0.0532 | 0.0021 |
| Directors’ pledge | –0.0287 | –0.0291 | –0.0344 | 0.0017 | 0.0027 | 0.0067 |
| CEO duality | 0.0003 | 0.0013 | 0.0065 | 0.0129 | 0.0126 | 0.0093 |
| Board size | 0.001 | 0.0009 | 0.0066 | –0.0014 | –0.0018 | –0.0014 |
| Leverage | 0.0275 | 0.0263 | 0.009 | 0.0216 | 0.0157 | 0.0274 |
| Net profit | –0.0101 | –0.0217 | –0.0289 | 0.0254 | 0.0211 | 0.0288 |
| Asset turnover | –0.0079 | –0.0179** | –0.0204*** | –0.0024 | 0.001 | 0.0032 |
| Firm size | –0.0093 | –0.0066 | –0.0016 | 0.0062 | 0.006 | 0.0024 |
| Const. | 0.255*** | 0.2158** | 0.1782 | 0.0292 | 0.0383 | 0.078 |
| yearly dummies | Y | Y | N | Y | N |
| Outliers excluded | N | Y | Y | N | Y |
| Adj R²⁷ | 0.2059 | 0.2143 | 0.1399 | 0.0873 | 0.0775 | 0.0329 |
| Coeff. Est. | GLS | GLS | Petersen | GLS | GLS | Petersen |
| Std. Err. | White | White | Cluster F&T | White | White | Cluster F&T |
occurred in Taiwan because tourism stocks are small-cap stocks that foreign investors dislike. Tourism firms with corporate governance issues may manipulate share prices, particularly by selling their shares at overbought prices, based on the characteristics (limited shares outstanding for Taiwan's small-cap tourism stocks) and aforementioned issues.

5. Robustness

Because of using firm-year data, we employ panel data models for robustness. Furthermore, since the range of dependent variables (for example, OB-SOI, OB-RSI, OS-SOI, and OS-RSI) is between 0 and 1, this study employs robust censored panel data models. Tables 6 and 7 show the results of using both models.

In Table 6, Columns (Va) and (Vb) show the outcomes of traditional panel data models. Columns (Vb) and (Vb) show the results of censored panel data models. Below the computed coefficients are the standard errors. *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

In Table 7, Columns (VIIa) and (VIIa) show the outcomes of panel data models. Columns (VIIb) and (VIIb) show the results of censored panel data models.

Using SOI = overreaction proxies (i.e., OB-SOI and OS-SOI) in either a traditional penal data model or a censored panel data model, Columns (Va)-(Vb) of Table 6 show that firms with a lower directors' shareholding ratio, lower managers' shareholding, higher leverage, and smaller firm size have a higher OB-SOI. Table 6, Columns (Vb)-(Vb) also show that companies with larger firm sizes have higher OS-SOI. We then show that the results in both tables (Table 4 and Table 6) are similar, representing that our findings are robust after employing diverse models. Similarly, using RSI-overaction proxies (i.e., OB-RSI and OS-RSI) in both models, Table 7 shows that firms with lower directors' shareholding (i.e., regarded as ill-functioning ownership structure) and lower asset turnover (i.e., regarded as inferior financial performance) have higher OB-RSI. We also show that the results in both tables (Table 5 and Table 7) are similar, representing that our outcomes are fairly robust. In summary, this study shows that firms with higher OB-SOI and OB-RSI are those with poorly functioning ownership structures after using either different overaction proxies or different models for robustness because our revealed results in Tables 4 and 5 are similar to those in Tables 6 and 7.

However, the results of these models may differ from our perception because firms with higher OB-SOI and OB-RSI may have even better share price performance. Firms with higher OB-SOI and OB-RSI may indicate that their share prices are frequently in the overbought zone. We then discuss our revealed results in the following manner, comparing them to relevant existing studies and explaining how our findings differ from the context of the current study. First, the tourism and hospitality industry may not be regarded as a competitive industry in Taiwan when compared to other industries (e.g., the high-tech industry) because tourism firms may not outperform high-tech firms in terms of stock price performance. Second, the data period's political ease between Taiwan and Mainland China may have resulted in stock price overbought phenomena (i.e., temporary phenomena instead of permanent phenomena).

| Table 6. Results of SOI-defined overreaction proxies by using other models for robustness. |
|-------------------|------------------|------------------|------------------|
|                  | OB-SOI           | OS-SOI           |
|                  | (Va)            | (Vb)            | (Va)            | (Vb)            |
| Directors' shareholding | -0.147**        | -0.1024**       | 0.038           | 0.0212          |
|                    | (0.0703)        | (0.0413)        | (0.0565)        | (0.0439)        |
| Top ten shareholding | -0.0791         | -0.0655**       | 0.0066          | 0.0433          |
|                    | (0.0521)        | (0.0327)        | (0.0435)        | (0.0351)        |
| Managers' shareholding | -0.5024*        | -0.38*          | 0.5105*         | 0.4506**        |
|                    | (0.299)         | (0.2108)        | (0.262)         | (0.2203)        |
| Directors' pledge  | -0.0324         | -0.0193         | 0.016           | -0.018          |
|                    | (0.0313)        | (0.0234)        | (0.0286)        | (0.0248)        |
| CEO duality        | -0.0308         | -0.0151         | 0.019           | 0.013           |
|                    | (0.0211)        | (0.0115)        | (0.0162)        | (0.0128)        |
| Board size         | 0.0037           | 0.0002          | -0.0058*        | -0.0024         |
|                    | (0.0037)        | (0.0024)        | (0.0031)        | (0.0025)        |
| Leverage           | 0.1714***        | 0.0686**        | -0.11***        | -0.0511         |
|                    | (0.0474)        | (0.0324)        | (0.0407)        | (0.0351)        |
| Net profit         | 0.0609           | 0.0023          | -0.043          | -0.0185         |
|                    | (0.096)         | (0.0265)        | (0.0325)        | (0.0279)        |
| Asset turnover     | -0.0122          | -0.0144         | 0.0179          | 0.0113          |
|                    | (0.0143)        | (0.009)         | (0.0119)        | (0.0119)        |
| Firm size          | -0.0422***       | -0.0201***      | 0.0345***       | 0.0257***       |
|                    | (0.0093)        | (0.0062)        | (0.0079)        | (0.0067)        |
| Const.             | 0.8545***        | 0.5906***       | -0.2885***      | -0.1912**       |
|                    | (0.1372)        | (0.0852)        | (0.1128)        | (0.0922)        |
| yearly dummies     | N                | Y               | N               | N               |
| Outliers excluded  | Y                | Y               | Y               | Y               |
| Adj R²             | 0.1925           | 71.75           | 0.1771          | 105.51          |
|                    | (0.000)         | (0.000)         | (0.000)         | (0.000)         |
| Coeff. Est.        | Panel            | Censor Panel    | Panel           | Censor Panel    |
| Std. Err.          | Random           | Random          | Random          | Random          |
Third, our findings could be the result of information asymmetry, illiquidity, and corporate governance issues that exist in small-cap firms (e.g., tourism and hospitality stocks in Taiwan). As a result, previous research indicates that firms with better share price performance and even firm performance would have a well-functioning ownership structure (Huang and Kang, 2017; Jarboui et al., 2015; Lee and Yeh, 2004; Linsmeier, 2016; Shah et al., 2018; Wang et al., 2019; Yeh, 2019), which may not be adequate for explaining the overbought phenomenon observed in tourism and hospitality firms from 2009 to 2015. As a result, prior research indicates that firms with better share price performance have a well-functioning ownership structure (Huang and Kang, 2002, 2017; Eisenberg et al., 1998; Jarboui et al., 2015; Lee and Yeh, 2004; Linsmeier, 2016; Shah et al., 2018; Wang et al., 2019; Yeh, 2019), which may not be adequate to explain the overbought phenomenon observed in Taiwanese tourism and hospitality firms from 2009 to 2015.

On the contrary, because we used tourism and hospitality firms rather than all TWSE firms, we deduce that some of these tourism and hospitality firms may manipulate their share prices at a higher level (i.e., overbought phenomenon), resulting in directors and managers (i.e., insiders) reducing their shareholdings due to shock prices for these firms that are likely overestimated. As a result, our findings may indicate that these companies have corporate governance issues. While we explain our key findings in terms of their economic significance for stock markets, we argue that a competitive industry would have not only longer better stock price performance but also a well-functioning ownership structure, as evidenced by the stock price performance of some high-tech firms (e.g., Taiwan semiconductor company).

6. Conclusion

6.1. Conclusion and discussion

We argue that stock price overbought phenomena may occur for firms with better share price performance and even better ownership structure as a result of continuously rising share prices (Al-Najjar, 2014; Beritelli et al., 2007; Jarboui et al., 2015; Peng et al., 2021; Singal, 2015; Yeh, 2013, 2019). However, contrary to our expectations, we find that the firms with the highest OB-SOI or OB-RSI are those without a well-functioning ownership structure or superior financial performance as reflected in their financial statements.

We conclude that share price shooting phenomena, such as stock price overbought (oversold) phenomena, may be manipulated to appeal to investors buying high (selling even short-selling low) (Ni et al., 2018). We also conclude that asymmetric information (Chiou et al., 2007; Lin, 2016), investor sentiments (Kim and Park, 2015; Wu et al., 2017), and corporate governance issues (Lo et al., 2010) may lead to some firms manipulating their share prices, particularly in emerging markets (Khwaja and Mian, 2005), IPOs (Neupane et al., 2017), and even Bitcoin markets (Gandal et al., 2018; Borgards and Crzudaj, 2020).

According to Imisiker and Tas (2013), firms with less free float and higher leverage are likely to manipulate their share price because share price manipulation occurs frequently for firms with corporate governance issues (Imisiker and Tas, 2013; SánchezBallesta & GarcaMeca, 2007). As a result, we conclude that stock price overbought phenomena are most likely manipulated by some tourism and hospitality firms with less free float, resulting in corporate governance issues.

6.2. Research implications and further studies

This study, we believe, has the following significant implications. First, we show that the stock price overshooting phenomenon may contain valuable information, such as revealing that firms with higher OB-SOI and OB-RSI are firms with corporate governance issues, as revealed by the fact that some tourism and hospitality firms sell their shares to individual investors at overbought prices, which actually hurt investors, implying that these firms may not be worthwhile for investments due to corporate governance issues.

Second, as political tensions eased during the data period, inbound travelers from Mainland China increased steadily, resulting in rising share prices and even stock price overreaction for some Taiwanese tourism and hospitality firms. As a result, because rising share prices are likely to appeal to many investors, some tourism and hospitality firms with corporate governance issues may manipulate share prices by taking advantage of increased inbound travelers as political tensions between Taiwan and China ease, particularly for tourism and hospitality firms with limited shares outstanding. Consequently, we believe that market participants should be cautious about investing in the stocks of some tourism and hospitality firms, particularly those with small scales in Taiwan because our findings show that information asymmetry, illiquidity, and corporate governance issues were likely present in small-cap firms such as tourism and hospitality firms during the data period.

Third, we argue that relative parties should pay attention to companies’ shock prices, which frequently fall into overbought zones as measured by the SOI and RSI because these overbought phenomena can be manipulated by firms if corporate governance is not improved. Furthermore, investors who purchase stocks with overbought phenomena, which may cause investors to seek higher prices, may incur losses as a result of purchasing the stocks at overestimated prices. As a result, in order to protect the interests of market participants, authorities may issue warnings to firms that experience frequent stock price overreactions, particularly those lacking a well-functioning ownership structure, such as those with lower directors’ shareholding ratios, lower managers’ shareholding ratios, higher debt ratios, and smaller firm sizes, as demonstrated in this study.

Furthermore, future studies will uncover more important variables related to the function of ownership structure and other critical variables, which may reveal more key factors influencing stock price overreaction and even stock price manipulation. Moreover, by looking for more proxies for stock price overreaction, we can reexamine our studies by using such proxies in future studies, which may improve our revealed results as well as learn more about stock price overreaction. Besides, despite the fact that outbound tourists from China increased as political tensions eased between 2009 and 2015, there are still only 165 firm-year samples of limited tourism and hospitality firms listed on the TWSE, which may be a limitation of this study.

Declarations

Author contribution statement

Yuhsin Chen, Ph.D; Paoyu Huang, Ph.D; Yaochia Ku, Ph.D; Yensen Ni, Ph.D; Bin-Tzong Chie, Ph.D; Yin-Tzu Lin, Ph.D student: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

Data will be made available on request.

Declaration of interest’s statement

The authors declare no conflict of interest.
Additional information

No additional information is available for this paper.

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