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Ex ante and ex post overvalued equities: The roles of corporate governance and product market competition

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ABSTRACT

This paper examines equity overvaluation and the effects of corporate governance and product market competition on market valuation of potentially overvalued equities in an economy with high earnings management and weak investor protection (Taiwan). We follow Beneish and Nicholas (2009) to mimic Altman Z-Score and Beneish M-Score to compose an ex ante O-Score to measure overvaluation. We show that our ex ante overvaluation measure (O-Score) can effectively identify those that are likely to be overvalued by manipulation. Portfolios of longing stocks with high current O-Score and shorting stocks with low current O-Score earn abnormal returns. Portfolios of longing stocks with high one-year-ahead O-Score and shorting stocks with low one-year-ahead O-Score suffer losses. We also show that corporate governance reduces but product market competition raises managers' incentive to manipulate market overvaluation. Moreover, product market competition reduces market valuation on currently overvalued equities. Corporate governance effectively reduces but product market competition reinforces the reverse effect of one-year-ahead overvaluation on current market valuation.

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1. Introduction

Jensen (2005) indicates that equity overvaluation means that a firm's stock prices are higher than its fundamental value and argues that agency costs of overvalued equity cause the future destruction of firm value. Miller (1977) argues that overvaluation arises from investors' disagreement on the payoff of the financial assets. Shleifer and Vishny (1997a) argue that even if short-selling is allowed, the substantial risks of short selling reduce short-sellers' incentives to borrow. Previous studies related to equity overvaluation focus on ex post overvalued equities, mostly on how overvalued firms take corporate actions or value-destroying activities to sustain overvaluation (see Chi and Gupta (2009), Houmes and Skantz (2010), Badertscher (2011), and among others). Little literature ever attempts to identify ex ante overvalued equities and/

or to trade on ex ante overvalued equities to make profits, especially in an economy with high earnings management and weak investor protection.

Similar to Beneish (1999) M-score to detect ex ante earnings management, Beneish and Nicholas (2009) propose an O-score to identify U.S. overvalued equity ex ante through the assessment of financial statement information and the value-destroying financing activities. This paper attempts to fill the lack of literature of ex ante equity overvaluation. We examine whether the Beneish and Nicholas's O-score can be applied to identify overvalued equity in a high earnings management and weak investor protection economy (such as Taiwan) and examine how corporate governance and product market competition influence managers' motivation to manipulate overvaluation of equities and the market reaction to the overvaluation.

Reward contracts typically link managerial compensation to stock market performance to maximize stockholders' wealth. Skinner and Sloan (2002) show that the stock market penalizes the stock prices of firms that cannot meet market expectations, raising managers' incentives to meet investors' optimistic expectation. Jensen (2005) theorizes that managers of overvalued firms have

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two options. On the one hand, the managers can allow the market to reflect the truth of overvaluation and allow the inflated stock price to decline to its fair level. However, this option hurts the managers' compensation and career. On the other hand, the managers can take corporate actions to meet market expectation to sustain the inflated stock price to delay the adverse compensation and career consequences. Bergstresser and Philippon (2006) show that managers of firms with overvalued equities try to sustain overvalued stock prices so that they can benefit from exercising their stock options or from stock sales. Consequently, overvaluation attracts managers to manipulate earnings or to take corporate strategies to meet market expectation to prolong equity overvaluation. Jensen (2005) argues that managers of overvalued firms tend to take value-destroying projects to prolong overvaluation even by manipulation and argues that the value-destroying actions hurt shareholder wealth in the long run after the revelation of overvaluation leading to the agency costs of overvalued equity.

Shiller (2000) concludes that overvaluation will not be sustainable in the long run. Managers of overvalued firms have incentives to take corporate actions to prolong the overvaluation. However, the managed income-increasing earnings cannot last indefinitely resulting in price reversals for firms with high income-increasing accruals afterwards. Consequently, firms fall in an overvaluation trap to stimulate market demand with short-term performance by manipulation. Such actions destroy substantial firm value in the long run. The stock price will converge towards its underlying value eventually. Overvalued price will, therefore, drop after the revelation of information about the firm's fundamental value over time.

Corporate governance ensures truthful information revealed to the investors. It is important to consider how corporate governance influences market overvaluation because equity overvaluation is very likely linked to accounting manipulation. Earnings management is considered as a cause and consequence of equity overvaluation. Moreover, product market competition changes the agency costs. Healy and Palepu (2001) argue that the agency conflicts between shareholders and managers induce the demand of financial reporting. The effect of product market competition on financial reporting influences managers' incentives to manipulate overvaluation.

Prior studies on overvaluation focus on ex post evidence of overvalued equities. Little work in the literature identifies overvalued equities ex ante. This paper fills this gap. This paper contributes to the existing literature by considering the ex ante and ex post equity overvaluation and how corporate governance and product market competition influence market reaction to the ex ante overvaluation in an economy with high earnings management and weak investor protection. Since equity overvaluation increases expropriation risk, it is important to understand if equity overvaluation can be detected beforehand and the roles of corporate governance and product market competition on market overvaluation. We further examine the profitability of trading on ex ante overvalued equities. To our knowledge, we are the first to document a systematic relation between ex post overvaluation and ex ante overvaluation and the effects of corporate governance and product market competition on market reactions to the ex ante market overvaluation.

We examine the Taiwan market primarily because of its stock volatility and because of its high earnings management and weak investor protection. The volatility of stock market, earnings management, and investor protection make Taiwan a good example to examine the equity overvaluation ex ante and ex post. Aggarwal, Inchan, and Leal (1999), Michelfelder and Pandya (2005), and Aroui, Jawadi, and Nguyen (2010) argue that emerging stock markets such as Taiwan are characterized by high volatility. Gursoy,

Yuksel, and Yuksel (2008) confirm the stock volatility persistence in emerging markets. High stock volatility implies that the price behavior in Taiwan stock exchange experiences price booms and drops significantly, which is consistent with the price behavior of overvalued equity. Leuz, Nanda, and Wysocki (2003) document that Taiwan is ranked 6 out of 31 countries by earnings management score. Tsai, Wu, and Chang (2012) show that managers in Taiwanese firms engage in earnings management leading to overvalued equities in Taiwan stock markets. Moreover, Chen, Kao, and Lu (2014) and Chen and Kao (2016) indicate that Taiwan is a civil law country with concentration of ownership and lack of takeover threats. La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000) document that civil law countries do not provide strong investor protection. Claessens, Djankov, and Lang (2000) document that firms in East Asian countries including Taiwan, are less likely to be faced with takeover threats because of their concentrated ownership structure leading to high expropriation risk from controlling shareholders.

Our empirical results are summarized as follows. We confirm the validity of the ex ante O-Score to identify overvalued equities in Taiwan. Investors can benefit from buying stock with high *current* O-Score and selling stocks with low *current* O-Score but suffer losses from buying stocks with high *previous* O-Score and selling stocks with low *previous* O-Score. Corporate governance limits managers' incentives to manipulate overvaluation and mitigates the reverse effect of overvaluation on stock price drop after the revelation of fundamental firm value. On the contrary, product market competition raises the likelihood of ex ante overvaluation and reinforces the reverse effect of overvaluation afterwards.

The remainder of this paper is organized as follows. Section 2 reviews the related literature and develops testing hypotheses. Data and variable definition are expressed in Section 3. In Section 4, we discuss if our ex ante overvaluation measure identifies ex post overvaluation. Section 5 examines the performance of trading strategies based on ex ante overvaluation. Section 6 examines the effects of corporate governance and product market competition. Robustness tests are presented in Section 7. Finally, Section 8 concludes.

2. Related literature and hypotheses

For the related literature, we focus on the previous work related to overvaluation, corporate governance, and product market competition.

2.1. Overvaluation

Jensen (2005) indicates that overvalued firms are those with weak fundamental values but experience high likelihood of earnings management, mergers and acquisition, equity issuance, and unrealistic market expectation. Even under market efficiency, firms are still possibly overvalued due to investors' disagreement on the present value of firms' future earnings and due to the short sale constraints. Short-sale constraints prevent the arbitrage of selling overvalued equities and contribute to the presence of overvaluation. Shleifer and Vishny (1997a) argue that even short-selling is not prohibited; the substantial risks of short selling make short-sellers hesitate to borrow. Previous studies support the presence of overvaluation. Beneish and Vargus (2002) indicate that equities with abnormal insider sales are likely overvalued; Desai, Rajgopal, and Venkatachalam (2004) point out that glamour stocks are likely overvalued; and Zach (2003) shows that firms engaging in M&A activities are likely overvalued.

Dong, Hirshleifer, and Teoh (2012) argue that equity is more sensitive than debt to firm value and that overvaluation effect is stronger for equity issuance than for debt issuance. Teoh, Welch,

and Wong (1998a, b) indicate that firms tend to issue equity during the periods of overvaluation. Managers of overvalued firms tend to manipulate earnings and overinvest to meet investors' optimistic expectation and to prolong overvaluation.

Earnings management leads to overvaluation and overvaluation needs further earnings management to prolong overvaluation. Marciukaityte and Varma (2008) show that managers of overvalued firms manipulate earnings to fool the market to meet the expectation of market participants. Chi and Gupta (2009) document a positive relation between equity overvaluation and income-increasing earnings management. Moreover, Houmes and Skantz (2010) show that highly overvalued firms tend to engage in income-increasing earnings management and that discretionary accruals increase in the year of the firms' overvaluation. Badertscher (2011) argues that managers of overvalued firms tend to engage in earnings management, invest aggressively, issue stocks excessively, and acquire other firms in order to sustain overvaluation.

Moeller, Schlingemann, and Stulz (2005) and Marciukaityte and Varma (2008) conclude that managers of overvalued firms also tend to implement M&As and issue equity. An overvalued firm tends to raise more capital through equity issuance to take advantage of market overvaluation and to generate a profit for its existing shareholders. The overvalued firms can use overvalued equity as median for M&As and overinvestment in capital expenditures to exploit market overvaluation. Polk and Sapienza (2009), Baker, Stein, and Wurgler (2003), and Gilchrist, Himmelberg, and Huberman (2005) argue that overvalued firms may raise external capital and invest in PPE to confirm market expectation. We argue that an effective ex ante overvaluation measure should consist of firm characteristics of fundamental value, earnings management, unrealistic market expectation, M&A activities, and equity issuance and reveals high current market valuation.

Hypothesis 1. An effective ex ante overvaluation measure is positively related to ex post overvaluation measured at the same time. That is, firms with high *current* ex ante overvaluation measure experience high *current* stock return or market valuation.

It is impossible that overvaluation lasts infinitely. If managers sacrifice long-term economic value to meet short-term earnings targets, the firm value will be destroyed substantially in the long run. Once the true value about the firms' future earnings is revealed, the market will react to the misvaluation leading to the drop of stock price. Overvalued equities will eventually experience price drop after the revelation of the fundamental value. Graham, Harvey, and Rajgopal (2006) indicate that the financial market pressures and overreactions encourage managers to meet short-term earnings targets and forge valuable long-term projects.

Marciukaityte and Varma (2008) indicate that firms with earnings restatement and high market valuation before restatement experience enormous loss in stock and operating performance after the year of overvaluation. Kothari, Loutskina, and Nikolaev (2006) argue that overvalued firms would experience future negative returns. The return reversals in years after the year of overvaluation are further expected primarily for the firms with high accruals because those are likely overvalued firms. Firms likely overvalued experience poor operating performance and poor stock return years behind overvaluation. Chi and Gupta (2009) and Badertscher (2011) indicate that reported earnings declines sharply because of the reversal of upward managed earnings and because of the overinvestment to sustain overvaluation. Fairfield, Whisenant, and Yohn (2003), Richardson and Sloan (2003), and Titman, Wei, and Xie (2004) observe that firms experience underperformance subsequent to high investments in operating assets.

Earnings management would not improve the future cash flows.

Instead, earnings management has adverse impacts on optimal business operations. Badertscher (2011) demonstrates that overvalued firms tend to engage in earnings management to prolong overvaluation leading to negative long-run stock returns years after overvaluation.

Hypothesis 2. Firms with high *previous* ex ante overvaluation measure experience low *current* stock return or market valuation.

Hypothesis 3a. Longing stocks with high *current* ex ante overvaluation and shorting those with low *current* ex ante overvaluation earns abnormal return.

Hypothesis 3b. Longing stocks with high *previous* ex ante overvaluation and shorting those with low *previous* ex ante overvaluation suffers losses.

2.2. Corporate governance and product market competition

La Porta et al. (2000) argue that corporate governance improves resource allocation and investor protection and thus raise fundamental value of a firm. Klein (2002) and Xie, Davidson, and DaDalt (2003) show that corporate governance through the function of board prevents earnings management. Leuz et al. (2003) argue that earnings management decreases investor protection. Chen et al. (2014) argue that corporate governance can improve firm performance to protect the interests of minority shareholders, especially for an economy lack of takeover threat. We argue that effective corporate governance should mitigate agency costs of overvaluation and raise the following hypotheses.

Hypothesis 4a. Corporate governance reduces a firm's ex ante overvaluation.

Hypothesis 4b. Corporate governance mitigates the reverse effect of *previous* ex ante overvaluation on *current* market valuation.

Product market competition changes the design of managerial incentive scheme. Horn, Lang, and Lundgren (1994) argue that product market competition raises agency conflicts between shareholders and managers. The agency conflicts resulting from product market competition induces managers to mislead outside investors. Raith (2003) shows that product market competition increases a firm's profit volatility. Managers of firms under intensive competition are more likely to engage in income smoothing management. Moreover, Schmidt (1997) indicates that competition reduces a firm's profit margin and profitability. Product market competition, thus, induces managers to overstate earnings to protect their compensation. Dechow and Skinner (2000) argue that managers tend to manage earnings for certain corporate purposes, such as equity issuance. Consequently, earnings management would increase with the intensity of product market competition.

Myers and Majluf (1984) point out that cost of issuing equity increases with firm profitability and that firms tend to issue equity as profit decreases. Gertner, Gibbons, and Scharfstein (1988) show that low-profit firms issue more equity. Irvine and Pontiff (2009) show that product market competition weakens firm's fundamental value by increasing its idiosyncratic risk of cash flows. Hoberg and Phillips (2010) examine how product market competition creates incentives to merge to differentiate the firm from existing competition. Consequently, product market competition hurts firms' fundamental value and contributes to incentives to merge and to issue equity. We, thus, raise the following hypotheses.

Hypothesis 5a. Product market competition is positively related to the ex ante overvaluation measure.

Hypothesis 5b. Product market competition exaggerates the

reverse effect of *previous* ex ante overvaluation on *current* market valuation.

3. Data source and variable definition

Our data consist of all the listed firms in Taiwan Stock Exchange during the period of 1996–2014. The sample period starts from 1996 in that Taiwan Economic Journal (TEJ) collected a corporate governance database for Taiwanese listed firms in 1996. All the variables including stock behaviors (returns, price, issuance, acquisition), corporate governance characteristics (number of directors, director share collateralization, controlling ownership, institutional ownership, duality, independent director, deviation of cash flow rights and control rights) and financial variables (sales, accruals, cash dividend, leverage) are collected from TEJ. We delete the observations with missing values on the variables and reach 8869 firm-year observations in our sample.

3.1. Variable definition

Our variables include ex ante and ex post overvaluation measures, corporate governance variables, product market competition, and control variables. Variables are explicitly defined below.

3.1.1. Overvaluation measure

3.1.1.1. O-score (ex ante overvaluation). Overvalued firms are supposed to have weak fundamental values but unrealistic market expectation and probably engage in earnings management, mergers and acquisition, and equity issuance. We follow [Beneish and Nicholas \(2009\)](#) to combine these firm characteristics into an overvaluation score (*O-Score*) ranging from zero to five to measure the likelihood of overvaluation ex ante.

$$O\text{-Score}_{it} = OCF_{it} + PROBM_{it} + SalesGrowth_{it} + Acquisition_{it} + Issuance_{it} \quad (1)$$

where,

$OCF_{it} = 1$ if firm *i* belongs to the bottom quintile of the firms in terms of annual operating cash flows to lagged total assets at year *t*; $OCF_{it} = 0$ otherwise. Low operating cash flows capture weak fundamental value.

$PROBM_{it} = 1$ if firm *i* belongs to the top quintile of the firms in terms of M-score defined in [Beneish \(1999\)](#) at year *t*; $PROBM_{it} = 0$ otherwise. M-score indicates the likelihood of earnings management.

$SalesGrowth_{it} = 1$ if firm *i* belongs to the top quintile of firms in terms of annual sales growth at year *t*; $SalesGrowth_{it} = 0$ otherwise. High sales growth attracts unrealistic market expectation.

$Acquisition_{it} = 1$ if firm *i* ever engaged in M&A during the past 5 years of year *t*; $Acquisition_{it} = 0$ otherwise.

$Issuance_{it} = 1$ if firm *i* ever issued equities in excess of the industry median during the past 5 years of year *t*; $Issuance_{it} = 0$ otherwise.

3.1.1.2. Price-earnings valuation (ex post overvaluation). Our proxy for ex post overvaluation is a price-earnings-based overvaluation measure developed by [Rhodes–Kropf, Robinson, and Viswanathan \(2005\)](#). As defined in [Rhodes–Kropf et al. \(2005\)](#), our price-earnings-based valuation model is measured based on market value, book value, net income, and leverage as follows.

A firm's logarithm of market-to-book equity ratio can be

decomposed into two components:

$$\ln(M/B) = \ln(M/V) + \ln(V/B) \quad (2)$$

where *M* is the market value of equity, *B* is the book value of equity, and *V* is the intrinsic value of equity.

$$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt} \ln(NI_{it}^+) + \alpha_{3jt} I(NI < 0) * \ln(NI_{it}^+) + \alpha_{4jt} LEV_{it} + \varepsilon_{it} \quad (3)$$

where,

m_{it} is the logarithm of market equity of firm *i* at the end of year *t*;
 b_{it} is the logarithm of book equity of firm *i* at the end of year *t*;
 NI_{it}^+ is the absolute value of net income of firm *i* at year *t*;
 $I(NI < 0) = 1$ for firms with negative net income at year *t*;
 $I(NI < 0) = 0$ otherwise;
 LEV_{it} is the leverage ratio measured by debt-to-assets of firm *i* at the end of year *t*.

Equation (3) is estimated cross-sectionally in each industry-year to compute the long-run parameters $\bar{\alpha}_j = 1/T \sum_t \hat{\alpha}_{jt}$ for firms in industry *j*. Industry definitions are taken from Taiwan Stock Exchange. The price-earnings valuation measure (*PV*) for ex post market valuation is as follows.

$$PV = \exp[m_{it} - \text{fitted value of } m_{it} \text{ from equation (3)}]. \quad (4)$$

3.1.1.3. Buy-and-hold abnormal return (BHAR). $BHAR_{it}$ is the buy-and-hold annual abnormal return of firm *i* at year *t*. $BHAR$ is the annual stock return of firm *i* at year *t* minus the market index return at year *t*.

3.1.2. Corporate governance variables

When COB and CEO positions are filled separately, the agency costs reduce and corporate governance improves. [Tang, Chen, and Chang \(2013\)](#) and [Chen et al. \(2014\)](#) confirm that CEO duality raises stockholder-manager agency conflicts. [Yermack \(1996\)](#) and [Kao and Chen \(2013\)](#) indicate a negative relationship between board size and firm value. [Xie et al. \(2003\)](#) and [Klapper and Love \(2004\)](#) show the importance of board independence in improving corporate governance. [Larcker, Richardson, and Tuna \(2007\)](#) show that institutional ownership is an important governance feature to influence accounting outcomes and firm performance. [Wahal and McConnell \(2000\)](#) suggest that institutional investors with short-term horizons raise managerial myopia. [Jensen and Meckling \(1976\)](#) and [Chen, Kao, Tsao, and Wu \(2007b\)](#) argue that firm value increases with the ownership of controlling shareholders due to the interest alignment between the controlling shareholders and minority shareholders. [Shleifer and Vishny \(1997b\)](#) and [La Porta et al. \(2000\)](#) argue that the deviation of controlling shareholders' cash flow rights and control rights leads to the expropriation on the minority shareholders. In Taiwan, board directors often collateralize their shares at financial institutions for funding. [Kao, Chiou, and Chen \(2004\)](#) and [Chen, Kao, and Chen \(2007a\)](#) show that directors' share collateralization raises the agency costs and exaggerates the deviation of controlling shareholders' cash flow rights and control rights.

$ControlHold_{it}$ is the percentage of shares owned by controlling shareholders of firm *i* at the end of year *t*. $Institution_{it}$ is the percentage of shares owned by institutional investors of firm *i* at the end of year *t*. $Board_{it}$ represents the number of directors on the board of firm *i* at the end of year *t*. $Independent_{it}$ is the percentage of independent directors on board of firm *i* at the end of year *t*.

$Deviation_{it}$ is the deviation of cash flow rights and control rights measured by the difference between controlling shareholders' control rights and their cash flow rights of firm i at the end of year t . $Collateral_{it}$ is the percentage of shares owned by directors of firm i collateralized at financial institutions at the end of year t . $Duality_{it} = 1$ if the CEO position is served by the COB of firm i at year t ; otherwise $Duality_{it} = 0$.

Besides the effects of corporate governance characteristics on overvaluation, we also follow Tang et al. (2013) to form a composite index of corporate governance by incorporating our corporate governance characteristics including board size, director share collateralization, controlling ownership, deviation between controlling shareholders' cash flow rights and control rights, institutional ownership, board independence, and CEO duality. The median of each governance variable, except for CEO duality, is used to distinguish firm governance quality, separately. A higher value of the corporate governance index ($CGindex$) denotes better governance quality.¹

$$CGindex_{it} = I(Board_{it} < median_{jt}) + I(Collateral_{it} < median_{jt}) + I(Deviation_{it} < median_{jt}) + I(ControlHold_{it} > median_{jt}) + I(Independent_{it} > median_{jt}) + I(Institution_{it} > median_{jt}) + I(Duality_{it} = 0) \quad (5)$$

where $I(\cdot)$ is an indicator function; i denotes firm, j denotes industry, t denotes year; $median_{jt}$ is the median of the corresponding governance variable of industry j at year t .

3.1.3. Product market competition

Previous studies generally employ the Herfindahl–Hirschman index (HHI) to capture industry intensity and industry product market competition. A high HHI indicates a high level of industry concentration or a low level of industry competition. The HHI is defined as the sum of the squares of individual firm market shares in an industry. We follow Chen et al. (2014) to measure product market competition (ONE_HHI) as 1 minus the HHI. ONE_HHI_{jt} is the product market competition measure for firms in industry j at year t .

$$ONE_HHI_{jt} = 1 - \sum_{i=1}^{n_j} \left(\frac{sales_{ijt}}{\sum_{i=1}^{n_j} sales_{ijt}} \right)^2 \quad (6)$$

here, $sales_{ijt}$ denotes the total sales of firm i in industry j during year t , and n_j is the number of firms in industry j .

3.1.4. Control variables

To take care of firm characteristics related to stock valuation and earnings management, we include firm size, beta risk, total accruals, cash dividends, book-to-market ratio, and sales-to-price ratio as control variables.

$\ln MV_{it}$ is the logarithm of market equity of firm i at the end of year t to proxy for firm size. $Beta_{it}$ is the beta risk of firm i of year t estimated by the market model using the daily stock returns during year $t-1$. $TACC_{it}$ is the total accruals of firm i at year t through the statement of cash flow approach. $Dividend_{it}$ is the cash dividend of firm i at year t to its lagged market equity. BM_{it} is the book-to-market ratio of firm i at the end of year t . $SalesP_{it}$ is the sales of firm i at year t to its lagged market equity.

3.2. Descriptive statistics

Table 1 lists the descriptive statistics of annual stock return, overvaluation measures, corporate governance characteristics, competition measure, and control variables.² On average, the annual stock return is 18.273%; the buy-and-hold abnormal return is 11.397%. The O -Score falls within $[0,5]$ with mean = 0.732 and median = 1. The price-earnings based overvaluation measure (PV) is 1.109 on average with median at 0.886 implying that at least 50% of the sample observations are undervalued after being adjusted for sector errors and long-run valuation. For the corporate governance characteristics, on average, there are 6.957 directors on board and 10.351% of the ownership of directors is collateralized at financial institutions. The mean of controlling ownership is 29.754% with median equal to 27.770%. The deviation between the cash flow rights and control rights of controlling shareholders is averaged at 5.788%. The institutional investors hold 34.714% ownership on average. 42.6% of the board members are independent directors. 30% of the observations experience CEO duality. The average composite corporate governance index is 3.647 with median at 4.

The average competition intensity (ONE_HHI) is 0.913 with a median of 0.956. The descriptive statistics for the competition measure imply that Taiwanese listed firms face intensive product market competition. For the control variables, the average total accruals, beta risk, cash dividend yield, book-to-market ratio, and sales-to-price ratio are -0.016 , 0.833 , 2.862% , 0.949 , and 1.373 , respectively.

Table 2 lists the descriptive statistics for the observations by ex ante overvaluation measure (O -Score). Firms with O -Score equal to zero are defined as low ex ante overvalued firms which are those less likely manipulated overvaluation; firms with O -Score ≥ 2 are defined as high ex ante overvalued firms which are those more likely manipulated overvaluation. Table 2 shows that firms with high O -Scores experience high annual stock returns ($t = -9.97$, $z = -4.70$ for $BHAR$) and ex post overvaluation ($t = -17.58$, $z = -16.11$ for PV) implying that the ex ante overvaluation measure (O -Score) is consistent with the ex post overvaluation measure. For

Table 1

Descriptive statistics. Descriptive statistics for a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded.

	Mean	Std	Minimum	Median	Maximum
Return(%)	18.273	69.650	-76.102	2.836	330.311
BHAR(%)	11.397	57.651	-78.530	-1.298	284.969
O-Score	0.732	1.016	0	1	5.000
PV	1.109	0.816	0.193	0.886	4.926
Board	6.957	2.428	0	7.000	19.000
Collateral(%)	10.351	20.261	0	0	90.280
ControlHold(%)	29.754	17.041	2.210	27.770	74.500
Deviation(%)	5.788	9.603	0	1.640	46.520
Institution(%)	34.714	21.714	0.940	31.250	88.940
Independent	0.426	0.494	0	0	1.000
Duality	0.300	0.458	0	0	1.000
CGindex	3.647	1.307	1.000	4.000	7.000
ONE_HHI	0.913	0.105	0.118	0.956	0.988
MV	11056	32502	180.000	2648	263648
TACC	-0.016	0.111	-0.289	-0.026	0.436
Beta	0.833	0.348	0.037	0.837	1.659
Dividend(%)	2.862	3.425	0	1.790	16.090
BM	0.949	0.664	0.122	0.787	3.846
SalesP	1.373	1.518	0.056	0.877	9.090

¹ We also construct a composite governance index by estimating the first principal component of the seven governance variables and reach qualitatively similar results.

² To take care of extreme values, we winsorize the variables at the 1/99 percentile level.

Table 2
Descriptive statistics by ex-ante overvaluation. Descriptive statistics by ex-ante overvaluation level (*O-Score*). A firm with its ex ante overvaluation measure (*O-Score*) equal to 0 is defined as a less likely overvalued firm; *O-Score* larger than or equal to 2 is defined as a more likely overvalued firm. ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	Less likely overvalued		More likely overvalued		t	z
	Mean	Median	Mean	Median		
Return(%)	14.456	1.823	31.136	7.974	-8.56***	-3.79***
BHAR(%)	7.614	-2.353	24.144	3.133	-9.97***	-4.70***
PV	1.016	0.829	1.423	1.136	-17.58***	-16.11**
Board	7.044	7.000	6.665	7.000	7.62***	3.10***
Collateral(%)	10.727	0	9.084	0	3.40***	5.80***
ControlHold(%)	30.216	28.470	28.198	25.260	4.97***	6.59***
Deviation	5.674	1.580	6.174	1.890	-2.18**	-2.50**
Institution(%)	34.278	30.540	36.182	32.960	-3.67***	-3.41***
Independent	0.404	0	0.500	1.000	-8.20***	-8.17***
Duality	0.290	0	0.334	0	-3.49***	-3.93***
CGindex	3.707	4.000	3.629	4.000	2.51**	1.29
ONE_HHI	0.905	0.945	0.940	0.962	-18.17***	-14.96***
MV	10447	2511	13105	3146	-3.21***	-5.27***
TACC	-0.041	-0.036	0.068	0.048	-31.79***	-23.85***
Beta	0.811	0.811	0.908	0.929	-11.04***	-10.24***
Dividend(%)	3.159	2.330	1.860	0.220	17.06***	18.02***
BM	1.007	0.847	0.756	0.606	17.59***	14.96***
SalesP	1.404	0.925	1.269	0.699	3.60***	8.32***

the corporate governance characteristics, firms with high *O-Scores* have smaller board, lower director share collateralization, lower controlling ownership, higher deviation between controlling shareholders' cash flow rights and control rights, higher institutional ownership, lower CG index, more independent directors on board, more likely with CEO duality and experience higher product market competition. The descriptive statistics in Table 2 provide preliminary evidence that firms with weak corporate governance and/or high product market competition are likely candidates to be manipulated overvaluation.

For the control variables, Table 2 also demonstrates that those more likely to be overvalued have more accruals, higher risk, lower dividend yield, lower book-to-market ratio, and lower sales-to-price ratio.

4. Does ex ante overvaluation measure identify overvaluation ex post?

Our *O-Score* measures the ex ante overvaluation. We need to make sure if this ex ante overvaluation measure can identify the ex post overvaluation effectively. If the ex ante overvaluation measure can identify overvalued equity beforehand, the ex ante overvaluation should be positively related to ex post overvaluation in the year of overvaluation but negatively related to ex post overvaluation in the year(s) following overvaluation. We regress the ex post overvaluation measures (*PV* and *BHAR*) on *O-Score* controlling for the lagged market valuation, accruals, beta risk, dividend, book-to-market, sales-to-price, and firm size.

$$PV_{it} = \beta_0 + \beta_1 O-Score_{it-k} + \text{control variables} + \varepsilon_{it} \quad (7)$$

$$BHAR_{it} = \beta_0 + \beta_1 O-Score_{it-k} + \text{control variables} + \varepsilon_{it} \quad (8)$$

k = 0, 1, 2

Table 3 shows that the *O-Score_t* is significantly positively related to *PV_t* (coefficient = 0.059, t = 8.60); *O-Score_{t-1}* is significantly negatively related to *PV_t* (coefficient = -0.001, t = -1.81); *O-Score_{t-2}* is insignificantly related to *PV_t* (coefficient = 0.004, t = 0.79).

Table 3
Relationship between ex post overvaluation and ex ante overvaluation. Regression analyses of ex post overvaluation on current *O-Score*, one-year-ahead *O-Score*, and two-year-ahead *O-Score* with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The t-values in parentheses are adjusted by clustered standard errors (Petersen (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	<i>PV_t</i>	<i>PV_t</i>	<i>PV_t</i>
Intercept	0.463*** (12.76)	0.507*** (13.91)	0.501*** (13.84)
<i>O-Score_t</i>	0.059*** (8.60)		
<i>O-Score_{t-1}</i>		-0.001* (-1.81)	
<i>O-Score_{t-2}</i>			0.004 (0.79)
<i>LPV_t</i>	0.548*** (66.91)	0.553*** (66.85)	0.552*** (67.05)
<i>TACC_t</i>	0.555*** (9.67)	0.728*** (13.49)	0.726*** (13.46)
<i>Beta_t</i>	0.026 (1.03)	0.048* (1.89)	0.044* (1.76)
<i>Dividend_{t-1}</i>	0.019*** (12.75)	0.019*** (11.88)	0.019*** (12.00)
<i>BM_{t-1}</i>	-0.025** (-3.09)	-0.025** (-3.15)	-0.025*** (-3.09)
<i>SalesP_{t-1}</i>	0.015*** (4.47)	0.016*** (4.73)	0.015*** (4.63)
<i>lnMV_t</i>	-0.005 (-1.29)	-0.008* (-1.79)	-0.007 (-1.77)
<i>R²</i>	0.3891	0.3854	0.3854
<i>F</i>	978.82	963.79	963.92
<i>Pr > F</i>	<0.0001	<0.0001	<0.0001
<i>N</i>	8869	8869	8869

Table 4 shows that *O-Score_t* is significantly positively related to *BHAR_t* (coefficient = 4.238, t = 6.84); *O-Score_{t-1}* is significantly negatively related to *BHAR_t* (coefficient = -1.369, t = -2.45); *O-Score_{t-2}* is insignificantly related to *BHAR_t* (coefficient = -0.991, t = -1.37). Tables 3 and 4 confirm that *O-Score_t* is effective in identifying overvaluation ex post. Market assesses higher value for those with higher current *O-score* but assesses lower value for those with higher previous *O-score*. Hypotheses 1 and 2 are confirmed.

5. Trading strategies based on the ex ante overvaluation

We examine if the substantially identified overvaluation experiences subsequently stock price decline. A zero-investment strategy of longing high *O-score* firms and shorting low *O-score* firms experiences a negative future abnormal return. Investors' overvaluation will be corrected in subsequent years due to the revelation of fundamental value of overvalued equities, thus leading to predictable price reversals for the high *O-score* firms. We examine the return behavior in the year of overvaluation and the years following overvaluation.

We expect a price run up in the year of overvaluation for high *O-score* firms because of investors' overvaluation; but a price drop after the year(s) of overvaluation because of the revelation of fundamental firm value. Therefore, in the year of overvaluation we expect positive abnormal returns for high *O-score* firms and a negative abnormal return years after the year of overvaluation.

In Section 4, we show that the *O-Score* can effectively identify the overvalued stocks. Basically, the overvalued stocks will experience higher market valuation currently and experience price drop eventually in the future after the revelation of the true value. Therefore, we can expect that a portfolio of high current *O-Score*

Table 4

Relationship between stock return and ex ante overvaluation. Regression analyses of buy-and-hold abnormal stock return on current *O-Score*, one-year-ahead *O-Score*, and two-year-ahead *O-Score* with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The *t*-values in parentheses are adjusted by clustered standard errors (Peterson (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	$BHAR_t$	$BHAR_t$	$BHAR_t$
Intercept	3.321 (1.02)	6.989** (2.15)	3.255** (2.11)
$O-Score_t$	4.238*** (6.84)		
$O-Score_{t-1}$		-1.369** (-2.45)	
$O-Score_{t-2}$			-0.991 (-1.37)
$BHAR_{t-1}$	-0.030*** (-4.08)	-0.031*** (-4.09)	-0.029*** (-3.83)
$TACC_t$	89.991*** (17.41)	103.215*** (21.30)	103.015*** (21.26)
$Beta_t$	20.842*** (13.46)	22.761*** (14.69)	22.535*** (14.59)
$Dividend_{t-1}$	2.529*** (18.15)	2.409*** (17.30)	2.405*** (17.19)
BM_{t-1}	12.676*** (18.18)	12.361*** (17.60)	12.425*** (17.71)
$SalesP_{t-1}$	2.497*** (8.41)	2.623*** (8.79)	2.590*** (8.70)
$lnMV_t$	-4.202*** (-10.83)	-4.313*** (-11.11)	-4.315*** (-11.11)
R^2	0.1312	0.1283	0.1281
F	232.00	226.15	225.72
$Pr > F$	<0.0001	<0.0001	<0.0001
N	8869	8869	8869

will experience a *current* positive abnormal return and a negative abnormal return some time in the future depending on how long it takes the market to reveal the true value of the overvalued equity. Therefore, a portfolio longing high $O-Score_t$ and shorting low $O-Score_t$ equities should earn a positive abnormal return; a portfolio longing high $O-Score_{t-1}$ and shorting low $O-Score_{t-1}$ (or longing high $O-Score_{t-2}$ and shorting low $O-Score_{t-2}$ equities) probably earns a negative abnormal return.

In Table 5, we calculate the performance of portfolios formed based on the current and previous *O-Score*. Columns 1, 2, and 3 of Table 5 report the performance of portfolios longing high and shorting low $O-Score_t$, $O-Score_{t-1}$, and $O-Score_{t-2}$, respectively. Table 5 shows that the intercept terms of Columns 1, 2, and 3 are

significantly positive, significantly negative, and insignificantly negative, respectively (coefficient = 1.242, $t = 2.67$ in column 1; coefficient = -1.373, $t = -3.86$ in column 2; coefficient = -0.789, $t = -1.54$ in column 3). The results in Table 5 indicate that investors can earn abnormal return by buying stocks with high *current O-Score* and selling stocks with low *current O-Score*; investors will suffer losses by buying stocks with high one-year-ahead *O-Score* and selling stocks with low one-year-ahead *O-Score*; and investors make no returns by trading based on the two-year-ahead *O-Score*. Table 5 confirms the Hypotheses 3a and 3b.

6. The effect of corporate governance and product market competition on ex ante and ex post overvaluation

6.1. Corporate governance

The *O-Score* is an ex ante measure for overvaluation. The ex ante overvaluation measure can be considered as the incentive or motivation for the managers to manipulate overvaluation. We focus on how corporate governance and product market competition influence managers' incentive to manipulate equity overvaluation. In Table 6, we employ OLS regressions with *O-Score* as dependent variable and logistic regressions with a dummy variable of *O-Score* as dependent variable. We define equities as ex ante overvalued when $O-Score \geq 2$; equities are not ex ante overvalued otherwise. Table 6 shows that both OLS and logistic regressions indicate that firms with higher lagged market valuation (PV_{t-1} , $BHAR_{t-1}$) are more likely to be ex ante overvalued candidates implying that managers tend to manipulate firms to be overvalued when their equities have experienced high market valuation recently.

Table 6 also indicates that firms with larger boards, lower controlling ownership, lower institutional ownership, less independent directors, and CEO duality are more likely to be manipulated to be overvalued. The composite corporate governance index indicates that firms under stronger corporate governance are less likely to be manipulated for market overvaluation (coefficient of $CGindex = -0.013$, $t = -2.27$ in column 2; coefficient of $CGindex = -0.037$, $t = -2.08$ in column 4). Corporate governance can reduce the managers' incentive or motivation to manipulate market overvaluation.

Firms under stronger corporate governance perform better. Consequently, market assesses higher value for the equities of firms under stronger corporate governance. Table 7 shows that the stock market tends to assess the firms of lower directors' share collateralization, higher controlling ownership, and lower deviation between controlling shareholders' cash flow rights and control

Table 5

Portfolio performance by longing high *O-score* firms and shorting low *O-score* firms. Fama-French regressions over 1996–2014 using monthly returns to examine the performance of portfolios by longing those likely overvalued equities and shorting those unlikely overvalued equities.

	Portfolio based on $O-Score_t$	Portfolio based on $O-Score_{t-1}$	Portfolio based on $O-Score_{t-2}$
Intercept	1.242*** (2.67)	-1.373*** (-3.86)	-0.789 (-1.54)
<i>RMRF</i>	1.285*** (30.37)	1.221*** (29.08)	1.164*** (19.31)
<i>SMB</i>	1.328*** (17.98)	1.370*** (18.69)	1.303*** (12.38)
<i>HML</i>	-0.271*** (-5.82)	-0.242*** (-5.24)	-0.207*** (-3.11)
R^2	0.848	0.84	0.70
F	49.97	39.63	13.44
$Pr > F$	<0.0001	<0.0001	<0.0001
N	223	223	223

Table 6
The determinants of ex ante overvaluation. Regression analyses of ex ante overvaluation on stock return, corporate governance, and product market competition to examine the determinants for managers' incentives for manipulating overvaluation with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The t-values in parentheses are adjusted by clustered standard errors (Petersen (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	<i>O-Score_t</i>	<i>O-Score_{t-1}</i>	<i>Pr(O-Score_t ≥ 2)</i>	<i>Pr(O-Score_t ≥ 2)</i>
<i>Intercept</i>	0.805*** (15.24)	0.754*** (17.35)	-0.623*** (-3.20)	-0.822*** (-5.18)
<i>PV_{t-1}</i>	0.133*** (12.03)	0.136*** (12.67)	0.366*** (10.63)	0.381*** (11.21)
<i>BHAR_{t-1}</i>	0.001*** (6.26)	0.001*** (6.26)	0.001*** (4.97)	0.001*** (4.95)
<i>Board_t</i>	0.014*** (3.99)		0.052*** (3.70)	
<i>Collateral_t</i>	-0.000 (-0.57)		-0.000 (-0.06)	
<i>ControlHold_t</i>	-0.003*** (-6.96)		-0.011*** (-5.78)	
<i>Deviation_t</i>	0.001 (1.63)		0.004 (1.42)	
<i>Institution_t</i>	-0.003*** (-6.44)		-0.010*** (-6.50)	
<i>Independent_t</i>	-0.065*** (-4.14)		-0.158*** (-2.85)	
<i>Duality_t</i>	0.068** (4.10)		0.187*** (3.23)	
<i>CGindex_t</i>		-0.013** (-2.27)		-0.037** (-2.08)
<i>ONE_HHI_t</i>	0.769*** (9.79)	0.981*** (13.35)	3.860*** (9.17)	4.634*** (11.41)
<i>lnMV_t</i>	-0.044*** (-6.49)	-0.031** (-5.54)	-0.165*** (-6.54)	-0.114*** (-5.38)
<i>R²</i>	0.0476	0.0391	0.0569	0.0482
<i>F</i>	57.42	102.87		
<i>Chi²</i>			524.38	441.43
<i>Pr > F/Chi²</i>	<0.0001	<0.0001	<0.0001	<0.0001
<i>N</i>	8869	8869	8869	8869

rights with higher value. The *CGindex* is positively related market overvaluation (*PV*) and stock return (*BHAR*). Coefficient of *CGindex* = 0.020, t = 4.32 in column 2; coefficient of *CGindex* = 1.533, t = 3.52 in column 4). These results in Table 7 support that corporate governance improves firm performance and raises market valuation.

We have demonstrated that firms of high current *O-Score* experience high current market valuation (*PV_t*, *BHAR_t*); but firms of high one-year-ahead *O-Score* (*O-Score_{t-1}*) experience low current market valuation (*PV_t*, *BHAR_t*). In this section, we further investigate whether corporate governance influences the relationship between market valuation (*PV*, *BHAR*) and *O-Score*. In Tables 8 and 9, we use the interaction between *O-Score* and *CGindex* to examine if corporate governance changes the effect of *O-Score* on *PV* and *BHAR*. To avoid multicollinearity between corporate governance index and the interaction term of overvaluation measure and corporate governance measure, we use a demeaned form for *O-Score* and *CGindex*.

$$PV_{it} = \beta_0 + \beta_1 O-Score_{it-k} + \beta_2 O-Score_{it-k} * CGindex_{it-k} + \text{control variables} + \varepsilon_{it} \quad (9)$$

$$BHAR_{it} = \beta_0 + \beta_1 O-Score_{it-k} + \beta_2 O-Score_{it-k} * CGindex_{it-k} + \text{control variables} + \varepsilon_{it} \quad (10)$$

k = 0, 1, 2

Table 7
Relationship between ex ante and ex post overvaluation. Regression analyses of ex post overvaluation (*PV*) on ex ante overvaluation (*O-Score*) controlling for recent stock return, corporate governance, market competition, and firm size with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The t-values in parentheses are adjusted by clustered standard errors (Petersen (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	<i>PV_t</i>	<i>BHAR_t</i>		
<i>Intercept</i>	0.501*** (9.89)	0.416*** (9.84)	15.349*** (3.37)	3.894 (1.03)
<i>O-Score_t</i>	0.127*** (7.60)	0.137*** (8.19)	8.570*** (5.69)	9.307*** (6.18)
<i>Board_t</i>	0.003 (1.22)		0.514 (1.60)	
<i>Collateral_t</i>	-0.002*** (-5.46)		-0.159*** (-5.57)	
<i>ControlHold_t</i>	0.001 (1.17)		-0.005 (-0.12)	
<i>Deviation_t</i>	-0.002** (-2.22)		-0.184*** (-2.80)	
<i>Institution_t</i>	0.004*** (10.90)		0.330*** (9.88)	
<i>Independent_t</i>	-0.008 (-0.61)		-2.146 (-1.49)	
<i>Duality_t</i>	0.005 (0.36)		-0.926 (-0.75)	
<i>CGindex_t</i>		0.020*** (4.32)		1.533*** (3.52)
<i>ONE_HHI_t</i>	-0.153** (-2.47)	-0.224*** (-3.74)	-2.381 (-0.43)	-9.552* (-1.78)
<i>PV_{t-1}</i>	0.547*** (59.38)	0.552*** (59.89)		
<i>BHAR_{t-1}</i>			-0.040*** (-4.66)	-0.039*** (-4.52)
<i>TACC_t</i>	0.565*** (8.67)	0.580*** (8.88)	96.621*** (16.51)	98.313*** (16.79)
<i>Beta_t</i>	0.046** (2.21)	0.004 (0.18)	25.775*** (13.70)	22.335*** (12.24)
<i>Dividend_{t-1}</i>	0.018*** (10.12)	0.019*** (10.96)	2.334*** (14.61)	2.408*** (15.19)
<i>BM_{t-1}</i>	-0.026*** (-2.77)	-0.026*** (-2.88)	11.245*** (13.87)	11.216*** (14.16)
<i>SalesP_{t-1}</i>	0.017*** (4.47)	0.018*** (4.70)	3.448*** (9.91)	3.518*** (10.07)
<i>lnMV_t</i>	-0.031*** (-4.90)	-0.002 (-0.43)	-6.791*** (-12.20)	-4.138*** (-8.98)
<i>R²</i>	0.4367	0.4261	0.1601	0.1470
<i>F</i>	432.43	663.19	106.33	153.93
<i>Pr > F</i>	<0.0001	<0.0001	<0.0001	<0.0001
<i>N</i>	8869	8869	8869	8869

In Columns 1 of Tables 8 and 9, the interaction of *O-Score* and *CGindex* is insignificant (coefficient of *O-Score_t*CGindex_t* = -0.012, t-value = -0.77 in Table 8; coefficient of *O-Score_t*CGindex_t* = 0.712, t-value = 0.46 in Table 9) implying that *CGindex_t* does not influence the relationship between *O-Score_t* and current market valuation (*PV_t*, *BHAR_t*). The market tends to assess higher valuation on firms at t with high *O-Score* at t. The strength of *CGindex_t* does not raise the effect of *O-Score_t* on stock performance. In Columns 2 of Tables 8 and 9, the interaction of *O-Score_{t-1}* and *CGindex_{t-1}* is significantly positive (coefficient of *O-Score_{t-1}*CGindex_{t-1}* = 0.019, t-value = 2.12 in Table 8; coefficient of *O-Score_{t-1}*CGindex_{t-1}* = 1.716, t-value = 1.65 in Table 9) implying that the strength of corporate governance at t-1 mitigates the adverse effect of *O-Score* at t-1 on stock performance. Column 2 of Table 8 indicates that for those with *CGindex_{t-1}* = 0, *PV_t* decreases by 0.109 as *O-Score_{t-1}* increases by 1 unit. However, *CGindex_{t-1}* mitigates the adverse effect of *O-Score_{t-1}* on *PV_t*. Table 1 shows that *CGindex* = 3.647 on average. With the help of *CGindex_{t-1}*, *PV_t* decreases by only 0.040 on average as *O-Score_{t-1}*

Table 8

The effect of interaction between corporate governance and ex ante overvaluation on ex post overvaluation. Regression analyses of ex post overvaluation (*PV*) on interaction between corporate governance and ex ante overvaluation to examine if corporate governance changes the effect of *O-Score* on ex post overvaluation with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The *t*-values in parentheses are adjusted by clustered standard errors (Peterson (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	<i>PV_t</i>	<i>PV_t</i>	<i>PV_t</i>
Intercept	0.296*** (5.55)	0.309*** (5.77)	0.310*** (5.78)
<i>O-Score_t</i>	0.098*** (4.06)		
<i>CGindex_t</i>	0.019*** (3.18)		
<i>ONE_HHI_t</i>	-0.119* (-1.68)		
<i>O-Score_t*CGindex_t</i>	-0.012 (-0.77)		
<i>O-Score_t*ONE_HHI_t</i>	-0.743*** (-2.80)		
<i>O-Score_{t-1}</i>		-0.109** (-2.38)	
<i>CGindex_{t-1}</i>		0.018*** (3.01)	
<i>ONE_HHI_{t-1}</i>		-0.262*** (-3.41)	
<i>O-Score_{t-1}*CGindex_{t-1}</i>		0.019*** (2.12)	
<i>O-Score_{t-1}*ONE_HHI_{t-1}</i>		-0.412** (-2.30)	
<i>O-Score_{t-2}</i>			-0.044* (-1.93)
<i>CGindex_{t-2}</i>			0.018*** (3.03)
<i>ONE_HHI_{t-2}</i>			-0.267*** (-3.44)
<i>O-Score_{t-2}*CGindex_{t-2}</i>			0.028* (1.69)
<i>O-Score_{t-2}*ONE_HHI_{t-2}</i>			-0.233* (-1.76)
<i>PV_{t-1}</i>	0.575*** (45.96)	0.581*** (46.27)	0.580*** (46.26)
<i>TACC_t</i>	0.576*** (6.38)	0.696*** (8.22)	0.686*** (8.11)
<i>Beta_t</i>	-0.019 (-0.76)	-0.005 (-0.23)	-0.008 (-0.32)
<i>Dividend_{t-1}</i>	0.020*** (9.18)	0.019*** (8.78)	0.019*** (8.80)
<i>BM_{t-1}</i>	-0.017 (-1.62)	-0.019* (-1.74)	-0.018* (-1.66)
<i>SalesP_{t-1}</i>	0.017*** (3.36)	0.018*** (3.43)	0.017*** (3.31)
<i>lnMV_t</i>	0.009 (1.43)	0.007 (1.05)	0.007 (1.09)
<i>R²</i>	0.4561	0.4536	0.4542
<i>F</i>	322.87	319.72	320.52
<i>Pr > F</i>	<0.0001	<0.0001	<0.0001
<i>N</i>	8869	8869	8869

increases by 1 unit ($-0.109 + 0.019 \times 3.647 = -0.040$). Even though market valuation at *t* declines due to its high *O-Score* at *t-1*, the reduction in stock performance of equities due to their *O-Score_{t-1}* is lower for those under stronger *CGindex_{t-1}* than those under weaker *CGindex_{t-1}*.

Tables 3 and 4 show that *O-Score_{t-2}* is insignificant related to *PV* and *BHAR*. Columns 3 of Tables 8 and 9 document significantly negative *O-Score_{t-2}* (coefficient of *O-Score_{t-2}* = -0.044 , *t*-value = -1.93 in Table 8; coefficient of *O-Score_{t-2}* = -0.927 , *t*-value = -1.71 in Table 9) and a significantly positive *O-Score_{t-2}*

Table 9

The effect of interaction between corporate governance and ex ante overvaluation on stock return. Regression analyses of buy-and-hold abnormal stock return on interaction between corporate governance and ex ante overvaluation to examine if corporate governance changes the effect of *O-Score* on stock return with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The *t*-values in parentheses are adjusted by clustered standard errors (Peterson (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	<i>BHAR_t</i>	<i>BHAR_t</i>	<i>BHAR_t</i>
Intercept	4.253 (0.85)	5.662 (1.03)	5.614 (1.11)
<i>O-Score_t</i>	3.599*** (2.59)		
<i>CGindex_t</i>	1.862*** (3.62)		
<i>ONE_HHI_t</i>	-3.508* (-1.68)		
<i>O-Score_t*CGindex_t</i>	0.712 (0.46)		
<i>O-Score_t*ONE_HHI_t</i>	-50.233*** (-2.01)		
<i>O-Score_{t-1}</i>		-3.809* (-1.75)	
<i>CGindex_{t-1}</i>		1.635*** (2.86)	
<i>ONE_HHI_{t-1}</i>		-17.346** (-2.40)	
<i>O-Score_{t-1}*CGindex_{t-1}</i>		1.716* (1.65)	
<i>O-Score_{t-1}*ONE_HHI_{t-1}</i>		-39.754 (-1.34)	
<i>O-Score_{t-2}</i>			-0.927* (-1.71)
<i>CGindex_{t-2}</i>			1.114** (1.96)
<i>ONE_HHI_{t-2}</i>			-15.708** (-2.15)
<i>O-Score_{t-2}*CGindex_{t-2}</i>			3.180** (2.00)
<i>O-Score_{t-2}*ONE_HHI_{t-2}</i>			-19.854* (-1.79)
<i>BHAR_{t-1}</i>	-0.067*** (-5.38)	-0.065*** (-5.19)	-0.067*** (-5.39)
<i>TACC_t</i>	98.588*** (11.62)	105.534** (13.32)	104.045*** (13.14)
<i>Beta_t</i>	20.706*** (8.60)	21.892*** (9.15)	21.539*** (8.97)
<i>Dividend_{t-1}</i>	2.236*** (10.91)	2.142*** (10.42)	2.189*** (10.65)
<i>BM_{t-1}</i>	10.125*** (10.38)	9.744*** (9.89)	9.750*** (9.88)
<i>SalesP_{t-1}</i>	3.036*** (6.05)	3.093*** (6.16)	3.065*** (6.09)
<i>lnMV_t</i>	-3.541*** (-5.82)	-3.673*** (-6.03)	-3.713*** (-6.09)
<i>R²</i>	0.1384	0.1380	0.1369
<i>F</i>	61.83	61.63	61.09
<i>Pr > F</i>	<0.0001	<0.0001	<0.0001
<i>N</i>	8869	8869	8869

**CGindex_{t-2}* (coefficient of *O-Score_{t-2}* CGindex_{t-2}* = 0.028, *t*-value = 1.69 in Table 8; coefficient of *O-Score_{t-2}* CGindex_{t-2}* = 3.180, *t*-value = 2.00 in Table 9). Tables 3 and 4 and Columns 3 of Tables 8 and 9 imply that firms with high *O-Score_{t-2}* and weak *CGindex_{t-2}* experience low market valuation (*PV*, *BHAR*) but not those with high *O-Score_{t-2}* and strong *CGindex_{t-2}*. Corporate governance two-year-ahead mitigates the adverse effect of *O-Score* two-year-ahead on current market valuation (*PV*, *BHAR*). Hypotheses 4a and 4b are confirmed that corporate governance reduces managers' incentive to manipulate overvaluation and mitigates the

Table 10

The effect of interaction between current corporate governance and ex ante overvaluation on ex post overvaluation. Regression analyses of ex post overvaluation (*PV*) on interaction between current corporate governance and ex ante overvaluation to examine if current corporate governance changes the effect of *O-Score* on ex post overvaluation with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The *t*-values in parentheses are adjusted by clustered standard errors (Petersen (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	<i>PV_t</i>	<i>PV_t</i>	<i>PV_t</i>
<i>Intercept</i>	0.296*** (5.55)	0.356*** (7.40)	0.355*** (7.39)
<i>O-Score_t</i>	0.098*** (4.06)		
<i>CGindex_t</i>	0.019*** (3.18)	0.018*** (3.38)	0.019*** (3.41)
<i>ONE_HHI_t</i>	-0.119* (-1.68)	-0.168** (-2.50)	-0.156** (-2.32)
<i>O-Score_t*CGindex_t</i>	-0.012 (-0.77)		
<i>O-Score_t*ONE_HHI_t</i>	-0.743*** (-2.80)		
<i>O-Score_{t-1}</i>		-0.207*** (-2.82)	
<i>O-Score_{t-1}*CGindex_t</i>		0.023* (1.69)	
<i>O-Score_{t-1}*ONE_HHI_t</i>		-0.181** (-2.31)	
<i>O-Score_{t-2}</i>			-0.028* (-1.82)
<i>O-Score_{t-2}*CGindex_t</i>			0.042** (2.50)
<i>O-Score_{t-2}*ONE_HHI_t</i>			-0.723*** (-2.79)
<i>PV_{t-1}</i>	0.575*** (45.96)	0.572*** (49.94)	0.572*** (50.08)
<i>TACC_t</i>	0.576*** (6.38)	0.687*** (9.22)	0.685*** (9.18)
<i>Beta_t</i>	-0.019 (-0.76)	-0.009 (-0.43)	-0.011 (-0.50)
<i>Dividend_{t-1}</i>	0.020*** (9.18)	0.019*** (9.72)	0.019*** (9.79)
<i>BM_{t-1}</i>	-0.017 (-1.62)	-0.016* (-1.71)	-0.015 (-1.57)
<i>SalesP_{t-1}</i>	0.017*** (3.36)	0.019*** (4.22)	0.018*** (4.05)
<i>lnMV_t</i>	0.009 (1.43)	0.003 (0.49)	0.003 (0.51)
<i>R²</i>	0.4561	0.4240	0.4239
<i>F</i>	322.87	367.27	367.11
<i>Pr > F</i>	<0.0001	<0.0001	<0.0001
<i>N</i>	8869	8869	8869

adverse effect of the reverse of lagged market overvaluation.

6.2. Product market competition

Product market valuation reduces firm profitability and influences managerial incentive to manipulate market overvaluation. Faced with intensive competition, the managers have higher incentives to manipulate overvaluation to increase their compensation linked to stock market performance. In Table 6, the positive relationship between *O-Score* and product market competition indicates that product market competition raise managers' incentive to manipulate market overvaluation. Table 7 indicates that product market competition is significantly negatively related to market overvaluation implying that firms faced with more intensive

³ We also use a demeaned form for *O-Score* and *ONE_HHI* to avoid multicollinearity.

Table 11

The effect of interaction between current corporate governance and ex ante overvaluation on stock return performance. Regression analyses of buy-and-hold abnormal stock return on interaction between current corporate governance and ex ante overvaluation to examine if current corporate governance changes the effect of *O-Score* on stock return with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The *t*-values in parentheses are adjusted by clustered standard errors (Petersen (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	<i>BHAR_t</i>	<i>BHAR_t</i>	<i>BHAR_t</i>
<i>Intercept</i>	4.253 (0.85)	4.918 (1.08)	4.804 (1.05)
<i>O-Score_t</i>	3.599*** (2.59)		
<i>CGindex_t</i>	1.862*** (3.62)	1.637*** (3.11)	1.634*** (3.10)
<i>ONE_HHI_t</i>	-3.508* (-1.68)	-1.631* (-1.90)	-1.29* (-1.88)
<i>O-Score_t*CGindex_t</i>	0.712 (0.46)		
<i>O-Score_t*ONE_HHI_t</i>	-50.233** (-2.01)		
<i>O-Score_{t-1}</i>		-3.032** (-1.67)	
<i>O-Score_{t-1}*CGindex_t</i>		0.631** (1.97)	
<i>O-Score_{t-1}*ONE_HHI_t</i>		-7.218* (-1.68)	
<i>O-Score_{t-2}</i>			-3.319* (-1.86)
<i>O-Score_{t-2}*CGindex_t</i>			0.715** (1.79)
<i>O-Score_{t-2}*ONE_HHI_t</i>			-9.008** (-1.98)
<i>BHAR_{t-1}</i>	-0.067*** (-5.38)	-0.047*** (-4.21)	-0.048*** (-4.36)
<i>TACC_t</i>	98.588*** (11.62)	94.911*** (13.49)	95.140*** (13.50)
<i>Beta_t</i>	20.706*** (8.60)	20.628*** (9.47)	20.727*** (9.50)
<i>Dividend_{t-1}</i>	2.236*** (10.91)	2.238*** (11.88)	2.248*** (11.99)
<i>BM_{t-1}</i>	10.125*** (10.38)	11.456*** (12.97)	11.445*** (12.97)
<i>SalesP_{t-1}</i>	3.036*** (6.05)	2.715*** (6.34)	2.749*** (6.40)
<i>lnMV_t</i>	-3.541*** (-5.82)	-3.725*** (-6.75)	-3.724*** (-6.75)
<i>R²</i>	0.1384	0.1305	0.1306
<i>F</i>	61.83	74.90	74.97
<i>Pr > F</i>	<0.0001	<0.0001	<0.0001
<i>N</i>	8869	8869	8869

competition are assessed with lower value by the market.

Contrary to the role of corporate governance, Tables 8 and 9 show that product market competition deteriorate market valuation.³ The lagged *O-score* has adverse effect on market valuation due to the termination of sustainability of overvaluation and due to the reverse effect of managed accruals. In Section 6.1, we show that corporate governance mitigates the reverse effect of *O-score*. Tables 8 and 9 also show that product market competition raises the adverse effect of lagged *O-score* on market valuation. No matter market valuation is measured by *PV* or *BHAR*, we show that interactions between *O-score* and product market competition have negative impact on market valuation. Tables 8 and 9 further confirm the validity of Hypotheses 5a and 5b.

Table 12

Relationship between ex ante and ex post overvaluation by instrumental variables (2SLS) regressions. Instrumental variables (2SLS) regression analyses of ex post overvaluation (*PV* and *BHAR*) on ex ante overvaluation to examine if corporate governance changes the effect of *O-Score* on ex post overvaluation with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The t-values in parentheses are adjusted by clustered standard errors (Petersen (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	<i>PV_t</i>	<i>PV_t</i>	<i>PV_t</i>	<i>BHAR_t</i>	<i>BHAR</i>	<i>BHAR</i>
<i>Intercept</i>	0.465*** (12.95)	0.553*** (12.78)	0.451*** (12.53)	2.269 (0.71)	11.982*** (3.07)	1.220 (0.38)
<i>O-Score_t</i>	0.057*** (8.48)	0.054*** (8.00)	0.059*** (8.73)	4.263*** (7.01)	3.908*** (6.40)	4.292*** (7.03)
<i>Board_t</i>		0.004* (1.76)			0.532** (2.33)	
<i>Collateral_t</i>		-0.001*** (-5.84)			-0.141*** (-5.65)	
<i>ControlHold_t</i>		0.001 (0.90)			-0.002 (-0.08)	
<i>Deviation_t</i>		-0.002*** (-3.31)			-0.186*** (-3.24)	
<i>Institution_t</i>		0.004*** (13.87)			0.347*** (11.95)	
<i>Independent_t</i>		-0.003 (-0.32)			-0.146 (-1.40)	
<i>Duality_t</i>		0.005 (0.44)			-0.158 (-0.15)	
<i>CGindex_t</i>			0.023*** (5.63)			1.504*** (3.98)
<i>ONE_HHI_t</i>		-0.136** (-2.41)	-0.202*** (-3.72)		-0.278 (-0.05)	-6.354 (-1.30)
<i>PV_{t-1}</i>	0.539*** (67.38)	0.531*** (66.40)	0.536*** (66.90)			
<i>BHAR_{t-1}</i>				-0.030*** (-4.07)	-0.032*** (-4.36)	-0.031*** (-4.18)
<i>TACC_t</i>	0.567*** (10.04)	0.551*** (9.78)	0.554*** (9.82)	90.528*** (17.87)	89.312*** (17.62)	89.929*** (17.74)
<i>Beta_t</i>	-0.034** (-2.03)	0.032* (1.78)	-0.011 (-0.65)	20.826*** (13.65)	25.334*** (15.61)	21.840*** (13.86)
<i>Dividend_{t-1}</i>	0.019*** (12.87)	0.017*** (11.29)	0.019*** (12.33)	2.537*** (18.44)	2.397*** (17.20)	2.489*** (18.01)
<i>BM_{t-1}</i>	-0.028*** (-3.49)	-0.029*** (-3.52)	-0.027*** (-3.35)	12.682*** (18.40)	12.799*** (18.02)	12.875*** (8.44)
<i>SalesP_{t-1}</i>	0.015*** (4.68)	0.015*** (4.78)	0.015*** (4.74)	2.465*** (8.39)	2.487*** (8.51)	2.478*** (8.44)
<i>lnMV_t</i>	-0.004 (-1.08)	-0.037*** (-6.98)	-0.005 (-1.21)	-4.090*** (-10.70)	-6.793*** (-14.46)	-4.082*** (-10.55)
<i>R²</i>	0.3879	0.4017	0.3901	0.1311	0.1451	0.1323
<i>F</i>	1001.21	529.91	808.16	238.35	134.01	192.65
<i>Pr > F</i>	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
<i>N</i>	8869	8869	8869	8869	8869	8869

7. Robustness tests

In Tables 7 and 8, we use the *CGindex* and *ONE_HHI* measured at the same time as *O-Score* to examine whether corporate governance changes the effect of *O-Score* on market valuation. That is, we examine if *CGindex_t* and *ONE_HHI_t* influence the effect *O-Score_t* on *PV_t* and *BHAR_t* and if *CGindex_{t-k}* and *ONE_HHI_{t-k}* influences the effect *O-Score_{t-k}* ($k = 1$ or 2) on *PV_t* and *BHAR_t*. We further examine if current corporate governance influences market valuation on equities overvalued currently and overvalued in the past (*current O-Score* and *previous O-Score*).

$$PV_{it} = \beta_0 + \beta_1 O-Score_{it-k} + \beta_2 O-Score_{it-k} * CGindex_{it} + \text{control variables} + \varepsilon_{it} \quad (11)$$

$$BHAR_{it} = \beta_0 + \beta_1 O-Score_{it-k} + \beta_2 O-Score_{it-k} * CGindex_{it} + \text{control variables} + \varepsilon_{it} \quad (12)$$

$k = 0, 1, 2$

Tables 10 and 11 report the effect of *CGindex_t* and *ONE_HHI_t* on how market values *O-Score_t*, *O-Score_{t-1}*, and *O-Score_{t-2}* with *PV_t* and *BHAR_t* as dependent variables. Table 10 shows that current corporate governance is not able to raise the market valuation (*PV, BHAR*) of the equities currently overvalued (coefficient of *O-Score_t* * *CGindex_t* = -0.012 and t-value = -0.77 in Column 1 of Table 10); but is effectively to reduce the reduction of market valuation of equities overvalued one year ahead or two years ahead (coefficient of *O-Score_{t-1}* * *CGindex_t* = 0.023 and t-value = 1.69 in Column 2 of Table 10; coefficient of *O-Score_{t-2}* * *CGindex_t* = 0.042 and t-value = 2.50 in Column 3 of Table 10). Similarly, Table 11 also indicates that current corporate governance does not raise *BHAR* of equities currently overvalued; but mitigate the reverse effect of market valuation due to previous overvaluation.

Tables 10 and 11 also show that current level of product market competition influences market valuation on current and previous *O-score*. Tables 3 and 4 indicate that market assesses higher value for firms with higher current *O-score* but lower value for those with higher previous *O-score*. Tables 10 and 11 show that product market competition reduces market valuation on *current ex ante*

Table 13

The effect of interaction between corporate governance and ex ante overvaluation on ex post overvaluation by instrumental variables (2SLS) regressions. Instrumental variables (2SLS) regression analyses of ex post overvaluation (PV_t and $BHAR_t$) on interaction between corporate governance and ex ante overvaluation to examine if corporate governance changes the effect of O -Score on ex post overvaluation with a sample of 8869 firm-year observations in Taiwan during 1996–2014. All observations with missing variable values are excluded. The t-values in parentheses are adjusted by clustered standard errors (Petersen (2009)). ***, **, and * represent the significance levels at 1%, 5%, and 10%, respectively.

	PV_t	$BHAR_t$
Intercept	0.392*** (9.24)	2.200 (0.58)
O -Score $_t$	0.059*** (8.38)	4.188*** (6.55)
$CGindex_t$	0.020*** (4.20)	1.486*** (3.39)
ONE_HHI_t	-0.202*** (-3.28)	-6.076* (-1.77)
O -Score $_t$ * $CGindex_t$	0.006 (0.60)	0.620 (0.60)
O -Score $_t$ * ONE_HHI_t	-0.344* (-1.71)	-53.930*** (-2.98)
PV_{t-1}	0.552*** (59.97)	-0.040*** (-4.62)
$TACC_t$	0.538*** (8.04)	94.669*** (15.78)
$Beta_t$	0.003 (0.16)	22.205*** (12.18)
$Dividend_{t-1}$	0.019*** (11.08)	2.432*** (15.33)
BM_{t-1}	-0.027*** (-2.97)	11.176*** (14.10)
$SalesP_{t-1}$	0.018*** (4.76)	3.529*** (10.10)
$lnMV_t$	-0.002 (-0.43)	-4.146*** (-9.00)
R^2	0.4272	0.1484
F	555.19	129.73
$Pr > F$	<0.0001	<0.0001
N	8869	8869

overvaluation (O -Score $_t$) and reinforces the adverse effect of market valuation on previous ex ante overvaluation (O -Score $_{t-1}$, O -Score $_{t-2}$). Hypotheses 5a and 5b are confirmed.

The determinants including recent stock return, corporate governance, market competition, and firm size not only influence ex post overvaluation measures (PV_t and $BHAR_t$) but also the ex ante overvaluation measure (O -Score $_t$). To take care of the endogeneity of O -Score $_t$, we also employ instrumental variables (2SLS) regressions with recent stock return, corporate governance, market competition, and firm size as instrumental variables to examine the relationship between ex post overvaluation and ex ante overvaluation. Our 2SLS regressions meet the order condition in that we have more instrumental variables than endogenous variables. Moreover, instrumental variables estimator is obtained implying that our 2SLS regressions meet the rank condition. Tables 12 and 13 still show that our ex ante overvaluation measure is effective in identifying ex post overvaluation when accounting for the endogeneity of O -Score $_t$.

8. Conclusion

Agency costs of overvalued equity will probably lead to the collapse of the firms due to the value destroying activities taken to prolong market overvaluation. Previous studies focus on the phenomena of overvaluation measured ex post to convince the existence of overvaluation and the related actions lead to market

overvaluation. This paper mimics the measure of ex ante financial distress (Altman Z-Score) and the ex ante earnings management (Beneish M-Score) to compose an ex ante overvaluation measure (O -Score) to identify those are likely to be overvalued beforehand.

We show that our O -Score can effectively identify market overvaluation. Firms with higher current O -score experience higher market valuation. However, firms with higher previous O -score experience lower market valuation. O -Score can proxy for managers' motivation or incentive to manipulation market overvaluation. We show that corporate governance reduces managers' incentive to manipulate market overvaluation and that product market competition raises managers' incentive to manipulate market overvaluation. Since corporate governance limits managers' incentives to manipulate market overvaluation, market does not assess higher value on those potentially overvalued equities under strong corporate governance. Overvalued equities will ultimately reverse back to their fair value after the revelation of the fundamental value and stock prices drop eventually. We confirm that corporate governance effectively reduces the reverse effect of previous overvaluation on current market valuation. Contrary to the role of corporate governance, product market competition raises managerial incentive to manipulate overvaluation and deteriorates the adverse effect of the reverse effect of overvaluation.

This paper is of interests to investors to avoid investing in overvalued equities and to make profits by trading on the overvalued equities. The regulation on corporate governance is suggested to reduce the agency costs of overvalued equities to avoid the break-down of the listed corporations.

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