

國立交通大學
經營管理研究所

博士論文

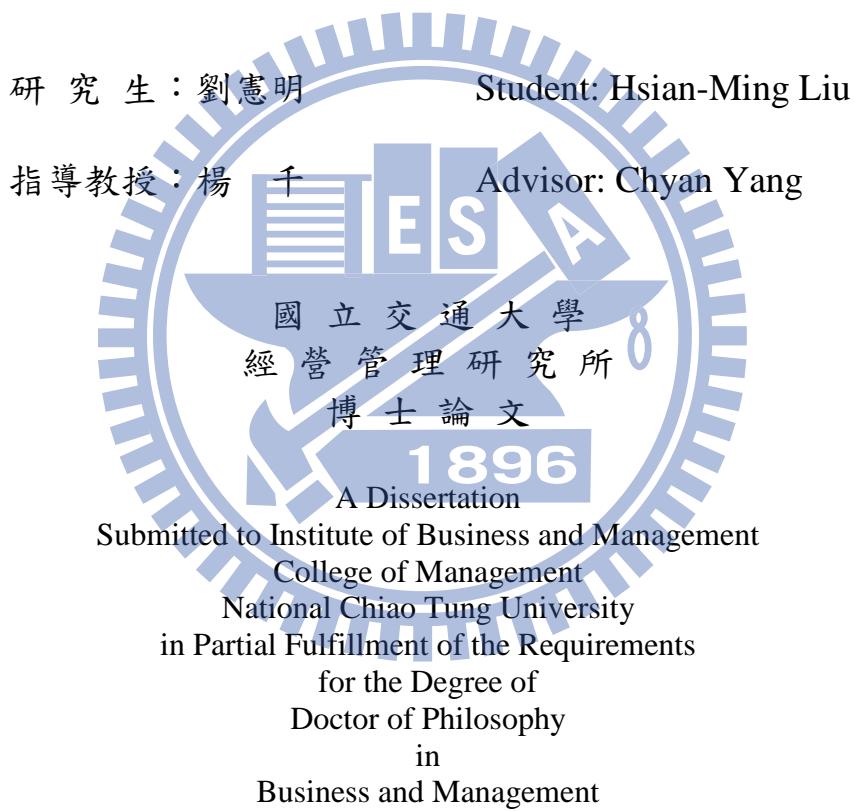


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中華民國一〇一年五月

台灣金融控股公司管理績效分析

Managerial Efficiency of Financial Holding Companies in Taiwan



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摘要

自從一系列的金融改革及開放之後，台灣金融市場中機構數量變得更為的密集且彼此間的競爭亦更加的激烈。雖然金融的改革與開放有助於台灣金融市場整體效率的提升，然伴隨而來的卻是國內金融機構面臨一個變動相對快速且高度競爭的市場環境。而這結構性的改變，促使台灣的金融機構必須進一步檢視其經營上優勢與弱點，期獲得更多的競爭優勢，維持企業的永續發展。

為了能充分了解台灣金控公司的經營效能及其持續性之競爭優勢，本研究採用二階段資料包絡模式，評估各家金控公司之管理與生產效能，並進一步探討其內部公司治理機制，乃至於外部風險因子對其經營績效的影響與關連。在管理績效的分析指出，金控公司的獲利能力在其經營績效上扮演著關鍵的因素，而規模較小的金控公司因具有較佳的獲利力，故管理績效與競爭優勢上表現較為優異；另獲利來源的剖析亦指出，多數金控公司的主要獲利來源雖然來自於原本的主要業務，但跨業整合擴充經濟範疇的策略，確實能擴充獲利的來源及增加經營的競爭優勢。在公司治理機制的研究指出股權結構及董事會組成等傳統治理變數對於金控公司的管理績效僅具有限的解釋效

果。因此，公司外部的投資者必須藉由其他的輔助性指標，如機構投資人的持股與管理者的直接持股及股權偏離程度，來監控公司的經營狀況及診斷投資價值被管理損害的可能性。因此，在公司治理議題的研究上指出金控公司的治理機制及投資者保護仍需回歸至內部營運資訊的揭露程度及管理階層的利益與公司整體價值的收斂程度來做判斷，亦即兩者相關程度越高之金控公司，其公司的管理績效表現越佳。另在金控公司經營風險的分析指出信用風險、市場風險及風險傳遞均會對公司的管理績效有顯著的影響。而透過這些指標的運用，金控公司的管理階層及投資者，不僅可以瞭解公司的風險偏好及投資組合的風險來源，並可進一步降低公司的風險程度及提高經營的績效。



關鍵詞：效率、競爭優勢、網絡資料包絡法、公司治理、風險值、條件風險值

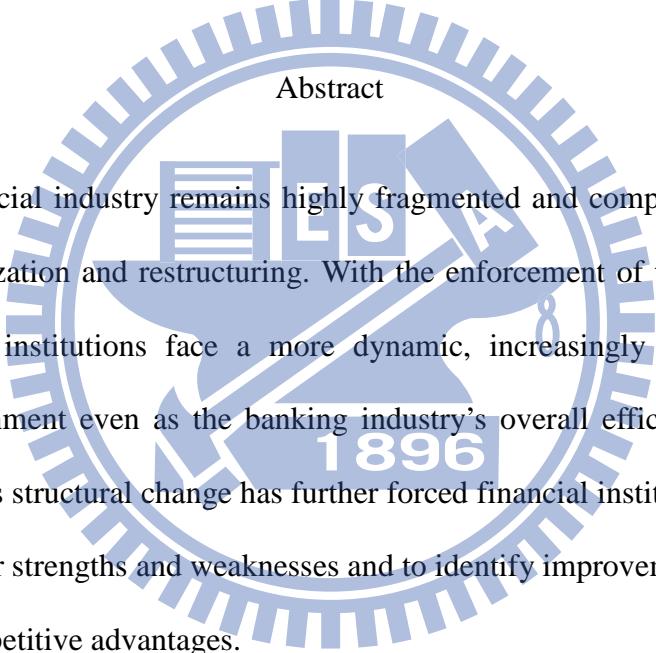
Managerial Efficiency of Financial Holding Companies in Taiwan

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Abstract



Taiwan's financial industry remains highly fragmented and competitive after a series of financial liberalization and restructuring. With the enforcement of these fiscal policies, domestic financial institutions face a more dynamic, increasingly intense and highly competitive environment even as the banking industry's overall efficiency has gradually been enhanced. This structural change has further forced financial institutions to inspect the performance of their strengths and weaknesses and to identify improvement directions so as to gain further competitive advantages.

To provide sufficient details of managerial performance and competitive advantage for financial holding companies (FHCs) in Taiwan, a multiple-factors performance model based on two-stage series model is employed to assess managerial performance and subsequently identify determinant governance mechanisms and risk factors of the FHCs in Taiwan by the truncated regression model.

The results of managerial performance indicate that the a FHC's profitability plays a critical role in the overall competitive advantage and small-size FHCs are suitable types in

Taiwan's current fragmented and overcrowded environment due to achieving better performance in profit efficiency and firm value productivity. In addition, the profit niche of all FHCs comes from their main businesses but other sideline activities also play an important role for FHCs' overall profit, indicating that the cross-business integration of financial institutions can enlarge their business scope and then can create more benefits and profits for their survival and development.

With respect to the effect of governance mechanisms and risk factors, the results of the former indicated that the conventional governance mechanism has been confirmed as having a limited effect on the FHCs' performance and the protection of shareholder's rights. Thus, investors can adopt auxiliary governance variables to supervise the operation of invested firms and to help them to diagnose the probability of managerial expropriation for their investment. The latter reveals that the FHC's managerial performance is significantly influenced by three factors including credit risk, market risk, and risk spillover. By using these risk measures, the FHCs' management team and investors can not only conduct evaluation for their risk preferences but they can also diagnose the risk source of their investment portfolio and reduce operation risks to enhance managerial performance. This study provides a sufficient and informative perspective for the firm's managers and investors to explore the FHCs' managerial performance by considering competitive capability, governance mechanisms and risk factors.

Keywords: Efficiency; Competitive advantage; Network DEA; Corporate governance; Value at Risk; Conditional VaR

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人生如樂章，要有旋律般的高低起伏，才能交織出精彩的故事。進入博士學習生涯是我生命中新開啟的樂章，四年前我離開安逸的職場，為下一階段職涯規劃預作準備，這事說起來輕鬆簡單，實踐之後卻是艱難重重。我一頭栽進了學術研究之路，其中的甘苦，正如一句古諺所說「如人飲水，冷暖自知。」過程中面臨的許多挑戰與考驗，讓原本平淡的生活增添一段令人無法忘懷的經驗與體會，也為自己的人生增加許多亮點。

人生因緣而聚合，然因事圓則緣散。四年學習生涯匆匆而過，在獲得博士學位的同時，滿懷深深的謝意。最要感謝指導教授楊千老師，他的學識智慧及處事典範，開闊我對事物的見解及學術研究之路，謹致以最深之謝意。這一路走來，要感謝的人實在太多了，研究指導委員會胡均立老師及曾芳代老師之建議與指正；口試委員楊維楨老師、諶家蘭老師與許芳銘老師在學位口試時給予我相當有用的見解，提升論文的完整性；而同門學長姐文民、耿杰、凱喻、翠娟及芳萍不時的鼓勵與適時協助；研究室學長姐乾臨、秀瑩及新風的照顧與陪伴；最後是同窗好友方冠兄、牟姐、雪娥姐、美吟的患難相伴，當然還有博士班蕭慧娟小姐在這段期間的熱心幫忙。感謝大夥成為我人生的一部份，因為你們使得這趟的學習之旅程更加的豐富與精彩。這一段的旅程即將劃上句點，但由您們身上所學習的學識與智慧，將是我朝下一階段的旅程努力邁進的能量。

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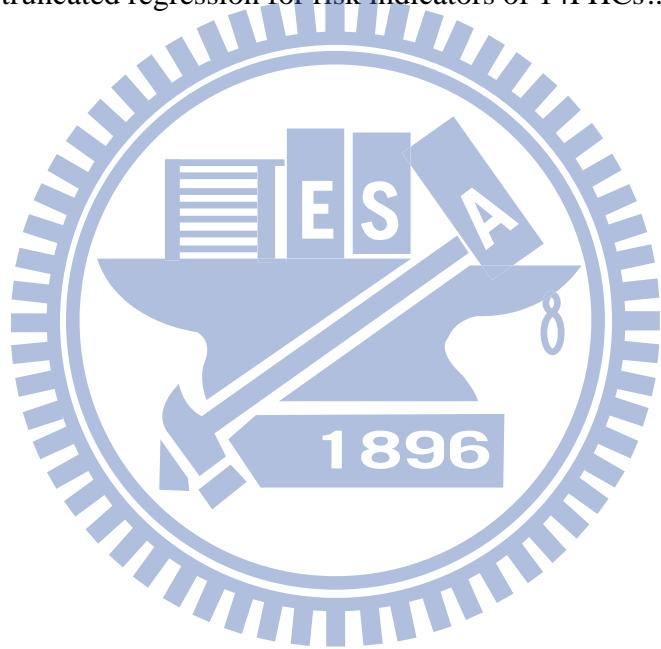
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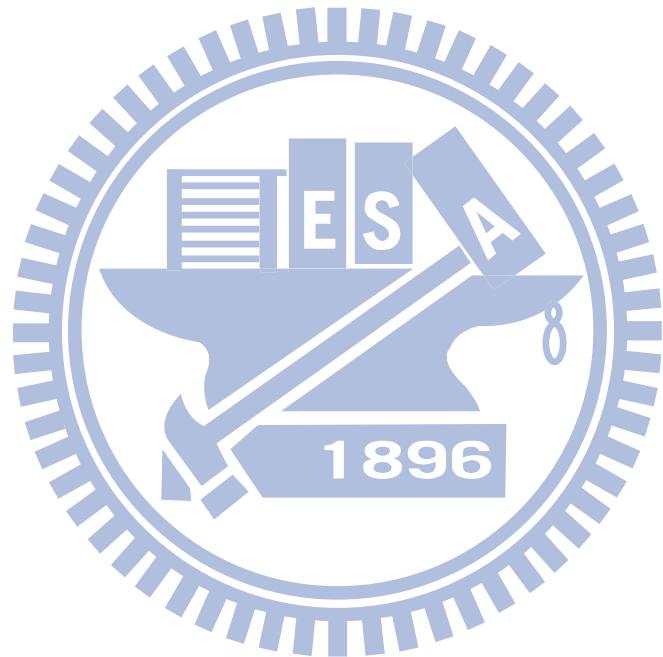
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1. Introduction

Taiwan's banking industry remains highly fragmented and competitive after a series of financial liberalization and restructuring actions. Starting in the early 1990s, Taiwan's government embarked on financial reforms to deregulate and restructure the domestic banking industry in order to construct a sound financial system, which is expected to support economic growth and respond to the challenges of powerful competition from international financial groups. Yu (1999) indicated that the financial sector has played a key role in the process of Taiwan's economic development. To strengthen the efficiency and performance of banking institutions, Taiwan's financial industry has experienced several important reforms. The first stage in 1991 relaxed the entrance barriers to the financial market when Taiwan's government announced the Commercial Bank Establishment Promotion Decree. This legislature helped to deregulate barriers and invite private domestic enterprises and foreign investors to participate in domestic banking. Soon afterwards, 27 new commercial banks and mixed ownership banks were set up, and more funds have been attracted into the loanable funds supply market, along with an improvement in banking operation efficiency.

Financial deregulation has also brought about some unsatisfactory effects. An excessive amount of banks make up Taiwan's banking industry with fierce competition among them leading to several financial crises such as abnormal peaks in the banks' non-performing loans (NPL) ratio, credit losses, and an inferior capital adequacy ratio. In the second stage, in order to overcome these financial obstacles to sustain industrial competitive advantages, the government decided to embark on various reforms and restructuring programs, referred to as the first financial restructuring (FFR), to reduce bad

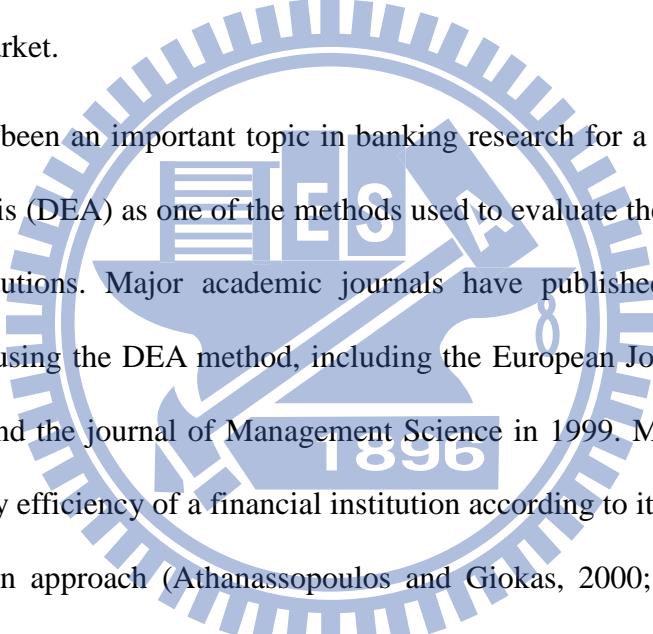
debt banking, encourage mergers and acquisitions among banks, and to push for the set-up of financial holding companies (FHCs). Through these policies, Taiwan's government has successfully controlled banks' operation costs and risks, seen the sector's average NPL ratio fall under 5%, the capital adequacy ratio rise above 8%, and approved mergers among some financial institutions as financial holding companies to cope with the problem of over-competition in the overcrowded market.

The third stage involved the second financial restructuring (SFR) in 2004, which continued the reform of the FFR to improve upon the defining characteristics of "too many in number and too small in size" in Taiwan as compared to other Asian countries (Lo and Lu, 2009). The main goals of this stage are to achieve the emergence of one or two particularly large and strong regional financial institutions with a market share of at least 10% each in Taiwan, a reduction of government ownership in financial institutions, and a drop in the number of banking institutions. Although the number of banks in Taiwan fell from 50 in 2004 to 44 at the end of 2006, the goals of the SFR have not been completely achieved and the banking industry still remains highly fragmented and competitive.

With the enforcement of financial liberalization and restructuring, the overall efficiency and competitiveness of Taiwan's financial industry have gradually improved and several main financial holding companies have gained a greater market share. However, they now face a more dynamic, increasingly intense and highly competitive environment. Such an environment forces these institutions to develop their capabilities to gain and maintain competitive advantages. Hill and Jones (2004) indicated that a firm's competitive advantages come from both the resources it has and the capabilities to use them. Thus, financial institutions have to identify the inefficient costs of acquiring funds and the efficient functions of generating profits to enhance their competitive advantages in

responding to external changes, which increases their survival.

Some earlier studies (Giokas, 2008; Pastor et al., 2006; Schaffnit et al., 1997) have indicated that the efficiency enhancement of a financial institution mainly depends on if it can identify the inefficiency source and profit niche for improving its competitive advantages. To confront the dynamic financial domestic market and improve their own performances, financial institutions need to define their competitive advantages and relevant capabilities by using the most effective method and sequentially maintain and improve its competitive advantage to ensure their survival and ultimate prosperity in the Taiwan financial market.



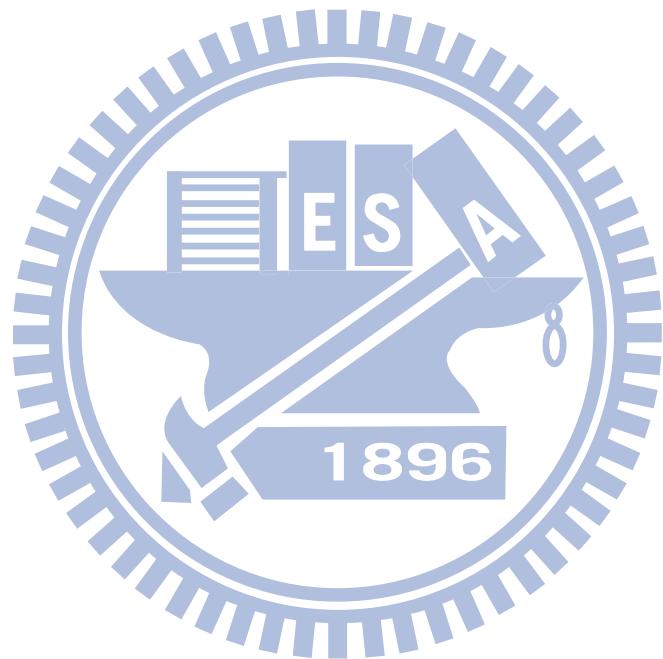
Efficiency has been an important topic in banking research for a long time, with data envelopment analysis (DEA) as one of the methods used to evaluate the efficiency of banks and financial institutions. Major academic journals have published special issues on banking efficiency using the DEA method, including the European Journal of Operational Research in 1997 and the journal of Management Science in 1999. Most previous studies evaluate profitability efficiency of a financial institution according to its operation activities using the production approach (Athanasopoulos and Giokas, 2000; Ferrier and Lovell, 1990; Sherman and Gold, 1985), whereby an operation activity is depicted as the production of services using input resources and expenses to produce desired outputs (i.e. deposits and non-interest incomes) or using the intermediation approach (Athanasopoulos and Giokas, 2000; Casu and Molyneux, 2003), and they describe the operation activity as a process of transforming deposit costs into income from loans and investments. In light of the efficiency evaluation, the former places emphasis on how to acquire outputs by using minimum resources, while the latter focuses on generating maximum income by using the available resources. However, performance improvement and competitiveness enhancement

cannot rely on either production or intermediation activities alone. These two types of operational activities occur simultaneously and both are crucial for improving the competitive capabilities of a bank and should not be separately evaluated. Thus, a more accurate way for identifying the profitability performance of a financial institution is to consider the complementary production and intermediation activities under the performance evaluation of financial institutions. In addition to profitability activities, the marketability activity also plays a crucial part and should be included in the performance model (Chakravarthy, 1986; Siford and Zhu, 1999; Zhu, 2000; Lo and Lu, 2009). This is particularly true for published and listed companies because their values are ultimately determined by the stock market. The marketability performance represents the ability that a financial institution can transform operating revenues and profits into the earnings of shareholders and market value in the stock market. Moreover, a firm with superior marketability can attract more capital and investments from the financial market. This is because the operating resources for the profitability performance represent a firm's profitability and marketability activities. A high dependence in a firm's value-creating process should be integrated together in performance evaluation. Therefore, this study adopts a two-stage series framework to include two types in the profitability and marketability activities for evaluating their contemporary managerial efficiency and sustained competitive advantage. In addition, in the wake of shock of the Asian Financial Crisis, the collapse of Lehman Brothers, the subsequent financial crisis and the subprime lending fiasco, the mechanisms of corporate governance and risk control have become major issues in the operation of financial institutions. Regarding corporate governance, although the previous studies have indicated that a firm with superior governance mechanisms result in better performance, Claessens and Fan (2002) also indicated that

limited investor protection of minority rights in Asia might allow controlling shareholders to expropriate minority shareholders and conventional governance mechanisms may have a limited effect to reduce agency problems. Therefore, this study first examines whether conventional governance mechanisms still have a significant effect on Taiwan financial institutions. Moreover, the auxiliary variables based on the perceptive of investor self-protection also are included to identify the determinant governance mechanisms and their effects for Taiwan financial holding companies. With respect to the effect of risk factors in financial institutions, the Basel Committee divided it into three parts including credit risk, operating risk and market risk and extant studies indicated that the efficiency of financial institutions is significant influenced by risk factors (Berger and DeYoung, 1997; Ataullah et al., 2004; Chang and Chiu, 2006). However, owing to the phenomenon of being too interconnected into the global financial market, Taiwan's financial market has been highly integrated with international markets and is also easily impacted by a specific financial distress which occurred in some international markets. Therefore, for considering the impact of risk factors, this study not only employs credit and market risks to explore their effect on the managerial performance of Taiwan financial institutions, but it also includes the measure of CoVaR to understand the effect of the risk spillover of other financial markets on Taiwan's financial market and institutions.

The main purposes of this study are to provide sufficient details of managerial performance and competitive advantage for Taiwan financial holding companies and to further explore the relation among the FHC's managerial performance, governance mechanisms and risk factors. Owing to the complexity of the value-creating process, a multiple-factors performance model based on Seiford and Zhu's (1999) findings to assess managerial performance and efficiency productivity. Moreover, these efficiency scores are

subsequently employed to identify determinant governance mechanisms and risk factors using the truncated regression model. Finally, the decision-making matrices constructed by the managerial performance and intertemporal productivity as well as the governance mechanism are expected to provide further managerial tools for Taiwan's financial holding companies.



2. Literature Review

2.1 Banking performance

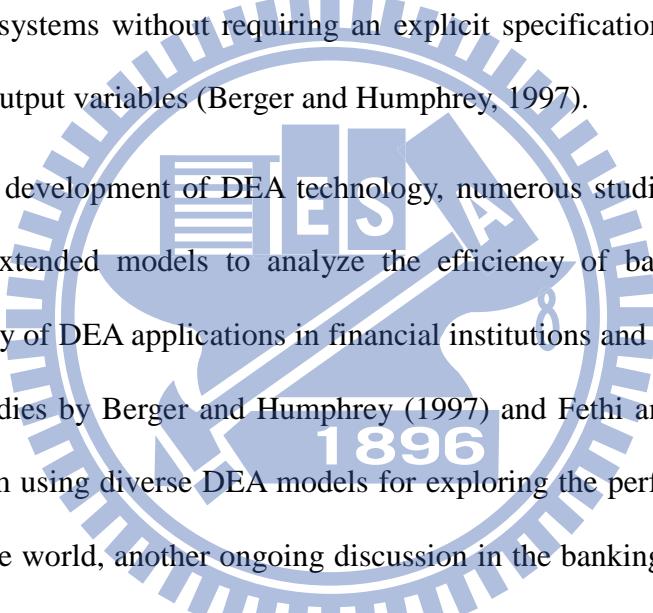
The evaluation of a financial institution's performance is a difficult task due to the scarce availability of operations data, diverse operating sizes, offerings of multiple products, and provision of complex service content to various customers. However, such a performance evaluation can be accomplished on the basis of a financial ratio or operation research technology using available financial or accounting data. In the literature, there are several methods used to measure a financial institution's performance, such as financial ratio analysis, regression analysis, and frontier efficiency analysis (Berger et al., 1993; Paradi et al., 2011b). A financial ratio analysis is employed for assessing the performance of financial institutions primarily based on the use of accounting data. By conducting single input and output analysis, financial ratio analysis provides the management team not only with indicators to monitor operation conditions and financial performance, but also further information to make better managerial decisions. Regression analysis is an alternative method to measure a financial institution's performance using the central trend method to identify the interaction between input and output variables. If a satisfactory regression model is found, it can assist a financial institution's management in identifying the determinants of the production or cost function. The management can also use it to estimate the performance gap between the actual and expected values and then translate the values into a ratio of an actual value to an expected value for identifying relative efficiency.

Although effective in many business areas, financial ratio analysis and regression analysis have many inherent limitations making them unsuitable for the evaluation of financial institutions' performance. For example, financial ratio analysis takes into account only single inputs and outputs in each evaluation, leaving out of the analysis situations with

multiple inputs and outputs (MIMO). Moreover, it is difficult to provide a useful aggregated performance score for comparative purposes. Each financial ratio has its specific function in diagnosing different aspects of a financial institution's operation, and simply subjectively aggregating these ratios together may result in a misleading indicator of overall performance and provide little contribution for identification of benchmarking policies. As for the limitations of regression analysis, this method is suitable only for the evaluation model with a single dependent variable (input or output) and cannot be used to deal with analytical situations with MIMO systems. Second, regression analysis is a parametric method that requires specifying a particular function from between the dependent and explanatory variables and the residuals of the evaluation model should follow the assumptions of normal distribution. Third, owing to the use of the central trend technique in regression analysis, the estimates using this method is a mean relationship providing less information to directly identify each institution's performance.

A recent alternative method for measuring the performance of financial institutions that surpasses the application of traditional methods is the frontier efficiency method, which estimates how well a financial institution performs relative to the frontier formed by the best institutions under the same operational conditions. The major advantage of this method is that it removes the effects of price differences in analytical variables as well as other external market factors and provides the institution's management a determined quantitative tool to identify best practices in a complex operational environment (Bauer et al., 1998). The methodology for frontier efficiency can be divided into parametric and non-parametric methods, including the Data Envelopment Analysis (DEA), the Stochastic Frontier Approach (SFA), the Free Disposal Hull (FDH), the Thick Frontier Approach (TFA), and a Distribution Free Approach (DFA). The primary differences among these

approaches are the restrictions imposed on the specification of the best practice frontier, the assumptions of random errors and inefficiencies, and the existence of random errors (Bauer et al., 1998; Paradi et al., 2011a). Compared to other approaches, DEA is a non-parametric approach which is recognized as being a better and more robust efficiency analysis tool since it uses actual data from evaluated units to construct the efficiency frontier without setting up a specific functional form, which reduces the possibility of a bias measure of efficiency due to specification errors. In addition, it permits efficiency to change over time and allows for the existence of random errors. It also has the capability of dealing with the analysis of MIMO systems without requiring an explicit specification of the relationship between input and output variables (Berger and Humphrey, 1997).



Ever since the development of DEA technology, numerous studies have applied this approach and its extended models to analyze the efficiency of banking and financial institutions. A survey of DEA applications in financial institutions and the banking industry can be found in studies by Berger and Humphrey (1997) and Fethi and Pasiouras (2010).

However, apart from using diverse DEA models for exploring the performance of banking industries around the world, another ongoing discussion in the banking literature is how to select appropriate inputs and outputs for conducting the evaluation of a bank or branch performance. By considering different dimensions of banking performance, Berger and Humphrey (1997) indicated that two main approaches are widely applied in evaluating the efficiency of banking profitability: the production approach and the intermediation approach. The former assumes that banking or financial institutions are a production unit that produces variables related to transaction services as outputs based on the use of capital and labour expenses as inputs (Sherman and Gold, 1985; Ferrier and Lovell, 1990), while the latter regards financial institutions as the entity between savers and investors,

transforming deposit costs into income from loans and investments (Miller and Noulas, 1996; Haslem et al., 1999). Fethi and Pasiouras (2010) in their recent survey identified that 30 studies use DEA-like techniques to estimate branch level efficiency, in which 16 adopt the production approach, 10 adopt the intermediation approach, and only four concurrently use both approaches. This review also discovers that most previous studies have focused on a single performance dimension and only a few have tried to evaluate branch performance from different dimensions. However, in evaluating two types of activities for banks, banks as financial transaction providers or financial intermediaries, they occur simultaneously and should not be evaluated separately. Berger and Humphrey (1997) presented that neither the production approach nor the intermediation approach can fully capture the overall activities in a financial institution. Although some studies (Fethi and Pasiouras, 2010) try to assess a bank's profitability performance from different perspectives using production, intermediation, or even other extended approaches in their evaluation framework, they still assume that these activities are independent and estimate a small portion of their performance separately from each perspective. Hence, for performance evaluation robustness, the major activities within a financial institution should be integrated on one side rather than as an individual activity in evaluating banking profitability performance.

In addition to profitability efficiency, the marketability performance also plays a crucial part and should be included in the performance model, especially for published and listed companies because their values are ultimately determined by the stock market. For the marketability performance of a financial institution, it represents the ability that a firm can transform operating revenues and profits into the earnings of each shareholder and market value in the stock market. Moreover, a firm with superior marketability can also attract more capital and investments from the financial market as operating resources for

profitability performance. Therefore, a firm's profitability and marketability performance are highly dependent on a firm's value-creating process and should be integrated in the performance evaluation.

In response to the complexity of a firm's value-creating process that cannot be measured by just a single criterion, a number of studies have used a multi-factor performance model to evaluate firm performance (Chakravarthy, 1986; Siford and Zhu, 1999; Zhu, 2000; Lo and Lu, 2009). Seiford and Zhu (1999) initially proposed a two-stage production process using the DEA technique to measure the efficiency of the top 55 U.S. commercial banks. Zhu (2000) employed the same framework proposing a multi-factor performance measure model to examine the performance of Fortune 500 companies, and Lo and Lu (2009) employed a framework to evaluate the performance of financial holding companies in Taiwan. This study adopts the same model as the performance framework to evaluate Taiwan financial holding companies. Moreover, in order to understand the competitive advantage of a financial holding company, this study further decomposes a firm's overall profit into those of its financial subsidiaries as the intermediary variables to connect profitability and marketability efficiency. By using this performance model and efficiency decomposition technique, all financial holding companies can be evaluated to identify the specific inefficiency source and profit niche and then enable the firm's management to assess their competitive capability to take remedial actions.

2.2 Corporate governance and performance

In the wake of widespread corporate distress at Enron, WorldCom, Adelphia, and other industry giants, corporate governance has become a major issue in contemporary management theories and practices. We deal with the ways in which shareholders can assure themselves of making a return on their investment and provide further exploration of the relationship between corporate and shareholder value and governance mechanisms related to agency problems. Extant studies on corporate governance show that the phenomenon of ultimate corporate ownership is extensive in the listed companies of most countries (La Porta et al., 1999; Claessens et al., 2000), and controlling ownership may do harm to shareholder value depending on whether they have enough incentives to expand their intentions to expropriate outside investors. Shleifer and Vishny (1997) showed that controlling shareholders prefer to exploit firm resources to generate private interest without sharing with minority shareholders when they fully control the corporation. La Porta et al. (1999) also indicated that controlling shareholders typically direct the firm through pyramidal structures and may have more power and incentives to seek out private interests at the expense of minority shareholders.

Compared to the uncertainties of managerial expropriations when outside investors finance a corporation, the return on their investment is limited and may never reap returns from the invested firms (Shleifer and Vishny, 1997). Specifically, outside investors do not receive any promise of return for their investment and do not have any claims to the firm's assets or rights to the firm's collateral. Moreover, they do not even possess any information or financial data when the firm is liquidated. Therefore, the protection mechanism for investors and shareholders is crucial.

Some research has explored the relationship among legal protection in shareholders,

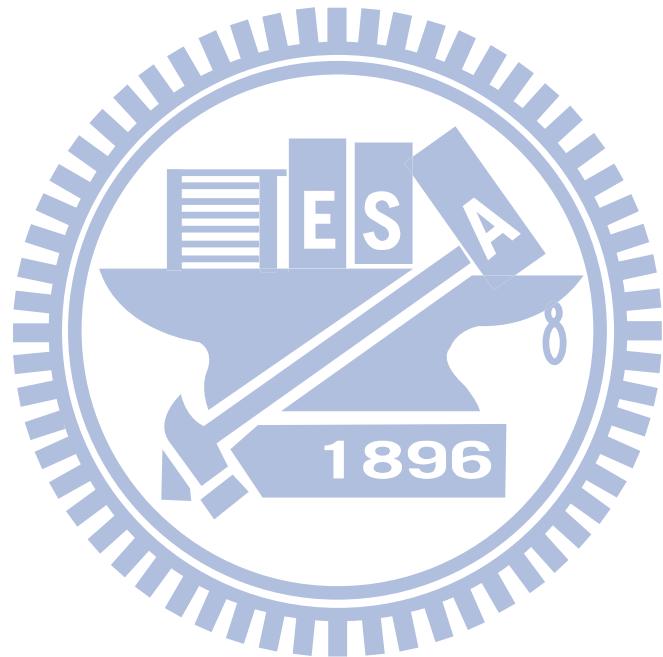
financial markets, and corporate governance. La Porta et al. (2000) discussed the difference between legal investor protection and the effectiveness of law enforcement to corporate governance among countries, indicating that investor protection matters in the ownership of firms and the development of financial markets. La Porta et al. (2002) examined a large sample of firms from 27 wealthy economies to test the effect of legal protection for investors on the valuation of firms, providing evidence that firms in countries with better legal protection for shareholders as well as investors would have higher valuations. Although the consequences of legal shareholder protection for firm valuation and financial development have been well discussed, the issue of investor self-protection has received less attention.

La Porta et al. (2002) indicated that outside investors could take corporate governance as a set of mechanisms that protect themselves against expropriation by the controlling shareholders and managers. Gompers et al. (2003) suggested that minority investors could use corporate governance mechanisms, such as monitoring directors and officers, as protection against managerial expropriation. Previous research studies focusing on firm-level governance mechanisms tried to predict determinant governance mechanisms, indicating that board size (Bonn, 2004), CEO duality (Boyd, 1995), outside directors (Cho and Kim, 2007), blockholders (Sánchez-Ballesta and García-Meca, 2007), independent directors (Liu and Yang, 2008), and supervisory directors (Huang, 2010) could provide better explanatory power for firm performance and thus enhance shareholder value. However, a survey of corporate governance conducted by Claessens and Fan (2002) indicates that limited investor protection of minority rights in Asia might allow controlling shareholders to expropriate minority shareholders and conventional governance mechanisms have a limited effect to reduce agency problems. Shleifer and Vishny (1986)

reported that minority shareholders might be able to confront the risks of managerial expropriation by exerting direct monitoring. Claessens and Fan (2002) presented that alternative corporate governance mechanisms might be employed to mitigate the expropriation of minority rights and have better predictability for firm performance. Thus, based on the perspective of considering the investor monitoring and corporate governance mechanism, governance variables related to financial supervisory of a firm's management as well as separation of ownership and control are employed, including institutional shareholding, firm leverage, board pledge, excess shareholding of controlling owners, divergence of voting rights to cash-flow rights, and control-affiliated directors and supervisors are regarded as alternative governance mechanisms to be appended with conventional governance mechanisms trying to explore their influence on minority shareholder value and further supervise managerial expropriation.

Regarding the evaluation of a firm's value, Rappaport (1997) indicated that value assigned by shareholders might differ from those of a firm or management in some situations. The measurement of a firm's value not only focuses on a firm's actual performance, but one should also consider the expected value of investors. Shleifer and Vishny (1997) indicated that the investors' objective of parting with their money to invested companies without controlling rights is to increase their wealth stock in the future, including market value, dividends, and capital appreciation. Therefore, a firm's value, usually measured by the proxy variables of Tobin Q, might not fully represent the value of outside investors and shareholders. In addition, although the literature on corporate governance generally adopts a single indicator (Tobin's Q) as the measure of firm value, Zhu (2000) indicated that a firm's value-creating process is a complex phenomenon requiring more than a single measure and a multi-factor performance measurement model

to capture it. In response, this study uses multiple indicators related to a firm's profitability and marketability as proxy variables and the DEA model to measure the managerial and operating performance.



2.3 Risk factors and performance

Taiwan's financial industry became highly fragmented and competitive after a series of financial liberalization and restructuring. This evolution not only encourages financial institutions to operate more efficiently, but it also exposes their operations with a higher risk level. Hence, it is important to evaluate the relationship between managerial performance and risk factors related to the efficiency of financial institutions.

Regarding the calculation of risk factors related to banking efficiency, the Basle Committee in 2001 divided it into three parts including credit risk, operating risk and market risk. Hence, two major research avenues are used to explore the impact of risk factors on the performance of financial institutions. One adopts the indicators related to credit and operating risks as an internal effect to calculate the risk impact, while the other considers the factors related to risk volatility of the external market as a market risk to analyze their impact on the efficiency of financial institutions. For the effect of credit risk, most extant research in the literature usually adopt nonperforming loans, capital adequacy ratio and allowance for loan losses as proxy indicators and then applied the two-stage approach to explore the impact of credit risk on the efficiency of financial institutions. The results indicated that efficiency scores are significantly influenced by internal risk factors. (Cebenoyan et al., 1993; Berger and DeYoung, 1997; Ataullah et al., 2004).

With respect to the measure of market risk, the most common indicator used by financial institutions is Value-at-Risk (VaR), which is defined as a threshold value with a maximum dollar loss (within the p% confidence interval) over a given time horizon (Jorion, 2006). VaR is widely used to evaluate the loss risk of specific assets or portfolio and converts the downside risk of an asset or portfolio into a single number, which can be regarded as an efficient measure to manage the exposure of risk assets held by financial

institutions. Regarding the calculation of VaR, there are several methods which are applied to estimate the value at risk in the literature including simple moving average, the exponentially weighted moving average, historical simulation, the Monte Carlo simulation and the extreme value theory (Jorion, 2006). Because these approaches are widely used in the financial field to determine the market value for a specific portfolio or institution (Beder, 1995; Hendricks, 1996), Chang and Chiu (2006) adopt value at risk calculated from historical simulation as a measure of market risk combined with bank efficiency obtained from the DEA model to explore the relationship between banking efficiency and market risk in the Taiwan banking industry. The results indicated that the risk factors have significant impact on bank efficiency. That is, banks with a higher level of market value lead to lower managerial efficiency in the Taiwan banking industry.

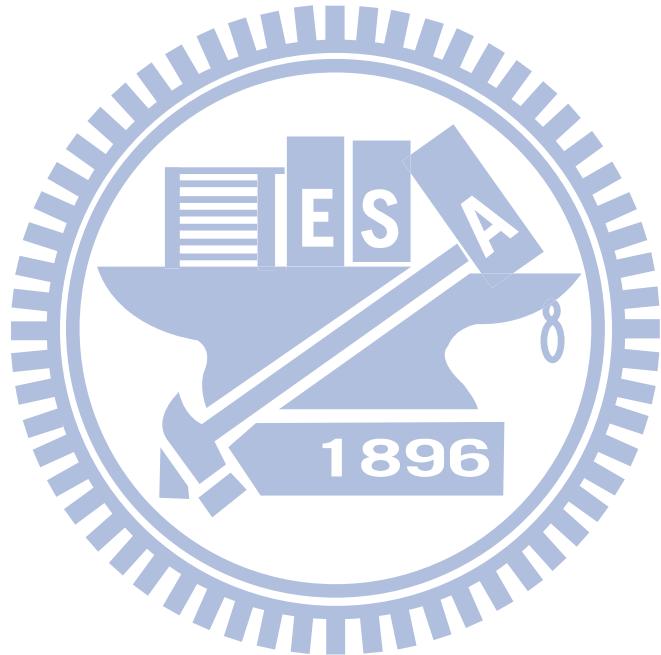
Due to financial liberalization, the Taiwan capital market and financial instruments such as futures, options and other derivatives have greatly increased over the past few decades. This empowered the Taiwan financial market to be highly integrated with the international markets which form an interconnected financial system. Therefore, the evaluations of market risk and risk transmission between the different financial markets have become important components of financial institutions. Traditionally, extant literature uses VaR to estimate the market risk. However, the methodological nature of VaR approaches is that they evaluated the risk of portfolios or markets in isolation and does not consider the interconnected effect among these assessed portfolio or financial markets (Wong and Fong, 2011; Sheu and Cheng, 2012). Using the VaR to estimate the market risk of a specific asset or market, it seems to be unable to fully capture the risk transmission between different financial markets and this led the true risk to often be underestimated. Since the high interconnection of financial markets is a common phenomenon, the

evaluation of market risk not only should consider the risk of a market's economic activities itself, but it should also include the risk impact from other financial markets. Thus, to compensate for the drawbacks of VaR for evaluating market risk, Adrain and Brummermeier (2008) propose a comprehensive measure, "CoVaR", to capture the interconnected nature of different financial markets.

The concept of CoVaR is defined as the VaR of a financial market conditional on some other financial markets under consideration to measure the severity of risk transmission. After the CoVaR model was proposed, several studies have applied this model to measure the risk spillover from a market to markets and an institution to a market (Acharya et al., 2010; Chan-Lau, 2008; Fong et al., 2009). Sheu and Cheng (2012) indicated that CoVaR has several advantageous properties including the ability of evaluating market risk more comprehensively, the ability of decomposing the marginal risk or risk spillover from the entire risk and the ability to help investors to focus on important risk factors. Following the study by Adrain and Brummermeier (2008), three steps are used to estimate market risk and risk spillover. The first step is to measure the VaRs of each of the analyzed financial markets and institutions, respectively. Next, the CoVaR model is employed to assess market risk which is conditional on external specific financial markets or institutions being in consideration. The final step is to calculate marginal risk contribution of a specific financial market or institution to overall market risk, denoted as ΔCoVaR , which is defined as the difference between VaR and CoVaR. By using CoVaR and ΔCoVaR , the market risk which is conditional on a specific financial market and its risk transmission which can be explored, provides a very useful tool to monitor the effect of market risk factors on financial institutions' performance. Therefore, Boyson et al. (2010) and Jorion and Zhang (2009) indicated that the CoVaR model is a valid approach to evaluate market risk and risk

spillover.

Hence, due to the severe interdependence in the global financial environment and the appearance of varieties of derivatives, it is important for assessing the performance of financial institutions not only by considering the credit risk of financial institutions but also by incorporating the external market risk and risk transmission between different financial markets. Therefore, this study employs these risk factors to explore the relation between risk factors and managerial performance in Taiwan's financial holding companies.



2.4 Network DEA model

Data Envelopment Analysis (DEA), as developed by Charnes et al. (1978), provides a measure of the relative efficiency of peer decision-making units (DMUs) when considering the conversion of inputs into outputs. The methodology of DEA is to determine a set of multipliers of outputs and inputs in order to reduce the multi-output and multi-input into a single aggregate measure of the relative efficiencies of units. Therefore, a particular DMU's relative efficiency score is defined as the ratio of weighted outputs to weighted inputs. The major characteristic of DEA allows the individual DMU to select multipliers with maximal flexibility to reach a perfect performance. Since DEA provides satisfactory procedures to assess the relative efficiencies of operation units, a widespread application of efficiency and productivity in both public and private sector activities has been found. The literature has also reported several bibliographies, including those of Seiford (1997), Gattoufi et al. (2004), and Emrouznejad et al. (2008).

As the DEA has gradually become one of the most powerful approaches in the operational research and management sciences, several alternative models have been presented to compute different performance measures, including the multiplicative model (Charnes et al., 1982), the BBC model (Banker et al., 1984), the additive model (Charnes et al., 1985), the FDH model (Tulkens, 1993), the SBM model (Tone, 2001), and others. However, Färe and Grosskopf (1996, 2000) indicated that the common underlying assumption among these models treats their reference technologies as “black boxes,” in which the transformation processes of converting input resources into output products are not explicitly modeled. In other words, performance management simply specifies what enters the box and what exits, but ignores the transformation processes structures that consist of several interrelated subcomponents in some applications. To measure the

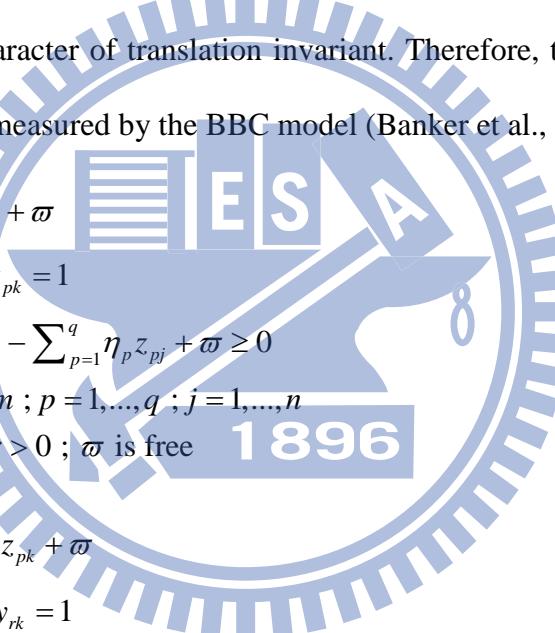
efficiency of such an interrelated system, the network DEA models, proposed by Färe and Grosskopf (1996, 2000), provide fuller access to the underlying diagnostic information of the black box and measure the overall and corresponding subcomponent performance of the DMUs.

According to the structure of the black box's transformation process, the network DEA model has several forms. Färe and Grosskopf (1996, 2000) classified the network DEA into three models. First, the static model replicates the black box as the production process. In this production process, some outputs of one process are transformed as the inputs of the other process. Second, the dynamic model takes the outputs of the process at one period, which is then consumed by the process in the next period as the inputs. The third model is composed of several parallel processes in the black box, and thus the inputs have to be allocated into these processes and the outputs are an aggregation of these processes.

On combining the evaluation of a firm's performance and the concept of network model, Seiford and Zhu (1999) indicated that a firm's value-creating process is a complex phenomenon and a multi-stage performance model is an appropriate model to evaluate a firm's overall performance. Hence, Seiford and Zhu (1999) initially propose a two-stage series model, named as profitability stage model and marketability stage, to examine the overall and stages efficiencies of the top 55 US commercial banks. Drawing on the methodology of transformation process in DEA models, one has access to look into the underlying diagnostic information of efficiency measurement and to evaluate the overall and subcomponent performance

In responding to the purpose of evaluating the managerial efficiency for Taiwan financial holding companies, this study adopts Seiford and Zhu's (1999) two-stage

transformation process as performance model to evaluating a FHC's overall, profitability stage, and marketability stage efficiencies. In the two-stage performance model, it is composed of a profitability stage and a marketability stage in a series. For any DMU_k ($k=1, \dots, n$), it uses m inputs x_{ik} ($i=1, \dots, m$) to produce intermediate products z_{pk} ($p=1, \dots, q$) in the first stage, which are then consumed in the second stage to finally generate outputs y_{rk} ($r=1, \dots, s$). In addition, by considering the impact of negative output data and subsequent translation, this study follows the Lovell and Pastor's (1995) suggestion using the output-oriented BBC model to conduct the evaluation of each stage's performance due to its character of translation invariant. Therefore, the efficiencies of the two stages for DMU_k are measured by the BBC model (Banker et al., 1984):

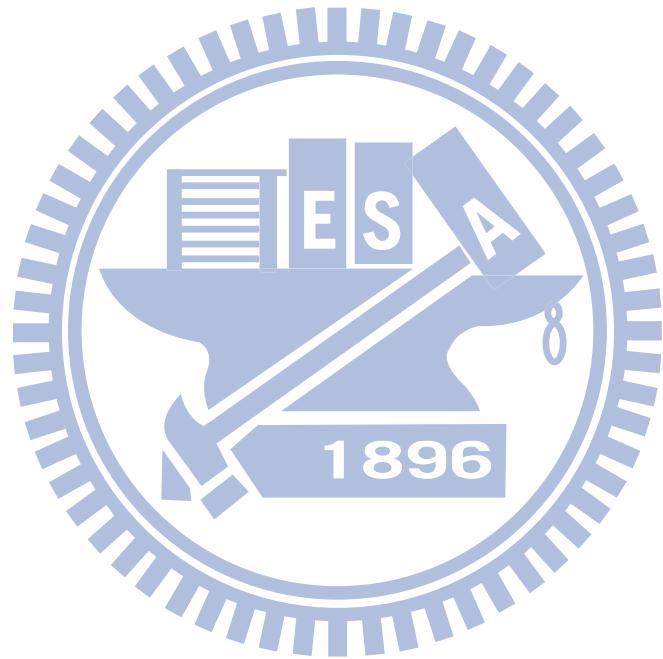


$$\begin{aligned} \theta_k^1 = \min \quad & \sum_{i=1}^m v_i x_{ik} + \varpi \\ \text{s.t.} \quad & \sum_{p=1}^q \eta_p z_{pk} = 1 \\ & \sum_{i=1}^m v_i x_{ij} - \sum_{p=1}^q \eta_p z_{pj} + \varpi \geq 0 \\ & i = 1, \dots, m ; p = 1, \dots, q ; j = 1, \dots, n \\ & \eta_p, v_i \geq \varepsilon > 0 ; \varpi \text{ is free} \end{aligned} \quad (2.1)$$

$$\begin{aligned} \theta_k^2 = \min \quad & \sum_{p=1}^q \eta_p z_{pk} + \varpi \\ \text{s.t.} \quad & \sum_{r=1}^s u_r y_{rk} = 1 \\ & \sum_{p=1}^q \eta_p z_{pj} - \sum_{r=1}^s u_r y_{rj} + \varpi \geq 0 \\ & r = 1, \dots, s ; p = 1, \dots, q ; j = 1, \dots, n \\ & u_r, \eta_p \geq \varepsilon > 0 ; \varpi \text{ is free} \end{aligned} \quad (2.2)$$

Where: θ_k^1 of model (2.1) is the efficiency of first stage, which represents the efficiency of DMU_k using inputs x_{ik} to produce intermediate products z_{pk} while θ_k^2 of model (2.2) represents of second stage's efficiency for using intermediate products z_{pk} to generate final outputs y_{rk} . Moreover, based on the concept of series transformation process, the

intermediate products z_{pk} are the outputs in first stage and also the inputs of second stage, Therefore, the overall efficiency (θ_k), representing the overall performance of Dm_{uk} , is estimated by the product of two-stage efficiencies (θ_k^1, θ_k^2).



3. Managerial performance issue

The Taiwan financial market has become highly competitive after the introduction of financial liberalization and restructuring. This evaluation results in an excessive amount of financial institutions and fierce competition among these institutions in the Taiwan market, which compel them to diagnose their competitive advantages and market positions. According to the elaboration of Hill and Jones (2004), a firm's competitive advantages come from both the resources it has and its capabilities to use these resources. Thus, to increase their survival and future development, the Taiwan financial institutions have to identify inefficient sources of using extant resources and efficient functions of generating profits and then they try to enhance and improve their strengths and weaknesses, respectively. Furthermore, different from contemporary managerial performance, the financial institutions also have to explore their long-term advantages that are not easily replicated and are defined as sustainable competitive advantages. Barney (1991) indicated that a firm's sustainable competitive advantage comes from its resources and capability that cannot be duplicated or imitated by other firms. Bharadwaj et al. (1993) propose that a firm with a sustainable competitive advantage will lead to superior business performance in the service industries.

The purpose of this section is to identify the managerial performance of financial holding companies in Taiwan. Due to the complexity of the value-creating process, a multiple-factors performance model is employed to assess firm performance, which is sequentially employed to diagnose competitive capabilities of FHCs' operation for determining inefficient costs and profit niches by conducting efficiency decomposition. In addition, the Malmquist index (MI) represents the change of total factor productivity

between two different periods. Thus, the MI is applied to evaluate the long-term competitive capabilities of financial institutions for their future development.

3.1 Performance model

This study uses 14 financial holding companies as the research sample. In Taiwan, a financial holding company is established containing more than two other financial subsidiaries. Therefore, according to their operating main body, 14 FHCs in Taiwan are divided into three groups. The first group focuses on the bank as a major body which includes China Development, Chinatrust, E.SUN, First, Hua Nan, Mega, SinoPac, and Taishin. The second group is the insurance company as the major body, which is composed of Cathay, Fubon and Shin Kong. The last group uses securities as the main body, and it is represented by companies such as Fuhwa, Jihsun and Waterland. In addition, a FHC's value-creating process is a complex phenomenon. The evaluation of a firm's value should consider not only profitability efficiency evaluated by the production or the intermediation approach but should also involve marketability efficiency. Previous studies have indicated that a multi-factor performance model is appropriated for evaluating a firm's overall performance (Chakravarthy, 1986; Siford and Zhu, 1999; Zhu, 2000; Lo and Lu, 2009). Thus, this study employs a two-stage series model to analyze FHCs' managerial performance, where each of these FHCs is treated as a decision making unit (DMU) in the DEA analysis. Moreover, a financial holding company is composed of more than two other financial subsidiaries and the performance of these financial subsidiaries also play a critical role in improving a firm's overall performance and competitive capability. Therefore, this study adopts Seiford and Zhu's (1999) two-stage series model but decomposes a FHC's overall revenue and profit into the financial subsidiaries' profit as intermediary variables of

a performance model for estimating a FHC's overall performance, profitability and marketability efficiency, as shown in Figure 1.

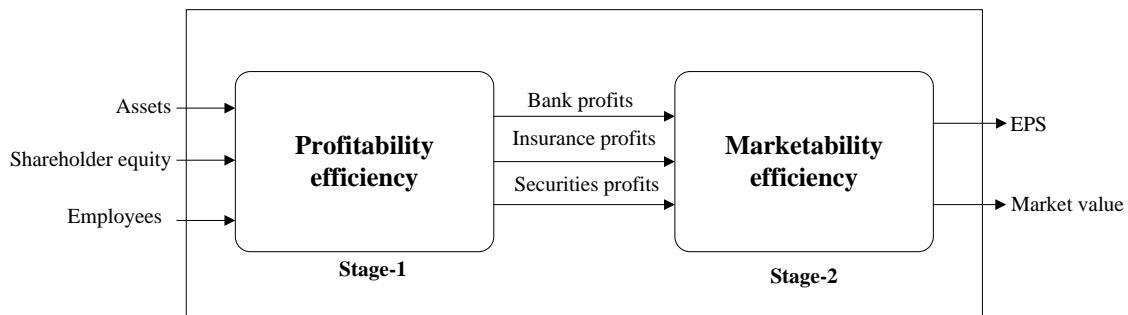


Figure 1 Network efficiency model for financial holding companies

Therefore, the overall performance model contains two stage activities, namely, a profitability activity and a marketability activity. The efficiency of the first stage is denoted as the profitability efficiency, which evaluates the ability about how a FHC utilizes its capital and labor resources to generate subsidiaries' profits. In this stage, three major costs consisting of assets, shareholder's equity, and employees are used to produce three intermediate outputs including the profits generated from banking, insurance and securities.

The efficiency of the second stage is marketability efficiency, which describes transformational activities of converting operating results into earnings of shareholders and stock prices in the stock market. In this stage, the three intermediate outputs generated from the first stage are consumed to eventually generate outputs including earnings per share (EPS) and market value. The input and output variables used in this study are defined as follows.

Table 1
Summary of definitions for managerial performance variables

| Variables | Definitions |
|-------------------------------|---|
| Input variables | |
| Asset | A firm's total economic value of resources at year-end |
| Shareholder equity | The amount of share capital plus retained earnings minus treasury shares |
| Employee | All staff members in a financial holding company |
| Intermediary variables | |
| Bank profits | After-tax profits from banking subsidiary |
| Insurance profits | After-tax profits from insurance subsidiary |
| Securities profits | After-tax profits from securities subsidiary |
| Output variables | |
| EPS | A company's earnings allocation per share of outstanding common stock. |
| Market value | The total dollar value of a company's outstanding common shares in the last exchange date of the year |

Table 2
Data description of variables for 14 FHCs' managerial performance

| Year | Stat. | Asset | Equity | Employee | Bank profits | Insurance profits | Securites profits | EPS | Market value |
|------|-------|-----------|----------|-----------|--------------|-------------------|-------------------|-------|--------------|
| 2007 | Avg. | 14446.14 | 1165.93 | 11103.07 | 61.40 | 32.83 | 24.05 | 1.22 | 1591.19 |
| | Max. | 36866.94 | 2298.90 | 38033.00 | 188.70 | 256.61 | 100.63 | 3.34 | 6271.26 |
| | Min. | 2459.30 | 256.07 | 1287.00 | -30.80 | -0.04 | 1.53 | 0.03 | 201.88 |
| | S.D. | 9701.34 | 606.14 | 9579.15 | 74.89 | 78.05 | 26.16 | 0.84 | 1500.72 |
| 2008 | Avg. | 14774.72 | 1003.32 | 11350.71 | 30.20 | -19.79 | 4.43 | -0.19 | 999.33 |
| | Max. | 37461.65 | 1780.34 | 42219.00 | 143.41 | 45.52 | 132.15 | 1.51 | 3554.20 |
| | Min. | 1805.82 | 216.18 | 1351.00 | -41.52 | -256.29 | -40.26 | -3.80 | 64.90 |
| | S.D. | 10148.49 | 491.21 | 10495.96 | 66.90 | 70.80 | 40.03 | 1.48 | 898.91 |
| 2009 | Avg. | 16,412.95 | 1,182.08 | 12,034.71 | 39.21 | 16.08 | 16.08 | 0.69 | 1,572.92 |
| | Max. | 42,955.36 | 2,154.23 | 43,340.00 | 166.34 | 142.31 | 51.78 | 2.47 | 5,773.51 |
| | Min. | 1,851.57 | 256.09 | 1,603.00 | -70.39 | -1.18 | 0.18 | -1.45 | 226.96 |
| | S.D. | 11,915.51 | 626.56 | 11,515.20 | 55.78 | 39.31 | 14.25 | 0.88 | 1,451.17 |
| 2010 | Avg. | 17,626.48 | 1,235.34 | 12,237.00 | 76.79 | -0.15 | 15.55 | 1.03 | 1,742.15 |
| | Max. | 46,889.37 | 2,224.75 | 42,605.00 | 218.00 | 96.84 | 77.70 | 2.10 | 5,249.83 |
| | Min. | 2,117.20 | 283.45 | 1,615.00 | 6.76 | -92.69 | -0.19 | 0.32 | 301.01 |
| | S.D. | 12,829.72 | 644.56 | 11,366.46 | 65.82 | 37.64 | 19.92 | 0.43 | 1,314.84 |

Note: The units of variables are measured by NT\$100 million except for the unit of EPS which is measured by NT\$.

3.2 Contemporary performance analysis

An evaluation of a FHC's profitability and marketability efficiencies is conducted from 2007 to 2010 and relevant data description is depicted in Table 2. The inputs for each FHC in the profitability stage are assets, shareholder equity, and employees. The intermediates are profits generated from financial subsidiaries. The marketability stage outputs are EPS and market value. The stage's efficiencies (θ_k^1, θ_k^2) and the corresponding overall efficiencies θ_k of 14 FHCs are calculated by equations 2.1 to 2.2. Table 3 shows all the results.

The mean score of the all FHCs computed from 2007 to 2010 is 0.799. In a performance analysis, just one of the 14 FHCs which performed efficiently in both stages is Jihsun, which can be regarded as a benchmark and niche player for other non-efficient units. This followed by an overall score of 0.979 which was recorded by Mega. The mean scores for the profitability and marketability stages based are 0.881 and 0.905, respectively. For the profitability stage, three FHCs: Fubon, Waterland, and Jihsun are FHCs that perform efficiently, which can be regarded as a benchmark of other inefficient FHCs in using the existing resources to create profits. Four FHCs: namely Cathay, Fuhwa, Chinatrust, and Jihsun are at perfect efficiency in the marketability stage, which is the marketability benchmark of other inefficient FHCs in transferring profits of financial subsidiaries to create more shareholders' earnings, stock prices and market value. To make comparisons among the FHCs' operation scale and operating main body, the average values of the overall performance, profitability and efficiency scores are calculated and shown in Table 3.

Table 3
Contemporary managerial performance for 14 FHCs from 2007 to 2010

| FHCs | Overall efficiency | Profitability efficiency | Marketability efficiency |
|-----------------------|--------------------|--------------------------|--------------------------|
| Hua Nan | 0.834(7) | 0.884(7) | 0.938(8) |
| Fubon | 0.944(3) | 1.000(1) | 0.944(7) |
| Cathay | 0.837(6) | 0.837(11) | 1.000(1) |
| China development | 0.848(5) | 0.998(4) | 0.851(10) |
| E.SUN | 0.851(4) | 0.863(9) | 0.988(6) |
| Fuhwa | 0.643(12) | 0.643(14) | 1.000(1) |
| Mega | 0.979(2) | 0.987(5) | 0.991(5) |
| Taishin | 0.688(11) | 0.908(6) | 0.762(13) |
| Shin Kong | 0.491(14) | 0.655(13) | 0.772(12) |
| Waterland | 0.831(8) | 1.000(1) | 0.831(11) |
| SinoPac | 0.605(13) | 0.858(10) | 0.681(14) |
| Chinatrust | 0.821(9) | 0.821(12) | 1.000(1) |
| First | 0.812(10) | 0.879(8) | 0.906(9) |
| Jihsun | 1.000(1) | 1.000(1) | 1.000(1) |
| Average scores | | | |
| Overall mean | 0.799 | 0.881 | 0.905 |
| By scale | | | |
| large | 0.797 | 0.879 | 0.902 |
| Small | 0.800 | 0.884 | 0.907 |
| By main body | | | |
| Banking | 0.805 | 0.900 | 0.890 |
| Insurance | 0.757 | 0.831 | 0.905 |
| Securities | 0.825 | 0.881 | 0.944 |

The overall efficiencies reveal that small-size FHCs (with a mean value of 0.800) operate better than large-size FHCs (with a mean value of 0.797). A further decomposition of overall performance indicates that the small-size FHCs perform better in both the profitability and marketability stages. These results show that large-size FHCs show less capability to generate higher profits and firm value with their large scale assets. Moreover, this finding also reflects the dilemma of Taiwan's financial industry - that is, under a fragmented financial environment, the large-size FHCs not only cannot take advantage of economies of scale to achieve better operating results, but they dilute their profitability and

marketability due to the inefficiency of excess assets. Hence, the small-size FHCs on average operate better than the large-size ones. This finding is consistent with Akhigbe and McNulty (2003) in that small-size financial institutions offer more profit efficiency than large-size ones, and perhaps the small-size FHCs scale are more suitable in Taiwan's fragmented and overcrowded market due to having better competitive capability in terms of profits and market efficiency. In terms of the FHCs' operation main body, the overall performance indicated that the securities-based FHCs (with a mean value of 0.825) operate better than the banking-based FHCs (with a mean value of 0.805) and insurance-based FHCs (with a mean value of 0.757). A further decomposition of overall performance indicates that the securities-based FHCs perform better than other types in both the profitability and marketability stages. This result might arise from two aspects. One is that the demand for financial services has recovered rapidly from the failure of subprime securities and credit default swaps of financial institutions leading to securities-based FHCs enjoying significant positive revenue and profits in this period. The other is that securities-based FHCs have better capabilities of using existing resources to create satisfactory profits. Hence, under high competition in the Taiwan financial market, the capability of efficiently using existing resources for creating profits might play a critical role in the FHCs' competitive advantage, which leads to superior profitability performance as well as subsequent marketability performance. In general, the results of contemporary performance analysis indicates that the competitive advantages of three types of financial subsidiaries in the current Taiwan financial market provides the FHCs' management with a direction of business planning and resource allocation.

3.3 Further efficiency decomposition

By adapting the two-stage series model such as in Figure 1, the performance of each FHC can be decomposed into the profitability and marketability stages. The results of the above section indicate that the profitability stage has an inferior average score than the marketability stage, indicating that a lower overall performance of these FHCs may be attributed to their worse performance in the profitability stage. This implies that the performance of profitability for each FHC plays a critical role in the overall performance although they present a better performance in the marketability stage. In order to provide investors and firm management with a better understanding of the operation of the FHCs, Table 4 draws a further decomposition of the efficiency scores to provide additional insights. The multipliers obtained from the DEA methodology represent the measure for the importance of the input, intermediary and output variables and they also represent the relative contribution of the corresponding variables to efficiencies. Thus, the main purpose of decomposition is to realize the importance of variables to further determine the FHC's managerial focus and competitive capabilities.

With respect to the capability to use of the firm's resources, the decomposition of profitability efficiency for FHC_k indicates the contributions from assets, employees, and shareholder equity by the ratio of $v_i x_{ik} / \sum_{i=1}^m v_i x_{ik}$. These ratios also reflect the importance of input variables to the profitability efficiency, which is the managerial focus of a FHC operation. Regarding the importance of these input variables; shareholder equity has the largest contribution, which accounts for 57.3% of the average profitability cost. The input variable of asset is second, and accounts for approximately 31.1% of the average profitability cost. The third input variable is employee with 11.6% contribution. By referring to these ratios, a FHC's management team further identifies the managerial focus

of cost-controlling and resource allocation in enhancing the profitability efficiency.

In the marketability sage, identifying the profit niche is a major concern in the efficiency decomposition. The marketability efficiency decomposition is composed of the contributions from intermediary outputs and eventually outputs. The former are the results of the profitability stage as well as the inputs in the marketability stage including profits created from financial subsidiaries. The latter represents eventual output in the marketability stage including EPS and market value. According to equations 2.1-2.2, their efficiency decomposition can be calculated by the ratios of $\eta_p z_{pk} / \sum_{p=1}^q \eta_p z_{pk}$ and $u_r y_{rk} / \sum_{r=1}^s u_r y_{rk}$, respectively. Regarding the contribution of these intermediary output variables to the profitability efficiency score, a profit of the banking subsidiary has the largest contribution, which accounts for 53.2% of the average profitability score. Second is the profit of the insurance subsidiary which accounts for 33.9% of the average profitability score. The last is the profit of the securities subsidiary with a 12.9% contribution to the average profitability score. With respect to the contribution of final output variables to the marketability efficiency score, the EPS has the largest contribution, which accounts for 87.0% of the average marketability performance and market value with a 13.0% contribution. Hence, investigating the contribution of the intermediary and output variables is very helpful for FHCs to identify their main profit niche and determinant factors of their marketability performance.

In addition, a further decomposition based on the operation scale indicates that the profit niche of small-size FHCs is same with the large-size FHCs. That is, the major profit resources of all FHCs come from the banking and insurance subsidiaries. However, the profits for securities have more contribution in small scale FHCs than in large scale ones.

The decomposition of the operation main body shows that the main profit niche of banking-based and insurance-based FHCs come from their main business while profit niche of the securities-based FHCs comes from sideline businesses. However, the results also demonstrate the importance of sideline businesses. For example, sideline businesses accounts for 83.1% contribution of securities-based FHCs' overall profit and it also contributes 47.3% and 37.6% to overall profit of insurance-based and of banking-based FHCs, respectively. Therefore, by maintaining existing financial market scale invariant, the cross-business integration of financial institutions not only can enlarge their business scope but also can create more benefits and profits for their survival and development in overcrowded and competitive environment. By using the results of efficiency decomposition, the FHCs' management teams are able to detect the major variables contributing to the overall performance, profitability and marketability efficiencies. They can also identify the areas where the greatest gains can be acquired from improvements and suggest to the FHCs some adjustments for resource reallocation and business strategy.

Table 4
Efficiency decomposition of 14 FHCs

| FHCs | Input variables | | | Intermediary variables | | | Output variables | |
|------------------------|-----------------|--------|----------|------------------------|-------------------|--------------------|------------------|--------------|
| | Asset | Equity | Employee | Bank profits | Insurance profits | Securities profits | EPS | Market value |
| Hua Nan (7) | 0.034 | 0.781 | 0.185 | 0.185 | 0.741 | 0.221 | 0.038 | 0.899 |
| Fubon (2) | 0.427 | 0.573 | 0.000 | 0.000 | 0.137 | 0.839 | 0.024 | 0.964 |
| Cathay (1) | 0.000 | 1.000 | 0.000 | 0.000 | 0.550 | 0.379 | 0.071 | 0.823 |
| China development (12) | 0.750 | 0.231 | 0.019 | 0.019 | 0.298 | 0.445 | 0.257 | 0.668 |
| E.SUN (10) | 0.000 | 1.000 | 0.000 | 0.000 | 0.558 | 0.442 | 0.000 | 1.000 |
| Fuhwa (11) | 1.000 | 0.000 | 0.000 | 0.000 | 0.479 | 0.492 | 0.029 | 1.000 |
| Mega (3) | 0.099 | 0.000 | 0.901 | 0.901 | 0.755 | 0.245 | 0.000 | 0.933 |
| Taishin (4) | 0.175 | 0.825 | 0.000 | 0.000 | 0.697 | 0.243 | 0.060 | 1.000 |
| Shin Kong (5) | 0.000 | 1.000 | 0.000 | 0.000 | 0.435 | 0.362 | 0.202 | 0.500 |
| Waterland (14) | 0.750 | 0.211 | 0.039 | 0.039 | 0.844 | 0.156 | 0.000 | 1.000 |
| SinoPac (9) | 0.000 | 0.842 | 0.158 | 0.158 | 0.217 | 0.190 | 0.593 | 0.686 |
| Chinatrust (8) | 0.750 | 0.250 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 1.000 |
| First (6) | 0.060 | 0.774 | 0.166 | 0.166 | 0.727 | 0.213 | 0.060 | 0.955 |
| Jihsun (13) | 0.314 | 0.535 | 0.151 | 0.151 | 0.006 | 0.518 | 0.477 | 0.750 |
| Average scores | | | | | | | | |
| Overall mean | 0.311 | 0.573 | 0.116 | 0.532 | 0.339 | 0.129 | 0.870 | 0.130 |
| By scale | | | | | | | | |
| Large | 0.114 | 0.708 | 0.179 | 0.577 | 0.357 | 0.065 | 0.868 | 0.132 |
| Small | 0.594 | 0.371 | 0.035 | 0.531 | 0.342 | 0.127 | 0.903 | 0.097 |
| By main body | | | | | | | | |
| Banking | 0.233 | 0.588 | 0.179 | 0.624 | 0.250 | 0.126 | 0.893 | 0.107 |
| Insurance | 0.142 | 0.858 | 0.000 | 0.374 | 0.527 | 0.099 | 0.762 | 0.238 |
| Securities | 0.688 | 0.249 | 0.063 | 0.443 | 0.389 | 0.169 | 0.917 | 0.083 |

Note: The ranking order of the FHC's scale is based on total assets and is coded in parentheses.

3.4 Intertemporal productivity analysis

The Malmquist index (MI) represents the change of total factor productivity of a FHC. The MI is applied to evaluate the efficiency change between two different periods and can be further decomposed into the products of a catch-up term and a frontier-shift term (Färe et al., 1994; Lo and Lu, 2009). The former reflects a progression or regression in efficiency that a FHC makes to improve by its efforts, and the latter is related to the change in frontiers technology surrounding a FHC between two adjacent periods. Using the notation for an efficiency score of $\text{FHC}(x_k, y_k, z_k)^{t_i}$ measured by the frontier technology t_{i+1} :

$\theta^{t_{i+1}}((x_k, y_k, z_k)^{t_i})$, the MI index, catch-up effect and frontier-shift effect are described as follows (Färe et al., 1994):

$$\text{Catch-up}_k = \frac{\theta^{t_{i+1}}((x_k, y_k, z_k)^{t_{i+1}})}{\theta^{t_i}((x_k, y_k, z_k)^{t_i})} \quad (3.1)$$

$$\text{Frontier-shift}_k = \left[\frac{\theta^{t_i}((x, y, z)^{t_i})}{\theta^{t_{i+1}}((x, y, z)^{t_i})} \times \frac{\theta^{t_i}((x_k, y_k, z_k)^{t_{i+1}})}{\theta^{t_{i+1}}((x_k, y_k, z_k)^{t_i})} \right]^{1/2} \quad (3.2)$$

$$\begin{aligned} \text{MI}_k &= \text{Catch-up}_k \times \text{Frontier-shift}_k \\ &= \left[\frac{\theta^{t_i}((x, y, z)^{t_{i+1}})}{\theta^{t_i}((x, y, z)^{t_i})} \times \frac{\theta^{t_{i+1}}((x_k, y_k, z_k)^{t_{i+1}})}{\theta^{t_{i+1}}((x_k, y_k, z_k)^{t_i})} \right]^{1/2} \end{aligned} \quad (3.3)$$

As can be seen from expressions of the MI, Catch-up and Frontier-shift, these indices consist of four terms: $\theta^{t_i}((x_k, y_k, z_k)^{t_i})$, $\theta^{t_{i+1}}((x_k, y_k, z_k)^{t_{i+1}})$, $\theta^{t_i}((x_k, y_k, z_k)^{t_{i+1}})$, $\theta^{t_{i+1}}((x_k, y_k, z_k)^{t_i})$. The first two terms reflect the evaluations within the same time period, while the last two are related to the measurements of intertemporal comparison. Therefore, as the $\text{MI}_k > 1$, this represents that FHC_k has an efficiency progress in the total factor productivity over the previous year, while $\text{MI}_k = 1$ and $\text{MI}_k < 1$ represent the status quo and a reduction, respectively, in the total factor productivity.

The evaluation of the FHC's MI, catch-up effect and frontier-shift effect is conducted using the data set from 2007 to 2010. The results of the cross-period productivity analysis are shown in Table 5. In the overall efficiency model, Five FHCs including Cathay, Taishin, Shin Kong, Chinatrust, and SinoPac perform better in the catch-up and frontier-shift effects, and thus exhibit superior efficiency productivity in this period. As for the rest of the FHCs, most of them exhibit expansion in terms of a catch-up effect but contraction in terms of the frontier-shift effect.

Moreover, by taking further decomposition into the profitability and marketability stages, most of the FHCs exhibit a better average progress in terms of self-efficiency and profitability technological improvements in the profitability stage, while they perform poorly in the marketability stage, especially in terms of the frontier-shift effect. The productivity of the Taiwan FHCs in the period from 2007 to 2010 is mainly dominated by the effect of the marketability change. On the other hand, most of FHCs in Taiwan have superior profitability in this period, but this positive effect seems unable to be devoted to subsequent market performance. The reason for this inferior market productivity of the FHCs in Taiwan arose from a negative effect of frontier-shift which may be attributed to the extent that most of FHCs suffer the impact of risk spillover and volatility from a series of global financial crises such as the 2007-09 subprime lending fiasco and the 2010 European debt crisis. This economic volatility and market-risk spillover also implies a high threshold of technological marketability that most FHCs have little difficulties in breaking through the previous frontier and having a superior productivity progress in this period. However, of the 14 FHCs, there are still several FHCs including Cathay, Shin Kong, and Chinatrust which register significant progress in frontier-shift of marketability efficiency. Other FHCs can regard them as benchmarks to explore their managerial capability about efficiently

enhancing marketability performance.

By taking the scale and operating main body into consideration, the large-size FHCs on average have better Malmquist index performance in the overall efficiency model than small-size FHCs. However, the decomposition indicates that the intertemporal competitive edge of two types FHCs comes from different aspects. That is, most small-size FHCs have better catch-up and frontier-shift effects in the profitability stage as compared to large-size FHCs. Therefore, the profit productivity progress has become their sustained competitive capability for their future development. In contrast, all large-size FHCs have a superior advantage in the marketability stage. Although some of them suffer from a regression in the efficiency change during this period, their overall marketability productivity still can be retrieved by better performance in the technological change. Hence, for the large-size FHCs, the marketability performance plays a critical role in their sustained competitive capability. In addition, the decomposition of the operation main body indicates that major source of sustained competitive advantage of all three types of FHCs comes from different aspects. For the insurance-based FHCs, main intertemporal competitive edge comes from their profit and market value productivity due to superior advantages in both stages. As for the rest of FHCs, the banking-based FHCs have better sustained capability in marketability stage while securities-based FHCs perform better in profit productivity.

Therefore, by using the intertemporal productivity analysis, the FHCs' management can figure out whether their companies have better productivity performance in firm operation. Moreover, they also can identify the source of long-term competitive advantage for different types of FHCs and then take some adjustment and improvement for the future operation and development.

Table 5

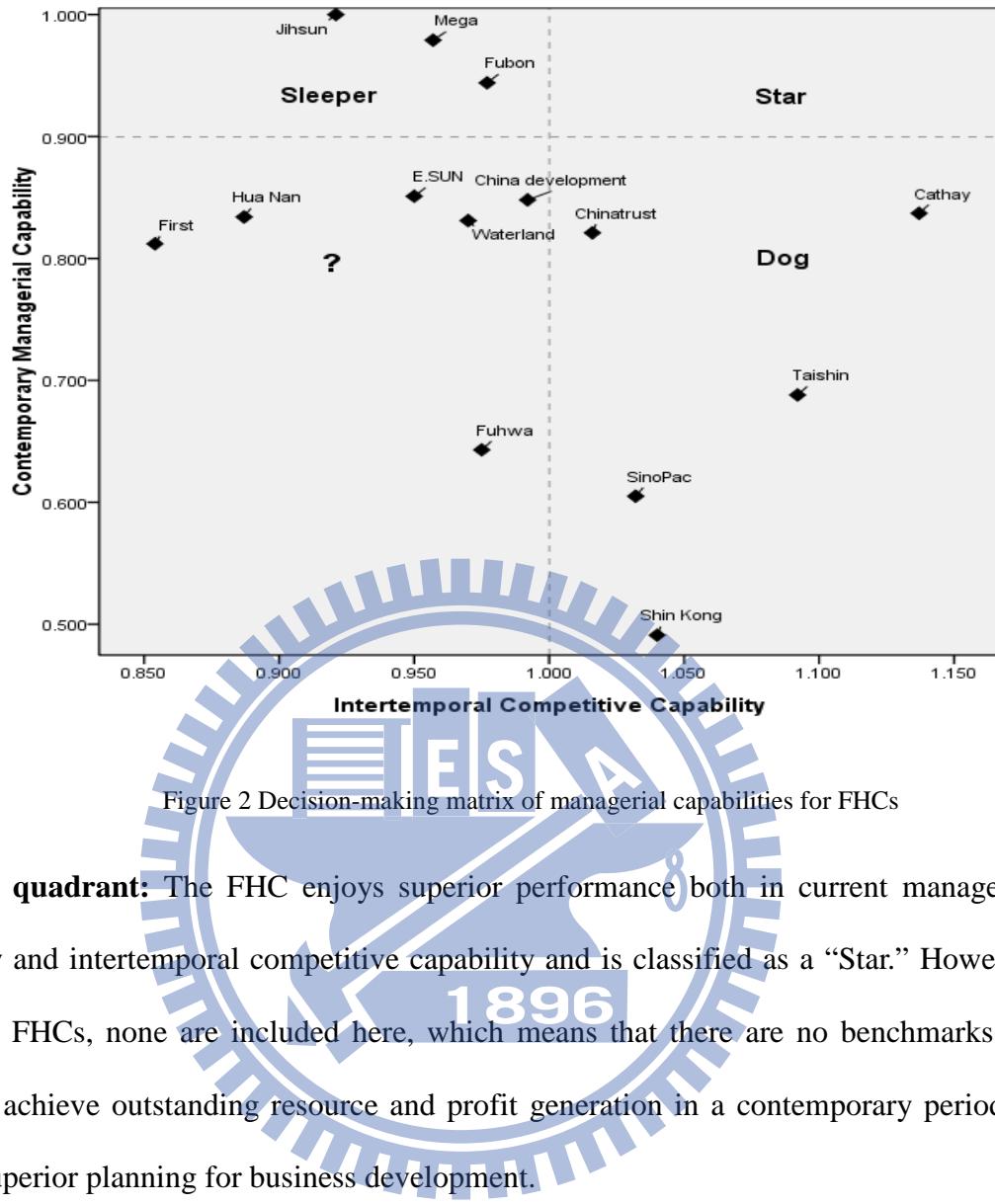
Productivity scores and decompositions of 14 FHCs from 2007 to 2010

| FHCs | Overall performance | | | Profitability efficiency | | | Marketability efficiency | | |
|--------------------------|---------------------|----------------|-----------------|--------------------------|----------------|-----------------|--------------------------|----------------|-----------------|
| | Catch up | Frontier shift | Malmquist index | Catch up | Frontier shift | Malmquist index | Catch up | Frontier shift | Malmquist index |
| Cathay (1) | 1.054 | 1.079 | 1.137 | 1.054 | 1.003 | 1.057 | 1.000 | 1.076 | 1.076 |
| Fubon (2) | 1.034 | 0.946 | 0.977 | 0.935 | 1.006 | 0.940 | 1.106 | 0.940 | 1.039 |
| Mega (3) | 0.979 | 0.978 | 0.957 | 1.023 | 0.969 | 0.991 | 0.957 | 1.009 | 0.966 |
| Taishin (4) | 1.160 | 0.942 | 1.092 | 1.067 | 0.986 | 1.052 | 1.087 | 0.955 | 1.038 |
| Shin Kong (5) | 0.973 | 1.070 | 1.040 | 1.004 | 1.018 | 1.022 | 0.969 | 1.051 | 1.018 |
| First (6) | 0.853 | 1.002 | 0.854 | 0.870 | 0.992 | 0.863 | 0.980 | 1.010 | 0.989 |
| Hua Nan (7) | 0.872 | 1.016 | 0.887 | 0.863 | 1.016 | 0.877 | 1.011 | 1.000 | 1.011 |
| Chinatrust (8) | 1.002 | 1.014 | 1.016 | 1.002 | 1.003 | 1.005 | 1.000 | 1.011 | 1.011 |
| SinoPac (9) | 1.008 | 1.024 | 1.032 | 1.007 | 1.015 | 1.022 | 1.001 | 1.009 | 1.010 |
| E.SUN (10) | 0.996 | 0.954 | 0.950 | 0.987 | 0.977 | 0.964 | 1.009 | 0.976 | 0.985 |
| Fuhwa (11) | 0.899 | 1.084 | 0.975 | 0.899 | 1.157 | 1.040 | 1.000 | 0.937 | 0.937 |
| China development (12) | 1.005 | 0.986 | 0.992 | 1.000 | 1.020 | 1.020 | 1.005 | 0.967 | 0.973 |
| Jihsun (13) | 1.029 | 0.895 | 0.921 | 1.000 | 1.006 | 1.006 | 1.029 | 0.890 | 0.916 |
| Waterland (14) | 1.020 | 0.951 | 0.970 | 1.000 | 1.005 | 1.005 | 1.020 | 0.946 | 0.965 |
| Average geometric scores | | | | | | | | | |
| Overall mean | 0.989 | 0.994 | 0.983 | 0.977 | 1.012 | 0.989 | 1.012 | 0.983 | 0.994 |
| By scale | | | | | | | | | |
| large | 0.984 | 1.003 | 0.987 | 0.970 | 0.998 | 0.969 | 1.014 | 1.005 | 1.019 |
| small | 0.993 | 0.985 | 0.979 | 0.984 | 1.025 | 1.009 | 1.009 | 0.961 | 0.970 |
| By main body | | | | | | | | | |
| Banking | 0.980 | 0.989 | 0.970 | 0.975 | 0.997 | 0.972 | 1.006 | 0.992 | 0.998 |
| Insurance | 1.020 | 1.030 | 1.049 | 0.996 | 1.009 | 1.005 | 1.023 | 1.021 | 1.044 |
| Securities | 0.981 | 0.974 | 0.955 | 0.965 | 1.054 | 1.017 | 1.016 | 0.924 | 0.939 |

Note: The ranking order of the FHC's scale based on total assets is coded in parentheses.

3.5 Decision-making matrix of managerial capabilities

By combining the results of relative efficiency analysis and the inertemporal productivity analysis from the period covering 2007 to 2010, this paper designs a managerial decision-making matrix to position the FHCs' competitive location in the Taiwan financial network and to provide a direction for further improvement. First, we employ the results of the overall performance model in a relative efficiency analysis as the vertical axis of the matrix representing the contemporary managerial capability. A higher score implies an effective utilization of resources and less urgency for managerial improvement, while a lower score indicates poor operation efficiency, which requires an urgent managerial strategy to improve performance. Second, the results of the Malmquist index analysis represents that the sustained competitive capability of FHCs are taken as the horizontal and vertical axis. Here, the FHC with a higher value shows that it has high capabilities to break through the previous frontier and better development potential. In contrast, a FHC with a lower value represents a small change in productivity, indicating that it is inefficient to utilize resources to reach better performance than in previous periods and inferior performance is sustained in a competitive capability. The thresholds of this matrix are 80 percentile of overall efficiency score and the score of status quo in MI as acceptable criteria of contemporary managerial capability and inertemporal competitive capability, respectively. According to these two criteria, the FHCs can be divided into four quadrants in the decision-making matrix as shown in Figure 2. This matrix can serve as a managerial tool for the FHC's management to provide further improvement directions and effort (Giokas, 2008). The four groups of the FHCs are described below.



Star quadrant: The FHC enjoys superior performance both in current managerial capability and intertemporal competitive capability and is classified as a “Star.” However, of the 14 FHCs, none are included here, which means that there are no benchmarks for others to achieve outstanding resource and profit generation in a contemporary period as well as superior planning for business development.

Sleeper quadrant: These FHCs experience better contemporary managerial capability, but a decreasing variation in the capability of sustained improvement in the intertemporal period, which are classified as “Sleeper.” Three FHCs are included: Mega, Fubon, and Jihsun. The FHCs located in this quadrant have superior capability in utilizing their resources to generate efficient outputs in the current period. However, they do not perform better when compared to the previous year and lack the sustained competitive capability for potential development. It is worth noting that these FHCs should be prime candidates for

productivity improvement efforts and can be a potential “Star group” if they place more emphasis on strategies that are aimed at actively expanding their business share and product mix.

Dog quadrant: These firms have better intertemporal competitive capability, but low contemporary managerial performance. Cathay, Chinatrust, Shin Kong, SinoPac, and Taishin are in this quadrant. For these firms, although they have right business strategies and directions to maintain their long-term performance productivity, some operation strategies still should be adopted to improve resource utilization in operations for improving their average contemporary managerial performance. Therefore, they should reference the operational strategies and administration skills from those of the Sleeper quadrant. Moreover, the results of efficient decomposition are employed to identify the key performance factors and weaknesses compared to other competitors. By maintaining their strengths and improving their weaknesses, firms in this quadrant are expected to increase better managerial performance and create a sound competitive advantage including contemporary and intertemporal capability for their business operation and development.

Question mark quadrant: These FHCs in the bottom-left quadrant perform worse in terms of contemporary managerial performance and intertemporal productivity performance. Six of the 14 FHCs are included in this group. From the viewpoint of a firm’s competitive advantage, they are the problematic FHCs and have potential for improvement in profit generation, resource utilization and the proactive management of the business share and product mix. Diagnostic actions should be taken to remedy these problems. It is suggested that these FHCs need to immediately adjust their operational management to be more efficient and then expand the sustained competitive capability hereafter.

4. Corporate governance issue

Corporate governance has become a major issue in management theories and practices after a series of high profile corporate distress cases. This issue is usually applied to explore the relationship between firm performance and governance mechanisms for diagnosing the effect of a firms' internal governance on its development. Moreover, outside investors also use this mechanism to protect their investments from managerial expropriation.

Taiwan's financial market and companies have several distinct characteristics including an abundance of individual investors, a higher degree of ownership concentration as well as controlling shareholders, and relatively weaker protection for outside shareholders. First, Taiwan's capital market has a particular and distinct characteristic in the shareholders of publicly-listed companies - that is, most shareholders are individual investors (Lin, 2010). For example, the Financial Supervisory Commission (FSC) in Taiwan revealed that individual investors including domestic (61.7%) and foreign (2.3%) shareholders are the major participants in the Taiwan stock market, constituting almost 64% of trading volume in 2008 as compared to domestic institutional investors at 14.0% and foreign institutional investors at 22.1%. Owing to the importance of outside shareholders in Taiwan's capital market, it is appropriate to evaluate the influence of governance mechanisms on a firm's value and then disclose some useful information for firm management and outside investors.

Second, controlled shareholding and concentrated ownership are still embedded in most Taiwan-listed companies. According to La Porta et al. (1999), Claessens et al. (2000), and Yeh et al. (2001), the proportion of family-controlled companies in Taiwan is similar to other Asian countries, and most Taiwan-listed companies are with a high degree of concentrated ownership. Moreover, these firms might enhance their control through

cross-shareholding by dispersing shareholding among family numbers or legal subsidiary entities or indirect shareholding with a pyramidal structure (Yeh et al., 2001; Solomon et al., 2003; Yeh, 2005). The interest convergence hypothesis proposed by Jensen and Meckling (1976) indicates that greater concentrated shareholding implies more interest calibration between controlling and minority shareholders and less incentives for controlling shareholders to expropriate the wealth of outside investors (Yeh, 2005). The ownership arrangements through a cross-holding or pyramidal structure allows the controlling shareholders to create deviation of voting from cash flow rights (Fan and Wong, 2002), which may result in controlling shareholders having a significant incentive to expropriate minority interests (La Porta et al., 1999; Claessens et al., 2000; Faccio and Lang, 2002). Therefore, the characters of ownership and board structure still play a crucial role on the performance of most Taiwan-listed companies.

Third, Taiwan-listed companies have weak investor protection attributed to the effect of board characteristics and ownership arrangement by pyramidal and cross-holding structures. The board of directors plays a critical role in the corporate governance system and two different types of board-based systems, including a unitary board system and a dual board system, have been identified in the literature (La Porta et al., 1998). The former is that executive directors and supervisors co-exist in a single unit and the latter is that executive directors and supervisors belong to separate bodies (Yeh and Woidtke, 2005; Huang, 2010). Taiwanese company law stipulates that listed companies adopt a dual board system composed of managing and supervisory boards. Based on this mechanism, a supervisory board would be expected to monitor a managing board more effectively and protect the shareholders' rights. However, the supervisors of Taiwanese companies might not be completely independent due to the ownership arrangement of pyramidal and

cross-holding structures. For Taiwanese companies, both directors and supervisors are elected at shareholders' meetings and family members of current employees as well as directors are eligible to run for these positions. Therefore, controlling shareholders have the ability to augment their influence on the election of directors and supervisors within the weak monitoring system and investor protection environment.

According to the above characteristics in Taiwan's financial market, it is a critical issue to explore the effects of governance mechanisms on FHCs' managerial performance. Moreover, owing to the limited effect of conventional governance in Asian countries, other variables related to the monitoring of the agency problem are included as auxiliary variables to identify their effects. Therefore, the purpose of this section is to ascertain determinant governance mechanisms of the FHCs and provide some informative information for the FHCs' management and investors.

4.1 Research design

To examine the relationship between the firm's performance and corporate governance mechanisms in Taiwan's financial holding companies, this section employs a two-stage approach. The first stage is the evaluation of the FHCs managerial performance using a two-stage series model. The second stage employs a regression model to investigate the relation between a governance mechanism and the FHC's performance. Because the efficiency score measured by the DEA model is distributed between 0 and 1, it becomes a censored dependent variable in the regression model. Therefore, the truncated model is applied as an appropriate regression model (Simar and Wilson, 2007) to determine if governance mechanisms have a significant impact on the FHC's managerial performance. The truncated regression model incorporates efficiency scores measured by the two-stage series model as dependent variables and corporate governance mechanisms consisting of

conventional and alternative variables as independent variables. To verify whether the conventional governance mechanisms still have an explanatory effect to identify the agency problems and of alternative governance mechanisms and can provide a better effect for Taiwan's financial holding companies, three different models based on Equation (4) are used to examine these effects. Model (4a) and Model (4b) consider several conventional variables related to board composition and ownership structure and are used to measure the impact of conventional mechanisms on the FHCs' performance. In terms of Model (4c), the auxiliary governance variables are listed in the regression model to provide a comprehensive result. Mathematically, the truncated regression model with full variables is expressed as follows:

$$Y_{kt} = \beta_{akt} BC_{akt} + \beta_{s_{kt}} \text{Firm Size}_{kt} + \beta_{r_{kt}} \text{Firm risk}_{kt} + \varepsilon_{kt} \quad (4a)$$

$$Y_{kt} = \beta_{akt} BC_{akt} + \beta_{bkt} OS_{bkt} + \beta_{s_{kt}} \text{Firm Size}_{kt} + \beta_{r_{kt}} \text{Firm risk}_{kt} + \varepsilon_{kt} \quad (4b)$$

$$Y_{kt} = \beta_{akt} BC_{akt} + \beta_{bkt} OS_{bkt} + \beta_{c_{kt}} AG_{c_{kt}} + \beta_{s_{kt}} \text{Firm Size}_{kt} + \beta_{r_{kt}} \text{Firm risk}_{kt} + \varepsilon_{kt} \quad (4c)$$

Here, ' kt ' represents the k th firm of the sample at the t period. BC_a and OS_b represent variables of board composition and ownership structure. Board composition related to the variables of independent directors, independent supervisors, control-affiliated board members, and board member's salary, while ownership structure consists of variables related to board shareholding, blockholder shareholding, controlling shareholding and board pledges. AG_c are auxiliary variables related to understanding the information of internal operation and monitoring mechanism of managerial expropriation including institutional shareholding, divergence of control to cash flow rights, direct control and firm leverage. The remaining terms are control variables including firm size and firm risk, which are measured by a firm's total assets and firm internal operation risk, respectively. A larger

firm scale might have abundant resources and intellectual capital to adopt aggressive competitive strategies and then achieve better performance. Moreover, a financial holding company with fluctuations in its performance may arise from the results of holding too many risky assets, investments and financial exposure. Therefore, this study controls firm size and firm risk to mitigate their impact on the results of the regression model. Table 6 presents a summary of corporate variables and definitions.

Table 6
Summary of definitions for corporate governance variables

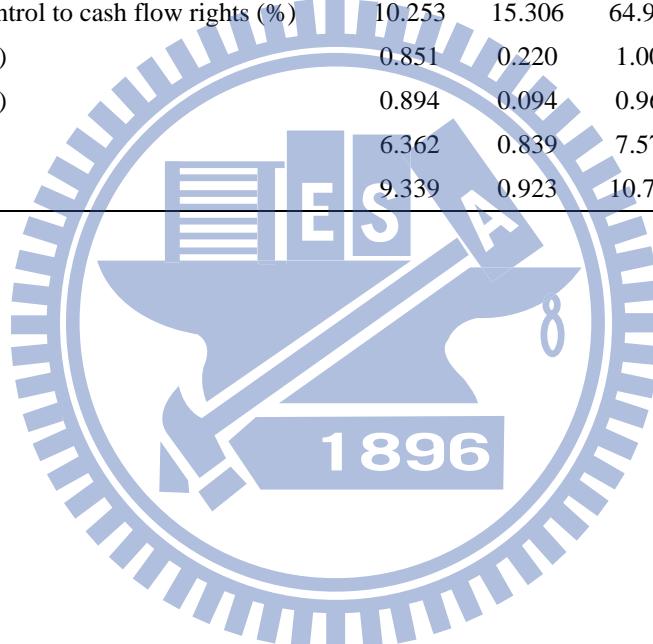
| Variables | Definitions |
|---|--|
| <u>Board composition</u> | |
| Independent director (%) | Proportion of independent directors divided by the total director number |
| Independent supervisor (%) | Proportion of independent supervisors divided by the total supervisor number |
| Control-affiliated board member (%) | Number of directors and supervisors affiliated with a firm's ultimate controller divided by the total board number |
| Board members' salary (%) | Proportion of Board members' salary divided by pretax income |
| <u>Ownership structure</u> | |
| Board shareholding (%) | Shareholding proportion of board members |
| Blockholder shareholding (%) | Shareholding proportion of holders whose percentage is more than 5% or having the top 10 shareholding, excluding the shareholding of the board members |
| Controlling shareholding (%) | Shareholding proportion of a firm's ultimate controller, including direct and indirect shareholding |
| Board pledge (%) | Percentage of shareholding that board members pledge for bank loans |
| <u>Auxiliary governance variables</u> | |
| Institutional shareholding (%) | Shareholding proportion of institutional investors, including financial, foreign, and domestic institutional investors |
| Cash flow rights (%) | Proportion of cash flow rights owned by a firm's ultimate controller |
| Divergence of control to cash flow rights (%) | The ratio of control rights to cash flow rights |
| Direct control (%) | The proportion of shareholding directly controlled by the ultimate controller divided by the critical control share level owned by the ultimate controller |
| Firm leverage (%) | A firm's total debt divided by total assets |
| <u>Control variables</u> | |
| Firm size | Book value of total assets |
| Firm risk | The firm's internal operations risk, including credit risk, operation risk and market risk |

This study examines the relationship between managerial performance and governance mechanisms of 14 FHCs from 2007 to 2010. Regarding FHCs' managerial performance, the evaluation has been estimated in previous chapter and employed as the dependent variable

in the regression model. In terms of corporate governance variables, 12 explanatory variables and two control variables, which are available from the Taiwan Economic Journal (TEJ) databank, are used to examine the relationship between FHCs' managerial performance and governance mechanisms and to identify determinant governance factors which have a significant influence on a firm's value. Among these variables, eight variables related to board composition and ownership structure are regarded as conventional governance mechanisms, which are employed to verify whether these factors have an explanatory effect in Taiwan financial holding companies. The remaining four auxiliary variables related to the monitoring mechanism of managerial expropriation are regarded as auxiliary governance mechanisms which would be expected to provide fuller explanatory power to explore the relation between managerial performance and governance mechanisms and further information about how investors make use of governance mechanisms to monitor their invested firms. Table 7 offers the relevant statistics of governance variables.

Table 7
Data regarding managerial performance and governance mechanisms

| Variables | Avg. | S.D. | Max. | Min. |
|---|--------|--------|--------|-------|
| Managerial performance | 0.799 | 0.226 | 1.000 | 0.068 |
| Independent director (%) | 0.210 | 0.096 | 0.364 | 0.000 |
| Independent supervisor (%) | 0.023 | 0.089 | 0.500 | 0.000 |
| Control-affiliated board member (%) | 0.590 | 0.154 | 0.900 | 0.308 |
| Board member's salary (%) | 0.562 | 0.477 | 1.550 | 0.000 |
| Board shareholding (%) | 0.166 | 0.121 | 0.566 | 0.024 |
| Blockholder shareholding (%) | 0.208 | 0.068 | 0.382 | 0.087 |
| Controlling shareholding (%) | 0.171 | 0.112 | 0.438 | 0.012 |
| Board pledge (%) | 0.322 | 0.331 | 0.930 | 0.000 |
| Institutional shareholding (%) | 0.164 | 0.140 | 0.501 | 0.004 |
| Divergence of control to cash flow rights (%) | 10.253 | 15.306 | 64.930 | 1.840 |
| Direct control (%) | 0.851 | 0.220 | 1.000 | 0.029 |
| Firm leverage (%) | 0.894 | 0.094 | 0.968 | 0.542 |
| Ln (Firm size) | 6.362 | 0.839 | 7.577 | 4.501 |
| Ln (Firm risk) | 9.339 | 0.923 | 10.756 | 7.499 |



4.2 Identification of determinant governance mechanisms

To identify the determinant Taiwan FHC governance mechanisms, a truncated regression (Equation 4) with panel data is applied to measure the relation between the managerial and governance mechanisms. In the truncated regression model, the dependent variable is the efficiency score of FHC's managerial performance evaluated by the two-stage series model, and the governance variables related to conventional and monitoring mechanisms are employed as explanatory variables. Table 8 presents the results of three truncated regression models. Model (4a) and Model (4b) are employed to examine the effect of board composition and ownership structure while Model (4c) tries to explore whether the auxiliary variables related to the monitoring mechanism of managerial expropriation have further informative effects.

The results of Model (4a) and Model (4b) indicated that conventional governance variables have limited effect on the FHC's managerial performance. In the conventional governance variables, only two board composition variables, the ratio of an independent supervisor and the board members' salaries, have a significant impact on FHCs' managerial performance in Taiwan. The effect of the ratio of the independent supervisor is strongly and negatively related to the FHC's managerial performance, while board members' salary has a significantly positive effect. The former indicates that a FHC with a higher ratio of independent supervisors leads to an inferior performance. This negative effect might be attributed to the extent in which independent supervisors may too independent to entirely participate in a FHC's operation and understand internal situations, which might increase the decision process of a critical investment, reduce the agility of business operations, and defer the value-creating process. As a result, it is disadvantage for a FHC's managerial performance to hire a higher ratio of independent supervisors, which is in line with the

findings by Agrawal and Knoeber (1996). The latter represents that there is a significant positive relationship between board member's salary and managerial performance. According to an interest convergence hypothesis proposed by Jensen and Meckling (1976), the higher ratio of board member's salary on a FHC's net income means that there is more interest calibration between board members and FHC's performance and more incentives for board members to enhance a firm's value and performance.

With regard to Model (4c), four governance variables are related to the monitoring effect, including institutional shareholding, divergence of control to cash flow rights, and direct control and firm leverage which are all added to the baseline of Model (4b). Therefore, Model (4c) employs all governance variables, including conventional governance and auxiliary variables related to value protection and self-monitoring of investors. Regarding the variables of board composition and ownership structure, the effects of an independent supervisor in Model (4c) are consistent with those of Models (4a) and (4b), while the board member's salary is unable to retain the same significant effect to managerial performance. The results indicate that the effect of a board member's salary for enhancing firm value might diminish after the auxiliary monitoring variables are considered in the model.

In terms of auxiliary governance variables, institutional shareholding and firm leverage have significantly positive impacts on FHCs' managerial performance. In contrast, the divergence of control to cash flow rights holds a significantly negative relationship. The negative effect of divergence of control to cash flow rights indicate that an ultimate controller with more board seats controlled through cross-shareholding by dispersing shareholdings into family numbers or legal subsidiary entities (or indirect shareholding with a pyramidal structure) might give them more power and motivation to exert decisions

to maximize their private profits without share losses from expropriations. This leads to decreasing firm performance and shareholder value. Moreover, the finding is consistent with the hypothesis of interest convergence, displaying that the larger shareholding which the ultimate controller and board members hold, the more interest calibration there is between a firm's management and performance and then there are more incentives for the firm management to enhance better efficiency of firm performance and efficient value-creating performances for investors. With regard to the effect of institutional shareholding, institutional investors have more information and resources to conduct direct negotiations with firm management and provide more active and effective monitoring mechanisms for the management of invested firms. Therefore, outside investors and shareholders might consider the reputation and equity participation of institutional investors as a reference to further choose a FHC with a better governance situation and then enhance as well as protect their investment value.

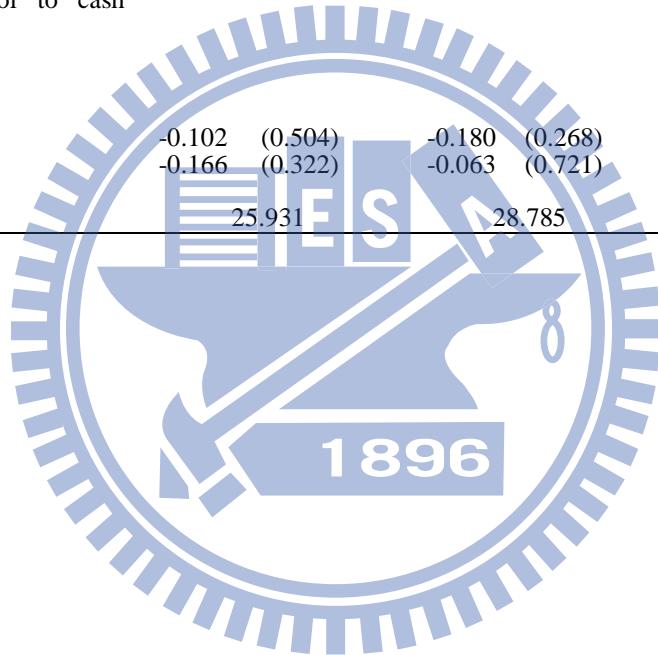
With consideration of firm leverage, it is a monitoring indicator to reflect a firm's overall financial situation and it allows investors to determine whether the management exerts redundant investment decisions or inappropriate transactions to damage a firm's value as well as investor's value. However, the findings indicate that a FHC can create superior managerial performance by utilizing higher leverage of its assets. This result may arise from the extent which FHCs in Taiwan can control operating risks under constraints of the Financial Holding Company Act and then it leads to creating better performance with supervisor leverage abilities. Therefore, outside investors can regard it as another governance mechanism to diagnose a FHC's development potential.

In summary, according to the results of the truncated models, the four determinant governance mechanisms of Taiwan FHCs have been identified -that is, two of these

variables have a positive effect on managerial performance including institutional shareholding and firm leverage. The two variables comprising divergence of control to cash flow rights and ratio of independent supervisors have a negative relationship with performance. Obviously, the conventional governance mechanism has been confirmed as having a limited effect on the FHCs' performance and the protection of shareholder's rights. Moreover, all of these identified governance variables are equipped with the mechanisms of monitoring and control although the effect of the independent supervisory has a reverse effect, indicating that the governance mechanisms of FHCs in Taiwan should focus on the detailed information disclosure about internal operations and interest calibration between a firm's management and a firm's overall value. Therefore, outside shareholders and investors can use them to supervise the operations of their invested firms and help them to detect the probability of managerial expropriation for their investment in FHCs in Taiwan. Finally, all variables are employed to construct the governance score, which provides a reference for the investment of outside investors and shareholders.

Table 8
Results of truncated regression for the governance variables

| Models variables | Model (4a) coefficients | Model (4b) coefficients | Model (4c) coefficients |
|---|----------------------------|----------------------------|----------------------------|
| Intercept | 2.055 (<0.001**) | 1.872 (<0.001**) | 2.236 (<0.001**) |
| Board composition | | | |
| Independent directors (%) | 0.302 (0.333) | 0.439 (0.153) | 0.256 (0.313) |
| Independent supervisors (%) | -1.023 (<0.001**) | -0.946 (<0.001**) | -1.063 (<0.001**) |
| Control-affiliated board members (%) | 0.254 (0.241) | 0.341 (0.119) | -0.220 (0.393) |
| Board members' salary (%) | 0.114 (0.014**) | 0.135 (0.004**) | -0.042 (0.838) |
| Ownership structure | | | |
| Board shareholding (%) | | 0.970 (0.397) | -0.550 (0.680) |
| Blockholder shareholding (%) | | 1.432 (0.201) | -0.272 (0.826) |
| Controlling shareholding (%) | | -0.640 (0.562) | -0.139 (0.902) |
| Board pledge (%) | | 0.114 (0.263) | 0.028 (0.789) |
| Auxiliary control variables | | | |
| Institutional shareholding (%) | | | 0.846 (<0.001**) |
| Divergence of control to cash flow rights (%) | | | -0.006 (0.029**) |
| Direct control (%) | | | -0.121 (0.469) |
| Firm leverage (%) | | | 0.653 (0.048**) |
| Ln (Firm size) | -0.102 (0.504) | -0.180 (0.268) | -0.160 (0.267) |
| Ln (Firm risk) | -0.166 (0.322) | -0.063 (0.721) | -0.126 (0.428) |
| <i>Log-likelihood</i> | 25.931 | 28.785 | 36.655 |



4.3 Decision-making matrix of governance mechanisms

In order to assist a firm's managerial authorities as well as shareholders to determine firm position and to provide direction for improvement and investment, the decision-making matrix about managerial performance and the governance mechanism of Taiwan FHCs is designed for providing further exploration. First, we construct the governance scores of the FHCs in Taiwan, which employs principal component analysis (PCA), a method of multivariate statistical analysis, to calculate the governance scores. The goal of PCA is to identify a new set of a few variables, which explain all of the total variance of variables. Therefore, all determinant governance variables are transferred to a single indicator by PCA and the scores extracted from first principle component are regarded as the governance scores of the FHCs in Taiwan. Moreover, to express the degree of governance index simply and clearly, the results of the principal analysis are also converted into a range from 1 to 0, in which a larger score implies the firm has better operations in corporate governance while a small score means poor governance mechanism. Therefore, the governance scores of the FHCs in Taiwan are evaluated and listed in Table 9.

As seen in Table 9, the mean governance level of all FHCs is getting better over time and First, Mega, and Cathay have better governance mechanisms. Second, by combining the scores of managerial performance and governance scores of Taiwan financial holding companies from the period covering 2007 to 2010, the decision-making matrix is designed. In this matrix, the efficiency scores as the horizontal axis of the matrix represent a firm's capability to create better performance, including profits, market value, and EPS. A higher score implies an effective utilization of resources and less urgency for managerial improvement, while a lower score means poor operation efficiency, which requires an urgent managerial strategy to improve a firm's internal operation performance.

Table 9
Distribution of governance scores

| | Mean | Std. | Max. | Min. |
|-------------------|-------|-------|-------|-------|
| By year | | | | |
| 2007 | 0.504 | 0.181 | 0.796 | 0.029 |
| 2008 | 0.584 | 0.030 | 0.628 | 0.505 |
| 2009 | 0.597 | 0.005 | 0.605 | 0.584 |
| 2010 | 0.600 | 0.001 | 0.601 | 0.597 |
| By FHC | | | | |
| Hua Nan | 0.586 | 0.002 | 0.587 | 0.584 |
| Fubon | 0.631 | 0.007 | 0.638 | 0.623 |
| Cathay | 0.633 | 0.014 | 0.650 | 0.622 |
| China development | 0.268 | 0.007 | 0.277 | 0.260 |
| E.SUN | 0.388 | 0.013 | 0.407 | 0.377 |
| Fuhwa | 0.582 | 0.025 | 0.599 | 0.546 |
| Mega | 0.676 | 0.014 | 0.697 | 0.668 |
| Taishin | 0.430 | 0.041 | 0.466 | 0.379 |
| Shin Kong | 0.469 | 0.059 | 0.529 | 0.389 |
| Waterland | 0.471 | 0.052 | 0.534 | 0.414 |
| SinoPac | 0.094 | 0.043 | 0.119 | 0.029 |
| Chinatrust | 0.487 | 0.021 | 0.513 | 0.462 |
| First | 0.726 | 0.031 | 0.769 | 0.701 |
| Jihsun | 0.557 | 0.020 | 0.585 | 0.540 |

On the other hand, governance scores are taken as the vertical axes that represent the ability of monitoring the firm's operations, abating the agency problem, and enhancing self-protection for investors. Therefore, a FHC with a larger value has better corporate governance, which has higher capabilities to supervise poor investment decisions and increase firm as well as shareholder value. In contrast, a firm with a smaller value means it is inefficient in governance mechanisms and the abatement of agency costs.

The threshold of this matrix is the 80 percentile of managerial performance and governance score, respectively. According to the two criteria, the firms can be divided into four quadrants in the decision-making matrix as shown in Figure 3. This matrix can serve as a managerial tool for firm management and outside investors to provide further improvement direction and effort. The four groups of firms are described below.

Star quadrant: This quadrant indicates that the firm enjoys better performances both

in terms of contemporary managerial performance and corporate governance and is classified as a “Star”. Mega is included here, which can be regarded as the benchmark for others to achieve outstanding resource and profit generation in a managerial performance as well as superior corporate governance mechanism. Hence, taking the performance of a firm’s value-generation and the protection of investor’s right into account, Mega stays in a leading position. In contrast, for the management of other FHCs, they should further identify and reference the operational strategies and governance mechanism of Mega to enhance their firms’ performance and conduct investor value protection.

Sleeper quadrant: These firms experience better contemporary managerial performance, but have a decreasing variation in their governance mechanisms. They are classified as “Sleeper.” Two FHCs are included: Fubon and Jihsun. Firms located in this quadrant are relatively efficient in utilizing their resources to generate corresponding outputs in their value-generation process, but are inferior in corporate governance mechanisms. The results indicate that these firms should be prime candidates for governance improvement efforts and can be a potential “Star group” if they place more emphasis on activities that are aimed at improving governance mechanisms. In addition, from the perspective of monitoring mechanisms, although these firms are able to generate more value, however, their weak governance mechanism might lead to managerial expropriation of the firm and shareholder values. Thus, investors and shareholders should take some monitoring mechanisms to supervise these FHCs’ operations and protect their values and rights.

Dog quadrant: These firms have better corporate governance mechanisms, but low managerial performance. First is in this quadrant, which should adopt some operation strategies to improve resource utilization and enhance profitability for their operations and

marketability for investor values. Therefore, it should reference the operational strategies and administration skills from those of the Sleepers quadrant. Moreover, the results of efficient decomposition are employed to identify the key performance factors and weaknesses compared to other competitors. By maintaining their strengths and improving their weaknesses, firms in this quadrant are expected to increase their competitive advantages and create more value for their shareholders.

Question mark quadrant: The firms located in the bottom-left quadrant perform worse in terms of firm performance and governance scores. Of the 14 FHC firms, ten are included in this group. From the viewpoint of outside investors, they are problematic firms and have scope for improvement both in profit generation and resource utilization as well as governance mechanisms. Diagnostic actions should be taken to remedy their problems. Hence, these firms should immediately adjust their corporate governance to be more efficient and then expand their profit generation.

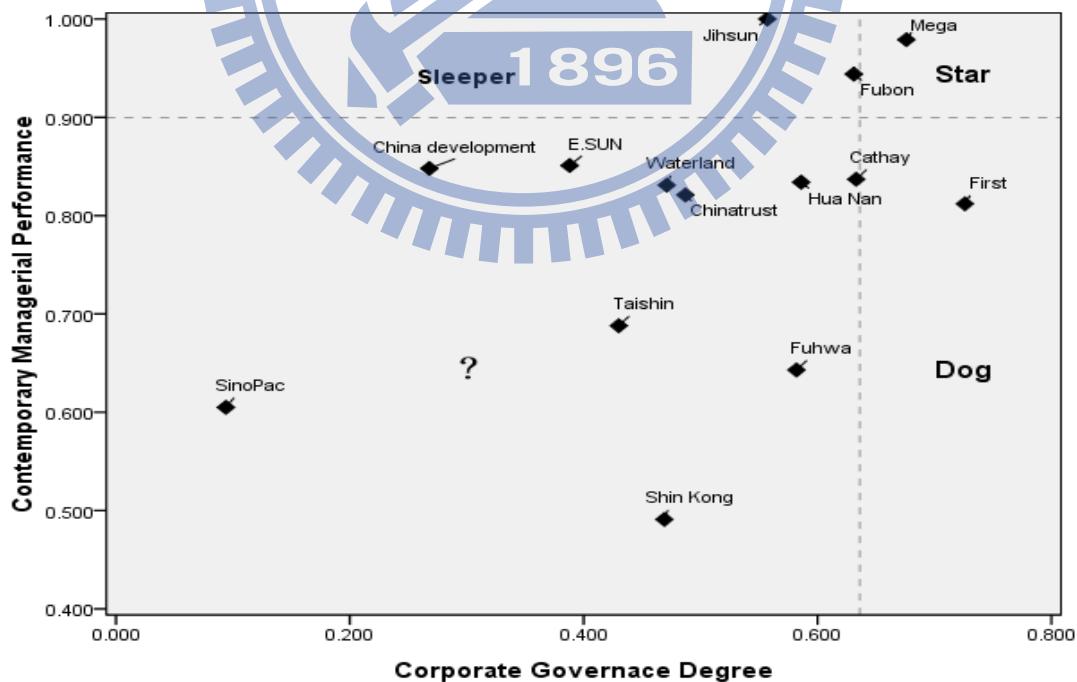
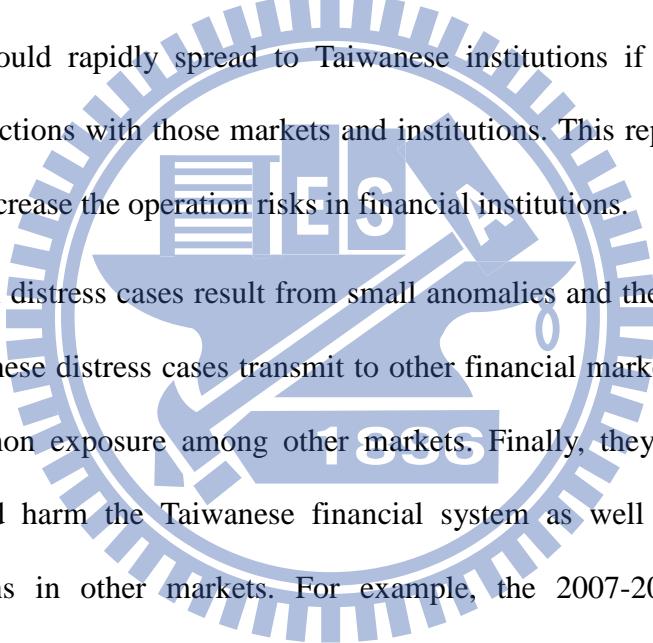


Figure 3 Decision-making matrix of the governance mechanism for FHCs

5. Risk issue

Taiwan's financial market becomes more interconnected with global markets after a series of financial liberalization and reconstruction adjustments. The process of globalization enables Taiwan capital and investments to flow into various financial markets and more economic activities and transactions are integrated with the international market. However, this financial integration means a high inter-linkage effect between the Taiwan and global markets and it also increases the financial exposure of financial institutions in Taiwan. Hence, a financial or economic shock from the overseas market or institutions being in distress could rapidly spread to Taiwanese institutions if they have common exposure and connections with those markets and institutions. This represents that the risk transmission will increase the operation risks in financial institutions.



Many financial distress cases result from small anomalies and their spillover effect in specific markets. These distress cases transmit to other financial markets through financial linkages and common exposure among other markets. Finally, they can lead to severe financial crises and harm the Taiwanese financial system as well as cause failure of financial institutions in other markets. For example, the 2007-2009 financial crises originated from the failure of subprime securities and credit default swaps of financial institutions in the United States. This distress rapidly spilled into other financial markets and devolved into a global crisis, which lead to the failures of financial institutions and the value-reduction of investments and commodities worldwide (Brunnermeier, 2009; Adrain and Shin, 2010).

Due to the nature of interconnectedness of global financial markets, the traditional risk indicators including credit and market risks are no longer valid indicators to evaluate the

risk of a financial institution. Moreover, by considering the effect of risk contagion among the different markets, it is important to assess the performance of a financial institution by incorporating its market risk and spillover of the global market. Therefore, by using credit risk, market risk (measured by value at risk; VaR) and the risk spillover effect of the international market (measured by Δ CoVaR), this study tries to identify the risk factors of Taiwan financial holding companies and their effects.

5.1 Research design

To understand the effects of risk factors, a two-stage approach is employed examine the relationship between the firm's performance and risk factors of FHCs in Taiwan. The first stage is the evaluation of the FHCs' managerial performance using a two-stage series model. The second stage employs a regression model to investigate the impact of risk factors including credit risk, market risk and risk spillover on the FHCs' managerial performance. Because the efficiency score measured by the DEA model is distributed between 0 and 1, it becomes a censored dependent variable in the regression model. Therefore, the truncated model is applied as an appropriate regression model to determine whether risk factors have a significant impact on the FHC's performance. Mathematically, the truncated regression model with full variables is expressed as follows:

$$Y_{kt} = \beta_0 + \beta_{1kt} CR_{kt} + \beta_{2kt} MR_{kt} + \beta_{3kt} RS_{kt} + \beta_{4kt} Size_{kt} + \varepsilon_{kt} \quad (5.1)$$

Here, ' kt ' represents the k firm of the sample at the t period; CR_{kt} represents credit risk calculated by a FHC's capital adequacy ratio. MR_{kt} represents the market risk of a FHC measured by VaR using the historical simulation approach and RS_{kt} is the risk spillover from another financial market which evaluates the difference between VaR and CoVaR. The firm size is measured by a firm's total assets, which is regarded as a control variable

because a firm with larger scale might have abundant resources and intellectual capital to adopt aggressive competitive strategies and then achieve better performance. Therefore, the effect of firm size should be controlled to avoid its impact on the results of the regression model.

5.2 Data source and risk estimation

This study examines the relationship between managerial performance and risk factors of 14 FHCs from 2007 to 2010. The input and output data of the performance model and the variables related to the estimation of three risk indicators are obtained from the Taiwan Economic Journal (TEJ) databank. In addition, because the VaR and CoVaR are employed to measure the FHCs' market risk and risk spillover from external stock markets, this study collects daily stock prices of 14 FHCs and daily returns of two stock markets from 2007 to 2010 for calculating their returns and VaR as well as CoVaR. Relevant denotations are listed as follows:

| Market VaR: | | |
|---------------------------------------|------------------------------|-------------------------------|
| RM ¹ : Taiwan stock market | 1896 | |
| RM ² : Dow Jones Index | | |
| FHC VaR: | | |
| RF ¹ : Hua Nan | RF ⁶ : Fuhwa | RF ¹¹ : SinoPac |
| RF ² : Fubon | RF ⁷ : Mega | RF ¹² : Chinatrust |
| RF ³ : Cathay | RF ⁸ : Taishin | RF ¹³ : First |
| RF ⁴ : China development | RF ⁹ : Shin Kong | RF ¹⁴ : Jihsun |
| RF ⁵ : ESUN | RF ¹⁰ : Waterland | |

By using the formula of a capital adequacy ratio is employed to estimate capital requirements as the proxy variable of credit risk indicators. With respect to market and spillover risk, this study adopts the value at risk and the difference between the CoVaR and VaR as measures. The Dow Jones Index is the most influential external source influencing the Taiwan stock market, and thus it is regarded as the main source of external market

analysis with a calculated risk spillover (Cha and Cheung, 1998). With respect to the evaluation of the VaRs, the VaR of each FHC (denoted as VaR_t^k), the VaR of the Taiwan stock market (denoted as VaR_t^{M1}) and the VaR of the Dow Jones Index (denoted as VaR_t^{M2}) are estimated by using the historical simulation approach which has proven to be a more accurate method to measure the tail probability and then provide a straightforward evaluation of market risk (Chang and Chiu, 2006; Sheu and Cheng, 2012). In addition, three steps are employed to calculate the CoVaR, First, quantile regressions are used to calculate the time-variation between the return and 1-month lagged return for all FHCs (denoted as RF_t^k RF_{t-1}^k), the Taiwan stock index (RM_t^1), and the Dow Jones Index (RM_t^2).

Moreover, to further assess the impact of the Taiwan stock index and the Dow Jones Index on the returns of the FHCs, the concept of a conditional regression is employed. Thus, the returns of the FHCs regress as the function of its lag 1 return (RF_{t-1}^k) and stock market returns (RM_t^j , $j=1,2$) to catch the contribution effect of these market indices. All quantile regressions are estimated by monthly data and are listed as follows:

$$RF_t^k = \alpha_t^k + \gamma_t^k RF_{t-1}^k + \varepsilon_t^k \quad (5.2)$$

$$RM_t^j = \alpha_t^j + \gamma_t^j RM_{t-1}^j + \varepsilon_t^j \quad (5.3)$$

$$RF_t^{kij} = \alpha_t^{kij} + \beta_t^{kij} RF_{t-1}^k + \gamma_t^{kij} RM_t^j + \varepsilon_t^{kij} \quad (5.4)$$

$k=1, \dots, 14$ FHCs;

$j=1$ for Taiwan stock market, $j=2$ for the Dow Jones index

Next, using the coefficients of quantile regressions from the first steps, the CoVaR is generated from following equation:

$$\text{CoVaR}_t^{k|j} = \alpha_t^{k|j} + \beta_t^{k|j} \text{VaR}_{t-1}^k + \gamma_t^{k|j} \text{VaR}_t^j \quad (5.5)$$

Finally, a panel of monthly $\Delta \text{CoVaR}_t^{k|j}$, representing the risk spillover from stock market j , is estimated by subtracting $\text{CoVaR}_t^{k|j}$ from VaR_t^k .

$$\Delta \text{CoVaR}_t^{k|j} = \text{CoVaR}_t^{k|j} - \text{VaR}_t^k \quad (5.6)$$

5.3 Empirical results

This section presents the empirical results of applying the estimations of VaR and CoVaR to explore the impact of risk factors on managerial performance of FHCs. First, using a historical simulation approach and quantile regressions, the VaR, CoVaR and ΔCoVaR of Taiwan financial holding companies are estimated. Next, these risk indicators and the proxy variables of credit risk are recruited to explain the relationship between FHCs' managerial performance and its risk factors. By using equations (5.2-5.3), the VaRs of 14 FHCs and the VaRs of external stock markets are calculated by a historical simulation approach at a 1% maximum loss probability and all risk indicators are shown in Table 10.

As seen in Table 10, Cathay and Mega have higher mean credit risks while Waterland and Jihsun have less risk. In addition, the VaRs of the Taiwan stock market and the Dow Jones Index are -0.0186 and -0.0173, respectively, indicating that the Taiwan stock market has a greater market risk than the Dow Jones Index. With respect to the VaRs of the 14 FHCs, the highest VaR is with Fuhwa with -0.0290, followed by -0.0289 occurring at Shin Kong and Waterland of -0.0222 which is the smallest VaR. These measures reflect the loss of FHCs because these companies are in distress in isolation and are regarded as a measure of market risk.

Moreover, to measure the spillover contribution for the external markets to the managerial performance of Taiwan FHCs, the coefficient of quantile CoVaR regressions

(5.4-5.6) are used to assess the CoVaR and the Δ CoVaR. Under these estimated equations, the CoVaRs for the 14 FHCs are conditional on the Taiwan stock market and the Dow Jones Index at a 1% maximum loss probability which are calculated respectively. As seen in Table 10, the Dow Jones Index has a larger average conditional effect (-0.0295) over the Taiwan stock market (-0.0287), indicating that the international market has a larger impact on the FHCs' managerial performance than the Taiwan financial market does.

Table 10
Risk indicators of 14 FHCs from 2007 to 2010

| Markets & FHCs | Credit risk | Market risk (VaR) | Risk spillover | |
|---------------------------------------|---------------|----------------------|--|--|
| | | | CoVaR ¹ (conditional on Taiwan stock market) | CoVaR ² (conditional on Dow Jones Index) |
| External stock market VaR : | | -0.0186 -0.0173 | | |
| EM ¹ : Taiwan stock market | | | | |
| EM ² : Dow Jones Index | | | | |
| FHC 14 VaR : | | | | |
| Hua Nan | 6.8020 | -0.0248 | -0.0279 | -0.0304 |
| Fubon | 7.0759 | -0.0258 | -0.0289 | -0.0282 |
| Cathay | 7.4310 | -0.0261 | -0.0290 | -0.0302 |
| China development | 5.1433 | -0.0247 | -0.0256 | -0.0299 |
| E.SUN | 6.1020 | -0.0252 | -0.0227 | -0.0265 |
| Fuhwa | 6.1518 | -0.0290 | -0.0313 | -0.0305 |
| Mega | 7.3332 | -0.0244 | -0.0305 | -0.0292 |
| Taishin | 6.5947 | -0.0274 | -0.0310 | -0.0308 |
| Shin Kong | 6.6255 | -0.0289 | -0.0308 | -0.0310 |
| Waterland | 4.6580 | -0.0222 | -0.0283 | -0.0292 |
| SinoPac | 6.3929 | -0.0261 | -0.0272 | -0.0307 |
| Chinatrust | 6.8849 | -0.0275 | -0.0310 | -0.0307 |
| First | 6.8151 | -0.0236 | -0.0284 | -0.0263 |
| Jihsun | 5.0628 | -0.0278 | -0.0297 | -0.0298 |
| Mean | 6.3623 | -0.02596 | -0.0287 | -0.0295 |

In addition, with respect to the CoVaRs which are conditional on the Taiwan stock market, the highest CoVaR is Fuhwa with -0.0313. Chinatrust is second with a CoVaR value of -0.0310 and the third is Taishin with a CoVaR of -0.0310. On the other hand, regarding the CoVaRs which are conditional on the Dow Jones Index, the highest VaR is Shin Kong with -0.0310, the next is Taishin with a VaR of -0.0308. These are followed by

SinoPac and Chinatrust with a VaR of -0.0307, each.

Finally, in order to capture the marginal risk impact of the external market to 14 Taiwan FHCs, we define ΔCoVaR as the difference between the CoVaR and the VaR, and we estimate the indicators of risk spillover which are listed in Table 11. Similar to the results of the CoVaR, the ΔCoVaR of the Dow Jones Index is greater than the score of the Taiwan stock index, indicating that risk spillover from the Dow Jones Index might have greater impact on the managerial performance than the Taiwan stock market. By considering the impact of the Taiwan stock market, Waterland, Mega, and Hua Nan possess the top three highest marginal risk spillovers, while Waterland, China development and Mega have the top three risk impact from the Dow Jones Index. By using the measure of ΔCoVaR , the FHC management and investors can evaluate the risk impact of invested external markets and reduce the potential losses under these markets in financial distress and then increase the FHCs managerial performance.

Table 11
 ΔCoVaR of 14FHCs conditional on two markets

| FHCs | ΔCoVaR^1 (conditional on the Taiwan stock market) | ΔCoVaR^2 (conditional on the Dow Jones Index) |
|-------------------|--|--|
| Hua Nan | -0.0056 | -0.0031 |
| Fubon | -0.0031 | -0.0024 |
| Cathay | -0.0029 | -0.0041 |
| China development | -0.0009 | -0.0052 |
| E.SUN | 0.0026 | -0.0012 |
| Fuhwa | -0.0023 | -0.0015 |
| Mega | -0.0061 | -0.0048 |
| Taishin | -0.0035 | -0.0034 |
| Shin Kong | -0.0019 | -0.0021 |
| Waterland | -0.0061 | -0.0070 |
| SinoPac | -0.0010 | -0.0046 |
| Chinatrust | -0.0035 | -0.0032 |
| First | -0.0049 | -0.0027 |
| Jihsun | -0.0020 | -0.0021 |
| Mean | -0.0029 | -0.0034 |

After all risk indicators for Taiwan's FHCs are estimated, this section further employs these indicators to identify the relationship between the Taiwan FHCs' managerial performance and risk factors using a truncated regression equation (5.1) with panel data from 2007 to 2010. In this model, the dependent variable is the efficiency scores of the FHCs managerial performance evaluated by the two-stage series model and the explanatory variables include three types of risk factors in the FHCs operation. In addition, we work to fully capture the risk transmission process from external stock markets. This encompasses the risk coming from a specific external market affecting the performance of the Taiwan stock market and then it further affects the performance of FHCs within Taiwan. Therefore, the interaction of ΔCoVaR with a conditional on the Taiwan stock market and ΔCoVaR conditional on the Dow Jones Index are also recruited in the regression model and the results are shown in Table 12.

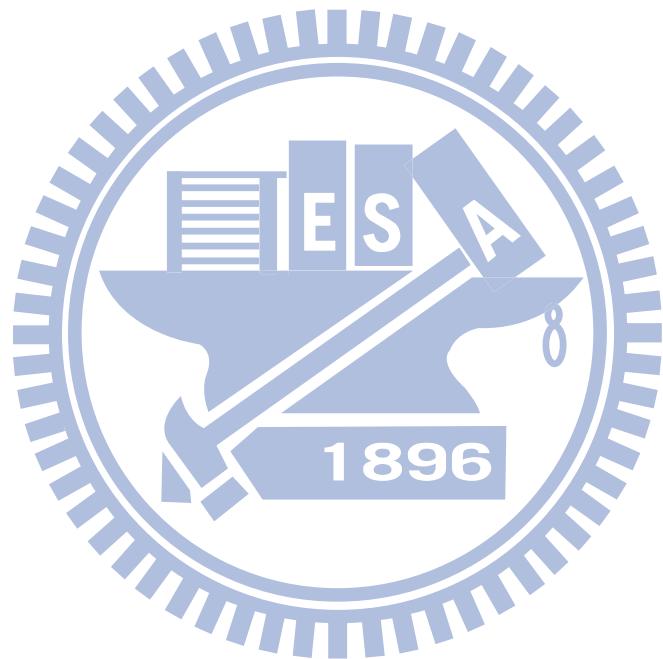
Table 12
Results of truncated regression for risk indicators of 14FHCs

| Model variables | Model coefficients |
|--|---------------------|
| Intercept | 3.550 (<0.001**) |
| Credit risk | 0.0002 (<0.016**) |
| Market risk (VaR) | -34.457 (0.041**) |
| Risk spillover of the Taiwan stock market (ΔCoVaR^1) | 13.652 (0.256) |
| Risk spillover of the Dow Jones Index (ΔCoVaR^2) | 14.423 (0.391) |
| $\Delta\text{CoVaR}^1 * \Delta\text{CoVaR}^2$ | -2543.145 (0.008**) |
| Ln (Firm size) | -0.259 (<0.001**) |
| <i>Log-likelihood</i> | 24.730 |

Table 12 shows that three types of risk factors including the credit risk, market risk and risk spillover have a significant impact on the FHCs' managerial performance. With respect to the credit risk, there is a significant positive impact on the FHC's managerial

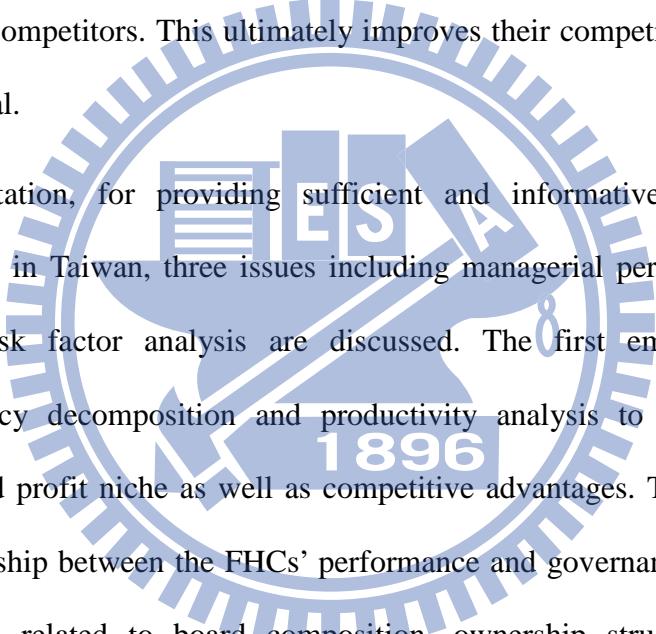
performance. The result may arise from the increased competition from financial liberalization and the attempts of FHCs to increase their market share in Taiwan's highly fragmented circumstance, which leads to enhance FHCs' operation performance and also increase their credit risk. Although the credit expansion strategy has significant effect on increasing a FHC's managerial performance, excessive credit might still have an uncertain negative effect due to the risks of bad or problematic loans and the costs of relevant loans management (Berger and De Young, 1997). Therefore, the FHCs' managers should pay attention to the loan management for preventing the negative and uncertain effect of the credit expansion and increasing the FHCs' operating performance. In addition, by using VaR as the measure of market risk, the results show that market risk has a significant negative influence on FHCs' managerial performance, which is consistent with the results of Chang and Chiu (2006). The market risk mainly results from the volatility of risky assets leading to the loss of FHCs' investment portfolios including the equity, foreign exchange, interest rate and other derivatives. A FHC with a larger VaR means that it has higher exposure on portfolios and might result in worse operation performance. Hence, for references to this risk indicator, the FHCs' management can inspect their portfolios preventing excessive risk exposure and investors can also employ this measure to assess the FHCs' risk preference as a reference for investment selection. Finally, as for the effect of risk spillover of the external market, the results indicate that risk spillover has a significantly negative effect on the FHC's managerial performance. Taking the Δ CoVaR of the Dow Jones Index as an example, this section provides an empirical result that the risk spillovers from external markets influence the FHCs' performance in Taiwan, in which the greater risk spillover a FHC suffer leading to the worse managerial performance. Moreover, the results also identify another risk source of FHCs' operation, that is, a FHC's managerial

performance might be affected by the idiosyncratic distress which occurred in a specific external market. Due to the effects of interconnection in the global financial markets, an idiosyncratic distress of a specific market can spill into other interconnected entities including financial markets and firms and finally cause the financial crises of an entire system and a sharp drop of the firm's operation. By using the measure of ΔCoVaR , the FHCs' management can analyze the risk impact of invested markets and can also use it as a supplementary indicator of VaR to diagnose their investment portfolio and then reduce operation risks and enhance managerial performance.



6. Conclusion

Faced with a highly fragmented and competitive Taiwan financial market, the major mission of financial institutions is to operate efficiently and enhance their competitive advantage. After financial liberalization and restructuring, the financial holding company has become the mainstream due to having both a larger scale and being more diversified in terms of operating scope. However, the FHCs in Taiwan still have the challenges of being “too small in size and too fixated on quality” which forces them to take a diagnostic analysis to assess their operating situation for exploring their strengths and weaknesses compared to other competitors. This ultimately improves their competitive advantages and secures their survival.



In this dissertation, for providing sufficient and informative details about the operations of FHCs in Taiwan, three issues including managerial performance, corporate governance and risk factor analysis are discussed. The first employs performance evaluation, efficiency decomposition and productivity analysis to explore the FHCs' inefficient costs and profit niche as well as competitive advantages. The next factor is to explore the relationship between the FHCs' performance and governance mechanisms. By recruiting variables related to board composition, ownership structure and auxiliary variables, this study tries to examine the effect of governance variables and discovers the determinant governance mechanisms of the FCHs in Taiwan. The last factor is to identify the effect of risk factors on the FHCs' performance and further explore whether the risk effect from the international market will spill over to the managerial performance of the FHCs in Taiwan.

For the issue of managerial performance, the main results are summarized as follows. First, the evaluation under a two-stage series performance indicates that most FHCs

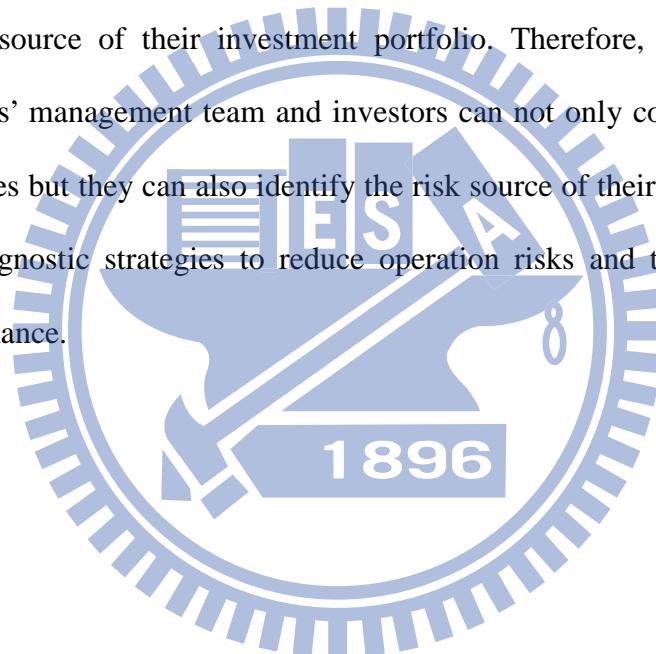
perform better in the marketability stage than in the profitability stage, indicating that a lower overall performance of these FHCs may be attributed to a worse performance in the profitability stage and implying that the performance of profitability for each FHC plays a critical role in the overall performance. Secondly, the comparison based on the operation scale and operating main component reveal that securities-based FHCs perform better than other types and small-sized FHCs are suitable types in Taiwan's current fragmented and overcrowded environment due to having better performance in profit efficiency and firm value productivity. Thirdly, further efficiency decomposition indicates that the profit niche of all three types of FHCs come from their main businesses but other sideline activities still play an important role for FHCs' overall profit. This result also demonstrates that the cross-business integration of financial institutions not only can enlarge their business scope but also can create more benefits and profits for their survival and development when the scale of existing financial market remains invariant. Fourthly, by combining the current managerial performance and productivity index, a four-quadrant decision-making matrix is presented to help the FHCs' management to determine their position in the Taiwan financial market and provide direction for improving a FHC's current managerial capability and sustained competitive capability.

Regarding the corporate governance issue, the main results are summarized as follows. First of all, this study confirms the results of Claessens and Fan (2002) which state that conventional governance mechanisms have a limited effect to reduce agency problems protect investor rights and diagnose a firm's managerial performance due to the effect of controlling shareholding. Next, the determinant governance variables of the FHCs are identified including the mechanisms of an independent supervisor, institutional shareholding, divergence of control to cash flow rights, direct control, and firm leverage.

The result indicates that the governance mechanisms of FHCs in Taiwan should focus on the detailed information disclosure about internal operations and interest calibration between a firm's management and a firm's overall value, which outside shareholders and investors can use as auxiliary governance variables to supervise the operation of invested firms and to help them diagnose the probability of managerial expropriation for their investments. Third, the determinant governance variables of the FHCs in Taiwan are employed to construct the FHCs' governance scores for providing a reference for investment by outside investors and shareholders. The mean governance score indicates that governance performance of all FHCs in Taiwan is improving over time. Finally, a four-quadrant decision-making matrix is designed by combining the FHC's managerial performance and corporate governance scores to help managerial authorities position themselves in the Taiwan capital market. This also provides shareholders and investors with more classification information about a firm's performance and governance mechanisms to prevent value expropriation.

Regarding the risk issue, this study tries to examine the effect of risk factors of the FHCs on their managerial performance. In addition to credit risk, market risk and risk spillover measured by VaR and Δ CoVaR, respectively, we examine their effects. Using the Dow Jones Index as the main source of external impact, the results of VaR and CoVaR indicate that the Taiwan market has a higher market risk as compared to the U.S. market but the U.S. market has a larger impact on the FHCs' managerial performance than the Taiwan financial market. Next, by means of the truncated regression model, three types of risk factors including the credit risk, market risk and risk spillover have a significantly impact on the FHCs' managerial performance, indicating that a FHC's credit expansion strategy has significant effect on increasing a FHC's managerial performance but the FHCs'

managers should pay attention to the loan management for preventing the negative and uncertain effect of the credit expansion to reduce FHCs' operating performance. Moreover, the market risk and the risk transmission have significantly negative effects on the FHC's managerial performance. Using the effect of market risk, the FHCs' managers can understand that the high exposure on risky assets and portfolios might result in inferior performance but they cannot further identify the source of market risk. However, by using the measure of risk spillover, the FHCs' management and investors not only can analyze the risk impact of invested markets and can also use it as a supplementary indicator of VaR to diagnose the risk source of their investment portfolio. Therefore, by using these risk measures, the FHCs' management team and investors can not only conduct evaluation for their risk preferences but they can also identify the risk source of their investment portfolio and take some diagnostic strategies to reduce operation risks and then further enhance managerial performance.



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