



Contents lists available at ScienceDirect

Journal of Contemporary Accounting & Economics

journal homepage: www.elsevier.com/locate/jcae

An accounting-based valuation approach to valuing corporate governance in Taiwan

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ARTICLE INFO

Article history:

Received 10 August 2009

Revised 1 June 2010

Accepted 2 June 2010

Available online 30 September 2010

Keywords:

Accounting-based valuation

Corporate control

Corporate governance

Feltham–Ohlson model

Ownership structure

ABSTRACT

We estimate the proportion of firm value that is related to governance mechanisms in a cointegrated system based on the Feltham and Ohlson (1995) accounting-based valuation model. Using a comprehensive set of 32 governance measures in five categories for Taiwan firms, we find that governance measures related to ownership structure and the divergence between cash flow rights and control rights capture variations in stock prices over time. Controlling for book value, net operating assets, and abnormal operating earnings which account for up to 59% of firms' equity value over time, the governance measures in addition track at least 39% of the equity value of these firms. We further identify that the shareholdings of board directors and supervisors, shareholdings of the controlling family, the critical control level of a firm, and the voting rights of the largest shareholder for ultimate control are sufficient governance measures to track changes in firm value. Our results shed some light on the extent of the equity value that can be generated by a firm's governance practices and the types of corporate governance mechanisms that are especially important for firms with similar ownership structure and controls.

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1. Introduction

The importance of corporate governance to firm value has long been well documented.² Its voluminous literature can be traced back to the pioneering work of Jensen and Meckling (1976) on the principal-agent contractual relationship. It can be argued that a firm with a set of effective corporate governance mechanisms that reduces the conflicts of interest between minority shareholders and insiders tends to increase its firm value by reducing information asymmetry and increasing management efficiency. Conversely, a firm may also use its sound governance practice to signal its true value. In a series of seminal papers on external governance, La Porta et al. (1998, 2000, 2002) report that countries with common laws provide better shareholder protection which is in turn related to the higher valuation of corporate assets. Shleifer and Vishny (1997) also emphasize that investor protection is crucial due to the conflicts of interest between minority and controlling shareholders.

Recent work on corporate governance has, however, placed emphasis on a firm's internal governance practices. For example, Durnev and Kim (2005) show that a firm's good governance practices are critical, especially when external governance is weak. Gompers et al. (2003), who first construct a governance index that is made up of 24 anti-takeover provisions to

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² See Gillan (2006) for a comprehensive review on corporate governance.

measure the strength of shareholders' rights, find that the firms with the strongest shareholders' rights outperform those with the weakest rights. Similarly, Klapper and Love (2004) in using an index of corporate governance rankings based on surveys from Credit Lyonnais Securities Asia on 14 emerging markets report that firms with better corporate governance are correlated with better operating performance and market valuation.³ Since then, Bebchuk et al. (2005), Cremers and Nair (2005), and Brown and Caylor (2006) not only confirm the positive relationship between governance practices and firm value, but have also identified a parsimonious set of governance measures that directly affects firm value.

While these prior empirical studies provide insights into the effect of corporate governance on firm value, few studies have directly measured the extent to which corporate governance enhances firm value. More specifically, if improved governance accounts for higher value as a result of higher earnings and a lower cost of equity capital, the question that naturally follows is "what is the proportion of firm value that can be attributed to corporate governance after controlling for financial performance?" This central question reflects the views of institutional investors in a global survey by McKinsey and Company (2000) in which they express willingness to pay a premium for well-governed companies even when their financial performance is similar to others. The survey highlights that firm value is at least as dependent on its governance practices as it is on reported accounting numbers.

In this paper, we attempt to estimate the part of firm value that is related to corporate governance within the Feltham and Ohlson (1995, FO95 thereafter) valuation framework. Based on the dividend discount model (DDM), FO95 operationalize the model by treating firm value as a function of book value, net operating assets, abnormal earnings, and the "other information". One advantage of using the valuation model over DDM is that the valuation can be readily applied to non-dividend paying firms. Furthermore, the accounting explanatory variables can be easily obtained and estimated from a firm's financial reports.

More importantly, the valuation model allows us to disentangle firm value that is explained by the financial performance of a firm from the value that is related to a firm's governance practices which may subsequently enhance its subsequent financial performance. To this end, we specify a firm's governance measures as the "other information" in the FO95 model. Measuring the difference between the values with and without governance measures according to the valuation model yields the value relevance that is related to a firm's corporate governance.

Specifying the "other information" in accounting-based valuation models is not new. For example, consensus analyst forecasts of the next year's earnings (Dechow et al., 1999), order backlogs (Myers, 1999), dividends (Hand and Landsman, 2005), accruals and cash flows (Barth et al., 1999), research and development expenses (Callen and Morel, 2005), and audit and non-audit fees (Brown and Caylor, 2006) have been hypothesized as the "other information". Our purpose in specifying the "other information," however, differs mostly from prior studies whose common aim is to examine the performance of valuation models. Instead, we employ the FO95 model to estimate the value relevance of corporate governance just as Amir et al. (1997) use the model to value deferred taxes.

We examine the relationship between firm value, financial performance, and corporate governance as a cointegrated system in the FO95 valuation framework. Treating the time series relationship between the stock price and firm value estimates from the valuation model as a cointegrated system in a long-run convergence has some advantages over the standard OLS regression analysis which equates price with value at all times. It is well known that price is noisy in that it deviates from its fundamental value. In the extreme cases during periods of bubbles and crises, the deviation of a firm's stock price could be substantial. By contrast, our approach does not require that price be equal to value at all times but that they rather converge over the long term. Such a depiction of the relationship between price and value is more realistic than the static relationship implied by OLS regressions. The explanatory power and the predictability of a valuation model should therefore be judged by its ability to track price variation in the long run despite short-term deviations due to market imperfections.

Another advantage of using the cointegration approach is that it addresses the potential spurious relationship between the stock price, the FO95 explanatory variables, and corporate governance that may be found in a regression analysis due to the presence of trends in these time-series data. In particular, Myers (1999) and Qi et al. (2000) point out that the stock price and book value tend to grow over time and are therefore non-stationary. Morel (1999) also finds that nonstationarities in her sample firms may have induced inconsistencies in estimating lag structures of information dynamics in the Ohlson (1995) model.

Spurious regression may occur because non-stationary data series which exhibit trends over time can appear to be correlated when there is no causal relationship between them. Granger and Newbold (1974) and Phillips (1986) demonstrate this phenomenon by generating two independent random walk series (i.e., the two series are non-stationary) and estimating a regression between them. They report that in a large number of cases, the regression results yield significant *t*-statistics.

The cointegration approach, however, overcomes this econometric problem by examining whether the relationship is a causal one or whether the correlation persists over a period. When the residuals of the modified Feltham–Ohlson relationship are stationary, the variables are said to be cointegrated the way in which market value is related to the FO95 variables and governance measures in a stable process. On the other hand, if the residuals are non-stationary, the observed relationship is likely to be misleading, and would also violate one of the fundamental assumptions of OLS regression, thereby making

³ Others which also focus on Asia-Pacific emerging markets and document similar findings are Bai et al. (2004) for China, Joh (2003) and Choi et al. (2007) for Korea, and Davis-Friday et al. (2006) for Indonesia, Malaysia, Thailand, and South Korea.

statistical inference unreliable. Engle and Granger (1987) further show that OLS estimates are consistent if the variables are cointegrated but are inconsistent otherwise. Hence, the first step is to examine if cointegration takes place among the FO95 variables and governance measures before OLS estimates can be applied to examine the impact of governance measures on firm value.

We estimate the value related to corporate governance using all available firms in Taiwan. Our data provide a set of comprehensive governance mechanisms that span several categories of corporate governance including ownership structure, board characteristics, the divergence between cash flow rights and control rights, privy transactions, the frequency of financial statements, and personnel changes.⁴ We initially reduce the governance measures to 32 proxies in five categories from the fourth quarter of 1998 to the fourth quarter of 2006. Since the coverage of the corporate governance mechanism in our data tends to be related to both depth and scope, the robustness of the market valuation of corporate governance can thoroughly be investigated.

More importantly, Taiwan provides a fertile background as an emerging market for our empirical analysis. Claessens et al. (2000) document that, similar to other East Asian corporations (with the exception of Japan), Taiwanese firms are generally family-controlled and display a significant wedge between ownership and control. They report that control is enhanced through pyramid structures and cross-holdings among firms. Sixty-six percent of firms in Taiwan are in family hands compared to 2.9% that are widely held for ultimate control at the cutoff level of 10% of voting rights. Coupled with poor investor protection due to corruption and an inefficient judicial system (see La Porta et al., 1998), our findings may yield more insight into the types of corporate governance that are more relevant, especially for East Asian markets with similar institutional backgrounds. In particular, shareholdings of directors and supervisors, shareholdings of the controlling family, critical control levels, and voting rights of the largest shareholder for ultimate control may play a more important role in a firm's governance practices.

By contrast, the categories of charter/bylaws, director education, and state of incorporation (an anti-takeover provision) in the US that form a major part of the governance index of Gompers et al. (2003) may be less applicable to emerging markets. Chen et al. (2007) contend that the threat of a takeover should not be considered to be a corporate governance mechanism because takeover cases are rare in Taiwan.

Our analysis yields several results. First, consistent with prior studies, corporate governance is strongly related to firm value. Without corporate governance factors, we find that book value, net abnormal earnings, and net operating assets account for variations in market value for up to 59% of our sample firms. It is not surprising that these accounting factors carry substantial predictive power regarding future market value. However, these results also suggest that the accounting numbers are inadequate for the remaining 41% of the sample firms.

Second, among the 32 governance proxies in five categories in the sample, only 11 of them which are under the categories of ownership structure and the divergence between cash flow rights and voting rights have an influence on market value. Adding these governance variables along with the accounting factors enables us to track the remaining 39% of sample firms whose market value cannot be explained by the accounting factors alone. The results suggest that up to 39% of the total market value of an average firm can be attributed to the value that is related to its corporate governance.⁵

Finally, using fewer governance measures results in the loss of little tracking power on firm value. Therefore, a parsimonious model with fewer governance measures is sufficient to fully incorporate firm value that is related to corporate governance mechanisms. We identify shareholdings of board directors and supervisors, shareholdings of the controlling family, and voting rights of the largest shareholder for ultimate control as being the most important governance measures. However, we do not find board characteristics to be important to firm value in Taiwan. This finding is not surprising since Young et al. (2008) report that 64% of firms in Taiwan do not have an independent director and another 21% of firms hire only one independent director despite the mandatory requirement since 2002 that two independent directors be hired for IPO firms. Our results therefore differ from Yermack (1996), Cheng (2008), and Coles et al. (2008) who indicate that board size and composition are strongly related to corporate performance in US firms.

Our work on valuing corporate governance bridges the valuation literature in accounting and the corporate governance literature in finance. To our knowledge, very few studies directly estimate the firm value related to corporate governance mechanisms using an accounting-based valuation model. The superior tracking ability of corporate governance on market value makes it possible to estimate the extent of value added due to a firm's governance practices. Furthermore, the cointegration analysis that we apply in this study is consistent with the spirit of the valuation model in which corporate governance acts as the information dynamic linkage between future residual income and market value. That is, changes in corporate governance mechanisms for a firm may accordingly vary with firm value in a long-run relationship.

The remainder of the paper is organized as follows. Section 2 provides the background to corporate governance in Taiwan. Section 3 describes the modified FO95 model. Section 4 presents the definitions of the data. Section 5 discusses the cointegration method. In Section 6, we present the empirical results of corporate governance within the FO95 valuation framework. Section 7 concludes the paper.

⁴ See Appendix A for a summary description of each factor.

⁵ We also test the Feltham and Ohlson (1995) model using all 32 corporate governance factors for robustness checks. However, since the results are similar to those of 11 factors, we do not report them in the paper.

2. Corporate governance in Taiwan

Taiwan's legal system is based on German civil law. Although on average the legal enforcement of such law of German legal origin is weaker only than that of Scandinavian law but stronger than that of English common law or French civil law, La Porta et al. (1998) report that the efficiency of Taiwan's judicial system and corruption are poorly ranked compared to other countries in weaker legal families. La Porta et al. (1998) also document that common-law countries on average provide better shareholder protection than civil-law countries. Again, Taiwan is ranked relatively low when compared with other countries of German legal origin. The overall poor investor protection in Taiwan due to its legal environment suggests that corporate governance may play a more important role in a firm's market valuation.

Following the German corporate governance structure, the board members in a Taiwanese firm consist of both directors and supervisors. The role of supervisors is to monitor the directors in terms of their corporate decisions and to review and audit reports prepared for the shareholders. However, in Taiwan the supervisory board is not independent as in the German two-tier system and its members can be elected from among the family members of current employees and directors. Furthermore, Lee and Yeh (2004) emphasize that controlling families may also set up nominal investment firms to increase their control by sending family members or their designated persons to the board after the representatives of investment firms are elected for the positions of directors and/or supervisors. Using these mechanisms, Claessens et al. (2000) document that 65% and 48.2% of firms in Taiwan are controlled by families at the 10% and 20% critical levels, respectively.

Given these governance practices by controlling families, Young et al. (2008) find that board independence is negatively related to managerial ownership and family control. They report that 64% of firms in Taiwan do not have an independent director and another 21% of firms hire only one independent director despite the mandatory requirement of two independent directors for IPO firms since 2002. Similarly, Boone et al. (2007) show that firms in which managers have substantial influence tend to be associated with less independent boards. Hence, the board size and structure of firms in Taiwan may not have as direct an influence on corporate performance as documented by Yermack (1996), Cheng (2008), and Coles et al. (2008) for firms in the US. Instead, ownership structure and the divergence between cash flow rights and control rights could provide more direct measures and impacts in relation to corporate governance in Taiwan.

The importance of ownership structure and control rights is further highlighted by the current literature. In terms of the ownership structure, McConnell and Servaes (1990) document that a low (high) level of insider ownership is positively (negatively) related to Tobin's *Q*. The presence of institutional investors also has a positive effect on firm valuation. Yeh et al. (2001) report that the percentage of board seats occupied by controlling families is negatively related to corporate performance. Linck et al. (2008) complement the findings by showing that smaller and less independent boards are associated with higher managerial ownership. As for the divergence between cash flow rights and control rights, Levy (1983), Lease et al. (1984), and DeAngelo and DeAngelo (1985) investigate the voting power of insiders. Morck et al. (1988) and La Porta et al. (2002) find that firms attract higher valuations when their controlling shareholders have higher cash flow ownership. Conversely, Mitton (2002), Claessens et al. (2002), and Lemmon and Lins (2003) report that firms in which managers have a higher level of control rights experience lower returns than those of other firms. Since these studies tend to focus on just one category of corporate governance mechanisms, our study complements them by examining the importance of several categories of corporate governance measures.

3. The modified Feltham and Ohlson (1995) model

There are four primary assumptions underlying the F095 model. First, non-arbitrage is assumed to hold so that firm value is the present value of expected dividends conditional on the information dynamic. Second, the model assumes clean surplus accounting where a change in book value is equal to its earnings after dividends. Third, (net) financial assets are assumed to be investment of zero net present value for which interest is the product of the risk-free rate and beginning of period (net) financial assets. Fourth, abnormal operating earnings and net operating assets (NOA) evolve according to the linear information dynamic.

However, due to the separation of ownership and control from which contractual relationships that are often based on accounting numbers arise between managers and shareholders, managers have the incentive to apply certain accepted accounting rules at their discretion to maintain such relationships while enhancing their own interests. Reported accounting numbers may therefore reflect more the contractual constraints imposed on managers rather the true underlying economic activities. It follows that corporate governance may affect a firm's earnings quality and in turn its abnormal operating earnings, book value and consequent market value.

Consistent with the above argument, Warfield et al. (1995) find that a higher level of managerial ownership enhances the stock price informativeness of accounting earnings and reduces the magnitude of accounting accrual adjustments. The improvement in earnings quality due to better governance practices is also documented by Beasley (1996) and Klein (2002) who report that board independence is negatively related to earnings management. After adjusting for the impact of earnings management, Cornett et al. (2008, 2009) show that corporate governance measures such as institutional ownership and board composition increase their impact on earnings.

Accordingly, we hypothesize that corporate governance constitutes "other information" that is related to abnormal operating earnings. The linear information model in the F095 model can therefore be modified as follows:

$$oX_{t+1}^a = \omega_{11}oX_t^a + \omega_{12}oA_t + cG_t + \varepsilon_{1t+1} \quad (1)$$

$$oA_{t+1} = \omega_{22}oA_t + v_t + \varepsilon_{2t+1} \quad (2)$$

$$cG_{t+1} = \gamma_1 cG_t + \varepsilon_{3t+1} \quad (3)$$

$$v_{t+1} = \gamma_2 v_t + \varepsilon_{4t+1} \quad (4)$$

where bv_t is the book value, oX_t^a is the abnormal operating earnings, oA_t is the net operating assets (net of operating liabilities), cG_t is the corporate governance, and v_t comprises the “other information” variables. Feltham and Ohlson (1995) show that the market value of a firm, P_t , can be simplified as:

$$P_t = bv_t + \alpha_1 oX_t^a + \alpha_2 oA_t + \beta_1 cG_t + \beta_2 v_t \quad (5)$$

Eq. (5) shows that the market value depends on book value and net operating assets, adjusted for abnormal operating earnings, governance practices, and other information that modify the prediction of future profitability.⁶

As discussed earlier, our purpose in using the valuation model is to estimate the intrinsic value of corporate governance rather than to test the valuation model per se. Our choice to use the Feltham–Ohlson model for valuing corporate governance as opposed to the original Ohlson (1995) model is that the former incorporates accounting conservatism and growth in operating assets in the equity valuation process whereas the latter assumes that accounting is unbiased and does not recognize the financial and operating assets dichotomy. The difference in the assumptions may suggest that the Feltham–Ohlson model provides a more robust estimation of corporate governance using the accounting numbers. Consistent with this view, CalLEN and Segal (2005) find that the FO95 model is more favorable compared to the Ohlson model.

Furthermore, Penman (2005) and Brief (2007) document that the residual income-based model of Ohlson (1995) outperforms the abnormal earnings growth model of Ohlson and Juettner-Nauroth (2005). They report that the former estimates are generally more accurate and the variability of distribution is less than the latter estimates. Based on their findings, we use the Feltham and Ohlson (1995) valuation framework for our estimation purposes.

4. Data and variable definitions

All data for the sample firms are obtained from the Taiwan Economic Journal (TEJ) database. To be included in the sample, a firm must have 33 consecutive quarters of data for our empirical tests. We exclude bank and insurance companies because they are heavily regulated firms. We also exclude firms for which the book values are negative. These selection criteria yield a final sample of 215 firms from July 1998 to December 2006.

All variables are reported on a per share basis except for the ratios and corporate governance variables. We define the market value P_t and book value bv_t as the closing stock price and book value at the end of each quarter, respectively. Net financial assets are calculated as cash and cash equivalents plus short-term investments, minus long-term debt, the current portion of long-term debt, and preferred stock. Net operating assets oA_t are defined as the book value of shareholders' equity minus net financial assets plus net deferred tax liabilities. Abnormal operating earnings oX_t^a are equal to operating earnings in year t minus expected normal earnings (cost of capital r_t multiplied by the previous period's net operating assets).⁷ r_t is the cost of capital for each firm in quarter t . Since there is little consensus on how the cost of capital should be determined, we use three different estimates. First, we follow Dechow et al. (1999), Barth et al. (1999), Bell et al. (2002), and Landsman et al. (2006) and use a constant rate of 12%. However, since Lee et al. (1999) find that the time-varying cost of equity capital tracks stock prices more closely, we also use the 30-day annualized commercial paper rate. In addition, the CAPM is used to estimate the time-varying rate for each quarter:

$$r_i = r_f + \beta_i(r_m - r_f) \quad (6)$$

where r_f is the 30-day annualized commercial paper rate for the risk-free rate, β is the market risk for firm i , and R_m is the market return. To avoid a negative discount rate when r_m is less than r_f , we take r_f as the discount rate. That is, $r_i = \text{Max}(r_f, r_{capm})$.

Table 1 reports the summary statistics of the sample firms. As expected, the average market value of \$15.78 per share is larger than the average book value of \$13.65 per share. However, the difference in the volatility between market value and book value is far greater than the difference in their equity values. The standard deviation of 48.29 for the market value is almost ten times greater than that of 4.85 for the book value. This suggests that the book value alone is insufficient to track the larger variation of the market value. For the three abnormal operating earnings that we estimate, oX_2^a which is based on the 30-day commercial paper rate has the highest average of \$0.31 per share since it has the lowest cost of equity capital. Using other higher cost of equity capital, however, results in negative abnormal earnings. Nevertheless, the variability in residual incomes under different assumptions allows us to conduct robustness tests on the time series relationship between firm value and corporate governance.

⁶ For a detailed derivation of the Feltham–Ohlson model, refer to Feltham and Ohlson (1995).

⁷ We use the same definitions as in Amir et al. (1997).

Table 1

Descriptive statistics of the Sample. All variables are reported on a per share basis. P_t is the market value at the end of quarter t . bv_t is the book value at quarter t . Net operating assets oa_t are the book value of shareholders' equity minus net financial assets plus net deferred tax liabilities. Abnormal operating earnings ox_t^a are operating earnings in year t minus expected normal earnings (cost of capital r_t times last period's net operating assets), where r_t is the cost of equity capital. $ox1_t^a$, $ox2_t^a$, and $ox3_t^a$ are 12%, 30-day commercial paper rate, and the maximum of the 30-day commercial paper rate or CAPM rate, respectively.

Variables	Mean	Std. dev.	Q1	Median	Q3
P_t	15.78	48.29	6.64	10.22	16.66
bv_t	13.65	4.85	10.95	13.00	15.80
$ox1_t^a$	-0.15	1.22	-0.63	-0.26	0.27
$ox2_t^a$	0.31	1.26	-0.21	0.14	0.73
$ox3_t^a$	-0.09	1.35	-0.61	-0.09	0.43
oa_t	20.31	8.12	15.12	18.68	23.56

For the corporate governance measures, we initially consider 32 proxies for each sample firm that are available in the Taiwan Economic Journal database (TEJ). They fall into the five categories of ownership structure, board characteristics, divergence between cash flow rights and control rights, frequency of financial statement regrouping and personnel changes, and privy transactions. Each variable is defined in Appendix A. Since the market value of a firm is non-stationary, only those corporate governance variables which are non-stationary can potentially explain the variation in market value over time. We therefore first test the nonstationarity of each variable.⁸

We find that 11 of the 32 variables related to ownership structure and divergence between cash flow rights and control rights are non-stationary. They include the shareholding of directors and supervisors (SDS), the shareholding of the largest shareholder (SLS), the critical control level (CCL), the shareholding of individuals (SID), the total shareholding of the controlling family (TSF), voting rights (VR), direct shareholdings by family (DSF), cash flow rights (CFR), the ratio of seating to cash flow (TSC), the ratio of seating to voting (TSV), and the excess of the critical control level (ECL). For reporting purposes, we only present the summary statistics and cointegration results for these 11 variables. The first five governance measures form part of the ownership structure, while the latter six relate to divergence between cash flow rights and control rights. Interestingly, Baek et al. (2004) also point out that chaebol firms in Korea with concentrated ownership by controlling family shareholders and in which controlling shareholders' voting rights exceed cash flow rights experience lower returns during the 1997 Korean financial crisis.

We report the summary statistics of the 11 corporate governance measures in the 2 governance categories in Table 2. Under the ownership structure, the shareholdings of directors and supervisors (SDS) vary from 12% in the first quartile to 27% in the third quartile with an average of 21%. This average is comparable to the 18% held by the management control group which is made up of a firm's officers, directors and their families as reported by Lemmon and Lins (2003). The largest shareholder (SLS) holds an average of 15% of the total shares outstanding. This figure is consistent with an average 18% of shares owned by the three largest shareholders of the 10 largest firms in Taiwan reported by La Porta et al. (1999). Since the largest shareholder is most likely to be a member of the controlling family, the average total shareholding (TSF) of the controlling family reaches 26% in our sample. Of the remaining shareholdings, 63% of the total shares are held by individuals (SID). The descriptive statistics provide an overall picture that firms in Taiwan are characterized by diffused ownership. The ease of control is further highlighted by the average critical control level (CCL) of 11%, which is less than half the average family shareholding of 26%.

As for the divergence between cash flow rights and control rights, we first measure both the voting rights (VR) and cash flow rights (CFR) of the largest shareholder according to La Porta et al. (1999). The average voting rights of 27% and the cash flow rights of 22% indicate that only a fraction of total shares is required for ultimate control (by the controlling family) of a firm. Furthermore, these voting and cash flow rights turn into 5.91 (TSV) and 11.65 (TSC) seating rights, respectively. It shows that a company board is likely to be filled with family-controlled directors and supervisors. The excess critical control level (ECL) of 16%, the difference between voting rights and the critical control level, suggests that the largest shareholders are at ease in controlling their firms. It appears that the degree of separation between ownership and control in Taiwan is large. As a result, corporate control by the controlling shareholder or family may play an important role in firm valuation.

5. Methodology

Granger (1986) and Engle and Granger (1987) develop a cointegration method for which cointegration variables are related in a long-run equilibrium even when they are individually non-stationary with infinite variance (each variable drifts over time). More specifically, a cointegration relationship indicates that these variables "move together" and are bounded by some relationship in the long run. In the short run, however, they may deviate from the relationship, but their association will return in the long run.

According to the cointegration approach, we first establish if the FO95 variables and governance measures are non-stationary for each firm. More specifically, we test whether each variable for each firm in the model possesses a unit root. A variable which has a unit root is characterized by a non-mean reverting process in which its variance grows as time in-

⁸ We discuss the cointegration methodology and report the results in detail in Section 4.

Table 2

Summary statistics of the corporate governance measures. This table reports the summary statistics of the 11 corporate governance measures in the categories of ownership structure and the divergence between cash flow rights and control rights. Each measure is defined in Appendix A.

Ownership structure	Mean	Std. dev.	Q1	Median	Q3
Shareholdings of directors and supervisors (SDS)	0.21	0.12	0.12	0.18	0.27
Shareholdings of the largest shareholder (SLS)	0.15	0.11	0.07	0.14	0.22
Total shareholdings of family (TFS)	0.26	0.16	0.14	0.24	0.38
Critical control level (CCL)	0.11	0.07	0.07	0.09	0.12
Shareholdings of individuals (SID)	0.63	0.20	0.47	0.63	0.79
<i>Divergence between cash flow rights and control rights</i>					
Voting rights (VR)	0.27	0.15	0.15	0.25	0.38
Direct shareholding by family (DSF)	0.22	0.15	0.10	0.20	0.31
Cash flow rights (CFR)	0.22	0.15	0.10	0.19	0.31
Ratio of seating to cash flow (TSC)	11.65	112.47	2.57	3.92	6.84
Ratio of seating to voting (TSV)	5.91	24.57	2.17	3.09	4.84
Excess of critical control level (ECL)	0.16	0.14	0.06	0.15	0.25

creases. As a result, the increasing variance violates the underlying assumption of a constant variance in the OLS regression and raises doubts regarding the validity of the OLS estimates. However, the OLS regression provides consistent estimates if the variables are non-stationary but are cointegrated.

To carry out this series of tests, we first use the Augmented Dickey–Fuller (ADF) method to test for the presence of a unit root. If a variable is found to have a unit root and is therefore non-stationary, we then test whether it still has a unit root after first differencing the variable. A variable is said to be integrated of order 1 when its first-difference no longer has a unit root. If the variables in the model are found to be integrated of order 1, we then regress market value on the FO95 variables and governance measures over the sample period. If the residuals in the OLS regressions are stationary, then market value is said to be cointegrated with the explanatory variables. In the final step, we examine the relationship between market value, the FO95 variables, and governance measures using OLS regressions that yield consistent and valid estimates. The OLS regressions allow us to examine the directional impact of the governance measures on firm value.

For robustness checks, we also run the cointegration tests based on different estimates of abnormal operating earnings as follows:

$$P_t = \gamma_0 + \gamma_1 bv_t + \gamma_2 ox1_t^a + \gamma_3 oa_t + e_t \quad (7)$$

$$P_t = \gamma_0 + \gamma_1 bv_t + \gamma_2 ox2_t^a + \gamma_3 oa_t + e_t \quad (8)$$

$$P_t = \gamma_0 + \gamma_1 bv_t + \gamma_2 ox3_t^a + \gamma_3 oa_t + e_t \quad (9)$$

$$P_t = \gamma_0 + \gamma_1 bv_t + \gamma_2 ox1_t^a + \gamma_3 oa_t + \gamma_4 CG_t + e_t \quad (10)$$

$$P_t = \gamma_0 + \gamma_1 bv_t + \gamma_2 ox2_t^a + \gamma_3 oa_t + \gamma_4 CG_t + e_t \quad (11)$$

$$P_t = \gamma_0 + \gamma_1 bv_t + \gamma_2 ox3_t^a + \gamma_3 oa_t + \gamma_4 CG_t + e_t \quad (12)$$

where bv_t is the book value, and $ox1_t^a$, $ox2_t^a$, and $ox3_t^a$ are the abnormal operating earnings determined by a constant cost of equity, 30-day commercial paper rate, and CAPM (if it is greater than the risk-free rate), respectively. oa_t is the net operating assets, and CG_t denotes the 11 corporate governance factors. We refer to Eqs. (7)–(9) as the FO95 models and to Eqs. (10)–(12) as the FO95-CG (Corporate Governance) models.

6. Empirical results

6.1. Nonstationarity test

Panel A of Table 3 presents the results of the ADF unit root tests of market value, book value, abnormal operating earnings, and net operating assets. For market value, the average (median) ADF-statistic is -1.64 (-1.86), which is above the critical value of -2.93 at the 5% significance level. Even for a firm at the first quartile (Q1), the ADF-statistic of -2.44 fails to reject the nonstationarity test. Over the entire distribution, we find that only 13.24% of market values in the 219 sample firms are stationary. Similar to market value, the average (median) ADF-statistic of -1.57 (-1.64) and -1.69 (-1.65) indicate that book value and net operating assets, respectively, for most firms exhibit nonstationarity. These initial findings are not surprising given that for an average firm as an ongoing concern, its stock price, book value and net operating assets are expected to drift upwards (become non-mean reverting) over time.

Based on different assumptions regarding the cost of equity capital described in Section 4, the percentage of stationarity of abnormal operating earnings varies from 37.67% ($ox2_t^a$) to 74.42% ($ox3_t^a$). It is interesting to note that using the CAPM to

Table 3

Augmented Dickey–Fuller unit root test with no trend. This table presents the summary statistics of the FO95 and corporate governance factors. The last column for each panel reports the percentage of firms that are stationary at the 5% level. The critical value for the Augmented Dickey–Fuller unit root test without trend at the 5% level is -2.93 .

	Mean	Std. dev.	Q1	Median	Q3	Percentage of stationarity (%)
<i>Panel A: Ohlson factors</i>						
P_t	-1.64	1.73	-2.44	-1.86	-0.58	13.49
bv_t	-1.55	1.41	-2.25	-1.64	-0.74	10.70
$ox1_t^a$	-2.85	2.01	-3.64	-2.82	-1.75	44.19
$ox2_t^a$	-2.66	1.94	-3.59	-2.56	-1.57	37.67
$ox3_t^a$	-3.57	1.23	-4.05	-3.50	-2.91	74.42
oa_t	-1.69	1.21	-2.39	-1.65	-1.06	11.16
<i>Panel B: Ownership structure (CG1)</i>						
Shareholdings of directors and supervisors (SDS)	-1.63	1.18	-2.07	-1.52	-0.93	10.70
Shareholdings of the largest shareholder (SLS)	-1.58	0.96	-2.23	-1.50	-1.02	7.44
Total shareholdings of family (TFS)	-1.56	1.38	-2.09	-1.44	-0.92	10.23
Critical control level (CCL)	-2.87	18.58	-3.07	-2.25	-1.43	26.98
Shareholdings of individuals (SID)	-2.19	1.60	-2.78	-1.81	-1.20	23.26
<i>Panel C: Divergence between cash flow rights and control rights (CG2)</i>						
Voting rights (VR)	-1.55	1.26	-2.10	-1.42	-0.87	10.23
Direct shareholding by family (DSF)	7.06	126.55	-2.09	-1.37	-0.86	11.63
Cash flow rights (CFR)	-1.69	1.38	-2.23	-1.54	-0.96	11.63
Ratio of seating to cash flow (TSC)	-1.76	1.39	-2.15	-1.61	-1.13	11.16
Ratio of seating to voting (TSV)	-1.83	1.36	-2.20	-1.67	-1.18	12.56
Excess of critical control level (ECL)	-1.99	1.36	-2.59	-1.77	-1.18	14.42

calculate the cost of equity capital yields a larger percentage of stationary abnormal operating earnings ($ox3_t^a$) than estimates based on using a constant rate and the commercial paper rate. It suggests that beta estimates using the CAPM tend to be time-varying and to covary with operating earnings and/or net operating assets. Overall, the preliminary tests suggest that market value, book value, and abnormal operating earnings are not stationary. Our results are consistent with Qi et al. (2000) who find that 90% of their sample firms exhibit non-stationary market and book values compared to 66% of residual incomes.

As discussed in Section 4, we find that only 11 of the 32 corporate governance (CG) proxies are non-stationary. The summary statistics of the ADF tests for the CG factors in ownership structure and the divergence between cash flow rights and control rights are reported in Panels B and C of Table 3, respectively. Compared with other CG factors, critical control levels (CCL) and individual shareholdings (SID) appear to be relatively more stable. At 27% and 23%, respectively, of the firms which exhibit stationarity for these two governance measures, they are higher than other CG measures which range from 7% (SLS) to 15% (ECL). We suspect that it takes more time for firms to achieve the minimum level of ownership required to control a firm and the level of ownership concentration. Nevertheless, the distributions of the ADF-statistics show that about 75% (after the first quartile) of firms are rejected at the 5% level.

As a sequel to the test of the non-stationary properties of the accounting variables and the CG factors, we investigate whether they are integrated of order 1 ($I(1)$). We therefore take the first difference of each individual variable and test it to see if it becomes stationary. Table 4 confirms that changes in the FO95–CG factors are stationary for most firms where the average ADF-statistic for each factor is less than the critical value at the 5% significance level. The market value for 85% of the firms is stationary compared to at least 90% for most CG factors.⁹ On the whole, our results which show that the variables are mostly integrated of order 1 ($I(1)$) pave the way to examine whether or not and the extent to which a linear combination of book value, abnormal operating earnings, net operating assets, and the CG factors are cointegrated with market value.

6.2. The value relevance of corporate governance

We begin the valuation of corporate governance by estimating the percentage of firms whose market value is cointegrated with the accounting variables according to Eqs. (7)–(9). A stationary error term suggests that market value is cointegrated with the accounting variables specified in the FO95 model. The percentage of firms whose error terms are stationary (or cointegrated) measures the extent of firm value that has accrued to the financial performance of these firms. The last column of Row 1 in each panel of Table 5 reports that cointegration takes place in 59% or less of firms under different assumptions regarding the cost of equity capital. It suggests that up to 41% of firm value may be explained by a firm's internal governance.

To examine whether governance practices account for the remaining 41% of the market value in the sample firms, we add the CG proxies in the presence of book value, abnormal operating earnings, and net operating assets according to Eqs. (10)–(12). We perform the analysis in two steps. First, we include the CG measures in each category. The additional explan-

⁹ We also conduct ADF tests with trend and find that 90% and 86% of market and book values are stationary, respectively.

Table 4

Augmented Dickey–Fuller unit root test with no trend: first difference. This table presents the summary statistics of the F095 factors and the corporate governance measures after taking the first difference. The last column for each panel reports the percentage of firms that are stationary at the 0.05 level after first differencing. The critical value for the Augmented Dickey–Fuller unit root test without trend at the 5% level is -2.93 .

	Mean	Std. dev.	Q1	Median	Q3	Percentage of stationarity (%)
<i>Panel A: Ohlson factors</i>						
P_t	-4.88	1.65	-6.00	-5.12	-3.77	85.12
bv_t	-4.80	1.76	-5.81	-5.00	-3.75	82.79
$ox1_t^a$	-5.38	2.86	-6.93	-5.47	-3.11	76.28
$ox2_t^a$	-5.40	2.84	-6.91	-5.46	-3.16	76.74
$ox3_t^a$	-6.20	1.91	-7.22	-6.17	-5.36	93.95
oa_t	-5.10	1.63	-6.12	-5.27	-4.47	87.91
<i>Panel B: Ownership structure (CG1)</i>						
Shareholdings of directors and supervisors (SDS)	-5.85	5.16	-5.85	-5.46	-5.04	96.28
Shareholdings of the largest shareholder (SLS)	-5.54	1.20	-5.92	-5.55	-5.40	97.21
Total shareholdings of family (TFS)	-5.53	1.67	-6.13	-5.51	-4.82	95.35
Critical control level (CCL)	-8.08	12.29	-6.41	-5.67	-5.14	86.98
Shareholdings of individuals (SID)	-5.59	2.18	-6.35	-5.66	-5.09	88.37
<i>Panel C: Divergence between cash flow rights and control rights (CG2)</i>						
Voting rights (VR)	-5.63	1.64	-6.24	-5.54	-4.96	95.81
Direct shareholding by family (DSF)	-8.69	48.87	-6.08	-5.50	-4.93	93.49
Cash flow rights (CFR)	-5.48	1.58	-6.17	-5.53	-4.85	94.42
Ratio of seating to cash flow (TSC)	-5.59	2.57	-6.28	-5.59	-5.02	95.81
Ratio of seating to voting (TSV)	-5.62	1.61	-6.20	-5.52	-5.03	95.81
Excess of critical control level (ECL)	-6.08	2.39	-6.74	-5.85	-5.09	93.95

Table 5

Cointegration analysis of Feltham–Ohlson and corporate governance factors. This table presents the summary statistics of the cointegration tests of the F095 and corporate governance factors. *Ohlson* includes the book value and residual income. *CG1* includes 6 CG measures for the ownership structure in addition to book value and residual income. *CG2* includes 5 CG measures for the divergence between cash flow rights and control rights in addition to book value and residual income. *CG-Total* includes all 11 CG measures in both categories in addition to book value and residual income. The last column for each panel reports the percentage of firms whose market value is cointegrated with book value, residual income, with or without the corporate governance factors at the 5% level. The critical value for the Augmented Dickey–Fuller unit root test without trend at the 5% level is -2.93 .

	Mean	Std. dev.	Q1	Median	Q3	Percentage of stationarity
<i>Panel A: Residual income 1 – (RI1_t)</i>						
Accounting variables	-3.17	1.18	-3.82	-3.09	-2.45	59.53
CG1	-4.69	1.09	-5.29	-4.56	-3.90	98.14
CG2	-4.60	1.12	-5.37	-4.46	-3.91	95.35
CG-Total	-5.35	1.14	-6.08	-5.18	-4.59	99.53
<i>Panel B: Residual income 2 – (RI2_t)</i>						
Accounting variables	-3.18	1.16	-3.83	-3.14	-2.41	57.67
CG1	-4.72	1.10	-5.26	-4.60	-3.92	98.60
CG2	-4.62	1.16	-5.38	-4.49	-3.84	94.88
CG-Total	-5.36	1.15	-6.21	-5.18	-4.61	99.53
<i>Panel C: Residual income 3 – (RI3_t)</i>						
Accounting variables	-3.09	1.13	-3.74	-3.01	-2.38	56.28
CG1	-4.62	1.11	-5.22	-4.50	-3.87	95.35
CG2	-4.60	1.10	-5.25	-4.44	-3.87	95.81
CG-Total	-5.35	1.09	-5.99	-5.18	-4.60	100.00

atory power from each CG category should highlight the importance of each individual category for firm valuation. Second, we include all 11 CG measures from both categories.

Rows 2 and 3 in each panel of [Table 5](#) report the results of 5 CG measures of the ownership structure (CG1) and 6 CG measures of the divergence between cash flow rights and control rights (CG2), respectively. As shown in the last column, both categories increase the percentage of cointegration to at least 95%. Our results, however, appear insensitive to the different assumptions regarding the cost of equity capital as the cointegration level varies between 95% and 98% for CG1 and remains at 95% for CG2. With the additional 35% increase in the cointegration between market value and governance measures after controlling for the financial performance of the firms, corporate governance appears to have an influence on firm value.

The final row (CG-Total) in each panel shows that adding all 11 proxies from both CG categories marginally improves the extent of cointegration. The additional contribution of including both groups of CG measures rather than just those from one group varies between one and 5%. It appears that both CG categories (i.e., ownership structure and the divergence between cash flow rights and control rights), may provide similar governance information regarding firm value. It follows that firms which have favorable ownership structures may also exhibit less divergence between cash flow rights and control rights.

6.3. Regression analysis

With 95–100% of sample firms whose market value is cointegrated with both the FO95 and CG factors, the regression results tend to yield consistent estimates and to exhibit non-spurious relationships. We therefore take a closer look at the effect of individual CG measures on firm value under OLS regression analysis. Such investigation identifies the relative importance of each CG variable and may lead to a parsimonious model. Before we examine the effect of individual CG measures on market value after controlling for the accounting numbers, we first examine the correlations among the explanatory variables.

As shown in Table 6, there is little correlation between the FO95 factors and CG measures where the correlation coefficients vary from -0.26 to 0.16 . This suggests that CG measures may capture additional information about market value that is missing in the accounting numbers. Among the CG measures, those for ownership structure are weakly correlated. However, those in the category of the divergence between cash flow rights and control rights are highly correlated, suggesting that they provide similar information about a firm's governance practices. The correlation coefficients range from -0.81 between the ratio of seating to voting (TSV) and voting rights (VR) to 0.97 between cash flow rights (CFR) and the direct shareholding by the controlling family (DSF). Between the two categories of corporate governance measures, the total shareholdings of the controlling family (TFS) in the ownership structure is highly correlated with voting rights (VR), the direct shareholding by the controlling family (DST), cash flow rights (CFR), and the ratio of seating to voting (TSV) in the divergence between cash flow rights and control rights.

A closer look at these highly correlated governance proxies reveals that they provide information about similar aspects of a firm's governance. For example, total shareholdings by the controlling family (TSF) factor and the direct shareholding by the controlling family (DST) factor differ only by the measure of the family unlisted firm shareholdings absent in the latter variable. Similarly, voting rights (VR) are strongly correlated with both TSF and DST because larger shareholdings of the controlling family lead to more voting rights on the part of the largest shareholder for the ultimate control according to La Porta et al. (1999). These strong correlations between some of the CG measures are consistent with our earlier cointegration results in which CG measures of the ownership structure and divergence category provide similar tracking power in terms of market value.

Table 7 presents the results of the OLS regression of market value on the FO95 and CG factors. We follow the steps of the cointegration analysis described earlier by first regressing market value on CG factors of ownership structure and then on factors in terms of the divergence between cash flow rights and control rights before we include both types of CG factors. To scale market value and book value which could vary from less than \$1 per share to more about \$1800, we take the natural log of these variables. We also take the natural log of the ratio of seating to voting rights (TSV) and the ratio of seating to cash flow rights (TSC) for the same reason.

Column 1 in Table 7 shows the effect of five CG 1 factors along with the accounting numbers on market value. Consistent with the FO95 model, market value is anchored by the book value and reconciled by abnormal operating earnings and net operating assets. We also find that the shareholdings of directors and supervisors (SDS), the shareholdings of the largest shareholder (SLS) and the critical control level (CCL) are positively related to market value. Consistent with *a priori*, increased ownership of directors and supervisors improves the monitoring role of the board and hence the earnings quality and its

Table 6

Correlations between explanatory variables. This table reports the correlations among three Feltham–Ohlson (1995) accounting factors and eleven corporate governance measures. *bv* is the book value. Net operating assets *oa* are the book value of shareholders' equity minus net financial assets plus net deferred tax liabilities. Abnormal operating earnings *ox^a* are operating earnings in year *t* minus expected normal earnings (cost of capital r_t times last period's net operating assets), where r_t is the cost of equity capital obtained from the Capital Asset Pricing Model. SDS is the shareholdings of directors and supervisors, SLS the shareholdings of the largest shareholder, TFS the total shareholdings of the controlling family, and CCL the critical control level. SID represents the shareholdings of individuals, VR voting rights, DSF the direct shareholding of the controlling family, CFR cash flow rights, TSC the ratio of seating to cash flow, TSV the ratio of seating to voting, and ECL the excess of the critical control level.

	<i>bv</i>	<i>ox^a</i>	<i>oa</i>	SDS	SLS	TFS	CCL	SID	VR	DSF	CFR	TSC	TSV	ECL
<i>bv</i>	1													
<i>ox^a</i>	0.40	1												
<i>oa</i>	0.55	0.15	1											
SDS	0.12	0.16	-0.02	1										
SLS	-0.05	-0.01	-0.02	-0.18	1									
TFS	0.05	0.06	-0.05	0.58	0.41	1								
CCL	-0.06	-0.02	-0.18	0.36	0.08	0.38	1							
SID	-0.26	-0.22	-0.14	-0.33	-0.20	-0.34	-0.15	1						
VR	0.05	0.07	-0.04	0.59	0.41	0.99	0.37	-0.33	1					
DSF	0.03	0.06	-0.09	0.37	0.43	0.83	0.33	-0.10	0.82	1				
CFR	0.01	0.05	-0.12	0.40	0.42	0.86	0.36	-0.11	0.85	0.97	1			
TSC	-0.01	-0.03	0.04	-0.29	-0.32	-0.63	-0.27	-0.01	-0.62	-0.76	-0.79	1		
TSV	-0.08	-0.07	-0.02	-0.53	-0.32	-0.80	-0.33	0.21	-0.81	-0.66	-0.68	0.78	1	
ECL	0.09	0.08	0.04	-0.46	0.41	0.88	-0.09	-0.28	0.89	0.72	0.74	-0.53	-0.70	1

Table 7

Regression analysis of Feltham–Ohlson and corporate governance factors. This table presents the regression results of market value on the F095 and governance factors. *bv* is the book value. Net operating assets *oa* are the book value of shareholders' equity minus net financial assets plus net deferred tax liabilities. Abnormal operating earnings *oa^a* are operating earnings in year *t* minus expected normal earnings (cost of capital r_t times last period's net operating assets), where r_t is the cost of equity capital obtained from the Capital Asset Pricing Model. SDS is the shareholdings of directors and supervisors. SLS is the shareholdings of the largest shareholder. TFS is the total shareholdings of the controlling family. CCL is the critical control level. SID is the shareholdings of individuals. VR is voting rights. TSC is the ratio of seating to cash flow. TSV is the ratio of seating to voting. ECL is the excess of the critical control level. Standard errors are reported in parentheses.

Explanatory variables	1	2	3	4	5
Constant	0.36*** (0.08)	-0.04 (0.07)	-0.02 (0.07)	0.34*** (0.09)	-0.18* (0.10)
<i>bv</i>	0.72*** (0.02)	0.78*** (0.02)	0.78*** (0.02)	0.72*** (0.02)	0.72*** (0.02)
<i>oa^a</i>	0.05*** (0.01)	0.06*** (0.01)	0.06*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
<i>oa</i>	0.19*** (0.02)	0.17*** (0.03)	0.16*** (0.03)	0.19*** (0.03)	0.22*** (0.03)
SDS	0.55*** (0.10)			0.53*** (0.1)	0.69*** (0.10)
SLS	0.44*** (0.09)			0.42*** (0.09)	0.48*** (0.09)
TFS	-1.1*** (0.08)				
CCL	1.02*** (0.12)			1.01*** (0.12)	0.65*** (0.15)
SID	-0.61*** (0.08)			-0.60*** (0.09)	-0.55*** (0.05)
VR		-0.26*** (0.50)		-1.02*** (0.08)	
CFR			-0.27*** (0.05)		
TSC					-0.002 (0.01)
TSV					0.17*** (0.02)
ECL					-0.47*** (0.10)
Adj. R^2	0.31	0.27	0.27	0.29	0.32
<i>N</i>	7095	7095	7095	7095	7095

* Significance at 10% level.

*** Significance at 1% level.

informativeness on firm value. A higher critical control level also contributes to firm value as a larger proportion of voting rights is required to control a firm.

By contrast, larger shareholdings by the controlling family (TFS) and by individual investors (SID) lower firm value. This suggests that family-controlled firms in Taiwan are on average less valuable than those with a different control structure, *ceteris paribus*. Contractual constraints are perhaps more severe in family-controlled firms. Similarly, larger shareholdings by individual investors (SID), which indicate more diffused share ownership, increase the cost of monitoring a firm as individual shareholders have less influence on the firm's decisions.

Since most of the CG measures in CG 2 (the divergence category) are highly correlated, we regress market value on each factor in CG 2 to reduce the multicollinearity problem and to test the robustness of our results.¹⁰ Columns 2 and 3 in Table 7 show the effect of voting rights and cash flow rights on firm value, respectively. It appears that the larger voting and cash flow rights of the largest shareholder for ultimate control (VR in column 2 and CFR in column 3) adversely affect firm value. Since the ultimate control tends to come from a member of the controlling family, the negative relationship between voting rights or cash flow rights and market value is consistent with the relationship between the total shareholdings of the controlled family (TFS) and the market value found in the ownership structure. Given that these CG measures are highly correlated, it is not surprising that the relationship with market value remains similar.

The last two columns in Table 7 report the combined effect of CG factors in both categories along with F095 factors on market value. Column 4 shows that our results have changed little when we include the voting rights variable with 4 of the 5 ownership measures. Adding voting rights marginally increases the explanatory power of the model. Consistent with the results of the cointegration analysis, the OLS regression results show that governance measures in these two categories provide similar information about a firm's governance mechanisms.

Column 5 shows the effect of other CG 2 factors which include the ratio of seating to cash flow rights (TSC), the ratio of seating to voting rights (TSV), and the excess critical control level (ECL). We find that in addition to the CG 1 ownership factors, TSV and ECL are also important to market value. The positive relationship between TSV and market value is, however, rather surprising since it suggests that a higher proportion of family-controlled directors and supervisors relative to voting rights increases firm value. Nevertheless, since board composition measures fail to track firm value over the long run in the cointegration analysis, we suspect that its positive significance is likely to be driven by voting rights which appear in the denominator of the TSV ratio. Finally, consistent with the effect of voting rights, the excess of voting rights above the critical control level (ECL) is also negatively related to firm value.

Based on the above-mentioned results, a smaller set of governance variables that contain information regarding the shareholdings of the board of directors and supervisors, the shareholdings of the controlling family, and voting rights seems adequate to capture variations in market value.

¹⁰ Since other CG2 factors provide similar results, we do not report all of them in Table 7.

7. Conclusions

To our knowledge, this study is the first to value the proportion of firm value that is related to corporate governance within an accounting-based valuation model. Our paper also differs from the current literature in that we adopt a long-run approach to analyzing the relationship between corporate governance and market value in a cointegrated system. The cointegration approach is arguably more realistic than the static relationship implied by OLS regressions as it does not require that the stock price be equal to firm value at all times but rather that these two converge over the long term.

We find that, among the five categories of corporate governance mechanisms examined, ownership structure and the divergence between cash flow rights and control rights are both influential to firm valuation over time. Based on our cointegration analysis, up to 39% of market value can on average be accounted for by the governance practices of our sample firms after controlling for accounting numbers. The results are robust to how we measure net abnormal earnings.

Our findings also provide some insights into improving a firm's corporate governance. First, anchoring on book value and reconciled by abnormal operating earnings and net operating assets according to the FO95 model provide a good starting point for market valuation. Incorporating corporate governance measures as the "other information" captures time variations in stock prices that are not explained by the accounting numbers.

Second, the explanatory power of corporate governance could sufficiently come from fewer governance measures as several of them provide similar information about a firm's governance mechanisms. In particular, the shareholdings of board directors and supervisors, the shareholdings of the controlling family, the critical control level of a firm, and the voting rights of the largest shareholder for ultimate control appear to be sufficient governance indicators to account for firm value. Our results, however, suggest that board characteristics (e.g., a smaller board and more independent directors) are less important for governance in Taiwanese firms. Board size and structure may give way to ownership structure and divergence in control rights due to institutional factors as few firms in Taiwan have independent directors.

Acknowledgements

We are grateful to an anonymous referee, Agnes Cheng, Bin Srinidhi (the co-editor), Katherine Schipper, and participants at the 2010 JCAE/SNU Symposium for comments and discussion that have greatly improved the paper. We also would like to thank National Science Council of Taiwan for the financial support.

Appendix A

Table A1.

Table A1
Definitions of corporate governance proxies.

<i>Ownership structure</i>	
Director and supervisor shareholding	Percentage of directors' and supervisors' shareholding
Largest shareholder	Percentage of largest shareholder's shareholding
Total family shareholding	Family individual shareholding + family listed firm shareholding + family unlisted firm shareholding + family foundation shareholding
Managers shareholding	Percentage of managers' shareholding or group of managers' shareholding
Total outside shareholding	Outside individual shareholding + outside listed firm shareholding + outside unlisted firm shareholding + outside foundation shareholding
Critical control level	The critical control level according to Cubbin and Leech (1983)
Personal shareholding	Sum of domestic individual shareholding and foreign individual shareholding
<i>Board characteristics</i>	
Manager directors and supervisors seats in board seats	Manager directors' and supervisors' seats on board = manager directors' seats + manager supervisors' seats / number of seats on board
Outside directors in directors seats	Outside personal directors + outside unlisted com directors + outside foundation directors + outside listed com directors / number of directors' seats
Outside supervisors in supervisors seats	Outside personal supervisors + outside unlisted com. Supervisors + outside foundation supervisors + outside listed com supervisors / number of supervisors' seats
Independent directors and supervisors	The independence is defined as: 1. Directors (supervisors) can not be employed by the company, 2. Do not have relationship by consanguinity (second-class) with directors and supervisors of this company, 3. Shareholdings can not exceed 1% while serving as directors and supervisors
Independent outside supervisors	Number of independent and external supervisors
CEO/chairman duality (chairman = CEO Y/N)	CEO/chairman duality is measured by a dummy variable, with 1 for a company having separate CEO and chairman, and 0 otherwise. The mean represents the proportion of companies having a separate CEO and chairman
Board pledged	Percentage of directors and supervisors pledging their stocks
Avg. bonus per directors and supervisors	Average bonus per directors and supervisors

<i>Divergence between cash flow rights and control rights</i>	
Seating rights	Percentage of family-controlled directors and supervisors on the board of directors and supervisors
Family-controlled directors	Percentage of family-controlled directors on the board
Family-controlled supervisors	Percentage of family-controlled supervisors on the board of supervisors
Voting rights	The voting rights occupied by the largest shareholder for each sample company according to the concept of ultimate control proposed by La Porta et al. (1999)
Direct shareholdings by family	Family Individual Shareholding + Family listed firm Shareholding + Family Foundation Shareholding
Cash flow rights	Percentage of cash flow rights for the ultimate control. See La Porta et al. (2002), Claessens et al. (2002)
Ratio of voting to cash flow	Voting rights/cash flow rights
Ratio of seating to cash flow	Seating rights/cash flow rights
Ratio of seating to voting	Seating rights/voting rights
Excess of critical control level	Voting rights – critical control level
<i>Privy transaction</i>	
Loan-to-related part to equity	The percentage of loan-to-related part to equity
<i>Frequency of financial statement regrouping and personnel changes</i>	
Times financial statements restated	Times financial statements restated in last 5 years
Turnover of chairman	Turnover of chairman in last 3 years
Turnover of CEO	Turnover of CEO in last 3 years
Turnover of CFO	Turnover of CFOs in last 3 years
Turnover of spokesman	Turnover of spokesmen in last 3 years
Turnover of internal auditor	Turnover of internal auditors in last 3 years

Data sources: TEJ database.

References

- Amir, E., Kirschenheiter, M., Willard, K., 1997. The valuation of deferred taxes. *Contemporary Accounting Research* 14, 597–622.
- Baek, J.S., Kang, J.K., Park, K.S., 2004. Corporate governance and firm value: evidence from the Korean financial crisis. *Journal of Financial Economics* 71, 265–313.
- Bai, C., Liu, Q., Lu, J., Song, F.M., Zhang, J., 2004. Corporate governance and market valuation in China. *Journal of Comparative Economics* 32, 599–616.
- Barth, M.E., Beaver, W.H., Hand, J.M., Landsman, W.R., 1999. Accruals, cash flows, and equity values. *Review of Accounting Studies* 4, 205–229.
- Beasley, M.S., 1996. An empirical analysis of the relationship between the Board of Director Composition and Financial Statement Fraud. *Accounting Review* 71, 443–465.
- Bebchuk, L., Cohen, A., Ferrell, A., 2005. What Matters in Corporate Governance? Working Paper, Harvard Law School.
- Bell, T.M., Landsman, W.R., Miller, B.L., Yeh, S., 2002. The valuation implications of employee stock option accounting for profitable computer software firms. *The Accounting Review* 77, 971–996.
- Boone, A., Field, L.C., Karpoff, J., Raheja, C.G., 2007. The determinants of corporate board size and composition: an empirical analysis. *Journal of Financial Economics* 85, 66–101.
- Brief, R.P., 2007. Accounting valuation models: a short primer. *Abacus* 43, 429–437.
- Brown, L., Caylor, M., 2006. Corporate governance and firm valuation. *Journal of Accounting and Public Policy* 25, 409–434.
- Callen, J., Morel, M., 2005. The valuation relevance of R&D expenditures: time series evidence. *International Review of Financial Analysis* 14, 304–325.
- Callen, J., Segal, D., 2005. Empirical tests of the Feltham–Ohlson (1995) model. *Review of Accounting Studies* 10, 409–429.
- Chen, A., Koa, L., Tsao, M., Wu, C., 2007. Building a corporate governance index from the perspective of ownership and leadership for firms in Taiwan. *Corporate Governance: An International Review* 15, 251–261.
- Cheng, S., 2008. Board size and the variability of corporate performance. *Journal of Financial Economics* 87, 157–176.
- Choi, J., Park, S., Yoo, S., 2007. The value of outside directors: evidence from corporate governance reform in Korea. *Journal of Financial and Quantitative Analysis* 42, 942–962.
- Claessens, S., Djankov, S., Lang, L., 2000. The separation of ownership and control in East Asian Corporations. *Journal of Financial Economics* 57, 81–112.
- Claessens, S., Djankov, S., Fan, J., Lang, L., 2002. Disentangling the incentive and entrenchment effects of large shareholdings. *Journal of Finance* 57, 2741–2771.
- Coles, J., Daniel, N., Naveen, L., 2008. Boards: does one size fit all? *Journal of Financial Economics* 87, 329–356.
- Cornett, M.M., Marcus, A.J., Tehranian, H., 2008. Corporate governance and pay-for-payments: the impact of earnings management. *Journal of Financial Economics* 87, 357–373.
- Cornett, M.M., McNutt, J.J., Tehranian, H., 2009. Corporate governance and earnings at large US. Bank Holding Companies. *Journal of Corporate Finance* 15, 412–430.
- Cremers, K.J.M., Nair, V.B., 2005. Governance mechanisms and equity prices. *Journal of Finance* 60, 2859–2894.
- Cubbin, J., Leech, D., 1983. The effect of shareholding dispersion on the degree of control in British companies: theory and measurement. *Economic Journal* 93, 351–369.
- Davis-Friday, P., Eng, L.L., Liu, C.S., 2006. The effects of the Asian crisis, corporate governance and accounting system on the valuation of book values and earnings. *International Journal of Accounting* 41, 22–40.
- DeAngelo, H., DeAngelo, L., 1985. Managerial ownership of voting rights: a study of public corporations with dual classes of common stock. *Journal of Financial Economics* 14, 33–69.
- Dechow, P.M., Hutton, A.P., Sloan, R.G., 1999. An empirical assessment of the residual income valuation model. *Journal of Accounting and Economics* 26, 1–34.
- Durnev, A., Kim, E.H., 2005. To steal or not to steal: firm attributes, legal environment, and valuation. *Journal of Finance* 60, 1461–1493.
- Engle, R.F., Granger, C.W.J., 1987. Cointegration and error correction: representation, estimation and testing. *Econometrica* 55, 251–276.
- Feltham, G.A., Ohlson, J.A., 1995. Valuation and clean surplus accounting for operating and financial activities. *Contemporary Accounting Research* 11, 689–773.
- Gillan, S., 2006. Recent developments in corporate governance. An overview. *Journal of Corporate Finance* 12, 381–402.
- Gompers, P., Ishii, L., Metrick, A., 2003. Corporate governance and equity prices. *Quarterly Journal of Economics* 118, 107–155.
- Granger, C.W.J., 1986. Developments in the study of cointegrated economic variables. *Oxford Bulletin of Economics and Statistics* 48, 213–228.
- Granger, C.W.J., Newbold, P., 1974. Spurious regressions in econometrics. *Journal of Econometrics* 2, 111–120.
- Hand, J., Landsman, W., 2005. The pricing of dividends in equity valuation. *Journal of Business Finance and Accounting* 32, 435–469.

- Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics* 3, 305–360.
- Joh, S.W., 2003. Corporate governance and firm profitability: evidence from Korea before the economic crisis. *Journal of Financial Economics* 68, 287–322.
- Klapper, L.F., Love, I., 2004. Corporate governance, investor protection, and performance in emerging markets. *Journal of Corporate Finance* 10, 703–728.
- Klein, A., 2002. Audit Committee, Board of Director Characteristics, and earnings management. *Journal of Accounting and Economics* 33, 375–400.
- La Porta, R., Lopez-De-Silanes, F., Shleifer, A., Vishny, R.W., 1998. Law and finance. *Journal of Political Economy* 106, 1113–1155.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 1999. Corporate ownership around the world. *Journal of Finance* 54, 471–517.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W., 2000. Investor protection and corporate governance. *Journal of Financial Economics* 58, 3–27.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W., 2002. Investor protection and corporate Valuation. *Journal of Finance* 57, 1147–1170.
- Landsman, W.R., Peasnell, K., Pope, P.F., Yeh, S., 2006. The value relevance of alternative methods of accounting for employee stock options. *Review of Accounting Studies* 11, 203–245.
- Lease, R.C., McConnell, J.J., Mikkelson, W.H., 1984. The market value of differential voting rights in closely held corporations. *Journal of Business* 57, 443–467.
- Lee, T.S., Yeh, Y.H., 2004. Corporate governance and financial distress: evidence from Taiwan. *Corporate Governance. An International Review* 12, 378–388.
- Lee, C.M.C., Myers, J.N., Swaminathan, B., 1999. What is the intrinsic value of the dow? *Journal of Finance* 54, 1693–1741.
- Lemmon, M., Lins, K., 2003. Ownership structure, corporate governance, and firm value: evidence from the East Asian financial crisis. *The Journal of Finance* 58, 1445–1468.
- Levy, H., 1983. Economic evaluation of voting power of common stock. *Journal of Finance* 38, 79–93.
- Linck, J., Netter, J., Yang, T., 2008. The determinants of board structure. *Journal of Financial Economics* 87, 308–328.
- McConnell, J., Servaes, H., 1990. Additional evidence on equity ownership and corporate value. *Journal of Financial Economics* 27, 595–613.
- McKinsey and Company, 2000. Investor Opinion Survey.
- Mitton, T., 2002. A cross-firm analysis of the impact of corporate governance on the East Asian financial crisis. *Journal of Financial Economics* 64, 215–241.
- Morck, R., Shleifer, A., Vishny, R., 1988. Management ownership and market valuation: an empirical analysis. *Journal of Financial Economics* 20, 293–316.
- Morel, M., 1999. Multi-lagged specification of the Ohlson model. *Journal of Accounting, Auditing and Finance* 14, 147–161.
- Myers, J.N., 1999. Implementing residual income valuation with linear information dynamics. *The Accounting Review* 74, 1–28.
- Ohlson, J.A., 1995. Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research* 11, 661–687.
- Ohlson, J.A., Juettner-Nauroth, B., 2005. Expected EPS and EPS growth as determinants of value. *Review of Accounting Studies* 10, 349–365.
- Penman, S.H., 2005. Discussion of 'on accounting-based valuation formulae and 'expected EPS and EPS growth as determinants of value. *Review of Accounting Studies* 10, 367–378.
- Phillips, P.C.B., 1986. Understanding spurious regressions in econometrics. *Journal of Econometrics* 33, 311–340.
- Qi, D., Wu, Y.W., Xiang, B., 2000. Stationarity and cointegration tests of the Ohlson model. *Journal of Accounting, Auditing and Finance* 15, 141–160.
- Shleifer, A., Vishny, R.W., 1997. A survey of corporate governance. *The Journal of Finance* 52, 737–783.
- Warfield, T.D., Wild, J.J., Wild, K.L., 1995. Managerial ownership, accounting choices, and informativeness of earnings. *Journal of Accounting and Economics* 20, 61–91.
- Yeh, Y.H., Lee, T.S., Woidtke, T., 2001. Family control and corporate governance. Evidence for Taiwan. *International Review of Finance* 2, 21–48.
- Yermack, D., 1996. Higher market valuation of companies with a small board of directors. *Journal of Financial Economics* 40, 185–212.
- Young, C.S., Tsai, L.C., Hsieh, P.G., 2008. Voluntary appointment of independent directors in Taiwan: motives and consequences. *Journal of Business Finance and Accounting* 35, 1103–1137.