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YMC Management Review Special Issue for the iFAIR 2010 Conference

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Conference Call and Information Asymmetry-Evidence from Regulatory Change on Earnings Forecast Disclosure in Taiwan

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ABSTRACT

The purpose of this study is to examine the effects of the 2005 deregulation of the earnings forecasts requirement on management's disclosure behavior. Using firms hosting conference call one year before and after the deregulation as samples, this study empirically tests three questions: (1) changes in the characteristics of firms hosting conference calls; (2) differences on the informativeness of financial statements of conference call firms, and (3) differences in the information contents of the conference calls. This study uses secondary data from financial databases covering sampling periods from 2004 to 2005. The results indicate that conference call firms are larger in size after the mandatory earnings forecasts amendment in 2005. Financial statements from conference call firms are more informative compared to 2004 conference call activities. Finally, a higher level of information content is observed from 2005 conference calls compared to 2004. The results of this research support the Taiwanese government's effort in reducing information asymmetry.

Keywords: conference calls, informativeness, information content

1. Introduction

Disclosure studies depict that managers have superior information than outside investors on firms' expected future performance (Healy & Palepu, 2001). In addition to private information, management has the discretion to select effective disclosure mechanism by evaluating the cost/benefit of the information disclosed. If the choice of the communication channel is limited to selective groups, investors are differently informed about a firm's value and investor with superior information can trade profitable at the expense of other investors (Brown, Stephen & Lo, 2004). Private information can become one of the major causes of information asymmetry. The level of information asymmetry is related to management's choices of disclosure method.

Many disclosure mechanisms are available for disseminating incremental information to investors. Conference calls are second to press releases as a popular means of disclosing corporate information (NIRI, 1996). Managers often use conference calls to make presentations to and answer questions from various market participants, usually about earnings (Frankel, Johnson, & Skinner, 1999). It saves time and mitigates selective disclosure problems for corporate managers for its capabilities in dealing with various interested parties simultaneously (Frankel et al., 1999). In Taiwan, conference calls are called "institutional investors' conference" because they are usually in closed format limiting the audience to invited institutional investors. Conference calls have improved the timeliness of disclosure to analysts and money managers in Taiwan while putting individual investors at a larger informational disadvantage. The Security and Exchange Commission

of Taiwan (SEC) established the Market Observation Post System (MOPS), an official website for firms posting conference summaries (not transcripts) to ensure availability of same day, on-time material information on line. The public is still concerned with the information gap from the private information only available to certain groups of investors.

Another issue of concern is on the content of conference calls. Public corporations in East Asia, including Taiwan, are recognized as having low levels of transparency and disclosure quality (Fan & Wong, 2002). Regulators and policy makers in this region frequently impose stricter reporting standards and mandatory disclosure rules for improving corporate governance and reporting transparency. For example, the SRC of Taiwan has required the inclusion of mandated financial forecasts in corporate prospectuses since 1991. The mandatory earnings forecast mechanism in Taiwan gave rise to serious forecast accuracy concerns (Yu, 2005). Lin (2002) investigated 1,026 firms issued earnings forecasts from 1992 to 2001 and reported over 70% of the companies overestimating the financial forecast of operating income and income before taxes. Serious deviation of mandatory earnings forecasts from reported earning is very pervasive for listed firm in TSE (Chin, Chi, & Lin, 2005). The Taiwanese stock market reacted to the misleading future earning information released during conference calls. The information asymmetry problem is even more serious considering the forecast deviation and private information problems.

The Taiwanese government is concerned about the quality of earnings forecast information, and, therefore reacted with the reform on mandatory earnings forecasts disclosure. Effective January 1, 2005, a publicly traded company is no longer compelled to prepare and publicize earnings forecasts, regardless of the reporting cycle (hereafter, the 2005 MEF amendment). This study speculates that management has less incentive to hold conference calls in explaining the content of the forecast information since it is no longer mandatory. Firms with less informative financial statements, on the other hand, have greater incentive to host conference call to expand on management's explanation on business activities and other pressing issues. Since earnings forecasts are no longer a subject of discussion during conference call after the 2005 MEF amendment, information content on these conference calls should change.

The purpose of this study is to examine how the 2005 MEF amendment affects managers' voluntary disclosure behavior. This study empirically tests companies hosting conference calls in 2004 and 2005 to test: (1) are there any differences in the characteristics of firms hosting conference calls, (2) any differences on the informativeness of financial statements of conference call firms, and (3) any differences on the information content of conference calls. Empirical results support most of the predictions. There is a big decline on the numbers of firms hosting conferences calls. Larger and more profitable firms are more likely to hold conference calls. Firms with less informative financial statement tend to host conference call to deliver voluntary information to the public. Lastly, higher information content is observed after the 2005 MEF amendment. The results of this research support the Taiwanese government's effort of leveling the play field.

2. Literature review and hypothesis development

Mandatory financial disclosure rules only ensure minimum standards of objectivity, verifiability and

conservatism on financial reporting (Tasker, 1998). Financial statements prepared according to required rules do not necessarily provide enough information for investor decision-making. The choice of disclosure mechanism such as conference calls or earnings forecasts is important for disseminating incremental information to investors.

Past researches on conference calls have investigated characteristics of firms hosting conference calls (e.g. Tasker, 1998; Tasi, 2002; Chen, 2004; Yu, 2004), the impact of conference calls on trading (e.g. Frankel, et al., 1999; Wong, 2004; Chen, 2004), and how conference calls affect analysts' forecasts (e.g. Bowen, Davis, & Matsumoto, 2002; Wu, 2004). Frankel, et al. (1999) argue that firms hosting conference calls exhibiting certain characteristics: higher sales growth, higher profitability, unusual and extraordinary earning items, more frequency in raising capital from market, larger assets, more analyst following, and higher market-to-book ratios. Certain industries, such as high-tech industry, uses conference calls more frequently to satisfy market demand for incremental information (Frankel, et al., 1999; Tasker, 1998). Wong (2003) confirms similar findings that firms with larger assets, higher sales growth and PE ratio are more incline to hold conference calls using 591 Taiwanese samples from 1997 to 2001.

Chin, et al. (2005) sampled 641 Taiwanese firms who issued mandatory earnings forecasts during 1997 to 2002 and 498 of them (about 78%) also holding conference calls. Regulatory reforms on management forecasts will inevitably affect incentives and the nature of voluntary disclosure behavior. Since earnings forecasts are no longer mandatory, fewer firms will prepare and voluntarily disclose earnings forecast information after the amendment. This study speculates that management has less incentive to hold conference calls to explain the content of forecast information. To provide more insight on how firms' voluntary disclosure behavior is affected by the 2005 MEF amendment, this study investigates differences, if any, in characteristics for firms hosting conference calls. Specifically, this study tests the differences in total assets (TA), price-earnings (PE) ratios, sales growth (SG), return on assets (ROA), and earnings per share (EPS) on conference call firms during 2004 and 2005.

Tasker (1998) argues that firms with less informative financial statements will provide more voluntary disclosure. Certain types of information are particularly difficult to convey using traditional financial reporting channels (Tasker, 1998). For example, firms engage in innovation activities that are speculative in nature are more likely to use conference calls to convey private information about the firm's performance not reflected in their financial statements. Conference calls provide a good medium to bridge information gap between managers and participants. Firms with less informative financial information may not be affected because these firms rely heavily on voluntary disclosure to communicate future perspectives to investors. Conference calls contributed to an information gap between participants and non-participants for firms with more private information (Bowen et al., 2002). Consistent with argument by Tasker (1998) and Frankel et al. (1999), this study speculates that firms with less informative financial statements use conference call to convey important information not understood by the market. Based on the above discussions, this study develops the following hypotheses:

H1: There are significant differences in the characteristics of conference call firms before and after

the 2005 amendment on MEF.

H2: There are significant differences in the informativeness of financial statements for conference call firms before and after the 2005 amendment on MEF.

Conference calls convey material information evidenced by large return volatility and trading volume (Frankel et al., 1999). Tsai (2002) examines 1370 conference calls from 1997 to 2000 in Taiwan and reports the significance of information content on conference calls in the form of abnormal return during call periods. Lai (2003) has similar conclusions using event studies to test information content on various types of conference calls. Since earnings forecasts are no longer a subject of discussion in a conference call after the 2005 MEF amendment, a major difference in the level of information content should be evidenced.

H3: There are significant differences in the information content of conference calls before and after the 2005 amendment.

3. Sampling procedure and measurement

This study uses secondary data from two sources. Conference call information was abstracted from the MOPS. Financial data and stock performance information was retrieved from the Taiwan Economic Journal (TEJ) database. There is no database available concerning conference call information. The information gathering is a difficult task. This study went through each posting of conference summaries on MOPS. A total of 619 conference calls were observed in the sample periods covering 2004 and 2005. Since initial public offering (IPO) firms display strong initiatives for holding conference calls, their disclosure behaviors were not suitable for comparison to other public companies. A total 123 IPO samples were excluded from the study. With three sample firms no longer listed during the sample period, total valid sample conference calls are 493. The number of conference calls decreased by 28% in these two years (206 in 2005 and 287 in 2004).

Some firms held conference calls more than once in a year. Table 1 presents the frequency of conference calls held during the sample period. The number of firms hosting conference calls decreased by 36% in these two years (from 150 in 2004 to 96 firms in 2005).

Table 1: Frequency of Firms Holding Conference Calls

Frequency(times per year)	2005	2004	Total
1	46	89	135
2	19	23	42
3	6	8	14
4	24	28	52
5	0	1	1
8	1	0	1
11	0	1	1
Total number of firms	96	150	246
Total number of conference calls	206	287	493

This study further examines whether conference call firms publicize earning forecasts information.

As indicated in Table 2, 114 firms issued earnings forecasts in 2004(76%). In 2005 only 19 firms voluntarily disclosed earnings forecast information (20%). The majority of firms chose not to publicize earnings forecasts as 2005 regulation no longer required them to do so. It should be noted that 72 firms (29%, 72/246) held conference calls in both years. Only 12 firms (5%, 12/246) held conference calls and publicized earnings forecasts in both years.

Table 2: Conference Call Firms with/without Earnings Forecast		
	2005(%)	2004 (%)
Publicized Earnings Forecasts	19(20%)	114 (76%)
No Earnings Forecasts	77(80%)	36 (24%)
Total	96(100%)	150(100%)

Five indicators were used to access firm characteristics: TA: Beginning year total assets of the firm, using log value to eliminate size effect. PE: Beginning year price-earning ratio. SG: Prior year sales growth. ROA: Prior year return on asset.

EPS: Prior year earnings per share. This study uses the market to book (MTB) ratio to access the level of informativeness of financial statement as proposed by Tasker (1998) and Frankel et al., (1999). The MTB indicator is as of the beginning of calendar year. This study uses event study to evaluate whether event-period stock price changes for sample firms are abnormally large comparing the two sample periods, controlling for market-wide effects on all firms during the event periods. The event is the date of conference call date abstracted from MOPS. Event windows and estimation windows are calculated as follows: Event windows

(e=11): calculated by $[-\frac{(e-1)}{2}, \frac{(e-1)}{2}]$, using five days before and after conference date totaling 11 days.

Estimation windows (t=300): calculated by $[-t-\frac{(e-1)}{2}, -\frac{(e-1)}{2}-1]$, using 300 transaction day before event

windows. This study then predicts a normal outcome during the event window in the absence of the event by market model using ordinary least square method. The regression model to estimate a sample firm's return is:

$R_{it} = \alpha_i + \beta_i R_{mt}$, $t=1, \dots, T_i$, i = sample firm, T_i -estimation windows for sample firm, R_{mt} - market return on t day. The abnormal return is defined as the difference between the actual and predicted returns during

each transaction in the event window for all companies as a group. It is calculated as:

$A_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt})$, A_{it} - abnormal return for sample firm during an event date. Finally, a test is done to determine whether the average cumulative abnormal return is statistically different from zero using standardized-residual cross-sectional method.

4. Study results

Table 3 is the descriptive statistics on the variables under study. The average assets size is 9.94(in ln). The average PE ratio is 19.33 and sales growth rate is 32.1%. The average ROA, EPS, and MTB is 11.8%, 3.55, and 2.2, respectively.

Table 3 Descriptive Statistics

Variables	Full Sample		Mean	SD	2005 Sample		2004 Sample	
	Min.	Max.			Mean	SD	Mean	SD
Assets (Ln)	8.00	12.00	9.94	.74	10.12	.72	9.82	.73
PE	.00	416.67	19.33	34.55	14.96	24.62	22.29	39.72
SG	-24.96	141.85	32.10	30.38	32.81	28.96	31.66	31.34
ROA	-31.87	45.65	11.80	9.48	12.67	9.99	11.24	9.136
EPS	-4.51	25.96	3.55	3.31	3.96	3.42	3.28	3.22
MTB	.50	8.78	2.20	1.16	1.97	.88	2.35	1.29

Year: 1 for 2005; 0 for 2004. TA: Beginning year total assets of the firm, using log to eliminate size effect.

PE: Beginning year price-earning ratio. SG: Prior year sales growth. ROA: Prior year return on asset. EPS: Prior year earnings per share. MTB: Beginning year market to book ratio

Table 4 is the summary of testing results for H1 and H2. There are significant differences in two types of firm characteristics between 2004 and 2005: firm size and ROA. The average size of conference firms increases from 9.82 in 2004 to 10.12 in 2005. Conference call firms exhibit higher ROA in 2005. Other firm characteristics did not change significantly in terms of sales growth, and earnings per share. Hypothesis 1 is partially supported.

The results indicate a significant difference at the MTB indicator between 2005 and 2004. H2 is supported. As shown in Table 3, the mean MTB indicator dropped from 2.35 in 2004 to 1.97 in 2005. The level of informativeness of financial statements is lower in 2005. Table 5 indicates that the stock market reacts more to the conference calls in 2005 than 2004. In 2005, the cumulative average abnormal returns are statistically significant during the whole event windows, but not significant in 2004. H3 is supported.

Table 5: Standardized Average Cumulative Abnormal Returns and T Values				
Event Period	2005		2004	
	SCAR	t(SCAR)	SCAR	t(SCAR)
-5	0.2741**	2.2354	-0.0646	-0.6611
-4	0.4042**	2.0070	0.0565	0.3601
-3	0.9144***	3.3894	0.1212	0.6578
-2	1.3513***	4.3415	0.0905	0.4160
-1	1.2475***	3.6849	0.1150	0.4396
0	1.4252***	4.5289	0.2330	0.8082
1	1.8699***	4.8787	0.4994	1.4604
2	1.9615***	4.6040	0.2827	0.7846
3	2.1308***	4.5541	0.0680	0.1718
4	2.0756***	9.9436	-0.0822	-0.1989
5	1.8281***	3.4503	-0.2610	-0.6050
SCAR: standardized cumulative average abnormal returns t(SCAR): t value for SCAR				
***: p<0.01, **: p<0.05, *: p<0.10				

5. Additional tests

As indicated in Table 2, there is a trend of less forthcoming disclosure policies after the 2005 MEF

amendment. This study observed less voluntary disclosure behaviors in terms of conference calls and earnings forecast. In addition, more than 76% of conference call firms in 2004 publicized earnings forecast but 80% of conference call firms in 2005 did not disclose earnings forecast. This study intends to generalize firm characteristics and disclosure behaviors on conference call firms before and after the 2005 MEF amendment. Additional test is performed for the validity of findings from the previous section. Therefore, this study selects firms did not disclose earnings forecast in 2005 (that is, 77 out of 96 firms) and firms did disclose earnings forecast in 2004 (that is, 114 out of 150) for comparison purposes. These samples represent the majority of firms' disclosure behaviors in terms of conference call and earnings forecast. Untabulated results show similar findings to the full sample.

6. Discussion and conclusion

While earning forecasts are quantitative in nature, conference calls deliver quantitative as well as qualitative information to investors. Both are effective forms of voluntary disclosure for the functioning of an efficient capital market. This study noticed a 36% decline on the numbers of firm holding conference call, or 28% decline on the number of conference calls after the 2005 MEF amendment. The majority (80%) of conference call firms chose not to publicize earnings forecast information, comparing to the majority of firms publicizing forecast information a year ago. Conference call firm size has grown larger and more profitable in 2005. Although conference call has become popular in recent year, there are extra efforts and additional costs involved. Considering the effect from the changes in earnings forecast disclosure requirement, smaller size firms chose other venues of disclosure due to limited staff and technology resources. The 2005 MEF amendment has had a major impact on management's choice of disclosure media and contents of the conference call.

Firms with less informative financial statement are more inclined to hold conference calls. This study uses market-to-book ratios as a proxy to measure informativeness of financial statement. Tasker (1997) argues that firms with low accounting quality are more likely to hold conference calls. The evidence suggests that conference calls can help managers reduce information asymmetries when firms are undervalued by the market. A higher level of information content is observed after the 2005 MEF amendment. In general, the stock market reacted more on conference calls in 2005 than 2004. Without earnings forecast information, conference calls in 2005 still reveal additional information helpful in mitigating information asymmetries between managers and shareholders. The results of this research support the Taiwanese government's effort in assuring the effectiveness of the amendment on forecast disclosure reform.

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Disclosure Level of Prospective Financial Information in IPO Prospectuses – New Zealand Evidence

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ABSTRACT

This study examines the level of disclosure of prospective financial information in prospectuses for initial public offerings (IPOs) of equity securities by New Zealand companies for a period of 15 years. The results indicate that, on average, companies disclose 75% of the recommended items of prospective financial information in their prospectuses. Levels of disclosure of prospective financial information are further categorised into three groups, namely, total disclosure items recommended by FRS-29 (TSR), total disclosure items not recommended by FRS-29 (TSV) and overall disclosure items recommended and not recommended by FRS-29 (TSRV) and then investigated for significant relationships.

The results show that the disclosure level of prospective financial information, measured by total disclosure items recommended by FRS-29, is significantly related to managerial ownership, number of IPOs and forecast accuracy. When level of disclosure is measured by items not recommended by FRS-29, only company size is significantly related to level of disclosure. When level of disclosure is measured by overall disclosure items, both recommended and not recommended by FRS-29, company size and number of IPOs are significantly related to level of disclosure.

Keywords: disclosure level, prospective financial information, initial public offerings, prospectus

1. Introduction

Prospective financial information has received increasing attention recently. Research by the Financial Accounting Standards Board (FASB, 2001) recommended companies to provide investors with more forward-looking information. With the advent of the 21st century and the business environment changing rapidly, historical financial statements alone are not meeting user needs fully. In the wake of the Enron business collapse, calls for reforms to modernise the accounting model are being made by the chair of the American Institute of Certified Public Accountants (AICPA) to include more forward-looking information for investors and creditors in order to lower the risk of poor investment or credit decisions (Castellano, 2002). It is thus evident that the importance of voluntary disclosure of prospective financial information is increasing.

This study contributes to the existing literature by establishing an objective assessment of prospective financial information. The disclosure indices used in most previous studies are derived from subjective assessments by the researchers (e.g. Chow and Wong-Boren, 1987; Botosan, 1997). This study establishes an objective measure of disclosure level of prospective financial information by using FRS-29 as a benchmark. This procedure may assist the financial reporting community to develop a more objective model for the

subsequent analysis of other financial reporting standard. It may also contribute to the positive accounting literature by providing useful insights into the need for accounting regulations in financial reporting for prospective financial information. The results may benefit standard-setters, the financial reporting community and financial information users, because voluntary disclosure of prospective financial information by managers is rare in most countries, especially the U.S.A., where the litigation costs for unattained earnings forecast are high.

2. The institutional and litigation environment in new zealand

Companies seeking an initial listing on the New Zealand Stock Exchange¹ (NZSE) are required to issue an offering document in respect of these securities. An offering document can be a prospectus, an investment statement or a profile (NZSE, 2002, Section 7.1.1; Securities Act, 1978, S. 33 (1))². A prospectus is a document that contains an offer of securities to the public for subscription, which must be delivered to the Registrar of Companies for registration under section 42 of the Securities Act 1978 (Securities Act 1978). An investment statement is a document that provides simplified, key information about the securities offered for subscription to assist a prudent, but non-expert person, to make investment decisions and to draw attention to the fact that more information is available in other documents (Securities Act 1978, Section 38C³). Each prospectus and investment statement or company profile under a listing application has to be approved by the Stock Exchange prior to issue.

Relevant Provisions of the Securities Act 1978 and the Securities Regulations 1983

In New Zealand, offers of securities to the public are governed by the Securities Act 1978 (the Act) and the Securities Regulations 1983 (the Regulations). The Act regulates the offer of securities to the public for subscription by requiring disclosure of information to potential investors, while the Regulations set down restrictions on the content of a registered prospectus (The Act, SEIntro.01). For content disclosed in a prospectus or investment statement, the Act requires these documents to comply with the requirements of the Regulations (Sections 38E and 39, the Securities Act, 1978).

Information to be contained in a registered prospectus is specified in the First Schedule of the Regulations. The specific provisions in the Regulations relating to prospective financial information are set out in Clause 9 of the First Schedule, under the heading “Prospects and Forecasts”. Clause 9 (1) of the First Schedule requires the inclusion in a prospectus of a statement about the trading prospects of an issuing group, “together with any material information that may be relevant thereto” (Clause 9 (1), First Schedule, the Regulations, 1983). This requires a description of “all special trade factors and risks” not mentioned elsewhere in the registered prospectus, that are not likely to be known or anticipated by the public and that could materially affect the

¹ The New Zealand Stock Exchange (NZSE) changed its name to New Zealand Exchange Ltd (NZX) on 30 May 2003 and is traded on the New Zealand Stock Market (NZSX) with effect from 4 June 2003. However, as the study focuses on IPOs before 2002, the abbreviation NZSE will be used throughout the thesis.

² Prior to 1 October 1997, a prospectus was required for new listings. With effect from 1 October 1997, if the issuer is required to register a prospectus under the Securities Act 1978, the offering document to potential investors shall be an investment statement. In other circumstances, the offering document shall be a profile (NZSE, 2002, Section 7.1.1). A prospectus is still required to be filed with the Registrar of Companies and be available to the public upon request.

³ Sections 38B to 38F were inserted into the Securities Act with effect from 1 October 1997. These sections regulate investment statements provided to non-expert investors.

prospects of the issuing firm, to be included in the statement (Clause 9 (2), the Regulations). If prospective financial information is included in a prospectus, the principal assumptions on which the prospective financial information is based have to be disclosed (Regulation 5 (4), The Regulations) and an auditor's report containing the following statement, must also be included:

Professional Guidelines

The Regulations do not expressly require prospective financial information in a registered prospectus to be prepared in accordance with Generally Accepted Accounting Practice (GAAP). However, FRS-29 *Prospective Financial Information* requires accountants and auditors to ensure that prospective financial information is prepared in accordance with FRS-29. FRS-29 was first issued in 1993 and was revised in 1996, with application extended to the public sector effectively from 1 July 1998 (ICANZ, 1998) and revised again in 2001 (ICANZ, 2003). FRS-29 establishes principles for the preparation and presentation of all general purpose prospective financial information and specifies minimum disclosures.

When prospective financial information is disclosed other than solely in general terms, FRS-9 - *Information to be Disclosed in Financial Statements* requires the company to present a comparison of the prospective financial information previously published with the actual financial results being reported (ICANZ, 2003, FRS-9, para. 5.4). Explanations for major variations are required, but there is no clear explanation of what constitutes a "major variation" and to what extent an explanation is required.

3. Hypothesis development

Agency theory suggests that costs exist when there is separation of the ownership and control of a firm and that the agency costs are borne by the managers (Jensen and Meckling, 1976). Agency costs increase with the proportion of outside capital, which tends to be higher for larger firms (Jensen and Meckling, 1976; Leftwich, Watts and Zimmerman, 1981). Accordingly, managers in larger firms may be motivated to voluntarily disclose more information to reduce agency costs. In order to test the relationship between level of disclosure and company size, the following alternative hypothesis is formulated:

H_{a1}: Disclosure levels of prospective financial information in prospectuses are positively related to company size.

In an IPO context, companies with higher leverage may need to obtain more capital than companies with lower leverage. In order to raise more capital through listing on a stock exchange, companies with higher leverage may therefore disclose more prospective financial information. In order to determine whether disclosure levels of prospective financial information are related to corporate leverage, the following alternative hypothesis is formulated:

H_{a2}: Disclosure levels of prospective financial information in prospectuses are positively related to corporate leverage.

Under signalling theory, the percentage of shares kept by insiders when a company goes public sends a

clear signal to investors about the quality of the operation (Leland and Pyle, 1977). A higher percentage of shares retained by insiders is perceived as a signal of credibility by investors, as the managers of a precarious company will not want to keep a high percentage of shares, as future profits will not compensate them for bearing the risks associated with an undiversified portfolio. To test this relationship, the following alternative hypothesis is formulated:

H_{a3}: Disclosure levels of prospective financial information in prospectuses are positively related to managerial ownership.

For initial public offerings, increased investor confidence makes external financing through the securities markets easier and cheaper (Buzby, 1975). IPOs with higher profitability may therefore tend to provide more prospective financial information in order to raise investors' confidence about their investments. It is therefore assumed that more profitable IPOs will voluntarily disclose more prospective financial information. The following alternative hypothesis is created to test the relationship between levels of disclosure and profitability:

H_{a4}: Disclosure levels of prospective financial information in prospectuses are positively related to profitability.

Many studies have found that IPOs are often underpriced in comparison to the prices that prevail immediately after the issue. For example, Ritter and Welch (2002) found that, from 1980 to 2001, 6249 companies making IPOs have an average first-day return of 18.8 percent. The inclusion of prospective financial information in an IPO prospectus can be seen as a means to minimise the degree of underpricing, i.e. trading premium, and may alleviate the information asymmetry problem prevalent in the IPO market to reduce investors' investment risk. Based on the information asymmetry theory, it can then be inferred that IPOs with higher disclosure levels of prospective financial information may have lower first day trading premiums. Accordingly, the following alternative hypothesis is developed to be tested:

H_{a5}: Disclosure levels of prospective financial information in prospectuses are related to first day trading premium.

In examining the relationship between voluntary disclosure and competition, researchers (Darrough and Stoughton, 1990; Verrecchia, 1990) have modelled competition in the context of an entry game in which one firm contemplates producing a good already produced by other firms. They claimed that greater competition encourages more disclosure⁴. In IPO settings resources are limited within the capital market. Companies wanting to raise capital from the capital market therefore have to compete with other listed companies or other IPOs, in attracting potential investors to invest in their companies. For years in which there are many initial public offerings, competition for capital may increase intensely. Therefore, to distinguish themselves from other

⁴ Others have modelled competition in the context of a post-entry game, in which both firms are currently producing and have claimed that greater competition inhibits more disclosure (see Clinch and Verrecchia, 1997). In the study, IPOs enter the market at a different time during the year, and therefore do not fit in the post-entry game competition model.

competitors, companies have incentives to disclose more prospective financial information. Accordingly, it is proposed that, in a competitive environment, superior companies have an incentive to disclose more prospective financial information. To examine this contention, the following alternative hypothesis is developed:

H_{a6}: Disclosure levels of prospective financial information in prospectuses are positively related to numbers of IPOs listed on the New Zealand Stock Exchange during the year of flotation.

In an attempt to analyse the impact of litigation cost on managers' discretionary disclosure decisions, Hughes and Sankar (1998) found that managers with high reputation costs tend to bias the company's expected future cash flows negatively to avoid the cost of litigation-related reputation loss. Companies that disclose more prospective financial information may be more closely scrutinised by future shareholders. To reduce possible reputation costs from unattained forecasts, companies which disclose more prospective financial information may be associated with less forecast errors and may tend to under-estimate profits. To test the relationship between levels of disclosure and accuracy of forecasts, the following alternative hypothesis is developed:

H_{a7}: Disclosure levels of prospective financial information in prospectuses are negatively related to accuracy of profit forecasts.

With the existence of information asymmetry, companies have incentives to disclose more information to diminish the asymmetry. More disclosure, however, may attract more attention from the media, analysts and investors. Companies with more disclosure could thus be placed in a position of tighter scrutiny. Management may accordingly be more cautious in preparing and releasing prospective financial information. Companies making IPOs with a higher level of disclosure may therefore tend to disclose pessimistic forecasts. Accordingly, the following alternative hypothesis is established:

H_{a8}: Disclosure levels of prospective financial information in prospectuses are positively related to forecast bias.

4. Research methodology

Measurement of the Dependent Variable – Level of Disclosure

There are two kinds of indices: weighted or unweighted. More recent studies tend to use an unweighted score as the measure for level of disclosure. Weighted indices are subject to certain limitations. For example, it is argued that a great deal of subjectivity exists in the assignment of weights and that users in different countries are likely to assign different weights to similar items (Cooke, 1989, 1991; Hossain *et al.*, 1995; Meek *et al.*, 1995). Furthermore, the importance attached to rankings by a particular group of users may not necessarily reflect the information needs of other users of financial reports (Chow and Wong-Boren, 1987). This approach has become the norm in annual reports' studies (Courtis, 1996). Accordingly, the unweighted disclosure index is used in the study.

The total points earned by a given company are computed by the following formula:

$$TSCORE_j = \sum_{i=1}^4 SCORE_{ij} \dots\dots\dots (1)$$

Where TSCORE is the total score for items disclosed by company j across all prospective financial statements.

Measurement of the Independent Variables

Historical sales turnover (revenue) and total assets, taken from the offering documents, are used to measure company size. *Leverage* is defined as the ratio of total debt, both current and long-term, to total assets, using figures extracted from the IPO prospectuses. The variable of managerial ownership is measured as the percentage of the number of ordinary shares held by managers, directors, staff and their associates to the total number of shareholdings before listing⁵.

Two measures of profitability are adopted in the current study to evaluate their relationships with disclosure levels of prospective financial information. The measures are defined as follows:

$$(1) \text{ Rate of Return} = \frac{\text{Net Profit after Tax and Interest}}{\text{Total Shareholders' Equity}} \dots\dots\dots (2)$$

$$(2) \text{ Profit Margin} = \frac{\text{Net Profit after Tax and Interest}}{\text{Net Sales}} \dots\dots\dots (3)$$

The first day trading premium is defined as $[(P_1 - P_i) / P_i] * 100\%$

where:

P_1 = closing price of shares on the first day of trading

P_i = issue price of shares.

The number of IPOs is defined as the number of new listings for each year during the study period. Information is obtained through the *Sharemarket Review* and *Fact Book* issued by the New Zealand Stock Exchange (NZSE, 1989-1995, 1995-2001).

Using forecast profit as the denominator, two statistical measures incorporating relative error were chosen as indicators in this study: the absolute relative error and the signed relative error. Their definitions are as follows:

(1) Forecast Accuracy: Absolute relative error

$$ARE = \frac{|Actual \text{ Profit} - Forecast \text{ Profit}|}{|Forecast \text{ Profit}|} \dots\dots\dots (4)$$

⁵ Although directors are arguably not management, they may, however, play a role in monitoring management's performance and action (Fama and Jensen, 1983) and their holdings therefore act as a signal of credibility. For this reason, directors' holdings are included in the measure of managerial ownership.

(2) Forecast bias: Signed relative error

$$SRE = \frac{Actual\ Profit - Forecast\ Profit}{|Forecast\ Profit|} \dots\dots\dots (5)$$

Data Collection

The sample population of the study consists of New Zealand companies making initial public offerings between 1 January 1987 and 31 December 2001. Companies newly listed on the New Zealand Stock Exchange (NZSE) during this 15-year period are identified from various sources.. As a result, a total number of 159 IPOs are identified. A number of companies are excluded from the study, resulting in a final sample of 72 companies.

5. Data analysis and results

Descriptive statistics for the dependent variable – level of disclosure - are reported in terms of the three financial statements, namely, statement of prospective financial performance, statement of prospective financial position and statement of prospective cash flow⁶. They are shown in Table 6-1. For the statement of prospective financial position, FRS-29 recommends that five items be disclosed. The mean score for recommended items disclosed is 3.94, with a median of 5. The mean score for items disclosed that are not recommended by FRS-29 is 2.85, with a median of 3. The mean score for all items disclosed in the statement of prospective financial position, both recommended and not recommended by FRS-29, is 6.79, with a median of 7, ranging from 0 to 14 items. For the entire period of the study, the median of the ratio of TSR to the total items recommended by FRS-29 is 75% (mean = 68.85%).

⁶ Most of the sample companies examined in the study did not provide a statement of movements in equity. This financial statement is therefore omitted from the calculation of disclosure scores.

Table 5-1. Descriptive Statistics for the Dependent Variable – Level of Disclosure ⁷							
A. Statement of prospective financial performance (7 items are required)	Sample	Total score	Min.	Max.	Standard Deviation	Median	Mean
(a) Items disclosed that are recommended by FRS-29	72	317	0	7	1.36	4	4.4
(a1) Items disclosed that are not recommended by FRS-29	72	260	0	11	2.95	3	3.61
(a2) All disclosure items	72	577	0	16	3.63	8	8.01
B. Statement of prospective financial position (5 items are required)							
(b) Items disclosed that are recommended by FRS-29	72	284	0	5	1.70	5	3.94
(b1) Items disclosed that are not recommended by FRS-29	72	205	0	11	2.29	3	2.85
(b2) All disclosure items	72	489	0	14	3.16	7	6.79
C. Statement of prospective cash flows (4 items are required)							
(c) Items disclosed that are recommended by FRS-29	72	188	0	4	1.89	4	2.61
(c1) Items disclosed that are not recommended by FRS-29	72	17	0	5	0.78	0	0.24
(c2) All disclosure items	72	205	0	9	2.19	4	2.85
Total scores of disclosure items recommended by FRS-29 for the three statements (TSR)	72	789	2	16	3.42	12	11
Ratio of total scores of disclosure items recommended by FRS-29 to total recommended items {TSR/(7+5+4)}	72	49.3	0.13	1	0.21	0.75	0.69
Total scores of disclosure items not recommended by FRS-29 (TSV)	72	482	0	19	4.48	6	6.69
Total scores of disclosure items recommended and not recommended by FRS-29 (TSRV)	72	1271	2	31	6.46	18	17.65

5.1 Results of Hypothesis Testing

The disclosure level measured by TSV is positively related to sales turnover at a significance level of $p \leq 0.05$ ($r = 0.243$, $p = 0.020$). Furthermore, the evidence from the test of the relationship between the disclosure level and total assets shows that TSV are positively related to total assets at a significance level of $p \leq 0.01$ ($r = 0.330$, $p = 0.002$). This implies that companies with more total assets tend to *voluntarily* disclose more prospective financial information. The disclosure levels measured by TSRV are also positively related to sales turnover at a significance level of $p \leq 0.05$ ($r = 0.224$, $p = 0.030$) and to total assets at a significance level of $p \leq$

⁷ Because of rounding errors, the sum of separate items may sometimes differ from the total.

0.01 ($r = 0.301, p = 0.005$). The results indicate that IPOs with higher sales turnover and larger total assets tend to disclose significantly more prospective financial information in prospectuses than those with lower sales turnover and smaller total assets. Accordingly, the evidence supports the alternative hypothesis H_{a1} .

A negative correlation is observed between leverage and TSR, indicating that IPOs with higher leverage disclose fewer items recommended by FRS-29. However, there is a positive relationship observed between TSV, indicating that IPOs with higher leverage disclose more items that are not recommended by FRS-29. A positive relationship is also observed between TSRV and leverage. The above relationships, however, are not statistically significant, which is consistent with the findings by Raffournier (1995), who finds no significant relationship between the extent of disclosure by Swiss listed companies and leverage. Accordingly, there is not sufficient evidence to support the alternative hypothesis H_{a2} .

The TSR is positively related to managerial ownership at a significance level of $p \leq 0.01$ ($r = 0.354, p = 0.005$). This indicates that IPOs with higher percentages of managerial ownership disclose more items of prospective financial information recommended by FRS-29 than those with lower percentages of managerial ownership.

However, a negative relationship exists between TSV and managerial ownership, indicating that IPOs with lower percentages of managerial ownership voluntarily disclose more prospective financial information. The relationship is not statistically significant, however. The evidence thus supports the alternative hypothesis H_{a3} , which states that disclosure levels of prospective financial information in prospectuses are positively related to managerial ownership, for TSR, but not for TSV and TSRV.

Rate of return is found to have no significant relationships with any of the three measures of the level of disclosure: TSR, TSV and TSRV. However, it is interesting to note that the coefficient of the relationship between rate of return and TSV is negative, indicating that when the rate of return is low, companies tend to disclose more prospective financial information than that recommended by FRS-29. This contradicts the findings of Singhvi and Desai, 1971, who found a positive relationship in the univariate analysis.

Profit margin is found to have a negative relationship with all of the measures of level of disclosure, indicating that when the profit margin is lower, companies tend to disclose more prospective financial information. However, the relationships are not statistically significant. Therefore, there is insufficient evidence to support the alternative hypothesis H_{a4} , which states that disclosure levels of prospective financial information in prospectuses are positively related to profitability.

There is a positive relationship between first day trading premium and the level of disclosure measured as the TSR ($r = 0.133, p = 0.388^8$), indicating that IPOs disclosing more items of prospective financial information recommended by FRS-29 tend to have a higher first day trading premium. However, the relationship is not statistically significant. The same positive relationships are obtained between first day trading premium and the level of disclosure measured as the TSV ($r = 0.071, p = 0.647$) and the level of disclosure measured as the TSRV

⁸ Pearson correlation, 2-tailed, N=44.

($r = 0.123$, $p = 0.427$). However, the relationships are not statistically significant. Therefore, there is not sufficient evidence to support the alternative hypothesis H_{a5} , which states that disclosure levels of prospective financial information in prospectuses are related to first day trading premium.

The results of the Kruskal-Wallis tests show that there are significant differences between years with different numbers of IPOs in the level of disclosure measured as the TSR at a significance level of $p \leq 0.001$ ($p = 0.001$). The TSRVs are also significantly different between years with different numbers of IPOs at a significance level of $p \leq 0.01$ ($p = 0.002$). However, there are no significant differences in terms of TSV between years with different numbers of IPOs. Therefore, the evidence supports the alternative hypothesis H_{a6} , which states that disclosure levels of prospective financial information in prospectuses are positively related to the number of IPOs between years for TSR and TSRV, but does not support the hypothesis for TSV.

Kruskal-Wallis one-way Analysis of Variance (N=72)			
Grouping Variable: Number of IPOs			
	TSR	TSV	TSRV
Chi-Square	26.703	12.679	24.584
df	8	8	8
Asymp. Sig.	0.001	0.123	0.002
^a Data are not available for 1988 and 1990.			

There is a negative relationship between the level of disclosure measured as TSR and the accuracy of profit forecasts at a significance level of $p \leq 0.05$ ($r = -0.220$, $p = 0.033$), indicating that IPOs with more items disclosed as recommended by FRS-29, have more accurate forecasts and less forecast errors. However, this negative relationship is not statistically significant between the level of disclosure, measured as TSV and TSRV, and forecast accuracy. Therefore, the evidence supports the alternative hypothesis H_{a7} , which states that disclosure levels of prospective financial information in prospectuses are negatively related to forecast accuracy only for TSR, but not for TSV and TSRV.

A positive correlation is observed between the three measures of disclosure levels of prospective financial information (TSR, TSV, TSRV) and forecast bias, indicating that companies that disclose more prospective financial information, whether the items are recommended or not by FRS-29, are associated with pessimistic forecasts. In other words, companies that disclose more prospective financial information, tend to under-estimate their profit forecasts. However, the relationships are not statistically significant. Therefore, there is not sufficient evidence to support the alternative hypothesis H_{a8} , which states that disclosure levels of prospective financial information in prospectuses are positively related to forecast bias.

6. Conclusion

The results indicate that the disclosure level of prospective financial information, measured by the TSR, is significantly related to managerial ownership and to forecast accuracy, indicating that companies with higher levels of disclosure tend to have a higher percentage of managerial ownership and their forecast errors are lower.

The TSR is also found to be significantly different between years with different numbers of IPOs. However, other variables, including company size, either measured by sales turnover or total assets, leverage, rate of return, profit margin, first day trading premium and forecast bias were not found to be significantly related to the TSR.

For level of disclosure measured by TSV, sales turnover and total assets, both of which measure company size, were found to be statistically significant, with positive coefficients. The positive relationship between the level of disclosure and company size shows that companies with higher sales turnover or more total assets are likely to disclose more prospective financial information that is not recommended by FRS-29. The remaining independent variables do not have a significant relationship with the TSV.

When examining the relationship between level of disclosure measured by TSRV, with the independent variables, sales turnover and total assets are found to be positively, significantly related to the total scores of prospective financial information. The level of disclosure is also significantly different between years with different numbers of IPOs. The other independent variables are not found to be significant.

Companies disclose, on average, 75% of the items of prospective financial information recommended by FRS-29 in their prospectuses. This implies a reasonable level of compliance. Nevertheless, larger companies tend to disclose less recommended prospective financial information than smaller companies, when other factors are also considered. This suggests that there may be a need for an incentive to improve the levels of disclosure for larger companies.

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Liquidity Discount in Valuing Unlisted Targets—Japanese M&A Market Evidence

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ABSTRACT

This paper examines 615 merger and acquisitions of Japanese publicly listed and unlisted targets over the period of 2004 – 2009 and tests how M&A or IPO market conditions, industry characteristics, and target financial performance affect liquidity discounts of the unlisted target. Using 6400 paired samples and controlling target information asymmetry, bidder's agency problem, and "value of control" variables such as target firm size, relative firm size between bidders and targets, and methods of payment, the acquisition discount still exists and can be attributed to illiquidity of unlisted targets. Besides, the liquidity discount is negatively correlated with IPO & M&A market volumes and target's profitability. Especially during 2007-2009 post global financial crisis period, liquidity discount increases owing to decreased liquidity supply measured by IPO volumes. More importantly, notwithstanding the general findings that acquisition discount is positive for all industries, I observe that the acquisition discount for financial industry is the smallest and for Construction industry is the largest. Apparently, the market rewards private targets with high asset liquidity and operating flexibility, thus the liquidity discount is smaller.

JEL: G34

Keywords: liquidity discounts; unlisted targets; acquisition discounts, multiples

1. Introduction

How liquidity affects the target valuation is interesting and important questions in Finance, but few studies are existent. From the target point of view, private owners want to cash out for liquidity reasons (Fuller, Netter and Stegemoller, 2002; Faccio and Masulis, 2005; Poulsen and Stegemoller,

2006) and may even be willing to accept a price discount upon selling (Officer, 2006). From the bidder's point of view, she is using liquid cash and/or her tradable shares to acquire nontraded assets of the private firms, bidder will ask for liquidity discount on unlisted target valuation. Empirically, Koeplin, Sarin and Shapiro(2000) document that private firms are acquired at an average 20-30% discount relative to similar public companies when using earnings multiples as the basis for valuing the transactions. Officer (2007) also document an average 15% to 30% acquisition discounts for stand-alone private firms and subsidiaries of listed firms. Looking at the literature to measure the liquidity discount, Kaplan and Ruback (1995), Kim and Ritter(1999) suggest that comparing unlisted targets to comparable listed targets provides more powerful evidence on the liquidity discount in acquisitions of unlisted targets. Kaplan and Ruback (1995) find that this technique provides lower average

valuation errors in highly leveraged transactions than the traditional comparables approach. Koeplin, Sarin, and Shapiro (2000), Officer(2007) adopt similar approach by comparing acquisition multiples for unlisted targets to acquisition multiples for portfolios of comparable (industry- and size- matched) publicly traded targets.

Notice that previous papers argue liquidity discount is constant or between a range, but have not shown what cause the change of liquidity discount. To fill up the void, I examine, in this paper, 614 Japanese mergers and acquisitions of unlisted targets over the period of 2004 – 2009 and evaluate liquidity discount and study what affect liquidity discount. This paper not only documents the average acquisition discount, but also demonstrates how these discounts vary with the need for liquidity and the availability of liquidity. Thus, the link between liquidity and acquisition discounts is made clearer. Unlike previous studies (i.e. Officer 2007), this paper present the possible influence of industry factor on liquidity discount. I expect that unlisted target at industries (such as financial industry) with liquid assets and operating flexibility has lower liquidity discount. To the contrary, unlisted target at industries (such as construction and industrial industry) with illiquid assets and less operating flexibility have higher liquidity discount.

Why I select to study Japan market? The previous studies usually focus on US data. Asian equity market structure is apparently different from US market, especially the high percentage of equity investors are individuals, comparing with US institutional investor driven market. Individual investors are tend to trade too much and needs high liquidity, thus I expect liquidity needs will be stronger in Asia, which implies higher liquidity discount. The previous US data empirical finding might not apply to Asia market. Secondly, Owing to data availability, Merger and Acquisition deals, especially for unlisted target firm data, are few in Asia (e.g. in Taiwan, there are only 53 public target cases and 13 private target cases with valuation multiples data since 2000), With enough Japan data, I can get statistic meaning results. The period 2004 to 2009 is selected is based on two considerations: to make sure I can have enough paired unlisted and listed target valuation multiple data. Before 2004, Only few data available; Secondly, I expect to see if liquidity discount change before and after recent 2007 global financial crisis. I expect the liquidity needs will increase and IPO market diminish after financial crisis, which means higher liquidity discount.

I develop testing hypotheses in Section 1. Data and methodology to be used for tests are discussed in Section 2. Section 3 provides empirical results and Section 4 covers some robust tests. Section 5 concludes the study.

2. Hypothesis development

The owner(s) of an unlisted firm cannot trade their equity easily: for private firms the obvious alternative to selling to another company is to undertake an IPO (Poulsen and Stegemoller, 2005) . All of these alternatives entail substantial transaction costs (out-of-pocket costs of offering securities to the public, and any underpricing of the securities sold), and the sale process for unlisted firms can be opaque (Fuller, Netter, and Stegemoller, 2002). This suggests that unlisted firms will sell at a discount to comparable listed

firms in the mergers and acquisitions market This intuition is formalized in the hypothesis below:

H1: On average, unlisted targets sell at discount to (or at a lower premium over “fair value” than) comparable listed targets.

The bargaining position of the owners of an unlisted firm should be affected by their need for liquidity and the availability of alternate sources of liquidity (Shleifer and Vishny (1992)). In other words, if the sale prices of unlisted targets reflect a discount for the liquidity provided by the buyer (H1), then the provision of liquidity should be relatively more valuable both when the seller’s need for liquidity is the greatest and when capital market conditions make obtaining liquidity from other sources more difficult. This leads to the following three related hypotheses:

H2a: Unlisted targets sell at a greater discount to comparable listed targets when the target’s pre-sale financial condition is worse (fire sales) and needs of liquidity increase.

H2b: Unlisted targets sell at a greater discount to comparable listed targets when target is at industry with less liquid assets. Other things being equal , liquidity discount is different across various industries.

H2c: Unlisted targets sell at a greater discount to comparable listed targets when IPO market conditions make alternate sources of liquidity more difficult or costly to obtain.

There are various alternative interpretation of acquisition discounts for unlisted targets. Information asymmetry argument is the one. Acquisition discounts may reflect the unwillingness of buyers to pay too high a premium for assets sold in an opaque information environment such as that which surrounds private companies (Hansen (1987), Martin (1996)). For private target, cash payment method signals that target information asymmetry problem is minimal to the acquirer, thus acquisition price is not necessary to be adjusted downward. Besides, management agency problem hypotheses might explain acquisition discount. Bidders in acquisitions of unlisted targets are substantially smaller than bidders acquiring publicly traded firms. If large firms are more likely to experience agency problems and hubris in takeover bidding (Jensen, 1986; Roll, 1986), it is possible that acquisition discount for unlisted targets reflects “better” bidding activity by smaller target firms (Moeller, Schlingemann, and Stulz, 2004) rather than liquidity discount. I use relative size between acquirer and target as proxy for bidder’s agency problem. The management agency problem theory implied negative relationship between acquisition discount and relative size. The third other explanation to acquisition discount is The Value of Control hypothesis. It suggests that acquirers will be willing to pay more if they expect higher possibility of post- takeover target performance improvement. This paper uses target ROA minus acquirer ROA to measure relative profitability between acquirer and target to control the effect of ‘value of control’. Higher ROA difference means targets have higher ROA, implies lower “value of control”. Thus, higher unlisted target acquisition discount is expected.

The above arguments lead to the following three related hypotheses:

H3a: the acquisition discount for unlisted firms is still apparent after controlling target size, relative size of acquirer and target, proxies for target information asymmetry and management agency problem.

H3b: Acquisition discount will still exist in cash merger and acquisition deal, which reveal small target information asymmetry problem.

H3c: Acquisition discount will still exist after controlling relative profitability between acquirer and target.

I use relative size, target size and method of payment as proxies for information asymmetry and management agency problems. After controlling these effects, liquidity discount can be properly estimated.

2. Data and empirical methods

2.1 The samples

The sample of acquisitions in this paper comes from the Zephyr Japanese Mergers and Acquisitions Database. I select samples data from the Zephyr database according to the following rules: (1) both the acquirer and the target are Japanese firms. The deals are either Merger or Acquisition. There are 1334 deals. (2) to avoid information asymmetry problem, we delete the deal value is below 1 million US dollars, (3) since there is few private target deals before 2004, for statistical meaning, I select takeover completion year lies between 2004 and 2009. There are 848 deals. (4) I also delete deals without asset or sales or all of four acquisition multiples information at the database. (5) If EV/Sales is bigger than five, the transaction is also deleted. My screening yield 615 acquisitions include 128 unlisted targets and 487 listed targets.

2.2 Measuring acquisition discounts

I use the Kaplan and Ruback(1995) “comparable industry transaction method” to calculate acquisition discounts. The comparable industry transaction technique is implemented in the following way. For each of 128 unlisted target firm, I form comparable listed targets, where comparable acquisitions are listed targets and completed within the same two year moving window and belong to the same industry SIC group, the same country (Japan). Using two-year moving window and public comparables with replacement approach, I can generate enough listed comparables to avoid small samples problem and get statistic explanatory power. There are 6400 paired comparables for 615 unlisted targets. each unlisted target has at least 10 listed comparables to avoid outlier problems.

I use four acquisition multiples such as deal value to sales, deal value to EBITDA, deal value to EBIT, or deal value to target asset to catch various value drivers of target valuation. I compute acquisition discount as the percent difference between the acquisition multiples for the unlisted target and the average corresponding multiple for the paired listed targets. Based on the four valuation multiples, I calculate equally weighted average of the estimates produced by the individual multiples as the acquisition discount. Using simple average of the individual multiples assumes equal importance of the four multiples in capturing target value. The reason for the equally weighted average

construction is two-fold. First, these proxies likely capture different facets of target firm value. Consolidating them into a single variable can hopefully come up with a “richer” measure of liquidity discount. Equally weighted average construction also helps to maximize the regression sample size as we do not have all four multiples in some cases and the average so constructed is based on available multiples. Because of outliers in acquisition multiple data, the acquisition discount estimates are truncated: estimates larger than one are discarded from the sample (the implicit lower bound of 1).

3. Data description and Analysis

Table 1a shows the yearly distribution of our sample and its degree of representation of the whole merger and acquisition transactions. The percentage of samples to population is 45.15%. Samples percentage for listed target transactions is little higher than for unlisted target transaction. This result is as expected, since unlisted target data is less available to the public, especially for the most recent year 2009 year, sample presentation percentage is the lowest (9%). The number of listed target and unlisted target transactions are nearly equal., which is different from US data (2/3 transactions are private target transactions). Table 1b shows the sample distribution across calendar year and industry SIC code grouping. Most samples are clustered on recent years, the same as population transactions concentration. Looking at transaction SIC distribution, there is no apparent industry clustering. **(Insert Table 1 here)**

Table 2 shows firm and deal characteristics difference between listed target and unlisted target transactions. The firm size (in tem of log of asset and operating sales) of unlisted targets are usually smaller to acquiring firms. Target firms are performed worse than acquiring firm, but unlisted target firms perform better than listed targets. The acquirer of unlisted targets perform better than acquirers of listed targets. This evidence seems to support bidder’s management agency problem hypothesis. That is, managers of poor-performing firms tend to acquire listed targets (their performance is poorer than unlisted targets) to enhance their own benefit. Unlisted target transactions tend to be controlled-shares transaction, which implies higher acquirer “value of control” and means that acquirers can accept lower acquisition discount.

(Insert Table 2 here)

Table 3 shows the calculated average and median of paired samples’ acquisition discounts grouped by 2-years windows and four valuation multiples. Looking at average acquisition discount, the median is - 0.41 and mean is -0.29. While comparing with Koeplin, Sarin, and Shapiro (2000) findings, the discount is higher (their paper’s four multiples discounts median are 0.79%, -30.62%, -18.14%,and -7%). The higher acquisition discount in Japan takeover market is not only attributed to liquidity issues and might be related to Japan unlisted target’s higher degree of information asymmetry, other risk factors, or different accounting principles between US and Japan.**(Insert Table 3 here)**

4. The Relationship between acquisition discounts and the need for, or availability of liquidity

Acquisition discount is cause by liquidity factors and non-liquidity factors. After controlling non-

liquidity factor effects, the correct liquidity discount can be estimated. The regression model is as follows:

$$\text{Average liquidity discount} = f(\text{liquidity variables, non-liquidity variables});$$

Liquidity variables include industry SIC code (as dummy variable), Target log(ROA), Target log(Sales), IPO market condition (for each of five two-year windows, we rank from 1 (the coolest period) to 5 (the hottest period) according the rule: if the IPO volume is larger than historical IPO volume, the period is defined as “hot”market period; if the IPO below the median, the period is defined as “cool market period”, M&A market condition (ranking approach is same as IPO market period approach). Non-liquidity factors include Target firm size (proxied by log Asset and log Sales), relative size, and relative performance.

Table 4 shows variables correlation matrix. Only looking at correlation coefficients larger than 0.5, there are three findings: (1) positive correlation between Target ROA and ROA difference, (2) positive correlation between log(Asset) and log(sales), (3) Interestingly, negative correlation between IPO market condition and M&A condition. It seems IPO markets and M&A market become close liquidity substitutes. While IPO markets diminish or IPO is costly, Japanese unlisted targets use M&A to go public, vice versa. While we run regression next section, I will only avoid put these highly=correlated variables as independent variables at the same equation to avoid possible multi-collinearity problem. **(Insert Table 4 here not shown here owing to 10 pages limitation)**

Tables 5 shows the regression results. First of all, industry factors affect level of acquisition premium--the intercept (which stand for less-liquid construction industry) is significantly negative and lower discount for financial industry which operating asset has much more liquidity. Second, unlisted targets with higher profitability (proxied by ROA) have lower liquidity discount since these firms have low liquidity needs. The last, when IPO market condition is “hot”, the supply of liquidity is rich, thus liquidity discount is lower. The negative relationship is statistically supported.

About explanatory power of non-liquidity variables, the results support that target size (as expected signed, but not significant), relative performance (as expected signed and significant), % stake acquired (as expected signed and significant) have influence on acquisition discount. **(Insert Table 5 here)**

At last, this study uses two stage OLS regression approach to test, after controlling non-liquidity effects, if the tested liquidity variables still have influence on acquisition discount. First, we run regression on acquisition discount using only non-liquidity variables as explanatory variables, then the estimated residuals from the first OLS is used as dependent variables in regression equation using only liquidity variables as explanatory variables. The results are shown as Table 6. The table shows that tested liquidity such as industry factor, firm performance, and liquidity market condition still have their own influence on acquisition discount (as expected signed and significant). While acquisition discounts may reflect factors other than the owner’s need for liquidity, the significant relation between

acquisition discounts and the need for or availability of liquidity implies that acquisition discounts reflect, at least in part, the price of obtaining liquidity by selling an unlisted asset. (Insert Table 6 here --- not shown here owing to 10 pages limitation)

5. Conclusions and implications

This paper examines 615 merger and acquisitions of Japanese publicly listed and unlisted targets over the period of 2004 – 2009 and tests how M & A or IPO market conditions, industry characteristics, and target financial performance affect liquidity discount of the unlisted target. After controlling target information asymmetry, bidder's agency problem, and "value of control" variables such as target firm size, relative firm size between bidders and targets, and methods of payment, the acquisition discount still exists and can be mainly attributed to illiquidity of unlisted targets. Besides, the liquidity discount is negatively correlated with IPO & M&A market volumes and target's profitability. More importantly, notwithstanding the general findings that acquisition discount is positive for all industries, I observe that the acquisition discount for financial industry is the smallest and for Construction industry is the largest. Apparently, the market rewards private targets with high asset liquidity and operating flexibility, thus the liquidity discount is smaller.

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Table 1 Sample representation of all Japanese merger and Acquisition

Panel A: Sample representation

This table presents the yearly distribution of our sample which contains 615 Japanese merger and acquisition deals during the period between 2004 and 2009, which represent 45.15% of overall deals during the period between 2001 and 2009. In the sample, both the acquirer and the target are Japanese firms

Completed YEAR	listed targets			Unlisted targets		
	Number of transactions	number of transactions with acquisition multiples data	% with acquisition multiples data	Number of transactions	number of transactions with acquisition multiples data	% with acquisition multiples data
2000	0			2		
2001	0			16		
2002	14			6		
2003	26			22		
2004	39	27	0.69	27	15	0.56
2005	74	46	0.62	39	15	0.38
2006	91	58	0.64	33	16	0.48
2007	120	92	0.77	71	29	0.41
2008	172	130	0.76	147	29	0.20
2009	196	134	0.68	267	24	0.09
Total	732	487	0.67	630	128	
Total transaction during 2000 to 2009				1362		
This paper's samples size				615		
This paper's samples size %				45.15%		

Panel B: Sample distribution by year and industry SIC code group

	Publicly traded targets	Unlisted targets	Total
Completed YEAR	27		
2004	46	15	15
2005	58	15	15
2006	92	16	16
2007	130	29	29
2008	134	29	29
2009		24	24
SIC Code	21		
15-17	183	10	31
20-39	22	35	218
40-49	105	7	29
50-59	44	28	133
60-67	112	19	63
70-88		29	141
Total			615

Table 2 Sample statistics

This table contains mean, standard deviation, and p-value (mean difference t test) of samples of completed deals of both listed and unlisted targets from the the Zephyr Japanese Mergers and Acquisitions Database. Mergers and Acquisitions database for 1994–2009. Bids are included in the sample if the bid has a deal value of more than \$1 million US dollar targets and acquirers total assets, operating sales, ROA, percentage of acquired shares are reported by Zephyr. Cash is a dummy variable equal to one if the bid is all-cash payment.

	listed target	unlisted target	
log(Target Total assets)			
Mean	2.4453	1.7774	
std dev	0.6650	0.9124	
p value for mean difference two-sided t test		0.0000	***
log(Target operating revenue)			
Mean	2.4730	1.8720	
std dev	0.6260	0.7754	
p value for mean difference two-sided t test		0.0000	***
target ROA - acquirer ROA			
Mean	(0.0378)	(0.0156)	
std dev	0.1587	0.1397	
p value for mean difference two-sided t test		0.0727	*
Relative Size= target asset /acquirer asset			
Mean	0.2593	0.2004	
std dev	0.6138	0.3838	
p value for mean difference two-sided t test		0.1813	
target ROA =after earning earning /asset			
Mean	(0.0212)	0.0081	
std dev	0.1518	0.1218	
p value for mean difference two-sided t test		0.0221	**
acquirer ROA			
Mean	0.0166	0.0237	
std dev	0.0796	0.0663	
p value for mean difference two-sided t test		0.0000	***
% stake acquired			
Mean	51.7542	69.1401	
std dev	31.4151	32.6001	
p value for mean difference two-sided t test		0.0000	***
sample size	480	128	

*, **, *** indicates that the mean in unlisted target category is significantly different from the mean in listed target category at the 10, 5, 1% level using a two-sided t test.

Table 3

Estimates of acquisition discounts of 6400 paired samples grouped by two-years window

This table contains means and medians of estimates of acquisition discounts for the sample of completed merger & acquisition for unlisted targets over the 2004 -2009 period. Acquisition discounts are the percent difference between acquisition multiples (deal value to sales, deal value to EBITDA, deal value to EBIT, or deal value to assets) for an unlisted firm and the multiples for paired industry- and two-year-window-matched comparable acquisitions of listed targets. The comparable acquisition of for each unlisted target is each of acquisitions of publicly traded targets in the same SIC code group as the unlisted target occurring within a two-year window centered on the acquisition completion year for the unlisted target. Because of outliers in acquisition multiple data, the acquisition discount estimates are truncated; estimates larger than one are discarded from the sample (to be symmetric with the implicit lower bound of 1). The average acquisition discount is the per-target equally weighted average of the acquisition discounts computed using the four separate multiples. ***, **, * indicates that the mean or median is significantly different from zero at the 1%, 5%, or 10% levels (respectively), using a two-sided t or Wilcoxon test.

	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
Deal Value /Sale Discount					
Average	-0.19 ***	-0.13 ***	-0.48 ***	-0.39 ***	-0.34 ***
median	-0.44	-0.42	-0.68	-0.61	-0.50
Deal Value /EBITDA Discount					
Average	-0.11 ***	-0.19 ***	-0.11 ***	-0.18 ***	-0.25 ***
median	-0.19	-0.30	-0.29	-0.40	-0.46
Deal Value /EBIT Discount					
Average	-0.32 ***	-0.14 ***	-0.05 ***	-0.16 ***	-0.33 ***
median	-0.47	-0.37	-0.41	-0.50	-0.56
Deal Value /Total Assets Discount					
Average	-0.33 ***	-0.28 ***	-0.37 ***	-0.32 ***	-0.18 ***
median	-0.49	-0.50	-0.57 ***	-0.49	-0.35
Equally-weighted Discount					
Average	-0.29 ***	-0.23 ***	-0.37 ***	-0.32 ***	-0.26 ***
median	-0.38	-0.32	-0.51	-0.46	-0.36
Number of Pairs	366	516	1164	2210	2161

Table 5 Regression Results

	(1) only liquidity variables	(2) All variables	(3) without correlate d variables	(4) with cash payment variable	(5) add cash variables and no correlated variables
Liquidity variables					
Intercept	-0.0311	-0.1157	-0.2926 ^{***}	-0.1124	-0.28795 ^{***}
SIC20to39	0.0789 ^{**}	0.1158 ^{***}	0.1019 ^{**}	0.1157 ^{***}	0.101781 ^{***}
SIC40to49	0.0964	0.1079	0.1146	0.1090	0.116402
SIC50to59	0.0051	-0.0016	0.0223	-0.0013	0.022791
SIC60to67	0.2030 ^{***}	0.3002 ^{***}	0.2254 ^{***}	0.3007 ^{***}	0.226593 ^{***}
SIC70to88	-0.0330	-0.0167	-0.0250	-0.0160	-0.02376
target ROA =after earning earning /asset	-0.2292 ^{***}	-0.5687 ^{***}	-0.5128 ^{***}	-0.5662 ^{***}	-0.51752 ^{***}
MA market hot ranking 5 is the highest	-0.0546 ^{***}	-0.0422 ^{***}		-0.0423 ^{***}	
IPO market hot ranking 5 is the highest	-0.0476 ^{***}	-0.0450 ^{***}	-0.0125 ^{**}	-0.0451 ^{***}	-0.50867 ^{***}
non liquidity variables					
log(Target Total assets)		-0.2235 ^{***}	-0.0178 [*]	-0.2236 ^{***}	-0.01246 ^{**}
log(Target operating revenue)		0.2212 ^{***}		0.2207 ^{***}	-0.01874
target ROA - acquirer ROA		0.4372 ^{***}	0.3273 ^{***}	0.4372 ^{***}	0.327813 ^{***}
Relative Size= target asset /acquirer asset		-0.0012 [*]	-0.0011 [*]	-0.0012 ^{**}	-0.00106
% stake acquired		0.0004 ^{***}	0.0003 [*]	0.000417 ^{***}	0.000322
if cash deal 1 or 0				-0.00765	-0.01319
Adjusted R square	0.0193	0.0338	0.0210	0.0335	0.0207
Number of observation	6400	6400	6400	6400	6400

***, **, * denote significance at the 0.01, 0.05, and 0.10 level, respectively.

Financial reforms in Indonesia and South Korea in 1980s and early 1990s: Policies and Outcomes

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ABSTRACT

This paper examines financial liberalisation in Indonesia and South Korea during the 1980s and early 1990s. The paper provides a brief discussion of a pre-reform political and economic environment in two countries, followed by a description of the state of the pre-reform financial sectors in both countries. The paper then focuses on the respective financial development policies and their pace, sequencing and outcomes in the two nations. The socio-economic impact of financial sector reforms is also carefully considered. The paper concludes by summarising its main findings and drawing out some major policy implications.

Introduction

In this paper, we re-visit the experiences of two developing countries that underwent relatively successful financial reforms in 1980s and early 1990s. The Indonesian financial development programme over the period 1983 to 1992 aimed to transform the country's financial system as a part of a wider economic renewal programme that included reform of the taxation system, international trade regulation and governance. The programme was adopted in response to the deteriorating economic situation, particularly in the oil industry – Indonesia's major export - and was intended to strengthen the economy through greater diversification (Chant & Pangestu 1994).

The South Korean programme of reforms over the time period 1981 to 1992 represents a unique example of how a carefully designed and gradual path of economic and financial reform can bring growth and prosperity. South Korea (hereafter Korea) chose an export-oriented strategy of economic development, putting substantial resources into priority sectors. A notable feature of the Korean path is its so-called 'one-side openness', which implied active export of Korean goods simultaneously accompanied by restrictive import policies.

The pre-reform environment in these countries differed substantially; nevertheless the purpose of reforms has been similar: to develop a modern financial system that would efficiently cater for the needs of the economy and thus contribute to economic growth. The scope of the reforms has also been analogous. What differed in each case were the pace and the sequencing of the reforms. Accordingly, an examination of the experiences of financial reform in these countries should teach us important lessons and hopefully assist policymakers in tailoring the optimal pace and the key elements of sequencing of financial reforms for their respective countries.

The novelty of this paper resides in the way in which we illustrate the proposition that the success of the financial development programmes is clearly linked with ability of policymakers to design and implement wider economic reforms in which financial development plays an important role.

The paper itself consists of five main sections. Section 2 looks at pre-reform political and economic environment in two countries. This is followed by description of the state of pre-reform financial sectors in both countries in section 3. Section 4 examines their respective financial development policies and their consequences. Section 5 discusses the socio-economic impact of the reforms. The paper ends in section 6 with some brief concluding remarks.

Pre-reform political and economic environment

Political history in Indonesia over last three decades of 20th century was dominated by the late General Suharto, who came into power in 1966 as a result of a military coup. Suharto adopted the term 'New Order' to designate his system of authoritarian rule. The New Order lasted until his forced resignation in 1998. In contrast, the political establishment of Korea since the Korean War in 1950-53 and until 1993 was dominated by military leadership. The political systems of both countries during these periods were stable, thus providing a good foundation to undertake major economic reforms.

The average rate of growth of the Indonesian economy was 8 per cent per annum over the period of 1971 to 1980. Oil revenues accounted for 70 to 80 per cent of government revenues and 80 per cent of exports in the late 1970s, when the decision was made to diversify economy by attracting investments to the non-oil production sector. Domestic savings were 23.8 per cent of GDP during the period of 1971-75, with 5-6 per cent higher rates towards the end of 1970s. Savings were generated largely by the oil revenues accruing to the government, and resources were redistributed to its priority sectors. Investment rates were similar to savings rate levels over 1971-1975, but around 5 percent lower than the rate of savings in 1976-1980. The efficiency of these investments, however, was low (Bisat, Johnston & Sundararajan 1999). The inflation rate was high, though gradually falling in the 1970s, only to rise again in 1979 to 1981. Indonesia has implemented pegged exchange rate arrangements for its currency (the rupiah) since 1971. Initially, the US dollar was chosen as the peg currency and the rate was fixed at 415 rupiahs per US dollar. However, in 1978, following the example of Singapore and Malaysia, it was decided to peg the rupiah to a basket of currencies of major trading partners. However, on a number of occasions the government used currency devaluations as a policy response to external shocks.

GDP per capita has remained low, although rising over the decade from US\$245 to US\$417. Similarly, life expectancy was relatively low in 53-56 years range, gradually rising toward the end of the period.

In the early 1980s, the price of oil, Indonesia's main export, began to fall, thus creating macroeconomic imbalances in the economy. As a result, the government decided to undertake macroeconomic adjustment and to reduce its dependency on oil through export diversification. Moreover, it undertook financial system reforms aimed at increasing domestic savings and expanding involvement of private financial institutions in financing the country's economy (Juoro 1993).

Korea used detailed five-year plans as a benchmark for economic management. Initially, in the 1960s, Korea decided to concentrate on development of labour-intensive production of light manufactured goods with subsequent exports all around the world. Initially, this strategy paid off well with good rates of economic growth and low unemployment. However, in early 1970s, the government realised that increased competition from other Asian countries and protectionist measures from industrialised countries could ruin its growth achievements. Therefore, it decided to re-orient all efforts in developing competitive heavy and chemical industries and export high-value-added goods to the world market. Moreover, policy makers believed that promoting the heavy and chemical industries could assist in the development of local defence industries and thus reduce the reliance on the US troops stationed in Korea. To assist the development of these industries, the government intervened in resource allocation through taxation, finance and restrictions on imports (Yoo & Moon 1999).

To protect infant industries and support their quick development, the Korean government imposed large tariffs in those sectors and provided policy loans on preferential terms. Moreover, substantial tax incentives were introduced for priority industries that included iron and steel, nonferrous metals, shipbuilding, general machinery, chemicals, and electronics. At first, this policy provided sound returns in terms of economic growth of over 8 per cent. However, the policy led to a disproportionate distribution of resources and to macroeconomic imbalances. Firstly, priority sector resource allocations were often made at the expense of non-favoured industries. Secondly, since smaller companies could not potentially handle the capital requirements of the priority projects, those projects were granted to large business groups, contributing to a high concentration of economic power. Thirdly, a booming credit expansion to the priority industries caused a rapid growth in money supply, causing inflation to rise over the 20 per cent mark in 1980. Since real interest rates remained low, inflation made financial savings less attractive reducing the domestic savings ratio from over 28 per cent in 1978 to under 24 per cent in 1980 (Nam 1994).

The oil shock of 1978 exposed structural weaknesses in the Korean economy and economic growth declined to a negative level in 1980. Moreover, chronic overcapacity and underutilisation caused by excessive competition and overinvestment in the heavy and chemical industries led to high inflation and foreign debt (Shin & Ha 2002). In response, the government introduced a number of measures to return to a high-level of economic growth. A flexible exchange rate was introduced to replace the peg to the US dollar. Measures to combat wage, dividend and interest rate hikes helped to reduce the current account deficit and inflation. Furthermore, gradual removal of subsidies and tax benefits to heavy industries coupled with a reduction of tariffs was implemented. Finally, the liberalisation measures to improve efficiency of financial sector took off.

In 1970-1980, Korea remained middle-income economy with GDP per capita rising from US\$2253 to US\$3558. Similarly, life expectancy rose from 63 years at the beginning of the decade to 67 years at the end. The comparative statistics of the key economic and social variables 1971-1982 are presented in Table 1.

Table 1. Key economic and social indicators in the pre-reform period

Indicator	5-year average		Annual average					
	1971-75	1976	1977	1978	1979	1980	1981	1982
GDP growth, %								
Indonesia	8	6	9	9	7	9	8	1
Korea	7	11	10	9	7	-1	6	7
GDP per capita (constant 2000 US\$)								
Indonesia	275	313	333	355	372	397	420	417
Korea	2253	2709	2934	3158	3322	3221	3367	3558
GDP per capita (PPP, 2005 international US\$)								
Indonesia	na	na	na	na	na	1351	1432	1420
Korea	na	na	na	na	na	5176	5410	5717
Gross domestic savings to GDP, %								
Indonesia	24	27	29	27	33	38	32	29
Korea	19	25	28	29	29	24	24	26
Investment to GDP, %								
Indonesia	24	24	23	24	25	24	27	28
Korea	27	27	29	33	36	32	30	29
Inflation, %								
Indonesia	20	20	11	8	16	18	12	9
Korea	15	15	10	14	18	29	21	7
Exchange rate,								
Indonesia, Rupiah/USD	415	415	415	442	623	627	632	661
Korea, Won/USD	405	484	484	484	484	607	681	731
Unemployment (% of labour force)								
Indonesia	na	na	na	na	na	na	na	3
Korea	na	na	na	na	na	5	4	4
Life expectancy (Years)								
Indonesia	na	53	na	na	55	na	56	na
Korea	63	na	65	na	65	66	66	67

Source: World Bank Development Indicators Online, International Financial Statistics Online databases and the author's calculations

Main characteristics of the pre-reform financial sectors

Since taking power in 1966, the Indonesian New Order government took steps to reduce its control over the extremely centralised financial system. In 1967, foreign banks were allowed into the market, but with

substantial restrictions on their operations. In 1968, a separate central bank - the Bank Indonesia - was established.

In 1974, a programme of direct credit control and allocation was introduced by the Bank Indonesia. Initially the system of direct credit control was designed to control aggregate money and credit to limit the expansionary pressures caused by the oil boom. Later, however, the system was increasingly used as a mechanism for credit allocation, with detailed ceilings by type of credit, category of assets, previous performance, and aggregate monetary targets (Chant & Pangestu 1994). However, state-owned banks had larger and easier access to priority loans at highly subsidised interest rates. These loans in 1982 amounted to 27 per cent of total loans.

State-owned banks were also subject to deposit ceilings and interest on deposits was often negative in real terms. Foreign and domestic private banks, as well as NBFIs, were free to set their deposit and credit rates. As a result, the share of domestic currency deposits attracted by the state-owned banks fell from 82 to 56 per cent in 1978-1982. Foreign currency deposits were not subject to interest rates control. Consequently, their share in total deposits rapidly grew to 17 per cent in 1982. No private banks had access to foreign exchange licenses due to prohibitive conditions set by the regulators (Bisat, Johnston & Sundararajan 1999; McLeod 1991).

The branch network management policy of all financial institutions was subject to detailed regulations and restrictions depending on the ownership structure of each institution. The interbank money market was small and lacking liquidity.

Prudential regulations and banking supervision were poor until reforms were introduced. Reliable information was lacking and basic regulations on capital adequacy, loan concentration and provisioning, and interest accrual rules were weak. NBFIs were under the supervision of the Ministry of Finance (Bisat, Johnston & Sundararajan 1999).

Money and capital market were underdeveloped. The Indonesian stock market, reopened in 1977, was largely inactive due to complex regulations related to equity issues, including disclosure requirements, minimum dividend rates, and a maximum trading range for most stocks (Beng 1993).

Monetary indicators in Indonesia in the 1970s stood at a level common for economies with a repressed financial sector. For example, the broad money to GDP ratio was a meagre 16.1 per cent. Open market operations as an instrument of monetary policy were largely unused. Instead, monetary policy was based on direct interest controls, credit ceilings, and access to central bank liquidity credits. The effectiveness of the central bank refinancing policy was weak due to the development-oriented objectives of monetary policy and the automatic availability of credit for this purpose (Bisat, Johnston & Sundararajan 1999).

The structure of the Indonesian financial sector in 1979-1983 is summarised in Table 2. Over that period, the financial sector was largely dominated by state-owned banks, which accounted for over 84 per cent of the financial sector assets. The share of the market for private and foreign banks was less than 12 per cent, while non-bank financial institutions accounted for only four per cent.

Table 2. Structure of the Indonesian financial sector

Indicator	Number of institutions		Number of branches	Assets (Rp billion)	Assets (%)
	03/1979	03/1982		1983	1983
Total of financial institutions	>139	215	na	49256	100
Central Bank	1	1	na	20348	41.3
Deposit money banks	127	118	866	27116	55.1
State-owned banks	33	33	685	21308	43.3
Commercial banks	5	5		18570	37.7
Development banks (including regional)	27	27	403	1919	3.9
Savings banks	1	1	282	819	1.7
Private banks	94	85	281	5808	11.8
Foreign	11	11	20		
Domestic	83	74	261		
Non-bank financial institutions	>12	97	na	1792	3.7
Insurance companies	Unknown	83*	na	471	1.0
Other financial intermediaries	12	14	na	1321	2.7

*Data for December 1981.

Source: Beng (1993), Bisat, Johnston and Sundararajan (1999) and McLeod (1991) and author's calculations.

The financial system of Korea before 1980 can be characterised as being highly regulated and controlled by the government in line with its five-year economic plans. The powerful Economic Planning Board (EPB) used the banking system as an instrument of its developmental policies by setting interest rates and directing loans to priority sectors. Moreover, it served as an intermediary between foreign and domestic capital by controlling the inflow of foreign capital (Shin & Ha 2002).

The financial sector was rather versatile and consisted of nationwide, local and specialised banks, branches of foreign banks, a capital market, various non-bank financial institutions, and an active informal credit market. Non-bank financial institutions come to existence in early 1970s and rapidly developed towards the end of decade to complement and compete with banks (Park 1994).

Due to high barriers of entry, the number of local banks remained largely unchanged. However, it was compensated by a substantial expansion of branch networks and increased presence of foreign banks. Nonetheless, foreign banks had substantial restrictions on branch expansion and the range of activities allowed. Banks were used by the government as a mean to finance investments and guarantee foreign investments in the priority sectors (Bisat, Johnston & Sundararajan 1999). The structure of the Korean banking sector in 1975-1985 is summarised in Table 3.

Table 3. Structure of the Korean banking sector

	Number of Banks	Assets (billion won)	Number of Banks	Assets (billion won)	Number of Banks	Assets (billion won)
	1975		1980		1985	
Nationwide	15	2890	38	11938	60	29772
Domestic	6	2485	5	10494	7	26646
Foreign	9	405	33	1442	53	3126
Local	10	na	10	na	10	na
Specialised	6	na	6	na	7	na
Total	31	na	54	na	77	na

Source: Bisat, Johnston and Sundararajan (1999:175) and Park and Kim (1994)

The entry barriers for NBFIs were smaller than for the banking sector and were further relaxed in the mid-1970s to reduce the importance of the informal sector. As a result, the number and variety of NBFIs grew rapidly, but despite all efforts, the informal sector remained active.

The role of the central bank was executed by the Bank of Korea. Its functions included conducting monetary policy and bank supervision. In the conduct of monetary policy, the Bank of Korea largely referred to direct instruments, like interest rates and individual bank credit ceilings, a varied reserve requirement ratio, direct credit allocation to priority sectors and subsidised central bank rediscount operations. Prudential regulations on banks were strict, though to a lesser degree on NBFIs (Bisat, Johnston & Sundararajan 1999).

The interest rate in Korea remained highly regulated. The authorities were trying to keep ceilings on deposit and lending rates in line with the rate of inflation. However, with inflation hitting 29 per cent and 21 per cent in 1980 and 1981 respectively, the real interest rate turned negative in these years. The difference between preferential and non-preferential loan rates remained roughly flat during the period of 1970-1980 and stood within the range of 0.8-1 percent. NBFIs had higher credit ceilings than banks and were also less burdened by limits in charging fees and commission.

Financial sector reforms and their outcomes

Indonesia: 1983-1992

During the period of 1983-1992, Indonesia introduced comprehensive adjustment and liberalisation programmes that included exchange rate devaluations, deregulation of the trade, industry and financial sectors, as well as greater fiscal discipline. The programmes were described by Ariff and Khalid (2005:141) as 'genuine reforms to restructure the economy on a balanced basis'. The reforms were implemented during two main phases.

The first phase of reforms took place during 1983-1985 and represented a partial step towards restoring the market mechanisms. It was intended to improve the efficiency of the financial system by relaxing the constraints

on the activities of existing banks. The reforms included the elimination of the credit ceilings system, the removal of interest rate controls on most categories of deposits and on all loans, except on those refinanced by the Bank Indonesia, and extensive modification of the liquidity credit system. The 1983-1985 reforms effectively eliminated the direct instruments of monetary control used by the central bank. This made it necessary for the authorities to urgently develop the government debt market required for open-market operations. Second stage commenced in February 1984. Bank Indonesia resumed issuing central bank certificates (SBIs) - short-term debt instruments to be used as a main monetary tool. A year later, to improve the liquidity of the money market, a new instrument, banker's acceptances (SBPU), was introduced, and a publicly owned investment company was founded to act as a market maker in the money market (Juoro 1993).

Despite these reforms, competition in the banking sector continued to be constrained in several ways. First of all, entry requirements for new banks were not eased. Therefore the total number of banks changed little over the period 1983-1987. Secondly, the state-owned banks retained monopoly powers over the deposits of state enterprises. Moreover, only state and a handful of large private local banks had access to the foreign exchange business. Lastly, the Bank Indonesia continued to be a major provider of cheap credit, used by financial institutions for lending to the private sector.

A third phase of financial reform commenced in 1988, following a deterioration of the external sector. The main elements of the reform included: (i) lifting barriers for entry by new banks; (ii) permitting unlimited branch expansion to existing local banks that met soundness standards; (iii) extending the limit of branch expansion for foreign banks and NBFIs from one to seven cities; (iv) streamlining foreign exchange licensing procedures; (v) allowing state enterprises to invest up to 50 per cent of their deposits into non-state banks; and (vi) unifying the reserve requirement among various classes of banks and deposits, and reducing it to 2 per cent.

Prudential measures to strengthen the financial system were also included in the reform agenda. Legal limits to a single borrower or a group of related borrowers were introduced; capital requirements were raised; central bank supervision was extended to the rural banks and NBFIs; and a beginning was made with the introduction of a comprehensive supervisory system (Chant & Pangestu 1994).

Since first phase of reforms primarily targeted banking sector, development of capital market has not really progress in early 1980s. The growth of corporate securities market was constrained by reluctance of private corporations to go public prior to substantial reforms in this sector. However, with third phase of reforms, several measures were also taken to improve the money and capital markets. Interest income from bank deposits became subject to a withholding tax, thus removing the privileged tax treatment of bank deposits over other debt and equity instruments. Banks and other NBFIs were permitted to issue shares. The Bank Indonesia organised a network of dealers and agents to trade with SBIs and to act as market makers on the secondary markets. All money market operations of the central bank were to be conducted through this network. In 1990, comprehensive institutional and regulatory reforms were initiated, including the privatisation of the Jakarta Stock Exchange (Bisat, Johnston & Sundararajan 1999).

Korea: 1982-1991

After the economic decline in the early 1980s, Korea launched extensive reforms to bring the economy back to a pattern of growth and reduce the inflation rate. The reform package included currency devaluation, tight monetary policy, strict wage guidelines, and partial liberalisation of administered prices. Moreover, the Korean government introduced macroeconomic stabilisation, financial reform programmes, liberalised the external sector and improved allocation of public investments. The decision to liberalise the financial system was due to belief that the inefficient allocation of financial resources exacerbated imbalances in the economy.

The financial reform package included institutional reforms to encourage competition in the financial sector, further liberalisation of interest rates and credit allocations, wider use of indirect instruments in conducting monetary policy and gradual capital account liberalisation. To promote institutional development, the government eased the regulations related to organisational, budgetary, branching and business practices of the banks. This enabled commercial banks to undertake wider range of activities, including sales of commercial bills, credit cards, sales of government bonds under repurchase agreement, factoring, mutual instalment savings, trusts, negotiable certificates of deposits, as well as the acceptance, discount and sale of trade bills (Oh & Park 1998). In 1981-1983, the government sold its share in all five nationwide banks. Entry barriers for new financial institutions were lowered. Two new nationwide commercial banks were founded in 1982-1983, many finance and mutual savings companies were established, and a number of foreign bank branches were opened.

A number of reforms were implemented in the area of monetary and credit management. In addition to direct monetary tools like rediscount mechanisms, reserve requirement directed credit, and interest rate ceilings, the indirect instrument in the form of stabilisation bond sales started to be developed. Moreover, the direct monetary mechanisms were gradually loosened. In 1981, the central bank unified reserve requirements for all banks and types of deposit and reduced the rate to 3.5 per cent. In 1982, individual credit ceilings of nationwide banks were abolished. Moreover, directed credits to priority sectors were progressively reduced by gradual abolishing preferential rates applying to various policy loans.

Interest rate liberalisation began in 1982 with the reduction of the differential between general and preferential lending rates. Another significant step was taken in 1984, when financial institutions were permitted to set up their lending rates according to their assessment of creditworthiness but within the set range. The set range was gradually widened from 0.5 to 3 per cent. In 1988, the authorities introduced further interest rate liberalisation measures. These included decontrol of most bank and non-bank lending rates, some long-term deposits, interest rates on financial debentures, corporate bonds, asset management accounts and funds and some money market instruments. Rates on some priority loans and short-term deposits, however, were not deregulated. Moreover, the liberalisation measures were not fully implemented due to adverse economic conditions in 1989. The revised the four-phase interest rate liberalisation programme was announced in 1991. According to the programme, the liberalisation was to start with loan rate liberalisation, followed by gradual deposit rate liberalisation. Long-term and large deposits were to be liberalised before short-term and smaller deposits.

The Korean monetary authorities have pursued gradual approach to capital account liberalisation since 1981. Initially, they created open-end international trusts to promote indirect investments by Europeans. Then, in 1984, they shortened the list of businesses where foreign ownership is prohibited. Korean firms were allowed to

issues convertible bonds and bonds with warrants at international markets since 1985, and permitted to participate in syndicates underwriting foreign securities since 1987. Most significant measures of capital account liberalisation were implemented in 1991-1992, when foreigners acquired the right to buy Korean securities (Bekaert, Harvey & Lundblad 2003; Park 1994).

Outcomes of the financial sector reforms

As a result of the reforms, financial sectors both in Indonesia and Korea experienced significant growth. In Indonesia, broad money to GDP and bank deposits to GDP ratios more than doubled, whereas both financial intermediation ratios showed substantial rise over the reform period. Domestic credit to GDO ratios more than tripled over the period 1983-1993 to 49 percent. Foreign direct investment boomed since the late 1980s, increasing the dependence of the Indonesian economy on foreign capital.

Similarly, in Korea, the M2/GDP ratio, which remained unchanged in 1970s, grew from 33 per cent in 1983 to 36 per cent in 1993. Financial intermediation ratios (total and private) also grew up to 15 per cent. Improved formal market environment since 1982 as well as excellent growth of the capital market since the 1987 reform contributed to enhanced financial intermediation ratios. Domestic credit to private sector has improved from around 55 percent in 1983 to over 60 per cent in the 1990s. In contrast, FDI to GDP ratios moved into negative territory as a result of active investing abroad by Korea firms. Table 4 summarises financial liberalisation indicators in Indonesia and Korea.

Table 4. Indicators of financial liberalisation

Indicator	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
M2 (% of GDP)											
Indonesia	17	18	21	25	25	26	28	34	37	39	40
Korea	33	32	32	32	32	33	35	34	34	35	36
FIR total (% of GDP)											
Indonesia	25	27	30	34	36	38	42	52	53	58	57
Korea	45	44	45	48	52	56	61	63	62	62	60
FIR private (% of GDP)											
Indonesia	15	17	19	22	24	28	35	48	47	46	49
Korea	47	47	50	49	50	49	55	57	57	56	53
Domestic credit to private sector (% of GDP)											
Indonesia	15	17	20	24	25	28	35	48	47	46	49
Korea	55	54	57	56	57	54	60	63	62	61	61
FDI/GDP (%)											
Indonesia	0.34	0.25	0.35	0.32	0.51	0.65	0.67	0.96	1.16	1.28	1.04
Korea	-0.07	0.06	-0.37	-0.69	0.07	0.20	0.23	-0.10	-0.10	-0.13	-0.21

Notes: FIR: Financial intermediation ratio = claims on public sector, claims on private sector and foreign assets.

FDI are measured as net inflow.

Source: *World Development Indicators Online*; *International Financial Statistics Online* database and author's calculations

Competition in the Indonesian banking sector, particularly for private banks has substantially benefited from the removal of credit ceilings, interest rate controls, and discriminatory regulations on different financial intermediaries. As a result of competition, less efficient state-owned banks were forced to adopt modernisation programmes. Bank deposit rates became positive in real terms, though real lending rates, initially, did not rise. Banks had to accept a reduction of lending margins under pressure of increased competition. Loan rates on average were around 20 per cent per annum during most of the period, while state-owned banks on average charged lower rates than private banks. The difference, however, has been decreasing and the rates almost equalised by 1990.

In spite of increased deposit rates, the rate of growth of banks deposits fell. This was a result of exchange rate instability and expectations of rupiah devaluations. The lack of liquidity was offset by an expansion of central bank credit to the Indonesian banking system.

Similarly, in Korea, the financial reforms of 1980s resulted in expansion of the formal financial sector, including the rise in number of banks and their branches, and an increase in number of non-bank financial institutions. Increased competition in the financial markets improved the allocative efficiency of financial resources. The structure of interest rates became more uniform, as differentials between credits to priority and non-priority sectors, and between bank and non-bank deposit rates, decreased. However, some legislation, which

provided advantages to non-bank financial institutions, remained. Accordingly, NBFIs had higher credit ceilings and were exempt from the burden to provide directed credits (Bisat, Johnston & Sundararajan 1999).

The bank deposit interest rates in 1981 were negative in real terms, due to a high level of inflation. As inflation was brought down to a single digit in 1982, interest rates became substantially positive. During 1984-1987, the real interest rates on one year deposit were in the range of 7 to 8 per cent, and that on general loans exceeded 8 per cent. As inflation rose in late 1980s, the real interest rates fell to a 3-4 per cent range. An interesting feature is that nominal deposit and general loan rates remained unchanged during the period of 1985-1990, despite all liberalisation measures.

The comparative statistics on exchange and interest rates are presented in Table 5.

Table 5. Exchange rates and interest rates in Indonesia

Indicator	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Exchange rate* (mkt)											
Indonesia	909	1026	1111	1286	1644	1686	1770	1843	1950	2030	2087
Korea	776	806	870	881	823	731	671	708	733	781	803
Inflation rate											
Indonesia	11.79	10.46	4.73	5.83	9.28	8.04	6.42	7.81	9.41	7.53	9.68
Korea	3.42	2.31	2.46	2.75	3.05	7.15	5.70	8.58	9.30	6.31	4.75
Interest rates (%)											
Money market rate											
Indonesia	13.17	18.63	10.33	n.a.	14.52	15.00	12.57	13.97	14.91	11.99	8.66
Korea	13.00	11.39	9.35	9.70	8.93	9.62	13.28	14.03	17.03	14.32	12.12
Deposit rate											
Indonesia	6.00	16.00	18.00	15.39	16.78	17.72	18.63	17.53	23.32	19.60	14.55
Korea	8.00	9.17	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	8.58
Lending rate											
Indonesia	n.a.	n.a.	n.a.	21.49	21.67	22.10	21.70	20.83	25.53	24.03	20.59
Korea	10.00	10.00	10.00	10.00	10.00	10.13	11.25	10.00	10.00	10.00	8.58

*Local currency per US dollar

Source: *International Financial Statistics Online* and author's calculations

A crucial ingredient of successful financial liberalisation programme is building a sound and efficient system of prudential regulation and supervision. However, this component experienced serious problems in both countries, particularly in Indonesia. The Indonesian system of prudential regulation and supervision remained weak, particularly at the stage of implementation. In many cases, large conglomerates simply abused their close relationships with politicians. Furthermore, reliance on foreign finance, particularly short-term debt, had increased, exposing it to foreign exchange risks.

In Korea, a prudential regulations and supervision, in particular over NBFIs, remained a notable problem. Prudential regulations and supervision over merchant banks, such as BIS capital adequacy or loan concentration requirements, were virtually non-existent. The sector has accumulated a significant mismatch in the maturity structures (64 per cent of borrowings were short-term and 85 per cent of lending was long-term), which monetary authorities failed to detect (Chang 1998). Moreover, the supervision functions over NBFIs were widely dispersed and competence of supervisors was questionable. This was due to the staff rotating policy in the Financial Supervisory Commission and the Ministry of Finance and Economics. The time horizon of supervisory bureaucrats was too short. Supervisors were thus discouraged from developing new policies and enforcing existing ones (Kim & Lee 2004). Various other problems existed (i) a moral hazard problem in the form of an unstated assumption that the government would not let banks to fail, which often led to the inefficient use of loan funds; and (ii) the lack of a meaningful financial disclosure system (Emery 2001).

Socio-economic impact of the reforms

The Indonesian economy underwent dramatic structural changes as a result of carefully designed liberalisation policies that aimed to improve the economic performance. With a rapid growth of income of over 7 per cent during the most of period, peaking in early 1990s, Indonesia moved from an impoverished nation with over 60 per cent of the population living below the poverty line in 1970, to a low-middle income economy with less than 10 per cent of the population living below the poverty line. Indonesia's income per capita trebled during the period. Moreover, the purchasing power of per capita income increased four-fold to reach nearly \$2,500 in 1993. This represented rapid growth in wealth (Ariff & Khalid 1999).

Reforms during the period 1982-1992 were a response to the external shock of falling oil prices. This induced the policy makers to maintain high GDP growth rates by improving private investments and expanding non-oil exports. In addition, external and domestic imbalances were stabilised.

Investments have been rapidly growing in line with GDP, forming a powerful engine for economic growth. Inflation rates were brought down to a single digit in the mid-1980s and remained there in late 1980s and early 1990s.

The Korean experience of reforms is unique and phenomenal. Following a cautious and gradual path the Korean economy achieved an excellent growth result and turned from a poor developing economy to an upper-middle level developed economy. After the slowdown in 1980, the Korean economy grew on average by an impressive 7.83 per cent during 1981-1985, and even more impressive by over 9 per cent during 1986-1991. The GDP per capita more than doubled during the period 1983-1993. The purchasing power of GDP per capita also substantially increased and reached US\$10,000 by 1993⁹. A high level (over 30 per cent of GDP) of domestic savings and investments rates were major drivers of the growth. Main economic indicators of Indonesia and Korea are presented in Table 6 below.

⁹ In current international US\$

Table 6. Main economic indicators of development

Indicator	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
GDP growth, %											
Indonesia	8	7	3	6	5	6	9	9	9	7	7
Korea	11	8	7	11	11	11	7	9	9	6	6
GDP per capita (constant 2000 US\$)											
Indonesia	444	467	474	494	511	534	572	612	656	692	730
Korea	3884	4147	4386	4807	5291	5798	6130	6615	7169	7522	7912
GDP per capita (PPP, 2005 international US\$)											
Indonesia	1511	1590	1616	1681	1739	1817	1948	2085	2233	2355	2487
Korea	6664	7047	7724	8501	9316	9849	10628	11519	12086	12713	13675
Gross domestic savings to GDP, %											
Indonesia	30	30	30	29	32	32	35	32	33	33	32
Korea	30	31	34	37	39	36	36	37	36	36	36
Investment to GDP, %											
Indonesia	31	27	28	30	30	29	33	31	32	30	29
Korea	30	30	29	30	31	34	38	40	37	36	37
Unemployment (% of labour force)											
Indonesia	na	na	2	3	na	3	3	na	na	3	na
Korea	4	4	4	3	2	3	2	2	2	3	2
Life expectancy (Years)											
Indonesia	na	na	59	na	60	na	na	62	na	63	na
Korea	na	69	na	70	na	71	71	72	72	73	na

Source: World Bank Development Indicators Online, International Financial Statistics Online databases and the author's calculations

The high economic growth was reflected in the large positive impact on the lives of Korean people. Unemployment rate remained low and declined to 2 per cent. Life expectancy improved by nearly 20 years during the period 1965-1995. The infant mortality dropped to 11 per 1,000 births. Due to substantial investment in education (21 per cent of the national budget), the illiteracy level virtually dropped to zero (Ariff & Khalid 1999).

In Indonesia, social indicators, like education and health, have also improved over the period: the literacy rate rose by around 20 per cent and the infant mortality rate fell from 132 per 1,000 in 1970 to 69 per 1,000 in 1990 (Hill 1996). Life expectancy grew to a reasonable 63 years in 1992. The unemployment rate remained low at around 3 per cent mark.

In spite these impressive achievements, both countries failed to detect or address a number of problems. These problems were exposed with dramatic consequences later, during the 1997-1998 Asian crisis. In Indonesia,

the crisis exposed weaknesses in the financial system, including weak prudential regulations and supervision, over-reliance on short-term foreign debt, and exchange rate mismanagement. Problems with the financial system, coupled with political instability and various natural disasters, brought about a severe reduction of incomes and living standards.

Similarly, in Korea, policy-makers failed to contain a ballooning short-term foreign debt problem, which became particularly apparent after capital account liberalisation. Short term debt grew from 14 billion US\$ in 1990 (45 per cent of total debt) to 100 billion US\$ in 1996 (64 per cent of total debt). Moreover, unaddressed problems with prudential regulations and supervision as well as political instability contributed to the problem (Dickinson & Mullineux 2001; Wade 1998; Yoo & Moon 1999).

However, the impact of the Asian crisis on Korean economy was relatively mild thanks to the carefully designed approach to the reforms, which involved exposing the Korean financial system to global threats cautiously and strictly in line with well-thought-out industrial and economic policies.

Conclusion

Despite numerous common elements, financial sector reform in Indonesia and Korea each has unique features. For instance, each country had its own economic pre-reform conditions, resource endowments, political environment and cultural traditions. As a result, their approaches to financial sector reform also differed. However, the scope of reforms and outcomes of implementing (or not implementing) of specific reform measures for both countries were similar. Some important commonalities are presented below:

- Both countries began their financial sector reforms as a result of ongoing economic problems, caused by the inefficient allocation of resources, rather than starting those reforms to prevent possible resource misallocation problems.
- In both countries, and particularly in Korea, financial sector reform was part of a larger economic development programme. Korea was more thorough in that regard and planned economic development within a five-year framework.
- Both countries, and especially Korea, undertook reforms in a gradual manner, in some instances through 'trial and error'. This facilitated avoiding major crises during the reform period.
- Both countries had the political stability and the political will to undertake reforms. At a later stage, political instabilities in both countries, particularly in Indonesia, hampered the ability of the authorities to react to the problems caused by the Asian crisis swiftly and effectively.
- Both countries were unable to establish an effective prudential regulation and supervision system, which became apparent during the Asian crisis.

By contrast, there were also some differences in the policies approaches adopted in the two countries. Indonesia, for example, opened the capital account early and therefore heavily relied on foreign investments in

its growth promoting policies. Korea relied on internal resources for a significant period of the reform process. It opened its capital account later but quickly allowed the huge build up of short-term foreign borrowing as in Indonesia, which was one of the other causes of the Asian crisis.

The fact that dissimilar approaches to financial development can work in different countries strongly suggests that there is no universal or 'optimal' pace and sequencing of financial sector reform. Rather the success of financial reforms depends on the political will and technical ability of local policymakers to design and implement a reform programme based on the existing economic, political and cultural features of the society in question.

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A Measure of the Model Adequacy: Using the Method of Area under ROC Curve (AUC)

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ABSTRACT

A logit model is frequently used to model the default probability for mortgage loans. However, the focus of previous studies has been on the significance of explanatory variables and thus the accuracy of a logit model is not adequately addressed. In this study we demonstrate that receiver operating characteristic curve (ROC curve) can serve as a measure of internal accuracy for a logit model. We also find that the AUC predictive method has better predictive ability than the other. The findings in our study can be practiced in individual credit prediction.

Keywords: residential mortgage loans, default, ROC curve.

1. Introduction

Accuracy is very important for making prediction in credit scoring. When a potential debtor asks for credit, creditors evaluate the probability of default to decide whether to loan the funds and at what interest rate. Thus accurately assessing a debtor's likelihood of default acts an important role for creditors to continue competitive. In general, the loan-to-value (LTV) ratio is less than 90%. For example, LTV ratio is less than 80% in Taiwan. But LTV ratio is 90% in Malaysia. Therefore, the creditor generally collateralizes the debtor's house and maintain low loan-to-value (LTV) to reduce the default risk (Marrison, 2002).

Many studies have attempted to monitor and examine the factors associated with the default of a residential mortgage. Such as incomes of family, education, grace period, the present value of mortgage payments, LTV ratio, home equity, unemployment rates, the effects of counseling on default, and divorce rates are significant to mortgage default (Green and Shoven, 1986; Lawrence et al., 1992; Deng et al., 1996, 1997, and 2000; Kau and

Keenan, 1999; Ciochetti et al., 2001; Marrison, 2002; Lambrecht et al., 2003; Hartarska and Gonzalez-Vega, 2005, 2006). Ambrose, Capone, and Deng (2001) decomposed the boundary conditions for optimal default exercise to look at the economic dynamics leading to optimal default timing for mortgage foreclosure. Ong, Neo, and Tu (2007) showed that price expectations, volatility and equity losses are influential factors for individual households, with past price movement being the most important of these. Chen and Chen (2010) discussed how these factors influence mortgages prior to foreclosure and how they are correlated with location.

Even though many previous studies on residential mortgage default behaviors, less research was found to especially focus on the measure of the predictive adequacy. Under choosing the significant factors affecting default of residential mortgages, this study attempts to search for an appropriate portfolio of predictive factors in the binary logistic regression model to raise the predictive accuracy. The remnants of this paper are organized as follows. Section 2 introduces research framework. Section 3 gives the empirical analysis using areas under the ROC curve as a comparison. Section 4 concludes this study.

2 Research framework

Logistic regression is widely used in biomedical research fields and is covered by many common textbooks (Hosmer and Lemeshow, 2000; Allison, 2005; Hilbe, 2009). The binary logistic regression model allows the user to include many observed factors that influence the dependent variables.

For a binary dependent variable Y , the independent variables $X_i = (X_{i1}, \dots, X_{ik})$ in logistic regression can take any form and the relationship between the predictors and dependent variable is linear through the logistic transformation of π_i (Xie, 2008):

$$\log \text{it}(\pi_i) = \ln\left(\frac{\pi_i}{1 - \pi_i}\right) = b_0 + b_1 x_1 + b_2 x_2 + \dots + b_k x_k \quad (1)$$

$$\pi_i = \frac{\exp(b_0 + b_1 x_1 + b_2 x_2 + \dots + b_k x_k)}{1 + \exp(b_0 + b_1 x_1 + b_2 x_2 + \dots + b_k x_k)} \quad (2)$$

where b_0 is the regression constant;

b_1, b_2, \dots, b_p are the regression coefficients;

2.1 Multicollinearity diagnostics

For multiple regression, if two or more variables are highly correlated with one another (Pardoe, 2006). Namely, very high correlations between two variables should be multicollinearity (Burns and burns, 2008). Multicollinearity can lead to unstable models and inflated standard errors (Pardoe, 2006).

Tolerance as well as variance influence factors (VIF) are used (Myers et al., 2002) to diagnose multicollinearity. Walker (2002) proposed that very large relative values of VIF might indicate multicollinearity. Especially, Burns and Burns (2008) proposed that a VIF values greater than 10 is of concern.

Letting $(VIF)_k$ denote the k th diagonal element of the matrix r_{XX}^{-1} , the variance of b'_k ($k=1, \dots, p-1$) is

$$\sigma^2 \{b'_k\} = (\sigma')^2 (VIF)_k \cdot \dots\dots\dots (3)$$

The variance inflation factor (VIF) for b'_k is

$$(VIF)_k = \frac{1}{(1 - R_k^2)}, \quad k=1, 2, \dots, p-1, \dots\dots\dots (4)$$

where R_k^2 is the coefficient of multiple determination when X_k is regressed on the $p-2$ other X variables in the model.

Tolerance is a commonly used measure of multicollinearity. It is defined as (George and Mallery, 2008)

$$Tolerance = (1 - R_k^2) = \frac{1}{(VIF)_k}, \quad k=1, 2, \dots, p-1 \dots\dots\dots (5)$$

2.2 Receiver operating characteristic curve (ROC curve)

The receiver operating characteristic curve (ROC curve) is a statistical method to assess the accuracy of predictions. It is a graphic display that gives a measure of the predictive accuracy of a logistic regression. ROC curve can be constructed by varying the cutoff point that determines which estimated event probabilities are considered to predict the event. The most commonly used summary statistic for an ROC curve is the area under the ROC curve (AUC).

Sensitivity and specificity vary according to the probability value that you choose as a cutoff point for deciding if an observation represents an event or nonevent. An ROC curve is a plot of a test's sensitivity (plotted on the y axis) versus its 1-specificity (plotted on the x axis). Each point on the graph is generated by a different decision cutoff point. Zhou et al. (2002) proposed the following examples of sensitivity and 1-specificity:

$$\begin{aligned} \text{Sensitivity} &= \frac{\text{number of default individuals who screen default}}{\text{total number of default individuals}} \dots\dots\dots (6) \\ &= P_r(\text{Test} = \text{Default} \mid \text{Default}) \end{aligned}$$

$$\begin{aligned} \text{Specificity} &= \frac{\text{number of normal-performing individuals who screen normal-performing}}{\text{total number of normal-performing individuals}} \dots\dots\dots (7) \\ &= P_r(\text{Test} = \text{normal-performing} \mid \text{normal-performing}) \end{aligned}$$

so,

$1 - \text{Specificity}$

$$= 1 - \frac{\text{number of normal-performing individuals who screen normal-performing}}{\text{total number of normal-performing individuals}} \quad \text{-----} \quad (8)$$

$$= 1 - P_r(\text{Test} = \text{normal-performing} \mid \text{normal-performing})$$

$$= P_r(\text{Test} = \text{default} \mid \text{normal-performing})$$

In Figure 1, a plot of sensitivity versus FPR (1-specificity) on the ROC curve represents a (FPR, sensitivity) point corresponding to a different decision threshold.

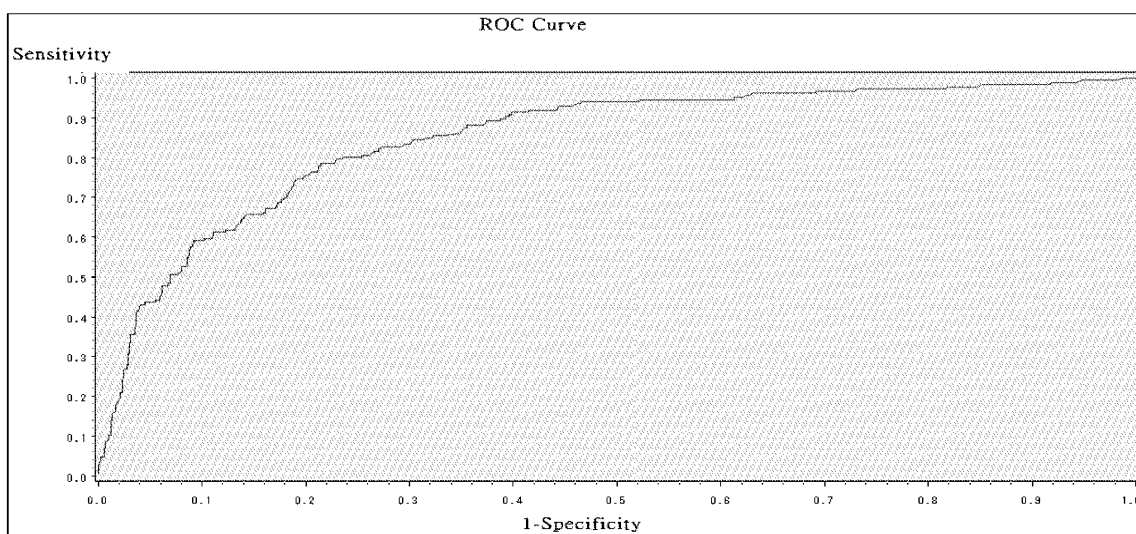


Figure 1 plot of the ROC curve for all possible cutoff points.

Hosmer and Lemeshow(2000) proposed that the area under the curve is large for a model with high predictive accuracy. Conversely, the ROC curve has a smaller area under the curve with low predictive accuracy. Thus, they summarize the rules of predictive accuracy.

if $\text{ROC} = 0.5$: this suggests no discrimination,

if $0.7 \leq \text{ROC} < 0.8$: this is considered acceptable discrimination,

if $0.8 \leq \text{ROC} < 0.9$: this is considered excellent discrimination,

if $\text{ROC} \geq 0.9$: this is considered outstanding discrimination.

3 Analytical results

For a binary logistic regression model, the dependent variables are classified into two groups based on the default mortgage rate (paid off and default). Mortgage data collected in this study are all individual residential loans originated in 1985 with maturities of 20 years. The original mortgage data are collected from a local bank in Taiwan, including 277 defaults, and 2381 normal-performing records during the observance period. The censoring time is the end of 2005, with all mortgages been terminated (either paid off or default).

3.1 Variables and explanations

The variables of our study are shown in **Table 1** including one dependent variable and nineteen independent variables. When a delinquency of a mortgage account has continued for over three months, default (Y) is considered. There are nineteen factors influencing the default of residential mortgages and are considered in the Logit regression model.

Table 1 Variables and Explanations

variables	explanations
dependent	
Y-default	Delinquency over three months = 1, pay off = 0
independent	
X ₁ -age	Age of borrower
X ₂ -years of job	the years of job experience
X ₃ -education	Dummy variables; University and above = 1, otherwise = 0
X ₄ -position	Dummy variables; public servants and manager = 1, otherwise = 0
X ₅ -marriage	Dummy variables; married=1, otherwise = 0
X ₆ -incomes of family	Total incomes of husband and wife
X ₇ -number of children	Number of children
X ₈ -balance of credit loans	The monetary amount of credit loans
X ₉ -balance of cash cards	The monetary amount of cash cards
X ₁₀ -number of cash cards	The number of cash cards
X ₁₁ -sex	Dummy variables; male = 1, female =0
X ₁₂ -guarantor	Dummy variables; with guarantee = 1, otherwise = 0
X ₁₃ -balance of mortgage loans	The monetary amount of mortgage loans
X ₁₄ -loan to value ratio	The ratio of original loan size to original housing price (individual data)
X ₁₅ - mortgage term	The mortgage loan term
X ₁₆ - package deal	Dummy variables; with package deal = 1, otherwise = 0
X ₁₇ - grace period	The grace period (years) of mortgage loan
X ₁₈ - category of collateral	Dummy variables; business office of large building = 1, otherwise =0(including single house, apartment building)
X ₁₉ - regional variation	Dummy variables; house located in urban areas = 1, otherwise = 0

3.2 Testing Global Null Hypothesis: $\beta=0$

Testing the Global Null Hypothesis ($\beta=0$) has three chi-square statistics (likelihood ratio, score, and Wald test). In Table 2, the explanatory variables have coefficients of zero. Associated p-values are all approximately

zero by chi-square analysis, suggesting that explanatory coefficient is not zero. That is, these measurements results indicate that the binary assumption is valid (see Table2).

Table 2 Testing Global Null Hypothesis: $\beta=0$

Test	Chi-Square	DF	Likelihood Ratio Pr > Chi-Square
Likelihood Ratio	615.6109	19	<.0001
Score	599.8895	19	<.0001
Wald	341.9500	19	<.0001

3.3 The result of predictive diagnostic of ROC curve

ROC curve provide a widespread and visually attractive way to summarize the accuracy of predictions. For a logit regression model with high predictive accuracy, the ROC curve rises rapidly. Therefore, the area under the ROC curve is larger for a model with high predictive accuracy. We rank the order according to the value of area under the ROC curve and list in table 3.

Table 3 the predictive diagnostic of ROC curve

Category	Dependent variable	order	The area under ROC curve
Characteristic of debtors	X ₁ -age	9	0.581
	X ₂ -years of job	16	0.525
	X ₃ -education	2	0.641
	X ₄ -position	7	0.595
	X ₅ -marriage	11	0.578
	X ₆ - incomes of family	1	0.737
	X ₇ -number of children	14	0.533
	X ₈ - balance of credit loans	10	0.581
	X ₉ -balance of cash cards	17	0.524
	X ₁₀ - number of cash cards	3	0.627
	X ₁₁ -sex	12	0.547
	X ₁₂ -guarantor	8	0.585
Lending Contract Conditions	X ₁₃ -balance of mortgage loans	5	0.604
	X ₁₄ -loan to value ratio	4	0.618
	X ₁₅ - mortgage term	19	0.509
	X ₁₆ - package deal	13	0.534
	X ₁₇ - grace period	6	0.600
	X ₁₈ - category of collateral	15	0.527
	X ₁₉ - regional variation	18	0.512

3.4 diagnosis of multi-collinearity

Table 4 shows the analytical results of detecting multicollinearity. As shown in Table 4, the column, labeled as tolerance for the diagnostic of multicollinearity, has the values that are all more than 1, and the column, labeled as variance inflation factor (VIF), has the values that are all less than 3. Mendard (1995) suggested that a tolerance of less than 0.20 is causing for concern and a tolerance of less than 0.10 certainly present a serious multicollinearity problem. Burns and Burns (2008) suggested that a maximum *VIF* values in excess of 10 is frequently taken as an indication that multicollinearity may be unduly influencing the least squares estimates. Therefore, no multicollinearity is evident.

Table 4 The diagnosis of multicollinearity

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Tolerance	Inflation
Intercept	1	-0.188	0.112	-1.67	0.094	.	0.000
X ₁ - age	1	-0.018	0.015	-1.16	0.245	0.971	1.029
X ₂ -years of job	1	0.008	0.002	4.5	<.0001	0.329	3.035
X ₃ -education	1	-0.002	0.002	-1.27	0.203	0.359	2.789
X ₄ -position	1	-0.027	0.017	-1.63	0.104	0.847	1.181
X ₅ -marriage	1	-0.019	0.017	-1.16	0.246	0.794	1.259
X ₆ - incomes of family	1	-0.040	0.025	-1.63	0.103	0.405	2.470
X ₇ -number of children	1	0.034	0.012	2.81	0.005	0.353	2.836
X ₈ - balance of credit loans	1	-0.002	0.000	-9.08	<.0001	0.554	1.805
X ₉ -balance of cash cards	1	0.001	0.000	2.84	0.005	0.892	1.121
X ₁₀ - number of cash cards	1	0.003	0.004	0.72	0.475	0.838	1.193
X ₁₁ -sex	1	0.049	0.008	5.94	<.0001	0.796	1.256
X ₁₂ -guarantor	1	0.173	0.028	6.2	<.0001	0.954	1.048
X ₁₃ -balance of mortgage loans	1	0.000	0.000	6.23	<.0001	0.729	1.372
X ₁₄ -loan to value ratio	1	0.001	0.001	1.28	0.199	0.795	1.258
X ₁₅ - mortgage term	1	0.002	0.005	0.36	0.720	0.824	1.214
X ₁₆ - package deal	1	0.040	0.018	2.24	0.025	0.753	1.328
X ₁₇ - grace period	1	0.017	0.006	3.01	0.003	0.865	1.156
X ₁₈ - category of collateral	1	0.163	0.053	3.06	0.002	0.876	1.142
X ₁₉ - regional variation	1	-0.014	0.017	-0.8	0.422	0.833	1.201

3.5 Comparing two kind's predictive power

3.5.1 fitting logit regression model by original method

Many factors possibly influence the default of residential mortgages. As fitting a model, several problems can cause the lack-of-fit, such as a model short of important explanatory variables (Collett, 2003).

Table 5 presents analytical results of maximum likelihood estimates. Most of them are consistent with expected effect on default. Nine factors have significantly positive effects on default and two factors have a significantly negative effect on default. The education, marriage, incomes of family, number of children, balance of cash cards, number of cash cards, mortgage term and regional variation are not significant.

Table 5 also shows the coefficient of the reduced model, in which each of the explanatory variables has a significant effect on the default of residential mortgages.

The fitted logistic regression model is listed as follows.

$$\log it(\hat{p}) = -7.6026 + 0.0963x_1 - 0.0611x_2 - 0.8576x_3 - 0.8933x_4 + 0.4526x_{10} - 0.6204x_{11} + 1.2896x_{12} + 0.0014x_{13} + 0.0401x_{14} + 0.2438x_{17} + 0.9698x_{18} \quad (8)$$

Table 5 Maximum likelihood estimates

full model					reduced model				
Parameter	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq	Parameter	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	-6.8571	1.2959	27.9966	<.0001***	Intercept	-7.6026	0.8276	84.3815	<.0001***
X ₁ -age	-0.4346	0.1613	7.2563	0.0071**	x8	0.0963	0.0133	52.7486	<.0001***
X ₂ -years of job	0.1028	0.0157	43.0159	<.0001***	x12	-0.0611	0.016	14.6359	0.0001***
X ₃ -education	-0.0254	0.018	1.9864	0.1587	x24	-0.8576	0.153	31.4263	<.0001***
X ₄ -position	-0.55	0.1666	10.9001	0.001***	x26	-0.8933	0.1589	31.6075	<.0001***
X ₅ -marriage	-0.327	0.1756	3.4678	0.0626	-	-	-	-	-
X ₆ - incomes of family	-0.32	0.2663	1.4435	0.2296	-	-	-	-	-
X ₇ -number of children	0.1627	0.1256	1.6769	0.1953	-	-	-	-	-
X ₈ - balance of credit loans	-0.0381	0.0036	112.1454	<.0001***	-	-	-	-	-
X ₉ -balance of cash cards	0.00581	0.00393	2.1808	0.1397					
X ₁₀ - number of cash cards	0.0191	0.0321	0.3559	0.5508	x41	0.4526	0.0527	73.6585	<.0001***
X ₁₁ -sex	0.3982	0.0641	38.6448	<.0001***	x3	-0.6204	0.1469	17.8366	<.0001***
X ₁₂ -guarantor	1.5919	0.2164	54.0991	<.0001***	x44	1.2896	0.1903	45.9061	<.0001***
X ₁₃ -balance of mortgage loans	0.00372	0.000504	54.4738	<.0001***	x7	0.0014	0.000385	13.1768	0.0003***
X ₁₄ -loan to value ratio	0.0491	0.0119	16.9341	<.0001***	x13	0.0401	0.00945	17.9581	<.0001***
X ₁₅ - mortgage term	-0.0393	0.0492	0.6383	0.4243	-	-	-	-	-
X ₁₆ - package deal	0.4363	0.2003	4.7442	0.0294*	-	-	-	-	-
X ₁₇ - grace period	0.2773	0.0621	19.9435	<.0001***	x18	0.2438	0.0561	18.9057	<.0001***
X ₁₈ - category of collateral	0.9874	0.4557	4.6951	0.0302*	x20	0.9698	0.3654	7.0443	0.008**
X ₁₉ - regional variation	-0.0734	0.1789	0.1683	0.6816	-	-	-	-	-

Note: *p<0.05 **p<0.01 ***p<0.001

Figure 2 shows the ROC curve of a test's sensitivity (plotted on the y axis) versus its 1-specificity (plotted on the x axis). In Figure 2, the area under the ROC curve is 0.836 using the original method.

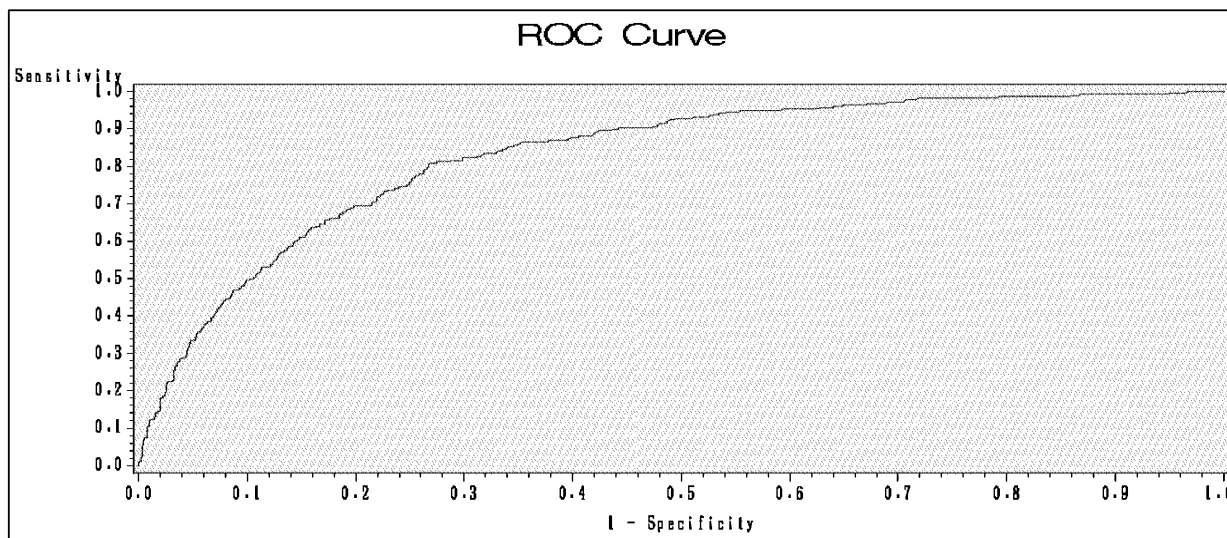


Figure 2 Plot of the ROC Curve using the original method.

3.5.2 fitting logit regression model by ROC curve method.

Table 3 presents other analytical results of maximum likelihood estimates by AUC method. Following AUC method, we chose eleven factors to run the logistic model. Six factors have significantly positive effects on default and two factors have a significantly negative effect on default. The position, marriage and balance of credit loans are not significant.

Table 3 also shows the coefficient of the reduced model, in which eight of the explanatory variables have a significant effect on the default of residential mortgages.

The fitted logistic regression model is listed as follows.

$$\text{logit}(\hat{p}) = -7.7737 + 0.087x_1 - 0.6477x_3 - 0.0403x_6 + 0.4366x_{10} + 1.5423x_{12} + 0.0042x_{13} + 0.0496x_{14} + 0.3245x_{18} \dots\dots\dots (9)$$

Table 6 Maximum likelihood estimates using AUC method.

full model					reduced model				
Parameter	Wald				Parameter	Wald			
	Estimate	Standard	Chi-Square	Pr >		Estimate	Standard	Chi-Square	Pr >
		Error		ChiSq			Error		ChiSq
Intercept	-7.9905	0.9467	71.2418	<.0001	Intercept	-7.7737	0.9194	71.4929	<.0001
X ₁ -age	0.0906	0.0103	77.1016	<.0001	x ₈	0.087	0.00921	89.2295	<.0001
X ₃ -education	-0.5713	0.161	12.5877	0.0004	x ₂₄	-0.6477	0.1561	17.2086	<.0001
X ₄ -position	-0.294	0.1708	2.9639	0.0851					
X ₅ -marriage	-0.1588	0.2045	0.6034	0.4373					
X ₆ -incomes of family	-0.038	0.0035	117.9599	<.0001	x ₃₄	-0.0403	0.00313	165.3101	<.0001
X ₈ -balance of credit loans	0.00611	0.00367	2.7654	0.0963					
X ₁₀ - number of cash cards	0.4064	0.0592	47.1364	<.0001	x ₄₁	0.4366	0.0565	59.7351	<.0001
X ₁₂ -guarantor	1.565	0.2133	53.8176	<.0001	x ₄₄	1.5423	0.2104	53.7555	<.0001
X ₁₃ -balance of mortgage loans	0.00409	0.000482	71.7477	<.0001	x ₇	0.00417	0.000476	76.8722	<.0001
X ₁₄ -loan to value ratio	0.0509	0.0118	18.6992	<.0001	x ₁₃	0.0496	0.0116	18.2875	<.0001
X ₁₇ - grace period	0.3201	0.0594	29.0709	<.0001	x ₁₈	0.3245	0.0592	30.0511	<.0001

Note: *p<.05, **p<.01, ***p<.0001.

Figure 3 shows the ROC curve of a test's sensitivity (plotted on the y axis) versus its 1-specificity (plotted on the x axis). In Figure 3, the area under the ROC curve is 0.890.

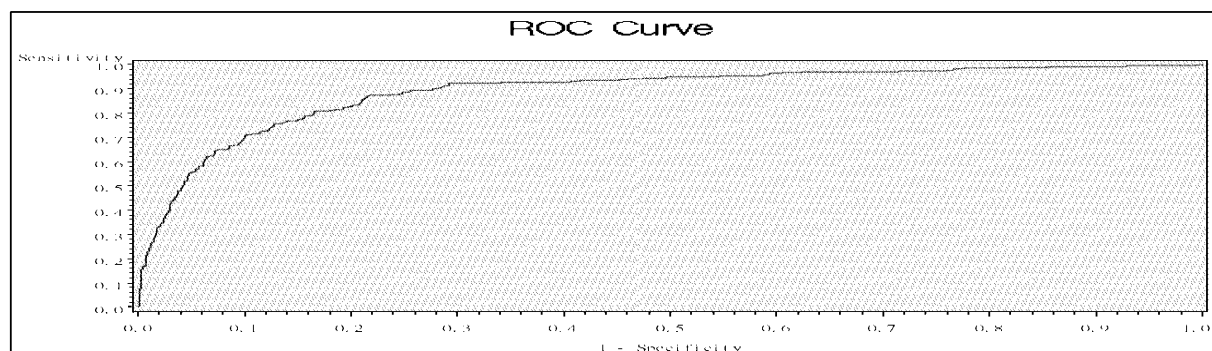


Figure 3 Plot of the ROC Curve using the AUC method.

3.5.3 Comparing two kind's predictive power

Summarizing two previous logit regression analysis (Table 5 and Table 6), Table 7 compares the results from original method and those from the ROC curve method. Comparing R-square, Max-rescaled R-square, AUC, sensitivity, and specificity, the AUC predictive method has better predictive ability than the other.

Table 7 comparison of predictive power from the original and ROC method

method	R-square	Max-rescaled R-square	AUC	sensitivity	specificity
original method	0.1375	0.282	0.836	75.4	74.5
ROC method	0.199	0.4082	0.89	80.9	82.1

4. Conclusions

Residential mortgage loans differ from other types of loans in several respects. As previously reviewed, the default probability of residential mortgages would be affected by many factors. This study aims to compare two different predictive method in a credit risk model, though illustrated with a logistic regression model, to reduce the cost of incorrect determination.

For detecting multicollinearity, the column labeled tolerance has the values that are all more than 0.3, and the column, labeled as variance inflation factor (VIF), has the values that are all less than 4. Therefore, no multicollinearity is evident. Summarizing two previous logit regression analysis (Table 5 and Table 6), Table 7 compares the results from original method and those from the AUC method. Comparing R-square, Max-rescaled R-square, AUC, sensitivity, and specificity, the ROC predictive method has better t predictive ability than the other.

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An Investigation on Capital Factors Influencing Medical Resources Utilization of the Elderly People in Taiwan

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ABSTRACT

The previous literature has indicted that capital factors are key components for understanding individual's behaviors. However, it has not been effectively in addressing the relative subjects in policies planning literature. A regression analysis approach was undertaken in order to provide a better understanding about the research issues. The analysis identified the significant influences of capital factors on medical resources utilization behavior of the elderly people in Taiwan. Administrative implications and research limitation of the study findings were discussed. Suggestions for further research were provided.

Key words: medical resources utilization, capital factors, elderly people.

1. Introduction

According to the latest statistics from Statistical Division in Interior Ministry, the total population in Taiwan was 22,484,364 and people over 65 were 2,013,147 (Sep. 2002). The aging index number is incessantly growing from 21.7 in 1989 to 43.67 in Sep. 2002. Moreover, the elderly population in Taiwan has been over 7% since March, 1993, which means Taiwan is an "aging country" (Based on the definition from the United Nations World Health Organization, when the population of over 65-year-old is more than 7% in a total population in a country, the country is an "aging country"). It has been indicated that the elderly people in Taiwan will rapidly enhance and reach 18% in 2020 (Chen, 1997). Many countries also have the same problem – aging society, however the reasons may not be the same. In Taiwan, the birth rate has been decreasing since 1951 and the death rate has been rapidly decreasing since 1920, which are the major reasons for changes of population structure (Chen, 1997). Therefore, how can Taiwanese's authority concerns to create a superior living environment to satisfy those elderly people's demands is the fundamental issues to be understood from both the perspectives of industry and academia.

Department of Health Statistics of Taiwan has reported that the aging problem in population structure and the higher rate of medication utilization of the elderly people make expenses of health insurance increase. In

2000, the expense for people over 65 years old are 3.41 times of people under 64 years old (Western medication clinic service was 4.09 times). Moreover, the medical service utilization expenses of the elderly people per person were 7.09 times of people 64 years old. From those reviewed reports above, it can be found that the elderly people are the major group of medical service utilization, particularly for the western medication. Therefore, this study was aimed to focus on the medical service utilization behavior of the elderly people in hospital in the case of Taiwan.

There is a general agreement that elderly people is viewed as the foremost group of medical service utilization while in a well developed health care system (Chang, 1994 ; Kang , Lee, Chen, and Cho Bi-Se, 1995). Capital factors generally links to means that act as platform for explaining resources of individuals (Coleman, 1990). It can be viewed in a range of forms on the basis of its feature. Researchers have shown that to examine the prospective influences of capital factors on personal wants would provide a useful basis for predicting individuals' actions. For instance, social capital is typically understood to be largely associated with patterns of social networks of individuals which may be used to achieve personal goals (Sidney, Schlozman, and Brady, 1995).

Despite the noteworthy importance of understanding the relationship between the relationships between dimensions regarding capital factors and medical resources utilization behavior of heavy users. There is not adequate research evidence available to providing evidence within the preceding literature has been provided focusing on the issues about the impacts of capital factors in contributing individuals' evaluation of the medical resources utilization. The major aim of this study is to examine the relationship between dimensions regarding capital factors and medical resources utilization behavior of the elderly people in Taiwan. In the subsequent section, previous research relating capital factors and medical resources utilization behavior is reviewed to provide a basis for the present study. From an administration and marketing perspective, understanding the significance of the above issues would be helpful for developing successful policies regarding medical resources utilization.

2. Literature review

2.1 Medical resources utilization model

Understanding the utilization of health service behaviors, there was a conceptual model which namely Illness behavior model developed by Suchman (1965). The personal behavior of utilizing medical resources is influenced by the society environment of during the period from time one thinks one self has been ill to seeking for medical service. Suchman (1965) further indicated four reasons to elucidate this behavior: (1) the situation of behavior after knowing the illness, (2) the relation ship between each behaviors during the illness period, (3) the time interval or time sections of illness period, and (4) the changes of behavior in the illness period. In addition, Suchman also suggested that the illness behavior may be explained into five steps: illness; defining patient's role by patient himself; seeking for medical care service; interaction between doctors and patients; and recovery.

Another model addressing individual health services utilization was proposed by Andersen (1968) suggesting that this model has been frequently employed to examine the health service utilization by many authors. Grossman (1970) developed a conceptual model by extending Becker's model to explain individual health condition as personal capital. In this model, the basic assumption is that everyone has his own stock of health degree after he was born. When a person is getting older, his stock of health degree will be decreased. But people can 'invest' the stock of their health to make themselves stronger. Grossman (1970) suggested that there are two ways to invest the stock of health degree: time and the resources that can keep health (like food and medical service). Based on the reviewed studies above, several novel approaches different from Andersen's model were employed in this current study. It was proposed that "capital" is discussed as the ability for an individual to use medical resources, not just only statement of personal economy.

2.2 Capital factors

Capital is also another major element in affecting the use of medical resources and health services of individual. Bourdieu (1983) has described capital into four different forms, which are economic capital, cultural capital, social capital and symbolic capital.

Economic related capital factors

Bourdieu (1983) suggested that the economic capital can be counted, such as land, currency and any other assets that can be changed into currency. Weber pointed out in his book of "Economic Action and Social Group" that the original typical model of capital goods comes from the exchanged goods between areas and races. Capital defined in the earlier period of Bourdieu (1983) treatise as a capital types in economics. Radner (1992) has defined that the income can be defined as types of income under the tax system. Therefore, generally speaking, the concept of economic capital means an asset which can be changed into currency directly or indirectly.

Social related capital factors

Various researchers give different definitions to social capital. Walker, Macbride, and Vachon (1977) proposed that the society is a social net to contact with people and then maintain social status on these contacts to acquire supports of emotional concerns, material assistances and related information in society. Lin (1982) pointed out that there are two resources to use: personal resources and society resources. Personal resources like to have symbolic goods. In the literature it has been commonly suggested that social capital is a resources coming from contacting with society. Therefore, social capital is different from the variety of personal connection range, which means people who have a wider social connection will have more personal social capital. Bourdieu (1983) also indicated three kinds of capital: economic capital, cultural capital and social capital. Social capital is made by personally social responsibility and social connection, which means that it is made by the types and quantities of personally social connection. In fact, social capital is a long-term relationship between people who you know and have good relationship with you. People share the personal resources by the net relationship. Therefore, social capital is like a group's resources. Coleman (1990) further

pointed out that how people get their useful resources by their actions. Briefly, it may be concluded that there is a significant feature in the concept of social capital, which is the resources in the social net. People have to get or use the social capital directly or indirectly by this social net.

Cultural related capital factors

Bourdieu (1983) has further explained that there are three forms in cultural capital. First, form in everyone himself. It is a kind of habit or personality to be stably existed in a person's mind or body for a long period. Second, form of body, which is showed in cultural goods. Third, form of system which is showed in a certain structure, such as certificate and diploma. Bourdieu (1983) supplementary pointed out that the development of cultural capital is at expense of economic capital. In other words, people have to pay in the process of getting cultural capital.

2.3 Medical resources utilization

In 1993 and 1994, Chen and Lin (1996) investigated 1455 respondents to examine a range of elements affect the behavior of the elderly people utilizing medical resources of the elderly people and health service. Elements comprise demographic characteristics of society, medical resources and health condition. The result showed that the demographic characteristics of society (including age, sex, city and marriage status) have significant relationship with the western medical utilization of the elderly people. In summary, it has been found that the demographic characteristics including age, sex, city, education, living style and born area have significant impacts on behavior of medical resources utilization.

In Baker and Perlman's (1967) research indicated that the affecting variables of medical demands include economy, sex, age, education, area, illness rate and population growth. The results showed that the illness is the key element to influence how many times people see a doctor. Economic situation is the second element. It has provided an explanation about why children in lower income family typically have to face the problem of insurance cut-off and less utilization in medical resources (Chen, 1999; Schaeffer, Brown, and Rice, 1997). Wang (1993) pointed out that the frequency of investigate elderly people participating society activities has a significant relationship with their health. This may suggest that individual who has the higher the social capital may be considered to be more likely to have the better self-evaluated health status. Huang and Giang (2001) also indicated that the health condition of the elderly people is not affected by social support, but the frequency of joining social activities has a significant relationship with the in health condition. According to Hsiung's (1999) research, it showed that social support can be viewed as the determinants that influence the evaluated health status of the elderly people.

According to the statistical result of Taiwanese citizen's health investigation in 2001, pointed out that people with lower education have higher frequency seeing a doctor. Chang (1997) also indicated that people with higher education have better self-evaluated health status. The elderly people with superior education have lower frequency of seeing a doctor. Based on the reviewed literatures above, these authors found out that education is an important variable affecting medical resources utilization of users. Since managing user

satisfaction with medical resources utilization would be complicated without knowing what various capital factors in influencing the evaluation of medical resources utilization. It is imperative to examine critical affects of various capital factors in linking the evaluation of medical resources utilization. Apparently, Taiwan's government administrators must know the above issues regarding medical resources utilization of users in order to provide a satisfactory experience of medical resources utilization.

Based on the above literature, this study proposes the research framework (Figure 1) and the hypotheses:

Hypotheses 1: There is a significant relationship between capital factors and medical resource utilization.

Hypotheses 1a: There is a significant relationship between economic capital and medical resource utilization.

Hypotheses 1b: There is a significant relationship between cultural capital and medical resource utilization.

Hypotheses 1c: There is a significant relationship between social capital and medical resource utilization.

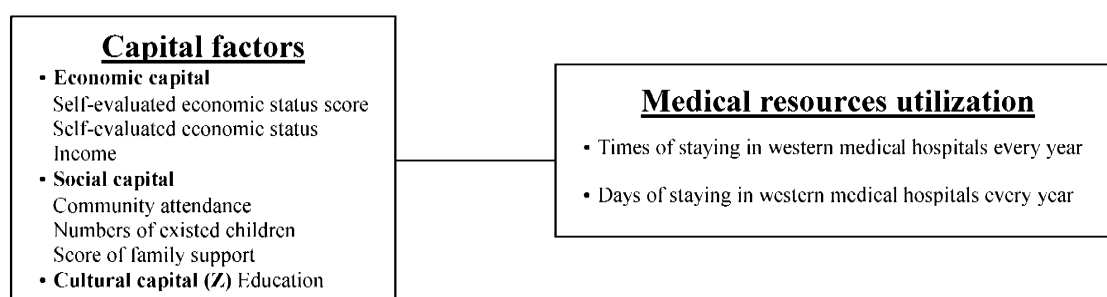


Figure 1 Conceptual model of the capital factors and medical resources utilization

3. Methodology

The research employed the investigation from the Family Health Plan of Department of Health Institute in 1989, 1993 and 1996. The information of capital variables is from the investigation in 1993, some are from 1989 and 1996. The data in this research comes from three investigations in the Family Health Plan Department of Health Institute, including "Investigation of Taiwanese elders' health care and life problems" in 1989 and 1993, and "Investigation elders' care and career planning" in 1996. The information taking the timing element into account will reduce mistake when conducting the research clarification.

The "Investigation of Taiwanese elders' health care and life problems" in 1989 is a panel inquisition sample with layering method of the machine sampling to investigate non-mountainous region living elders. This study includes 4,412 respondents, which are interviewed by phone call or visiting. In order to make a more complete database, Family Health Plan Department of Health Institute preceded the third investigation in 1996. Besides the two tracking condition in 1989 and 1993, the institution selected 3,041 elder people from 50 to 66 years old for a supplementary data (The familiar problem explanation of elders' investigation in National Health Insurance Bureau in Administration Yuan, 2003). This is the first national and long-term advanced age population data set in Taiwan. In order to reduce mistakes when examining the data, the author only chooses the existed sample in the third investigation to investigate. The samples size of this study is 2,669. Literature suggests that Likert-type scales can be used for evaluating the capital factors of users, for the reason that they

are helpful in measuring attitudes and are simple to manage.

3.1. Index of measurement and method of analysis

The economic capital in this research includes the elders' and their spouse's salary and economical support from their children and relatives, as well as the subjective evaluation from elders comparing the economic condition themselves with others'. The measurement of this conception includes: 1. Economic income; 2. Comparing other people's economic condition; and 3. Self-evaluated economic status score. The social capital in this research means elders' participation in folk's activities or community activities, which include the church, the school, the political activity and any other professional activity, together with the support and concerns from their family. Elders' children will also be the measure index sign of the social capital conception. This conception measures: 1. The community participation degree; 2. Existing children amounts; and 3. The society supports. The cultural capital in this research is the elderly people's educational background. The degree and frequency of receiving the messages include reading books and newspapers, watching TV and listening to broadcast. The degree of joining the high level's cultural activity includes appreciating the concert, Taiwanese opera and Peking opera. This conception includes: 1. Educational background; 2. Media of reading and listening; and 3. The cultural activity participation degree. In order to examine the capital related factors and their level of influence on the medical resource utilization of the elderly people in hospital, multiple regression analysis was undertaken

4. Results and discussions

One of the key objectives of this study was to establish an improved understanding regarding medical resource utilization of the elderly people in Taiwan. Table 1 contains the results of the frequency distribution analyses. According to the Table 1, males are 1,492 respondents (55.9%) and females were 1,177 respondents (44.1%). The distribution for sample age: Interviewee's age at 65-69 it contains 929 respondents (34.8%); age at 70-74 it contains 898 respondents (33.6%); age at 75-79 it contains 501 respondents (18.8%); age at 80-84 it contains 239 respondents (9.0%); and age above 85 it contains 102 respondents (3.8%). The sample distribution for native place: interviewees whose native place is South Fukien are 1,631 respondents (61.3%); interviewees whose native place is other provinces in mainland are 583 respondents (21.9%); interviewees whose native place is Hakka are 410 respondents (15.4%); and interviewees whose native place is aborigine are 36 respondents (1.4%).

The sample distribution for marital status: 1554 interviewees' marital status are married (58.2%); 94 interviewees are single (3.5%); 44 interviewees are divorced or separated (1.6%); 965 interviewees lose spouse (36.2%); and 12 interviewees have cohabitation companion (0.4%). The sample distribution for living place (city or country): 905 interviewees live in cities (34.0%); 1521 interviewees live in countries (57.2%); and 235 interviewees live in other places (8.8%). The sample distribution for occupation: 1671 interviewees are without working (62.6%); 673 interviewees have a full-time job (25.2%); 292 interviewees have part-time jobs (10.9%);

and 33 interviewees are seasonal worker (1.2%).

Table 1 Demographic profile of the respondents

Variable	Numbers	Percentage
Sex:		
Male	1492	55.9
Female	1177	44.1
Total	2669	100.0
Age:		
65-69	929	34.8
70-74	898	33.6
75-80	501	18.8
81-84	239	9.0
>85	102	3.8
Total	2669	100.0
Native place		
South Fukien	1631	61.3
Other provinces in Mainland	583	21.9
Hakkanese	410	15.4
Other	36	1.4
Total	2660	100.0
Marital status		
Married	1554	58.2
Single	94	3.5
Divorce or separation	44	1.6
Lose spouse	965	36.2
With cohabitation companion	12	0.4
Total	2669	100.0
Living place		
City	905	34.0
Country	1521	57.2
Others	235	8.8
Total	2661	100.0
Occupation		
Without working	1671	62.6
Full-time	673	25.2
Part-time	292	10.9
Seasonal	33	1.2
Total	2669	100.0

4.1 Relationship between factors of capital and behavior of medical resources utilization

Economic capital and medical resources utilization

Table 2 shows that the economic income variable has negative impacts on the times of staying in western medical hospitals every year. This may suggest that elders with an uncertain economic income less stay in hospitals per year than the elders with <5000 economic income. The self-evaluated economic score variable is negative to the times of staying in hospitals every year. The results of the study provide strong evidence suggesting elders with high self-evaluated economic score have less times of staying in hospital per year than those with low self-evaluated economic score. Furthermore, the R-square from the economic capital variable towards the time of staying in hospitals every year shows the explanation of power of 0.9%.

The self-evaluated economic score variable in the economic capital towards the days of staying in hospitals is negative. This means elders with high and middle scores have less days of staying in hospitals than those with low scores. The R-square from the economic capital variable towards the days of staying in hospitals every year is 0.4%. To sum up, the economic capital conception and the stern medical clinic service utilization has obvious effect. The Table 2 shows that the elders' economic capital conception is negative towards the times of using western medical clinic service every month, times of staying in hospitals every year and days of staying in hospitals every year. In this research, the author assumes that a man has more ability to gain the medical service he needs when he has more economic capitals. However, this negative situation between economic capitals and elders' medical resources utilization is because other factors are not further controlled. In other words, the economic capitals may influence the elders' medical resources utilization by other factors.

Social capital and medical resources utilization

Table 2 shows the family support variable in the social capital conception towards the times of staying in hospitals every year is positive. The research findings have indicated that the higher the family support variable score, the more the times of staying in western medical hospital every year. The results of the study provide strong evidence suggesting when elders gain more support from their family, the ability of medical resources utilization will increase. The R-square indicates that the explanation power of social capital variable towards the times of staying in western medical hospitals every year is 2.9%.

The family support variable in the social capital conception towards the days of staying in hospitals every year is positive. It means the higher the family support variable score, the more the days of staying in western medical hospital every year. The existing children variable in the social capital conception was demonstrated to have the negative influence on the days of staying in western medical hospitals every year. It means elders with more existing children have less days of staying in hospitals every year than those with less existing children. The R-square from the social capital variable towards the days of staying in western medical hospitals every year is 2.4%. To sum up, the family support score variable in the social capital conception towards the elders' medical resources utilization has positive effect by the three factors of medical resources utilization. It is also rational to note that to gain the support from families when seeking various medical services is an important influence factors in affecting the elders' medical resources utilization. In this research, the author assumes that elders can get support and help from their family. In fact, when elders' body function is getting increased, elders with more support from their family will have more ability to gain the medical resources they need than those with less or without support from their family. The result shows the existing children variable in the social capital towards the days of staying in western medical hospitals is negative. When elders have more children, they will get more cares and concerns from the family during the days in hospitals. Therefore, the days of staying in hospitals every year become less.

Cultural capital and medical resources utilization

According to the Table 2, the media reading and listening variable in the cultural capital is negative to the times of staying in western medical hospitals every year. It means that elders who get higher score in this variable will less stay in western medical hospitals every year. The R-square shows that the explanation power of cultural capital variable towards the times of staying in western medical hospitals every year is 2.0%.

The education background variable in the cultural capital is positive to the days of staying in western medical hospitals every year. It means that elders whose education background is elementary school, junior high school, senior high school, university will have more days of staying in hospitals than those illiteracy elders. The result also shows the education background in the cultural capital has a positive affection towards the days of staying in western medical hospitals every year. It means that elders with higher education background will have better economic status than those illiteracy elders, so they will have more ability to gain a better medical resource when they are in hospitals. The significant role of the media reading and listening variable in the cultural capital is negative to the days of staying in western medical hospitals every year. It means that elders who get higher score in this variable will less stay in western medical hospitals every year. The R-square suggests that the explanation power of cultural capital towards the days of staying in western medical hospitals every year is 3.1%. In summary, the media reading and listening variables which has negative effects on medical resources utilization? This may suggest that elders use more media will have less medical resources utilization. The media reading and listening variables in this research means the frequency of elders watching TV or listening to the radio. This variable towards the three direction items of elders' medical resources utilization has a negative influence. The possible reason is that the elders who often use the media will more easily ignore the uncomfortable parts on their body and therefore to reduce the medical resources utilization.

Table 2 Summary results of regression analysis

Variables	Times of staying in western medical hospitals every year (Regression Coefficient)	Days of staying in western medical hospitals every year (Regression Coefficient)
Economic capital		
Economic income		
<15000	-4.438E-02	.393
<50000	-6.994E-02	.300
>50000	2.458E-03	2.529
Uncertain	-.286*	.451
Self-evaluated economic status		
Okay	-3.575E-02	-3.938
Better	4.181E-02	1.796
Self-evaluated economic status score		
High economic score group	-.143*	-3.671*
Middle economic score group	-8.308E-02	-2.731*
Level of significance(α)	0.002	0.173
R-square	0.009	0.004
Social capital		
The community participates	-.124	-.873
Existing children amounts	-3.704E-03	-.537*
Family support score	.145***	4.005***
Level of significance (α)	0.00	0.00
R-square	0.029	0.024
Cultural capital		
Educational background		
Elementary school	4.747E-02	3.715**
Junior high school	.117	4.975*
Senior high school	8.486E-02	5.072*
University	.153	11.433***
Illiteracy	9.812E-02	6.235***
The culture participates	5.056E-03	-.199
Reading habit	-1.314E-02	-1.050
Media reading and listening habit	-.173***	-4.963***
Level of significance(α)	0.00	0.00
R-square	0.020	0.031

Note: 1. The above regression coefficient is not standardized,

2. *Stand for level of significance(α). $\alpha \leq 0.05$

4. Conclusion

In the Bourdieu's theory, the certain background with different types of capitals will process an exchange in a certain level. Moreover, the results from Table 2 have provided helpful insights addressing the hypothesis in this research. The results establish that elders will have better health status when they have better economic capital. Therefore, if the elders with worse economic status can have proper economic support (like various living subsidy), they will have a better and healthier life in order to reduce the medical resources utilization. On the basis of above discussion, it is evident that Hypotheses 1a, 1b and 1c have been supported by the research data. These results provide an enhanced understanding of successful communications that address capital factors in relation to the use of elders' medical resources utilization in the case of Taiwan. This research used secondary investigation data. Thus, it is not easy to get a complete explanation from the concept in this analysis framework.

In other words, the author only can get the variables in the nearest related conceptions among the used investigation data. However, this research uses the national investigation data from the Family Plan Institution, which increases the data's range and riches the data's content.

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Smart Money or Dumb Money? The Evidence from Taiwan

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ABSTRACT

We showed the mutual fund flows in Taiwan during the global subprime mortgage storm. The changing of mutual fund size is from the changing by the mutual fund performance and the spread between the subscription and redemption of fund size. We found the subscription of fund size was larger than the redemption of fund size during this period. We found the institutional investors have timing ability by significantly redemption when negative mutual fund performance, but the individual investors do not.

Keywords: smart money, dumb money, mutual fund performance, fund size

1. Introduction

Geoffrey and Travis (2007) pointed out that Gruber (1996) and Zheng (1999) suggest that investors have the ability to select funds with superior subsequent performance, a result referred to as the “smart money” effect. Mutual fund investors can enhance their returns by selecting superior funds, advantageously timing their cash flows to the fund, or both. These studies find that the short-term performance of funds experiencing positive net cash flow appears better than those experiencing negative net cash flow. Sapp and Tiwari (2004), however, demonstrate that the smart money effect is explained by stock return momentum over the short run. Further research by Frazzini and Lamont (2006) suggests that poor fund selection decisions end up costing longer-run investors (those who do not rebalance quarterly) about 0.84% per year, a result they dub the “dumb money” effect. And Andrea and Owen (2008) also calculate that mutual fund investors experience total returns that are significantly lower due to their reallocations. Therefore, mutual fund investors are “dumb” in the sense that their reallocations reduce their wealth on average.

In this paper, we ask whether the mutual fund investors in Taiwan during the global subprime mortgage storm make good investment decisions in the timing of their cash flows. For any given fund, do equity fund investors put cash in and take cash out at the right time on average? It is well established that inflows to mutual funds are strongly correlated with past fund performance (Ippolito (1992)). Less clear is the impact of investor

timing decisions on investor returns. And while numerous studies¹⁰ have examined the timing ability of mutual fund managers or other investment professionals (Geoffrey and Travis (2007)). Ours is the first comprehensive study to examine the timing ability of the mutual fund investors using cash flow data in Taiwan during the global subprime mortgage storm.

2. Background, data, and method

Our sample period is from 2007/7 to 2008/12. And the database is from securities investment trust and consulting association in Taiwan.

Table 1 showed that there are 514 domestic mutual funds, 132 private funds, 952 offshore funds, and 1038 discretionary investments in the Taiwan mutual fund market in October, 2009. And the fund size of domestic mutual funds, private funds, discretionary investments, and offshore funds was 1.94 trillion, 28.36 million, 1.04 million, and 1.83 trillion NT dollars.

In figure1, the mutual fund size in Taiwan dropped from 2.15 trillion NT dollars to 1.57 trillion NT dollars during the global subprime mortgage storm. The decreasing of the mutual fund size is 27%. The changing of mutual fund size is from the changing by the mutual fund performance and the spread between the subscription and redemption of fund size. We tried to see the mutual fund flows during this period.

We define the smart money as investors who have the timing ability to avoid the worse mutual fund performance period by redemption beneficiaries of mutual funds. And we define the dumb money as investors who do not have the timing ability to avoid the worse mutual fund performance period by subscription.

We define the growth rate of the redemption of fund size for the current month as G_{RS} , see the formula 2-1. We define the growth rate of the subscription of fund size for the current month as G_{SS} , see the formula 2-2. We define the growth rate of the net fund flow of fund size for the current month as G_{NS} , see the formula 2-3.

$$G_{RS} = \frac{\text{The redemption of fund size for the current month} - \text{The redemption of fund size for the last month}}{\text{The redemption of fund size for the last month}} * 100\% \quad (2-1)$$

$$G_{SS} = \frac{\text{The subscripti on of fund size for the current month} - \text{The subscripti on of fund size for the last month}}{\text{The subscripti on of fund size for the last month}} * 100\% \quad (2-2)$$

$$G_{NS} = \frac{\text{The net fund flow of fund size for the current month} - \text{The net fund flow of fund size for the last month}}{\text{The net fund flow of fund size for the last month}} * 100\% \quad (2-3)$$

¹⁰ Studies on the timing ability of fund managers include Bollen and Busse (2001), Dellva (2001), Volkman (1999), Daniel, Grinblatt, Titman, and Wermers (1997), Lee and Rahman (1990), Cheng and Lewellen (1984), and Henriksson (1984). Timing ability has also been examined in the context of investment newsletter recommendations (Graham and Harvey (1996)), portfolio managers (Elton and Gruber (1991)) and investment advisors (Kleiman, Sahu and Callaghan (1996); Cumby and Modest (1987)).

We define the growth rate of natural person beneficiaries for the current month as G_{PB} , see the formula 2-4. And We define the growth rate of institutional beneficiaries for the current month as G_{IB} , see the formula 2-5. We define the growth rate of natural person beneficiaries for the current month as G_{NB} , see the formula 2-6.

$$G_{PB} = \frac{\text{Natural person beneficiaries for the current month} - \text{natural person beneficiaries for the last month}}{\text{Natural person beneficiaries for the last month}} * 100\% \quad (2-4)$$

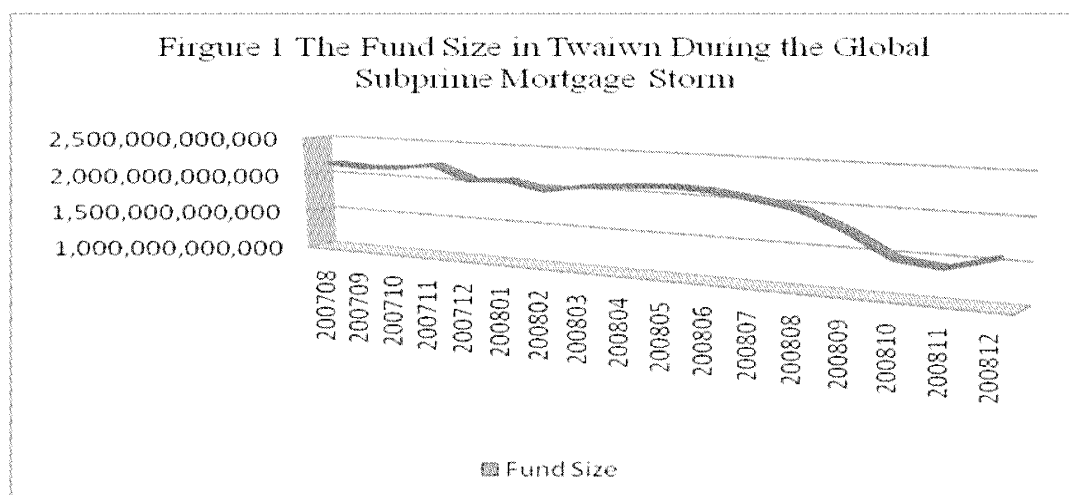
$$G_{IB} = \frac{\text{Institutional beneficiaries for the current month} - \text{Institutional beneficiaries for the last month}}{\text{Institutional beneficiaries for the last month}} * 100\% \quad (2-5)$$

$$G_{NB} = \frac{\text{Natural person beneficiaries for the current month} - \text{natural person beneficiaries for the last month}}{\text{Natural person beneficiaries for the last month}} * 100\% \quad (2-6)$$

Table 1 Mutual fund industry statistics

The data is 2009/10. And the data is from www.sitca.org.tw. Taiwan Depository of Cleaning Corporation is the source of the offshore funds data.

Type	Item	Amount (TWD million)/ Number
Mutual Funds	Fund Size	1,940,184
	Number of Funds	514
Private Funds	Fund Size	28,598
	Number of Funds	132
Discretionary Investments	Fund Size	688,625
	Number of Contracts	1,038
Offshore Funds	Fund Size	1,828,839



What made the mutual fund size decrease in Taiwan during the global subprime mortgage storm? The decreasing of fund size is from the poor mutual fund performance and the redemption of the investors. And the increasing of fund size is from the subscription of the investors. If investors direct their money to funds which invest in stocks that have worse future returns, we call that the dumb money. If investors direct their money to funds which invest in stocks that have better future returns, we call that the smart money. Our definition is not same as the “dumb money” effect proposed by Andrea and Owen (2008). Their definition is the “dumb money” effect which mutual fund investors are “dumb” in the sense that their reallocations reduce their wealth on average.

We examine the timing ability of mutual fund investors using the mutual-fund-flow data during the global subprime mortgage storm. Table 2 reported the growth rate of subscription and redemption in mutual fund size. We found the amount subscription of fund size larger than the amount redemption of fund size in the first three months at the initial global subprime mortgage. Till the fourth month, the amount subscription of fund size was smaller than the amount redemption of fund size. The investors reflected that the global subprime mortgage storm came in Taiwan slowly. The net amount decreasing of fund size is -34 billion NT dollars in the fourth month. The changing of fund size caused by the current-month-fund performance was -102 billion NT dollars in consequence month. It means the investors avoided the bigger loss on average by their timing ability in November, 2007. And the investors avoided the bigger loss in January, June, July, September, October, and November, 2008, too.

Who loss more during the global subprime mortgage? We could get the answer from Table 2 and Table 3. Table 2 also reported the average of monthly subscription was 362,621,177,130 NT dollars and the average of monthly redemption was 358,724,198,241 NT dollars. The average of monthly fund flows was 3,896,978,890 NT dollars. Compared to figure 1, we found the dropping of Taiwan mutual fund size was driven by the poor mutual fund performance, and not driven by redemption by investors. In figure 2, we saw the average of monthly subscription, redemption, and net fund flows were positive. And the average of monthly subscription was larger than the average of monthly redemption in the initial global subprime mortgage storm. But the average of monthly redemption was larger than the average of monthly subscription.

Table 3 reported the growth rate of natural person beneficiaries, institutional beneficiaries, and total beneficiaries. The growth rate of the natural person beneficiaries was still positive when the mutual fund performance was worse in the eleven months. But the growth rate of the institutional beneficiaries was negative in the second and fifth months. Even the growth rate of the institutional beneficiaries was negative from May to December in 2008.

Figure 3 showed the growth rate of the redemption, subscription, and net flow of fund size during the global subprime mortgage storm. The subscription of fund size was going down. And the redemption of fund size was going up. The net flow of fund size was going down. But the subscription, redemption, and net flow of fund size were going up in December, 2008.

Figure 4 showed the difference of natural person, institutional, and total beneficiaries between the last and

the current month. We showed the institutional beneficiaries were slightly going down but the natural person beneficiaries were slightly going up. Until September, 2008, the spread which was the subscription minus the redemption of the natural person beneficiaries was negative. And the spread was 20,126 beneficiaries. On the other side, the institutional investors seemed smarter than the individual retail investors. The institutional investors bought 1667 beneficiaries in October, 2007. But they soon sold 1667 beneficiaries in December, 2007. The beneficiaries of the institutional investors decreased from 27,670 to 24,837 during the global subprime mortgage storm. The beneficiaries of the natural person increased from 1,581,389 to 1,792,217 during the global subprime mortgage storm. The increment of beneficiaries of the natural person was 210828 during this period.

Figure 5 showed the growth rate of total, natural person, and institutional beneficiaries for the current month. We saw the total beneficiaries dropping deeply in October, 2008. Because the large increment of the redemption of beneficiaries was sold by the individual investors. And during the global subprime mortgage storm, the average monthly growth rate of institutional beneficiaries was -0.59. The average monthly growth rate of natural person beneficiaries was 0.75%, and the average monthly growth rate of total beneficiaries was 0.73%.

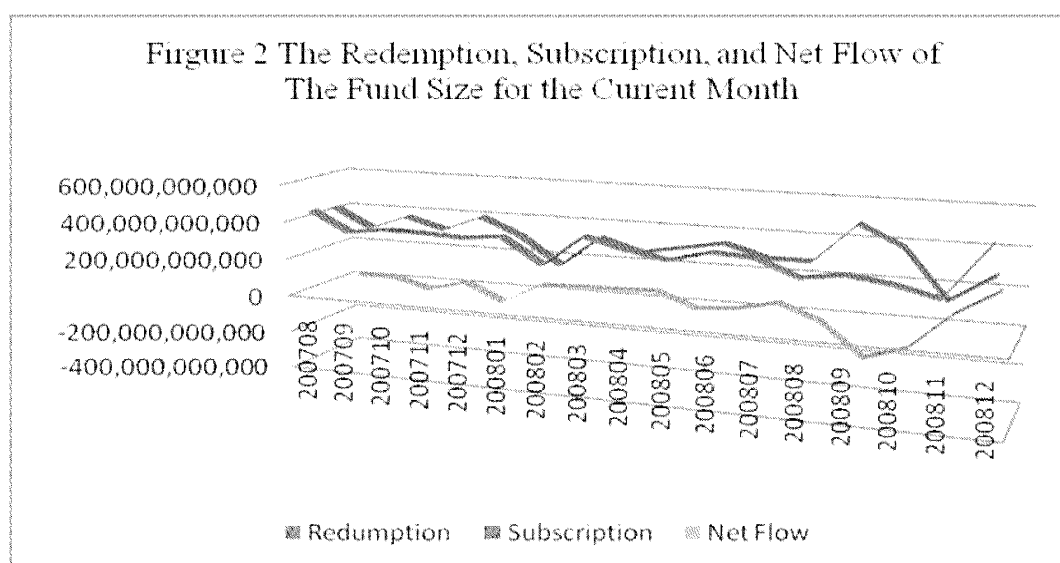


Figure 3 The Growth Rate of the Redemption, Subscription, and Net Flow of the Fund Size for the Current Month

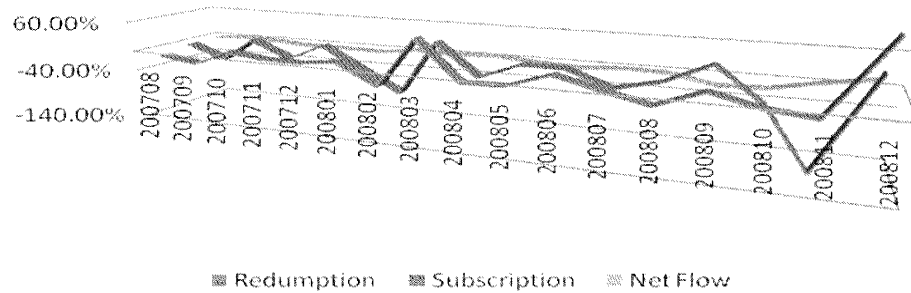


Figure 4 The difference of Natural Person, Institutional, and Total Beneficiaries between the Last and Current Months

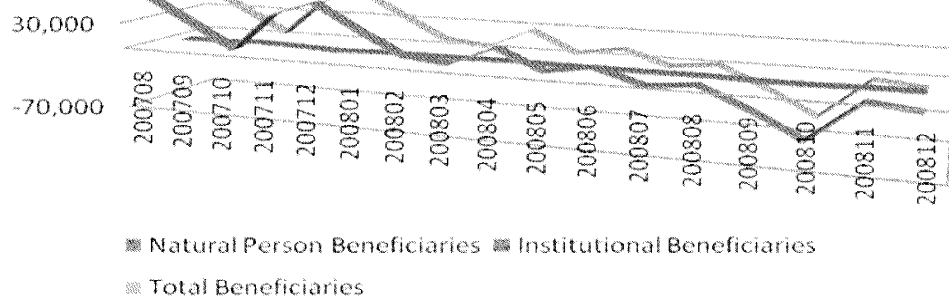


Figure 4 The difference of Natural Person, Institutional, and Total Beneficiaries between the Last and Current Months

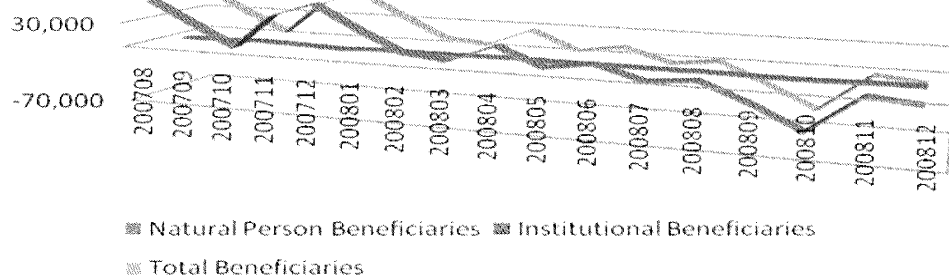


Table 2 The growth rate of subscription and redemption in mutual fund size

Date	Mutual Fund Size NT\$	The Last Fund Size – The Net Fund Flow	The Fund Size Changing Caused by the Current Month Fund Performance	The Subscription Amount For This Month	The Redemption Amount For This Month	The Net Amount Increasing Fund Size This Month	The Growth Rate of Subscription For This Month	The Growth Rate of Redemption For This month	The Growth Rate of Fund Size For This Month
200707	2,145,519,136,558			519,181,344,394	444,735,572,130	74,445,772,264			
200708	2,120,360,613,757	2,162,184,062,438	-41,823,448,681	455,248,165,559	438,583,239,679	16,664,925,880	-12.31%	-1.40%	-1.17%
200709	2,187,698,167,194	2,132,409,940,471	55,288,226,723	349,953,778,981	337,904,452,267	12,049,326,714	-23.13%	-29.80%	3.18%
200710	2,202,107,687,784	2,153,287,767,105	48,819,920,679	376,835,753,444	411,246,153,533	-34,410,400,089	7.68%	17.83%	0.66%
200711	2,116,171,927,920	2,218,773,650,629	-102,601,722,709	371,897,680,483	355,231,717,638	16,665,962,845	-1.31%	-15.77%	-3.90%
200712	2,040,907,741,045	2,042,836,273,653	-1,928,532,608	362,678,146,536	436,013,800,803	-73,335,654,267	-2.48%	18.53%	-3.56%
200801	1,934,050,998,668	2,075,615,539,185	-141,564,540,517	383,776,994,057	349,069,195,917	34,707,798,140	5.82%	-24.91%	-5.24%
200802	2,015,198,692,077	1,977,504,923,693	37,693,768,384	252,473,822,416	209,019,897,391	43,453,925,025	-34.21%	-67.00%	4.20%
200803	2,040,478,072,179	2,060,161,661,001	-19,683,588,822	413,756,627,237	368,793,658,313	44,962,968,924	63.88%	43.32%	1.25%
200804	2,146,438,351,085	2,095,822,331,228	50,616,019,857	361,455,652,708	306,111,393,659	55,344,259,049	-12.64%	-20.48%	5.19%
200805	2,107,200,258,687	2,124,742,852,157	-17,542,593,470	321,974,773,147	343,670,272,075	-21,695,498,928	-10.92%	10.93%	-1.83%
200806	1,993,137,764,458	2,102,220,522,931	-109,082,758,473	376,984,911,137	381,964,646,893	-4,979,735,756	17.09%	10.03%	-5.41%
200807	1,987,753,375,148	2,036,083,956,185	-48,330,581,037	363,446,685,544	320,500,493,817	42,946,191,727	-3.59%	-19.18%	-0.27%
200808	1,952,592,003,589	1,950,009,675,573	2,582,328,016	282,847,800,884	320,591,500,459	-37,743,699,575	-22.18%	0.03%	-1.77%
200809	1,599,389,326,275	1,743,493,719,216	-144,104,392,941	312,429,623,939	521,527,908,312	-209,098,284,373	10.46%	38.53%	-18.09%
200810	1,347,706,313,512	1,460,784,685,241	-113,078,371,729	282,604,621,803	421,209,262,837	-138,604,641,034	-9.55%	-23.82%	-15.74%
200811	1,364,024,855,156	1,404,691,525,424	-40,666,670,268	231,807,785,583	174,822,573,671	56,985,211,912	-17.97%	-140.94%	1.21%
200812	1,571,380,696,995	1,555,812,046,711	15,568,650,284	507,827,020,493	316,039,828,938	191,787,191,555	119.07%	44.68%	15.20%
Avg.	1,937,339,776,783	1,958,613,831,344	-33,519,899,254	362,621,177,130	358,724,198,241	3,896,978,890	4.34%	-9.38%	-1.53%

Table 3 The growth rate of natural person beneficiaries, institutional beneficiaries, and total beneficiaries

Date	Unit Beneficiaries	Natural Person Beneficiaries	Institutional Beneficiaries	Total Beneficiaries	The Growth Rate of Unit Beneficiaries	The Growth Rate of Natural Person Beneficiaries	The Growth Rate of Institutional Beneficiaries	The Growth Rate of Total Beneficiaries	The Difference of Natural Person Beneficiaries between the Last and Current Months	The Difference of Institutional Beneficiaries between the Last and Current Months	The Difference of Total Beneficiaries between the Last and Current Months
200707	143,178,729,803.51	1,581,389	27,670	1,609,059							
200708	144,068,134,664.56	1,638,066	27,782	1,665,848	0.62%	3.58%	0.40%	3.53%	56,677	112	56,789
200709	144,135,897,055.73	1,668,041	27,645	1,695,686	0.05%	1.83%	-0.49%	1.79%	29,975	-137	29,838
200710	143,226,660,505.96	1,671,431	29,322	1,700,753	-0.63%	0.20%	6.07%	0.30%	3,390	1,677	5,067
200711	144,929,103,068.27	1,717,666	29,505	1,747,171	1.19%	2.77%	0.62%	2.73%	46,235	183	46,418
200712	138,915,397,803.24	1,780,512	27,838	1,808,350	-4.15%	3.66%	-5.65%	3.50%	62,846	-1,667	61,179
200801	142,373,206,354.33	1,815,269	28,268	1,843,537	2.49%	1.95%	1.54%	1.95%	34,757	430	35,187
200802	144,378,338,579.14	1,825,079	28,331	1,853,410	1.41%	0.54%	0.22%	0.54%	9,810	63	9,873
200803	146,221,545,493.36	1,829,581	28,398	1,857,979	1.28%	0.25%	0.24%	0.25%	4,502	67	4,569
200804	149,865,112,994.79	1,855,297	29,308	1,884,605	2.49%	1.41%	3.20%	1.43%	25,716	910	26,626
200805	147,648,403,608.05	1,859,257	29,091	1,888,348	-1.48%	0.21%	-0.74%	0.20%	3,960	-217	3,743
200806	146,239,138,207.75	1,871,220	28,973	1,900,193	-0.95%	0.64%	-0.41%	0.63%	11,963	-118	11,845
200807	145,360,991,460.12	1,867,672	28,537	1,896,209	-0.60%	-0.19%	-1.50%	-0.21%	-3,548	-436	-3,984
200808	142,797,942,055.53	1,869,202	28,423	1,897,625	-1.76%	0.08%	-0.40%	0.07%	1,530	-114	1,416
200809	125,716,349,625.13	1,849,076	26,923	1,875,999	-11.96%	-1.08%	-5.28%	-1.14%	-20,126	-1,500	-21,626
200810	113,139,960,619.32	1,802,943	25,345	1,828,288	-10.00%	-2.49%	-5.86%	-2.54%	-46,133	-1,578	-47,711
200811	116,902,368,489.58	1,800,335	25,067	1,825,402	3.33%	-0.14%	-1.10%	-0.16%	-2,608	-278	-2,886
200812	129,163,721,005.47	1,792,217	24,837	1,817,054	10.49%	-0.45%	-0.92%	-0.46%	-8,118	-230	-8,348
Avg	139,347,834,522	1,783,014	27,848	1,810,862	-0.48%	0.75%	-0.59%	0.73%	12,402	-167	-6,192

3. Conclusion

We showed the mutual fund flows in Taiwan during the global subprime mortgage storm. The changing of mutual fund size was from the changing by the mutual fund performance and the spread between the subscription and redemption of fund size. We found the subscription of fund size was larger than the redemption of fund size during this period. We found the institutional investors had timing ability by significantly redemption when negative mutual fund performance, but the individual investors did not.

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An Empirical Study of Myopic Loss Aversion on Taiwan Security Risk Premium

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ABSTRACT

We investigate equity risk premium (ERP) and explain the ERP puzzle in Taiwan security market from Myopic Loss Aversion (MLA). The risk premiums, estimated from the fundamentals suggested by Fama and French (2002), cannot explain the ERP in Taiwan. MLA's evaluation periods are indifferent between risky portfolio and riskless one is about ten months. The results indicate that market price of risk shows the longer the holding period the more significant the estimates are, and the shorter the holding period, the smaller the estimated market prices of risk. The empirical results are consistent with the MLA viewpoint.

Keywords: myopic loss aversion, equity premium puzzle

1. Introduction

Under the assumption that the expected-utility maximizing investors with standard additively separable state preferences and constant relative risk aversion (CRRA), financial economic theory predicts the level of risk premium offered by a risky asset which each individual with homogeneous belief and CRRA will maximize her/his intertemporal expected utility of consumption under the risk level she/he can afford. (Locus, 1978 and Breeden, 1979) Mehra and Prescott (1985) study the U.S. equity premium from 1889 to 1978 and find the coefficient of relative risk aversion needed to justify the U.S. historical equity risk premium nears 30, implying it is too high to be reasonable.

Empirical evidences studied outside the U.S. market showed a similar puzzle. Jorion and Goetzmann (1999) studied inflation-adjusted stock market appreciation, excluding dividends, for 39 countries on the period of 1926-1999 and found that the median real appreciation rate was only 0.8 percent per year compared to 4.3 per year for the U.S. implying there does not exist an implausible equity premium. Similar empirical findings by Siegel (1992), Siegel and Montgomery (1995), Siegel and Thaler (1997), Welch (2000), and Fama and French (2002) for the U.S. security market, and Baytas and Cakici (1999) for Japanese Nikko Securities market indicate that an unreasonable large equity risk premium exists across countries and varies with time.

Benartzi and Thaler (1995) firstly combined loss aversion and mental accounting to propose "Myopic Loss Aversion (MLA)." They suggested that investors care strongly about the market changes that occur over short periods, which explains both the observed portfolio holdings and the large equity premium. Loss-averse investors will find a risky portfolio even more risky if they receive or search information on its value more frequently. Evaluating the portfolio less "myopically" will reduce the risk viewed from these individuals. MLA combines two concepts together and forms a preference scheme trying to explain the premium puzzle. Barberis, Huang, and Santos (2000) added the "house money effect" (that is, loss aversion is reduced following recent gains) to the MLA model and came to similar conclusions of Benartzi and Thaler (1995). Thaler, Tversky, Kahneman, and Schwartz (1997) conducted experiments to examine whether or not investors actually behave the way Benartzi and Thaler's (1995) MLA model suggests. They found that the more often investors look at the market, the more risk averse they behave, and the results exactly match what Benartzi and Thaler (1995) suggest.

Perhaps due to the lack of data, Taiwan's market is not included in Jorion and Goetzmann's (1999) sample, although Taiwan has emerged as an important market recently. The Taiwan Stock Exchange Corporation's

(TWSE) value weighted stock index (TAIEX) increases its weight on the Dow Jones World Stock Market Index and the MSCI Emerging Market Free Index series more¹¹. We hold the viewpoint that it still exist a gap to fill up the lack of a long-run, complete and detailed research of this more working upon market by hiring lots of proposed methodology in the literatures.

Our empirical results contributing the literatures in explaining the equity premium puzzle are follows. First, the risk premium in Taiwan seemly is contrary to the viewpoint of Fama and French (2002). The results could be contributed to (i) more violate dividend-payout policy and more earning dressing effects in Taiwan, (ii) the difference on time-varying risk premium induced by time-varying risk aversion between Taiwan and U.S. markets, (iii) different behavioral factors.

The structure of this paper is as follows. First, presents our sample and related statistics. Second, we estimate the expected risk premium proposed by Fama and French (2002) and the realized premium calculated from TAIEX. We show whether the foundation economic variables explain the puzzle. Third, we hire the prospect theory to solve the puzzle. It is closely followed by the work of Benartzi and Thaler (1995) to estimate the return distributions on different periods by non-parameter bootstrapping method. Applied the results, we identify the portfolio evaluation period that brings indifference between the two portfolios

2. Data description and preliminary results of ERP

We use Taiwan Economic Journal (TEJ) "Equity Data Base" from 1986 to 2002 and "Status of Securities Listed" from 1962 to 1985 to calculate the daily market value on each stock. Ex-dividend dates are collected from the "TSEC Monthly Reviews" and "Daily Trading Reports" for the period 1971 to 2002, and from "United Daily News" and "Daily Trading Reports" of the TSEC for the period 1962 to 1970 manually.

In addition, we use the monthly deposit interest rate averaged from one-month Board Rate¹² (rolled over each month), calculated from the average on the five major commercial banks including, Bank of Taiwan, Taiwan Cooperative Bank, First Bank, Hua Nan Commercial Bank and Chang Hua Bank and disclosed on Web. site of Central Bank of R.O.C. from 1962 to 2001 as the proxy for risk free rate. The summary statistics are shown in Table 1. Preliminary calculations on real rate of equity returns on TAIEX, riskless assets and equity premium from 1961 to 2002 on different holding periods including 20-, 10-, 5-years and two sub-periods divided by the highest historical price level are shown in Table 2.

Some interesting phenomenon shows in Table 2. Firstly, realized equity premium in Taiwan varies differently with the holding periods: longer the holding period, more the realized premium. The long-term stability of real equity returns does not deny that short-run returns can be quite variable. In Table 2, the range of 5-year real return of equity, 32 percent, is about twice than that of 10-year, 62 percent. Secondly, average year equity premium (not reported) is 11.00 percent, far more than that in U.S., 6.90 percent shown by Mehra and Prescott (1985). Likely to most emerging markets, such as Philippines, Peru, Chili, South Korea and Mexico..., reported in Shiller (2000, pp121), this could be contributed to the different macro factors of developing country. Thirdly, the range of Sharpe ratio, a direct measure of reward-to-risk and to proxy for the relative risk aversion, is from -1.29 to 0.80 which implies a largely time-varying market risk and related premium, although the negative Sharpe ratio is difficult to interpret. Finally, roughly consisting with Benartzi and Thaler (1995) MLA arguments, it shows that loss-averse investors will find a risky portfolio even more risky if they receive information, frequency of checking performance of their portfolio, on its value frequently based on the relation between different evaluation period and equity premium.

For the holding period of twenty years, equity risk premium is 6.84 percent in the first sub-period (from 1962 to 1982) and 15.15 percent in the second period (from 1983 to 2002). But, in second ten-year sub-period (from 1973 to 1982), the equity risk premium is negative and is contrary to standard consumption-based financial theory. Our data also shows that investors were compensated with a risk premium of 26.85 percent on sub-period prior to the highest point of TAIEX (12495.34). In contrast, equity premium was -0.49 percent afterwards from 1990 to 2002. Since investors would not accept, ex ante, negative equity risk premium, this

¹¹ For example, MSCI Emerging Market Free Index, consisted of the following 26 emerging markets, indices: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand, Turkey and Venezuela. The rank of TAIEX's weight in MSCI Emerging Market Free Index was raised to the first one in May, 2005.

¹² Interest rate published on the Central Bank website.

disappointing result ought to be a surprise to investors. Our observation supports Sigel and Thaler's (1997) viewpoints that the issue on investigating equity risk premium should be empirically studied under the long run. Our evidence also shows that risk premiums in Taiwan exhibits, in addition to a volatile market, is not matched with the case of the U.S. and that is full of many interestingly empirical issues, such as, negative risk premium (a negative Sharpe ratio), time-varying risk premium, and a more volatile characteristic much different from prior evidence of U.S. market.

Table 1. Summary Statistics of Dividend Yield and Inflation Rates

Real returns of risky and riskless portfolios including cash dividends are calculated from the year normal year return by removing inflation factor. We use monthly price index published by "Directorate General of Budget Accounting and Statistics Executive Yuan, R.O.C." to adjust the nominal return.

		1962 to 2002	1962 to 1982	1982 to 2002
Dividend yields	Arg. average	3.94%	6.38%	1.50%
	Geo average.	2.54%	4.98%	1.30%
	Standard deviation	4.22%	4.84%	0.80%
Inflation rates	Arg. average	4.74%	7.44%	1.89%
	Standard deviation	7.94%	10.37%	1.71%

3. Expected and realized equity risk premium

The core concept on Fama and French's model is whether estimates, including realized and expected premiums, approach to the real equity premium in one economic. The average return on a board portfolio of stocks is typically used to estimate the expected market return. We estimate the realized average stock return by including average dividend yield and average rate of capital gain as follows,

$$A(R_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GP_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A\left(\frac{P_t - P_{t-1}}{P_{t-1}}\right), \quad (1)$$

where, D_t represents the average dividend for the year t . P_t represents the market index level at the end of year t . is the $GP_t = (P_t - P_{t-1}) / P_{t-1}$ rate of capital gain, and $A(\cdot)$ indicates an average value. Additionally, we define D_t / P_t as the dividend-price ratio, D_t / P_{t-1} as dividend yield, E_t / P_t as earning-price ratio, E_t / P_{t-1} as ratio of earnings for year t to price at the end of year $t-1$. The expected average stock return is estimated from two fundamentals (dividends and earnings). The average stock return of dividend growth model is defined as follows,

$$A(R_t^{div}) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GD_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A\left(\frac{D_t - D_{t-1}}{D_{t-1}}\right), \quad (2)$$

where, $GD_t = (D_t - D_{t-1}) / D_{t-1}$ is average growth rate of dividends.¹³

Another proxy of the expected premium model can be found through average stock return of earning growth model,

$$A(R_t^{em}) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GE_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A\left(\frac{E_t - E_{t-1}}{E_{t-1}}\right), \quad (3)$$

where, $GE_t = (E_t - E_{t-1}) / E_{t-1}$ is average growth rate of earnings.¹⁴

¹³ Fama and French view the dividend-price ratio, D_t/P_t , follows a stationary (mean reverting) process. Stationary property implies that if the sample period is long, the compound rate of dividend growth approaches the compound rate of capital gain.

¹⁴ As stated in footnote 3, if the earning-price ratio, E_t/P_t , follows stationary, the average growth rate of earnings is an alternative estimate of the expected rate of capital gain.

Table 2. Real Return of TAIEX, Riskless and Equity Risk Premium

Real returns of risky and riskless portfolios including cash dividends are calculated from the year normal year return by removing inflation factor. We use monthly price index published by "Directorate General of Budget Accounting and Statistics Executive Yuan, R.O.C." to adjust the nominal return. Real return R_t of TAIEX is calculated by $(D_t/P_{t-1}) + (P_t - P_{t-1})/P_{t-1}$, and considering inflation rate for the year t is $\pi_t = CPI_t/CPI_{t-1} - 1$, where CPI_t is the price level at the end of the year t . The Sharpe Ratio is defined as, $(R_t - r_{f_t})/\sigma(R_t)$.

Note: Taiwan's stock market reached its highest level at 12495.34 points on Feb. 10, 1990.

	Period	Real Return of Stock Index	Real Return of Riskless Rate	Equity Risk Premium	Sharpe Ratio
Holding Period of 20 Years	1962~1982	14.44%	7.60%	6.84%	0.1731
	1983~2002	21.49%	6.33%	15.15%	0.2992
Holding Period of 10 Years	1962~1972	22.74%	4.72%	18.03%	0.4742
	1973~1982	6.14%	10.48%	-4.35%	-0.1054
	1983~1992	35.20%	7.31%	27.89%	0.4577
	1993~2002	7.78%	5.36%	2.42%	0.0674
Holding Period of 5 Years	1962~1967	18.04%	4.32%	13.72%	0.3493
	1968~1972	18.24%	7.01%	11.23%	0.7538
	1973~1977	8.86%	9.62%	-0.76%	0.1549
	1978~1982	-17.42%	10.13%	-27.57%	-1.2927
	1983~1987	40.98%	6.63%	34.35%	0.8062
	1988~1992	14.81%	8.12%	6.69%	0.2017
	1993~1997	15.04%	7.01%	8.03%	0.3996
	1998~2002	-10.21%	2.31%	-12.52%	-0.3265
Two Sub-periods Divided by the Highest Historical Price Level	1962~1989 (28 years)	26.85%	7.39%	19.46%	0.4178
	1990~2002 (13 years)	-0.49%	6.09%	-6.58%	-0.1805

Using equation (1) through (3), we can estimate the realized and two expected yearly TAIEX returns and the results are shown in Table 3.¹⁵ We can find two estimates of expected risk premium from dividend and earning growth model and realized risk premium from TAIEX in the last three columns in Table 3. The earning growth model provides larger premium, 19.64 percent on average, than that of dividend model, 17.49 percent and realized premium is 15.86 percent, averagely. Similar results could also be found in their standard deviations. The estimates of expected risk premium on dividend and earning growth model are more than that of realized ones, shown about 1.63 and 3.78 percent, respectively.

Risk premium in Taiwan induces a very interesting result that is contrary to the viewpoint of Fama and French (2002). In contrast of the evidences provided from Fama and French (2002), the averagely realized return, 18.52 percent in Taiwan from 1961 to 2001, is about twice than that of U.S., 9.62 percent from 1951 to 2000. The similar results could also be found in the realized risk premium, 15.86 percent for Taiwan and 7.43 percent for U.S. But, our results show more large values of the expected risk premiums no matter from dividends growth model or earnings growth model. In U.S., the average risk premium of dividends and earning

¹⁵ When estimating the expected return from equation (2) and (3), we should be care of dealing the issue that, D_t/P_t , dividend-price ratio, and, E_t/P_t , earning-price ratio may vary through time because of variation in the conditional expected stock return and the conditional expected growth rates of dividends and earning (see, e.g., Campbell and Shiller, 1989). But if the stock return and the growth rates are stationary (they have constant unconditional means), the D_t/P_t and E_t/P_t both are stationary. Thus, such as the average return in equation (1), the dividend and earning growth models in equation (2) and (3) provide suitable estimates of the unconditional expected stock return.

models are just about 2.55 and 4.32 percent, respectively. Estimated value of risk premiums from fundamentals suggested by Fama and French (2002) to explain the "Equity Premium Puzzle" seemly deeps the puzzle in Taiwan.

Fama and French (2002) hold the views that expected return estimates from the dividend and earnings growth models are more precise than the average realized return, since the standard errors of the average stock return is higher than that of two expected growth models. The same viewpoint is also hold in Claus and Thomas (2001). But, our empirical studies of Taiwan show the different results. The standard error of the expected risk premium on dividend and earning growth model for 1961-2001 are 41.23 and 44.78 percent, versus 30.23 percent for the realized risk premium. Supporting the general sense that earnings growth is more volatile than dividend growth, our evidence of standard error on expected return from earnings growth model, 44.78 percent, is slightly higher than that from dividend growth model, 40.56 percent. But the standard errors are much larger than those in U.S. No matter from the standard errors or from the Sharpe ratio (not reported), we can find standard errors of risk premium on dividend, earning growth model in Taiwan from 1961 to 2001 is about eight time and three time than that of U.S. from 1951 to 2000; the standard error of realized risk premium is less double than that in U.S. Our empirical results cannot be judged from the fundamentals suggested by Fama and French (2002) and we contribute the results to, (i) more violate dividend-payout policy and more earning dressing effects in Taiwan's market, and (ii) different behavioral factors of investors between Taiwan and U.S. markets.

3.1 How Well the Myopic Loss Aversion Explains the TAIEX Equity Premium

Mypotic loss aversion (MLA) was presented and applied firstly to the equity premium puzzle by Benartzi and Thaler (1995) who use preference scheme combining mainly two experimentally observed behavioral concepts, namely loss aversion and mental accounting which are well illustrated by the famous example of Samuelson (1963). Samuelson assumes that his colleague has the following value function.

$$u(x) = \begin{cases} x & \text{if } x \geq 0 \\ 2.5x & \text{if } x < 0 \end{cases} \quad (4)$$

But what evaluating frequency can fill the gap between the realized risk premium and that consumption-based theory predicts and how to bring it into an empirical? To determine the evaluation period that makes the loss averse investor indifferent between the historical returns on stocks and bonds, Benartzi and Thaler (1995) derive prospective utilities of holding these assets with lengths between evaluations for the investor. If the agent evaluates her/his portfolio every six months, her/his utility of holding a stock portfolio is derived using six-month data on assets returns. In order to apply equation (4), we must have the possible payoffs on stocks and riskless assets with corresponding probabilities, at each data frequencies. There are many ways to determine these distributions and Benartzi and Thaler use a non-parametric bootstrap approach. Thus, using historical data on any portfolio we can derive the perspective utility of holding this portfolio at an evaluation period of choice. All we need to do is decide on how loss averse the investor behaves and how often she/he evaluates her/his portfolio. Overall, the non-bootstrap method of estimating stock return distributions shows changes in the first three unconditional moments, as the aggregation level increases, though the forth moment shows an unclear changes.

What do the estimated distributions look like? Figure 1 illustrates estimated distribution for 1-, 2-, 3-, 6-, 9-, 12-, 18-, and 24-months returns when using the non-parametric bootstrap. Monthly stock returns from 1967:1 to 2003:6 are used. The mean of portfolio is expected to be larger over longer holding periods and also, to show a greater uncertainty, compared with shorter portfolio horizons. Our results show that the distributions

Table 3. Annual Equity Premium and Related Statistics for the TAIEX

The inflation rate for the year t is $\pi_t = CPI_t / CPI_{t-1} - 1$, where CPI_t is the price level at the end of the year t . The real return for year t , on one-month Board Rate, rf_t , (rolled over each month) calculated from the average on the five major commercial banks including, Bank of Taiwan, Taiwan Cooperative Bank, First Bank, Hua Nan Commercial Bank and Chang Hua Bank. The normal values of book equity and price for TAIEX index at the end of year t are B_t and P_t . Normal TAIEX dividends and earnings for year t are D_t and E_t . Real rates of growth on dividends, earnings and stock price are represented by the following estimators, $GD_t = (D_t / D_{t-1})(CPI_{t-1} / CPI_t) - 1$, $GE_t = (E_t / E_{t-1})(CPI_{t-1} / CPI_t) - 1$ and $GP_t = (P_t / P_{t-1})(CPI_{t-1} / CPI_t) - 1$. The real dividend yields is $d_t / p_{t-1} = (D_t / P_{t-1})(CPI_{t-1} / CPI_t)$. $RD_t = d_t / p_{t-1} + GD_t$ is the dividend growth estimate of the real TAIEX return for year t . $RE_t = d_t / p_{t-1} + GE_t$ is the earnings growth estimate. R_t is realized real TAIEX return. $RP(D_t) = RD_t - rf_t$ and $RP(E_t) = RE_t - rf_t$ are the dividend and earnings growth estimates of the real equity premium for year t . $RP(R_t) = R_t - rf_t$ is the real equity premium from the realized real return. The first and second moments of all variables are expressed as percents. The variables, mean and standard deviation, include Taiwan and U.S. markets which are shown in the parentheses, are placed in the second and sixth rows.

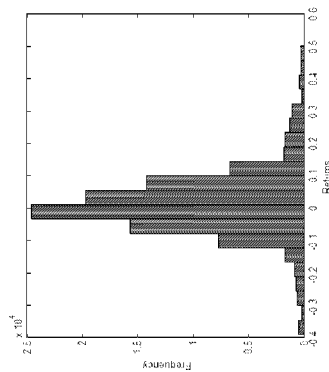
1961-2001											
annual values of variables	π_t	rf_t	GD_t	GE_t	GP_t	RD_t	RE_t	R_t	$RP(D_t)$	$RP(E_t)$	$RP(R_t)$
(1951-2000 in U.S.)											
Mean in Taiwan	5.29	5.84	20.72	22.51	14.48	20.76	22.55	18.52	17.49	19.64	15.86
(in U.S.)	(4.00)	(2.19)	(1.05)	(2.82)	(5.92)	(4.74)	(6.51)	(9.62)	(2.55)	(4.32)	(7.43)
Median	3.22	2.19	18.30	21.10	8.39	18.40	21.10	15.52	12.00	18.11	14.52
Maximum	47.50	82.45	78.36	144.82	124.03	178.79	144.91	78.26	174.68	145.03	104.15
Minimum	-0.17	-0.22	-70.37	-63.19	-73.58	-70.29	-63.13	-1.49	-74.38	-62.94	-71.07
Std. Dev. In Taiwan	8.33	14.00	40.52	44.77	46.61	40.56	44.78	15.28	41.23	44.78	30.23
(in U.S.)	(3.11)	(2.46)	(5.09)	(13.79)	(16.77)	(5.21)	(13.51)	(17.03)	(5.62)	(14.02)	(16.73)
Skewness	3.9156	4.7891	1.6641	0.3941	0.6004	1.6715	0.3940	2.0727	1.7325	0.3929	0.3527
Kurtosis	19.7587	26.4558	8.2919	3.1381	3.0210	8.3217	3.1378	8.3162	8.3062	3.1382	5.1420
Observations	36	36	36	36	36	36	36	36	36	36	36

Figure 1.

Non-parametric bootstrapping distribution of estimated stock returns

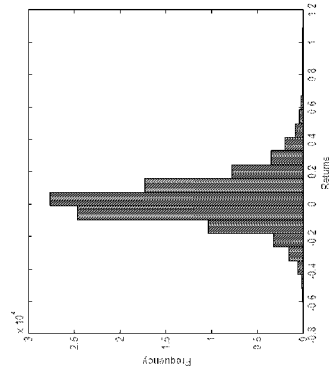
1-month returns

Mean: 0.014
Standard deviation: 0.102
Skewness: 0.563
Kurtosis: 6.558



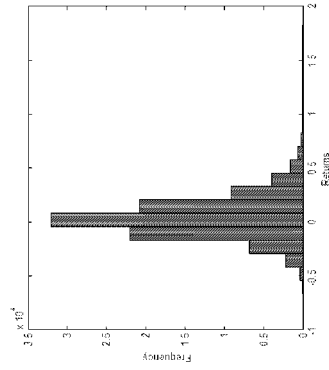
2-month return

Mean: 0.029
Standard deviation: 0.146
Skewness: 0.581
Kurtosis: 5.122



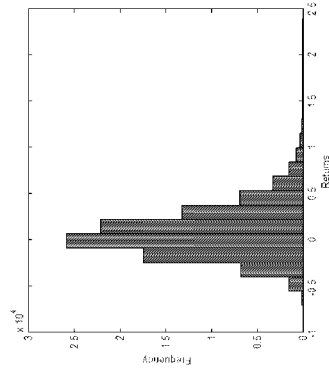
3-month returns

Mean: 0.044
Standard deviation: 0.182
Skewness: 0.670
Kurtosis: 4.967



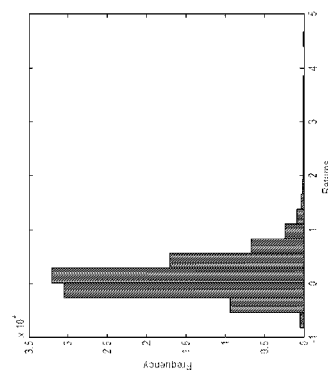
6-month return

Mean: 0.089
Standard deviation: 0.272
Skewness: 0.865
Kurtosis: 4.962



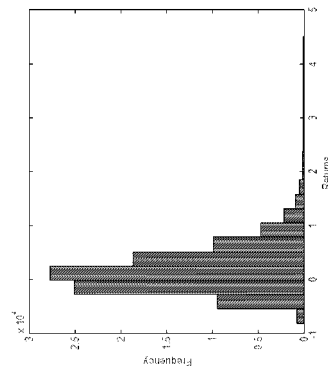
9-month returns

Mean: 0.135
Standard deviation: 0.348
Skewness: 1.070
Kurtosis: 5.842



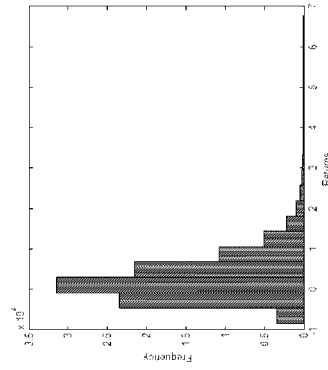
12-month returns

Mean: 0.188
Standard deviation: 0.425
Skewness: 1.204
Kurtosis: 6.114



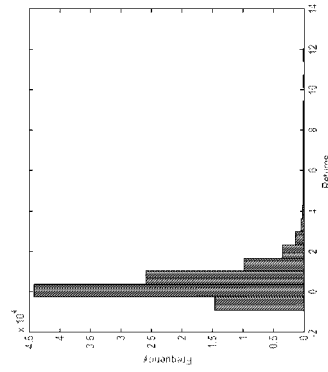
18-month returns

Mean: 0.294
Standard deviation: 0.575
Skewness: 1.503
Kurtosis: 7.698



24-month returns

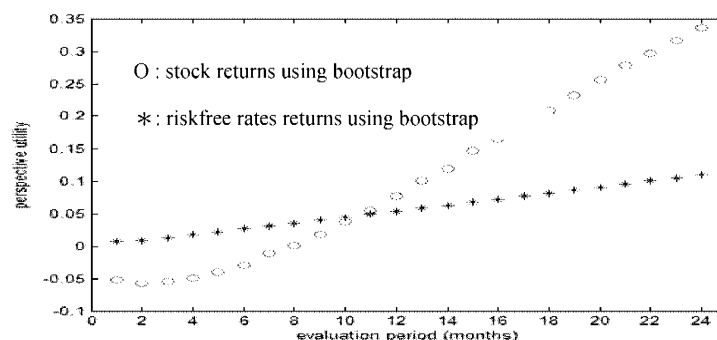
Mean: 0.406
Standard deviation: 0.734
Skewness: 1.804
Kurtosis: 9.986



Note: Distributions were estimated using the non-parametric bootstrap method and the sample period covers from 1967:1 to 2003:6 including 458 monthly returns. The size of histogram interval is twenty.

display larger means accompanying with larger standard deviations and become more outspread with a greater aggregation supported by the skewness on each distributions. The paper does not figure any clear picture in kurtosis, which does not show a consistent pattern, although there might be such. Overall, the non-bootstrap method of estimating stock return distributions shows changes in the first three unconditional moments, as the aggregation level increases, though the forth moment shows an unclear changes.

From Figure 1, the returns and related distributions are available and ready to calculate the horizon of evaluation, which represents a kind of market equilibrium where investors are content with the risk-return relationship of stocks and bonds. We use equation (4) as the prospective utility scheme, just as Tversky and Kahneman (1992) and Benartzi and Thaler (1995), to identify an indifferent holding horizon between stock and riskless assets. Results are shown in Figure 2. The figure displays two graphs, one for the riskfree rate and another is stock return which both are estimated from non-parametric bootstrapping method. The portfolio evaluation period that beings indifference between the risky and riskless portfolios is ten months in Taiwan from 1967:01 to 2004:12. This is near but a little smaller than the value of twelve month evaluation period of Benartzi and Thaler (1995) from 1926:01 to 1990:12. The fact that indifferent holding horizon in Taiwan (ten months) is small than that in U.S. (twelve months) reflects a shorter horizon of market equilibrium where investors consist with the risk-return relationship of stocks and bonds under prospective utilities scheme, though the sample period is different, Taiwan is from 1967 to 2004, in contrast, the U.S. is from 1926 to 1990. To check the relation between the equity premium and the evaluation periods in advanced, we divide the sample in Taiwan into two subsets, one is from 1967 to 1986, another is from 1987 to 2004 based on the roughly identification that there could exist a structural change at 1986.



Note: Distributions were estimated using the non-parametric bootstrap method and the sample period covers from 1967:1 to 2003:6 including 458 monthly returns. The size of histogram interval is twenty.

Figure 2. Prospective utility as a function of evaluation period in Taiwan

Table 4 shows annual risk premium and indifferent holding horizon in Taiwan and U.S.. Whole sample period provides an annual risk premium about 12.69 percent with an evaluation period, ten months, while the

first sub-period from 1967 to 1986 suggests 9.38 percent and twelve months, respectively and the second one from 1987 to 2004 offers 15.49 percent and seven months. Borrowing the statistics from Benartzi and Thaler (1995), the annual risk premium and evaluation period are about 6.40 percent and twelve months. Two things should be noticed. First, there exists a negative relation between the equity premium and the equilibrium evaluation period, i.e., evaluation period decreases as the risk premium increases, even if we could not identify the causality between equilibrium evaluation periods and risk premium. Second, the indifferent evaluation period, twelve months, in Taiwan from 1967 to 1986 is equal to that in U.S. from 1926 to 1990, but the annual risk premium differs a lot, 2.98 percent, between them. The additional premium could be caused the different sample period limited to the evolving process in each security market, market risk, investing behavior or some factors the academic still can not figure out. The economic meaning of two evaluation periods from twelve months to seven months tells us the investors ask more risk premium at the second stage than that on the first stage and implies loss-averse investors check their portfolios more frequently than they did before. It could also be a phenomenon that the composition of market participants has changed or that the investing behavior of participants was affected by some structural factors, such as an introduction of the electric ordering system, a faster diffusion mode of information by all communication tools and other social factors that could affect the mentality of the market. To investigate these factors is quite interesting, though it could beyond the content of this paper.

Table 4. Annual Risk Premium and Indifferent Holding Horizon

	Taiwan 1967:01 -2004:12		Taiwan 1967:01 -1986:12		Taiwan 1987:01 -2004:12		U.S. 1926:01:1990:12	
	stocks	Riskfree	stocks	riskfree	stocks	riskfree	stocks	riskfree
Mean of return	0.0146	0.0046	0.0128	0.0053	0.0159	0.0038	N.A.	N.A.
Standard deviation. Of return	0.1022	0.0044	0.0752	0.0016	0.1252	0.0016	N.A.	N.A.
annual risk premium	0.1269		0.0938		0.1549		0.0640	
indifferent holding horizon (months)	≈ 10		≈ 12		≈ 7		≈ 12	
observation	456		240		216		780	

Note : 1. the mean and standard deviation are monthly data where the risk premium is presented as annual data

2. the U.S. data is from Benartzi and Thaler (1995).

3. Notion, \approx , presents a approximate value.

4. Conclusion

This research investigates the premium from the expected return by fundamentals and using MLA hypothesis to estimate the average evaluation interval in Taiwan. Our paper conscientiously and completely studies the equity premium in Taiwan from 1961, which the TWSC commenced, to 2004 from the fundamentals and the MLA hypothesis in behavioral finance.

Estimated value of risk premiums from the fundamentals suggested by Fama and French (2002) to explain the “Equity Premium Puzzle” seemly deeps the puzzle in Taiwan. The results could be contributed to (i) more violate dividend-payout policy and more earning dressing effects, (ii) the difference on time-varying risk premium induced by time-varying risk aversion between Taiwan and U.S. markets, (iii) different behavioral

factors. Moreover, we find the portfolio evaluation period that beings indifference between the two portfolios is ten months, which is near but small the twelve month evaluation period of Benartzi and Thaler (1995) from 1926:01 to 1990:12, in Taiwan from 1967:01 to 2004:12. Furthermore, we find the indifferent evaluation period, twelve months, in Taiwan from 1967 to 1986 is equal to that in U.S. from 1926 to 1990, but the annual risk premium differs a lot, 2.98 percent, between them.

The additional premium could be caused the different sample period limited to the evolving process in each security market, market risk, investing behavior or some factors the academic still can not figure out. It could also be a phenomenon that the structure of the composition on market participants has changed or that the investing behavior of participants was affected by some structural factors, such as an introduction of the electric ordering system, a faster diffusion mode of information by all communication tools and other social factors that could affect the mentality of the market.

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Hedging With Futures Contract: Estimation and Performance Evaluation of Optimal Hedge Ratios in European Union Emissions Trading Scheme

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ABSTRACT

Following the introduction of the European Union Emissions Trading Scheme, CO₂ emissions have become a tradable commodity. As a regulated party, emitters are forced to take into account the additional carbon emissions costs in their production costs structure. Given the high volatility of carbon price, the importance of price risk management becomes unquestioned. This study is the first attempt to calculate hedge ratios and to investigate their hedging effectiveness in the EU-ETS carbon market by applying conventional and recently developed models of estimation. These hedge ratios are then compared with those derived for other markets. In spite of the uniqueness and novelty of the carbon market, the results of the study are consistent with those found in other markets – that the hedge ratio is in the range of 0.5 to 1.0 and still best estimated by simple regression models.

1. Introduction

The aim of this paper is to calculate optimal hedge ratio in EU-ETS carbon market using conventional and recently developed models of estimation. Based on variance reduction and utility improvement capabilities, relative merits of each model is to be established. The novelty of the paper rests in two areas: firstly, this is an original estimation of minimum variance hedge ratio applied in the EU-ETS carbon market; secondly, this is a first study to compare carbon market hedge ratios with other markets.

This paper consists of five main sections. In Section 2 results of diagnostic tests are discussed. In Section 3, estimations of optimal hedge ratios are conducted. Section 4 presents the effectiveness of application of hedging. The paper concludes in Section 5.

2. Data, descriptive statistics and diagnostic tests

The study is conducted over the period 2005 to 2009 which is divided into two sub-periods: sub-period 1 or Phase 1 of the ETS from 2005 to 2007, and sub-period 2 or Phase 2 of the ETS from 2008 to 2009. Daily spot and futures price data are used. To test for stationarity, Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) stationarity tests were applied. They revealed a stationarity problem in practically all time series. Then, two-step Engle and Granger method was used to test for cointegration of spot/futures price combinations. Similarly, all combinations showed cointegration. Then, Johansen's cointegration procedure was applied to identify the

number of cointegration relationships between spot and future series. Hedging combinations EUA vs. Dec-05 and EAU vs. Dec-07 exhibit two cointegration equations and all other show one cointegration relationship.

3. Hedge ratios calculations

The hedge ratio (h) formula can be shown to be equal to the following which is simply the coefficient of the regression of the spot price on the future price.

$$h = \frac{Cov(\Delta s, \Delta f)}{Var(\Delta f)} = \rho \frac{\sigma_s}{\sigma_f}$$

A number of regression models, fixed and time-varying, are therefore used to estimate the hedge ratios. Prior to the estimation of these models, diagnostic tests are conducted as discussed in Section 2. Sorted by models, the following Table 1 contains a summary of hedge ratios for all hedging combinations. Each hedging combination consists of a spot contract and a futures contract. For all Phase I hedging combinations, the starting point is 24th of June, 2005. Therefore, every next combination comprises the entire horizon of the previous combination. This applies to all combinations in Phase II as well, except for Phase II EUA hedging combinations, the starting point is 24th of February 2008, and 12th of August 2008 for CER combinations. Treating Phase I and II separately for hedge ratio application implies the exclusion of inter-phase hedging of EUA. In addition, hedge ratios computed using Naive, OLS, ECM and VECM models are fixed, in other words time-invariant hedge ratios. All of them remain unchanged throughout the entire hedging horizons (i.e. Phase I and II). In contrast, since VECM-GARCH produces conditional hedge ratio, results of VECM-GARCH reported in Table 1 are the averaged value of the dynamic, time-varying hedge ratio at each point in time. The purpose of presenting the averaged dynamic hedge ratio is solely comparative, since it cannot be used in practice.

Table 1. Calculated Hedge Ratios

Phase	Hedging Horizon	Hedging Combo	Naive Approach	Simple OLS	Two-stage ECM	Vector ECM	VECM GARCH*
I	2005	EUA vs Dec05	1.0000	0.8556	0.7683	0.7743	0.7157
	2006	EUA vs Dec06	1.0000	0.8533	0.7016	0.6801	0.8740
	2007	EUA vs Dec07	1.0000	0.8962	0.9331	0.9099	0.5565
	2008	EUA vs Dec08	1.0000	0.9557	0.9666	0.9666	0.9792
	2009	EUA vs Dec09	1.0000	0.8794	0.9444	0.9384	0.9379
II	2008	CER vs Dec08	1.0000	0.9431	0.8928	0.8929	0.9293
	2009	CER vs Dec09	1.0000	0.8325	0.8679	0.8636	0.8732

* note that hedge ratios listed in table are averaged values

Observe from Table 1, hedge ratios (OHR) vary from model to model and period to period. First point to note is that the calculated hedge ratio for two-stage ECM and VECM are extremely close to each other in most of the cases. This is not surprising given that they share the same error correction fundamentals. However, this minor difference may generate implications for hedge ratio performance evaluations as OHR is one of the inputs for performance calculation. Secondly, in Phase II, all OHRs for both EUA and CER decline in 2009 as

compared to 2008 hedging horizon. Thirdly, Phase II OHRs are generally greater than Phase I, this can be explained by the lowered overall variance of futures price changes in Phase II as compared to Phase I. However, in Phase I of the one year hedging horizon, OHR derived by OLS and ECMs decreased in 2006 compared to 2005 and increased again in the 2007. Meanwhile, the averaged OHR derived by VECM-GARCH increased in 2006 and decreased again in 2007. Note further that these hedge ratios are within the range of hedge ratios estimated for such markets as equities, bonds, foreign exchange, and commodities (see Appendix I).

In order to better understand the changes in calculated hedge ratios, recall the basic formula for hedge ratio estimation that was shown earlier. Fundamentally, the minimum variance optimal hedge ratio in this study is calculated as dividing the covariance between spot and futures return by the variance of the futures return. Accordingly, any factors that have an effect on the changes of covariance and variance become the objects for investigation towards the changes of hedge ratios. Therefore, the question has essentially become the behaviors of both spot and futures prices since changes in price levels contribute to variations in covariance and variances.

To demonstrate the discussion, Figure

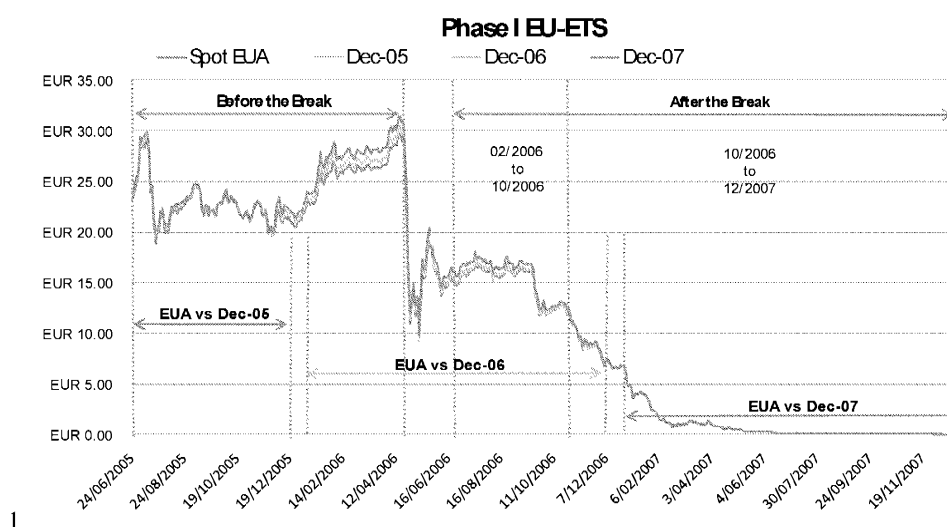


Figure 1 revises the historical price of EUA and futures in Phase I, however, this time the full period is divided into three sub-periods¹⁶. By doing so, we are able to identify the different sub period volatility that contributes to the high full period volatility. It also indicates the hedging horizons of each phase I hedging combinations in addition to the prices.

¹⁶ This study adopts the breaks carried out in Alberola, Chevallier and Che`ze (2008)

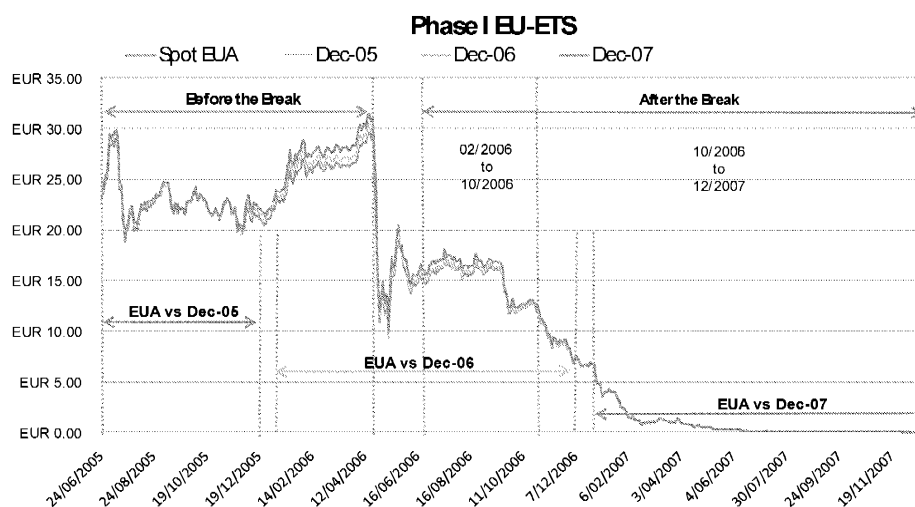


Figure 1. Phases I EU ETS and Hedging Combinations (Sub-phases)

The EUA and futures price exhibit massive price changes in Phase I. Starting from early, 2005, EUA and futures price increased to around 30 Euro in July 2005, bouncing within 20-25 euro during the following six months, then rose to 30 euro until the end of April. On the last week of April 2006 EU officials disclosed 2005 verified emissions data and reported the over-allocation of free permits. In the following four days, prices went down by 54%, and after about a week, EUA prices slightly recovered and fluctuating within the range from 15 to 20 euro until October 2006. Approaching the end of Phase I, since the unused allowances are not allowed to be carried forward the Phase II, companies tried to sell out all their allowances. From this date, Phase I prices were declining towards zero and eventually fell to one euro cent. Observe from Figure 1, Phase I EUA futures and spot prices are strongly correlated, which was expected based on the cointegration test results. These events created substantial volatility to the market in Phase I. The following Table 2 reports the sub-periods variance and standard deviation of EUA.

Table 2. Phase I EUA Variance and Standard Deviation (Break up)

	Before the Break	During the Break	After the break	
	24/06/2005- 21/04/2006	24/04/2006- 20/06/2006	20/06/2006-28/12/2007	
Variance	6.5147	16.5169	10.0839	
Standard Deviation	2.5524	4.0641	6.1525	
			2/05/2006- 19/10/2007	20/10/2007- 28/12/2007
Variance			3.0633	37.8538
Standard Deviation			1.7502	3.1755
	Complete Period 24/06/2005-28/12/2007			
Variance	104.7334			
Standard Deviation	10.2339			

Demonstrated in Figure

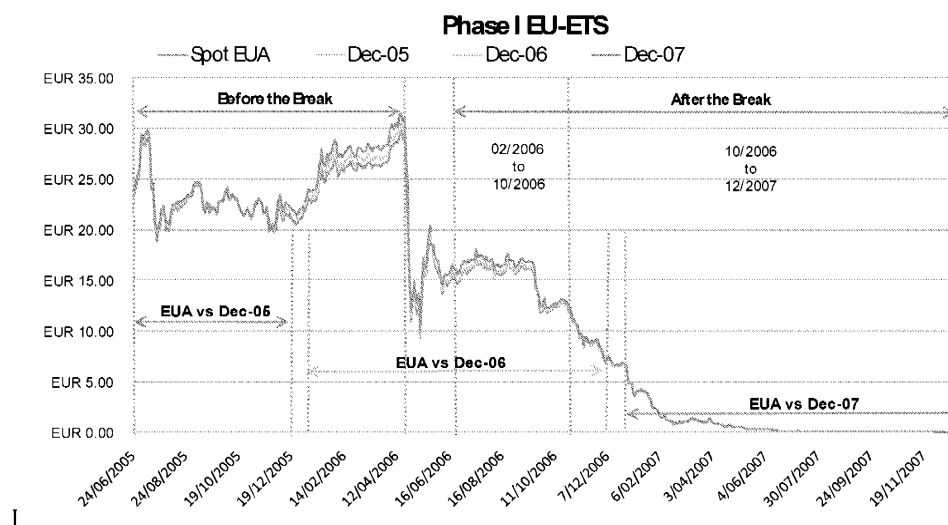


Figure 1, the compliance break happened within EUA vs Dec-06 hedging horizon, the sudden excessive variance of EUA as seen in Table 2 contributed to the lower optimal hedge ratios calculated by OLS, ECM and VECM. This also applies to EUA vs Dec-07 hedging combination as futures contract over the full period exhibits extremely high variance (104.73) due to the incorporation of both the compliance break and the price collapse in late Phase I.

In Phase II, despite the impact of GFC on the market, the overall volatility has largely decreased. Similarly with Phase I, in Figure 2, Phase II (up to 20/12/09) is subdivided into three sub-phases in relation to Phase II hedging combinations.

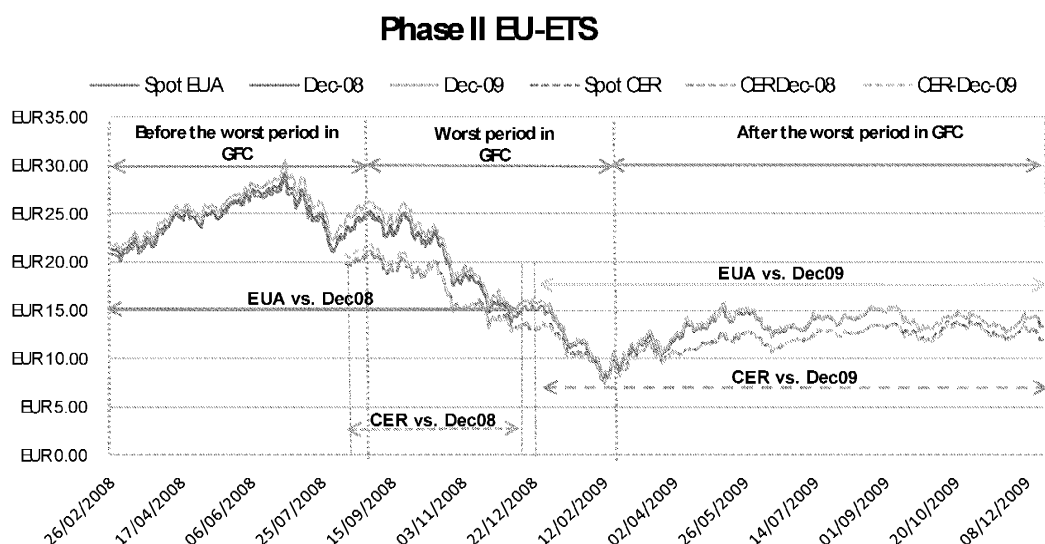


Figure 2. Phases II EU ETS (up to 20/12/09) and Hedging Combinations (Sub-phases)

This was done to accommodate the impact of the global financial crisis on the EU ETS market. A contracted production caused by a drop in demand led to a lower emissions output. Meanwhile, price of EUA and CER fell consecutively during the worst period of the GFC. To take into account the effect of GFC, there are three

sub-periods shown in Figure 2. The worst period in GFC was from September 2008 to February 2009, when global stock markets suffered enormous losses due to uncertainty about bank solvency, credit availability, and damaged investor confidence (particularly in the U.S.). This period was separated from “before the worst period” and “after the worst period” in GFC for analytical purposes. The following Table 3 provides statistical evidence on sub period and full period volatility of Phase II EUA measured by variance and standard deviation.

Table 3. Phase II EUA Variance and Standard Deviation (up to 20/12/09)

	Before the worst time in GFC	During the worst time in GFC	After the worst time in GFC
	26/02/2008- 29/08/2008	1/9/2008- 13/2/2009	16/2/2009- 20/12/2009
Variance	4.3876	22.1292	1.9582
Standard Deviation	2.0947	4.7042	1.3994
Whole period 26/02/2008-20/12/2009			
Variance	28.7482		
Standard Deviation	5.3617		

If the results in Table 3 and Table 2 are compared, it can be observed that the full period variance of Phase II EUA (28.74482) is substantially lower than in Phase I (104.7334), which explains the higher overall level of Phase II hedge ratio compared to Phase I.

A critical point to note here is that the covariance of spot and futures returns and variance of futures returns for OLS and ECMs hedge ratio estimation are assumed to be constant. In other words, the constant OHRs derived using OLS and ECMs are designed to minimise the unconditional variance in a particular hedging horizon. In contrast, covariance and variance used in VECM-GARCH framework is conditional, which means it varies over the hedging horizon. Therefore, it is important to note that VECM-GARCH hedge ratio minimises the dynamic variance of futures returns. The following Table 4 provides the decomposition of OHR derived using VECM as an example of the constant covariance and variance.

Table 4. Unconditional Covariance and Variance for VECM Hedge Ratio

Asset	Hedging horizon	Cov($\Delta s, \Delta f$)	Var (Δf)	OHR ¹⁷	Cov Change	Var Changes
EUA	2005	0.3431	0.443	0.7743		
	2006	0.4362	0.641	0.6801	<u>0.093</u>	<u>0.1982</u>
	2007	0.0071	0.008	0.9099	<u>-0.429</u>	<u>-0.6335</u>
	2008	0.2632	0.272	0.9666		
	2009	0.1145	0.122	0.9384	<u>-0.1487</u>	<u>-0.1503</u>
CER	2008	0.1773	0.199	0.8929		
	2009	0.0827	0.096	0.8636	<u>-0.0947</u>	<u>-0.1029</u>

¹⁷ Taken from Table 1

From Table 4, it is now clear to see the changes of OHR. In 2006, OHR decreased because variance has increased more than covariance due to the compliance break. In the end of 2007, price of EUA quickly fell to its technical minimum. This led the variance and covariance to decrease accordingly. As a result, OHR increased as variance decreased much more compared to covariance. Similar behavior can be observed in 2009 (Phase II). OHR for both EUA and CER decreased compared to the previous year. The decreasing variance was expected as the worst period in GFC past.

As one may notice, OHR derived by VECM-GARCH model in Table 1 does not follow the general rule discussed as such. Apart from the inconsistency of the results, the OHRs listed were averages of all the time-varying OHRs. Therefore, it is necessary to observe the full dynamics of these hedge ratios from time to time in order to investigate the possible explanations of such inconsistencies. The conditional hedge ratios derived by VECM-GARCH are fully graphed in Figure 3 (Phase I), Figure 4 (Phase II) against the conventional OLS and VECM hedge ratios in each graph. Each figure consists of four sections, it starts with the price level of EUA/CER and futures contract which is followed by the spot and futures returns. Based on the return, the conditional variance of futures returns and covariance between the returns are calculated using GARCH framework. Finally, the dynamic OHR is plotted against the fixed OHR derived by OLS and VECM. With the OHR section of each figure, the horizontal axis dedicates the hedging horizon and vertical axis represents the level of hedge ratios. The fluctuating line is the conditional hedge ratio at each point in time derived by VECM-GARCH model and the straight lines represent the constant hedge ratios with the solid straight line being the conventional OLS hedge ratio and the broken straight line being the VECM hedge ratio. All sections in each sub-figure share the same timeline, which provides a comprehensive visualization of the dynamic hedge ratio in relation to its determinative elements. It is also important to note that each section in the figure includes not only one futures contract, but all available contracts within the phase. For every year, the graph uses a respective futures contract. This is because EUA and CER futures contract with different maturities are completely different assets being traded in the market simultaneously.

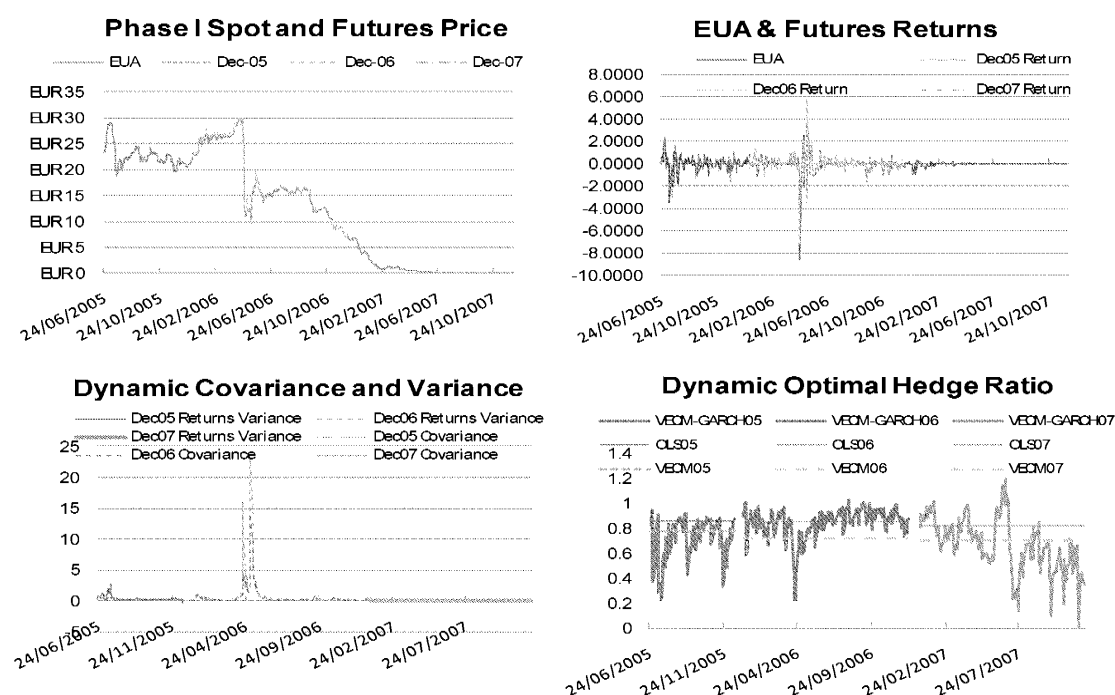


Figure 3. Phase I Conditional Hedge Ratio with Determinative Elements

Most notably from Figure 3, the Phase I compliance break generated large returns variations, which caused the conditional variance and covariance surging to an extreme height for 2006 hedging horizon. The conditional variance and covariance in all three hedging horizons (2005-2007) generally appear to be very close. However, OHRs are very sensitive to changes in prices since the hedged portfolio is calculated on a daily basis. Despite extremely low level of several OHRs, such as during the compliance break, most of the dynamic OHRs throughout the hedging horizon appear to be larger than the lower-end extremes. It is reasonable that one may expect the averaged OHR in 2007 to be higher than in 2006. However, because of the price collapse at the end of Phase I, when both spot and futures price fell to virtual zero, the covariance and variance became extremely small. Accordingly, the dynamic OHR are forced to become lower and eventually meaningless at the end. This has been the major factor that contributes to the much lower averaged OHR derived by VECM-GARCH in hedging horizon 2007 compared to 2005 and 2006. A number of studies cut out the data from a few days after the price fell to near zero. However for the completeness purposes, this study incorporated the full Phase I data which possibly included some meaningless data at the end of Phase I.

Similarly with Figure 3, the following Figure 4 provides the complete set of dynamic optimal hedge ratio for Phase II EUA. Most notably in Figure 4, the dynamic OHR in 2008 presents a relatively stable trend over the hedging horizon which in other words, is very close to the fixed hedge ratio derived by OLS and VECM. One of the most apparent explanations for such a “calm” dynamic hedge ratio is primarily because of the price level. The price level and returns in 2008 hedging horizon created a series of dynamic variances and covariances that are fairly stable. Since Phase II is a more ‘mature’ phase after “learning” the lessons from Phase I when massive volatility took place, such calm conditional OHRs are expected. Accordingly, the use of conditional

optimal hedge ratio in this hedging horizon may not be necessary. In 2009, the conditional variance and covariance returned to the volatile form as seen before. However, compared to Phase I hedging horizons, there are no sudden extreme jumps in variance and covariance after taking into account the worst period in GFC. As a result, the dynamic OHR does not vary substantially as happened in Figure 3.

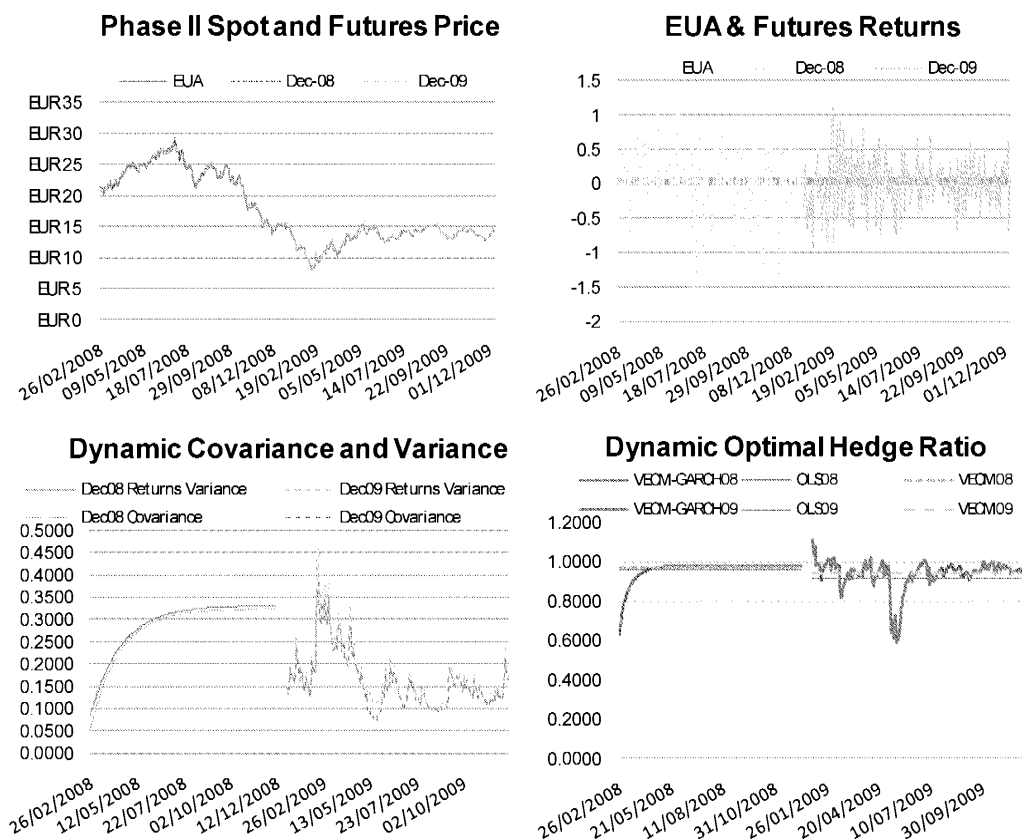


Figure 4. Phase II Conditional Hedge Ratio with Determinative Elements (EUA)

The following Figure 5 illustrates dynamic hedge ratios of CER, 2008 hedging horizon demonstrated similar behavior as seen in Figure 4. The dynamic covariance between spot and futures returns and variance of futures return are relatively stable as is the conditional OHR. Particularly with the covariance of futures returns, which has been almost flat over that entire hedging horizon except little changes at the beginning. CER started trading only from August 2008, therefore, hedging horizon 2008 in Figure 5 is the shortest hedging horizon in this study. Again, for 2009 hedging horizon, the results are similar to 2009 EAU hedge. The dynamic variance and covariance as well as conditional OHR for CER vs Dec-09 hedging combination exhibit a very close relationship with the EUA vs Dec-09 hedging combination. Despite a different commencement date, they share similar trends in dynamic covariance, variance and OHR. Most notably, during May 2009, both OHR experienced a sudden drop caused by divergence variance of future returns from covariance between spot and futures return, which can be observed from the conditional variance and covariance section of both figures. Based on such similarities, the cointegration relationship between EUA and CER is

likely.

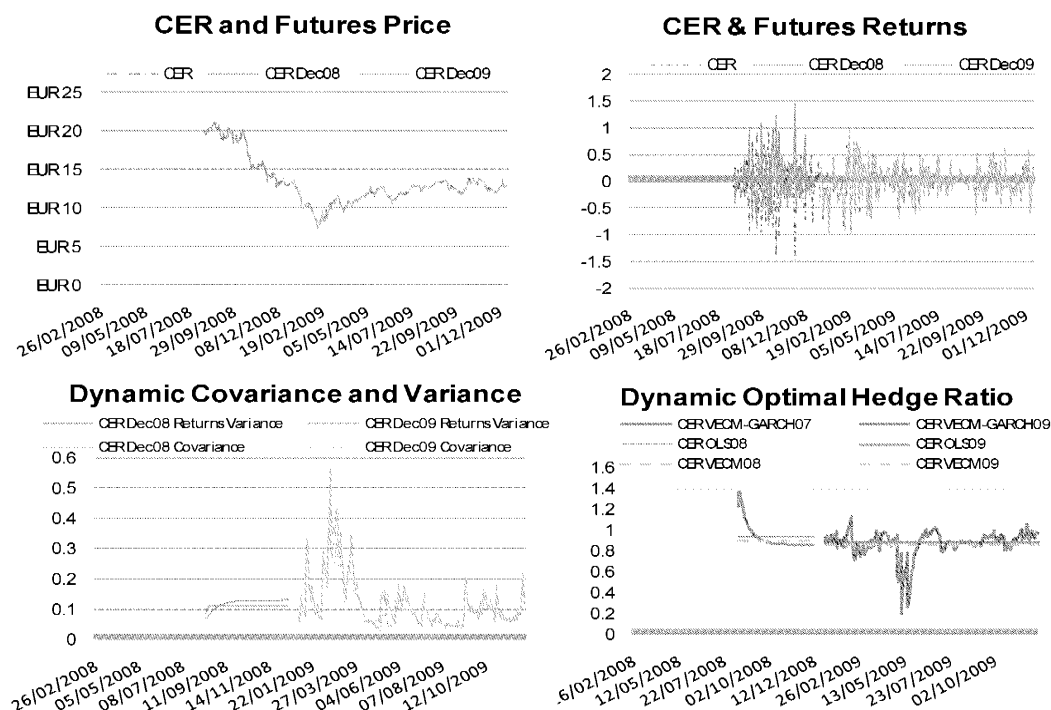


Figure 5. Phase II Conditional Hedge Ratio with Determinative Elements (CER)

4. Hedging effectiveness

This section reports the performance of the estimated hedge ratios in two aspects. The first part of this section reports the results of the variance reduced by employing different models over the unhedged position. The second part adopts the maximum utility technique. The utility improvements of each model over the unhedged position are reported separately for each hedging combo.

Variance Reduction

The following

Table 5 reports the results of variance reduction for each hedging combination achieved using Naive, OLS, ECM, VECM and VECM-GARCH model. There are two rows for variance reduced of each hedging combination. The first row represents the variance reduction in natural numbers, where the second row shows percentage variance reduction over the unhedged position.

As evident from the

Table 5, all models have suggested significant variance reduction over the unhedged position across the entire Phase I and II hedging horizons. The smallest reduction is greater than 60 percent of the unhedged position. Meanwhile, the largest reduction (91 percent) indicates a variance reduction of nearly a hundred percent. These

results are consistent with the conceptual framework whereas hedging with futures contracts, as a financial risk management avenue, has significantly reduced the risk (variance in this case) of unhedged trading in spot EUAs or CERs. However, the performance of individual hedge ratio estimation models is mixed, thus a single conclusion on superiority of a certain model cannot be drawn with confidence. Instead, a generalised result which attempts to consolidate the results is to be discussed. The following frequency distribution table is designed to pool the output.

Table 5. Variance Reduction Based on Different Models

Phase	Hedging Horizon	Hedging Combo	Variance Unhedged	Hedged Portfolio Variance Based On				
				Naive	OLS	ECM	VECM	VECM-GARCH
I	2005	EUA vs Dec05	0.4862	0.14801	0.13809	0.14171	0.14123	0.19013
			Variance Reduced	<u>0.33820</u> <u>69.56%</u>	<u>0.34812</u> <u>71.60%</u>	<u>0.34450</u> <u>70.85%</u>	<u>0.34498</u> <u>70.95%</u>	<u>0.29609</u> <u>60.90%</u>
	2006	EUA vs Dec06	0.7927	0.22498	0.20767	0.22616	0.23177	0.28203
			Variance Reduced	<u>0.56772</u> <u>71.62%</u>	<u>0.58503</u> <u>73.80%</u>	<u>0.56655</u> <u>71.47%</u>	<u>0.56093</u> <u>70.76%</u>	<u>0.51068</u> <u>64.42%</u>
	2007	EUA vs Dec07	0.0112	0.00141	0.00130	0.00174	0.00185	0.00101
			Variance Reduced	<u>0.00984</u> <u>87.49%</u>	<u>0.00995</u> <u>88.48%</u>	<u>0.00950</u> <u>84.50%</u>	<u>0.00939</u> <u>83.52%</u>	<u>0.01024</u> <u>91.01%</u>
	2008	EUA vs Dec08	0.2705	0.02469	0.02415	0.02419	0.02419	0.02435
			Variance Reduced	<u>0.24582</u> <u>90.87%</u>	<u>0.24635</u> <u>91.07%</u>	<u>0.24632</u> <u>91.06%</u>	<u>0.24632</u> <u>91.06%</u>	<u>0.24616</u> <u>91.00%</u>
	2009	EUA vs Dec09	0.1316	0.02720	0.02520	0.02578	0.02568	0.02614
			Variance Reduced	<u>0.10440</u> <u>79.33%</u>	<u>0.10640</u> <u>80.85%</u>	<u>0.10581</u> <u>80.41%</u>	<u>0.10592</u> <u>80.49%</u>	<u>0.10545</u> <u>80.14%</u>
II	2008	CER vs Dec08	0.2062	0.02713	0.02647	0.02699	0.02698	0.02869
			Variance Reduced	<u>0.17902</u> <u>86.84%</u>	<u>0.17969</u> <u>87.16%</u>	<u>0.17917</u> <u>86.91%</u>	<u>0.17917</u> <u>86.91%</u>	<u>0.17746</u> <u>86.08%</u>
	2009	CER vs Dec09	0.0895	0.02347	0.02090	0.02193	0.02179	0.02123
			Variance Reduced	<u>0.06601</u> <u>73.77%</u>	<u>0.06858</u> <u>76.64%</u>	<u>0.06756</u> <u>75.50%</u>	<u>0.06769</u> <u>75.64%</u>	<u>0.06825</u> <u>76.27%</u>

The performance of each model in terms of variance reduction is ranked within the seven hedging horizons (see Table 6).

Table 6. Frequency Distribution Chart for Ranking of Variance Reduction.

	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank	Overall rank
Naive	0	0	2	2	3		Fifth
OLS	6	1	0	0	0		First
ECM	0	2	2	3	0		Third
VECM	0	3	3	0	1		Second
VECM-GARCH	1	1	0	2	3		Fourth

In contrast to some existing research, this study does not support superiority of VECM-GARCH model. VECM-GARCH has been ranked the worst on three occasions. On the other hand, the conventional OLS is ranked the best performing model in six cases, clearly outperforming all other models in overall ranking.

Moreover, it is not surprising to see that frequency rankings and variance reduction of ECM and VECM are close to each other since they share the same foundations of error correction mechanism. Also note that the difference in variance reduction between OLS and ECMs are relatively small (within 0.8 percent). The naive model, with no rank 1, hangs together with the VECM-GARCH model as the worst performer in overall ranking. Despite the difference in overall result, variance reductions achieved using Native, OLS, ECMs are very close to each other, with differences of less than 3.5 percent in all hedging combinations. Most notably, although the Native model provides near worst results, variance reduction is not too far away from OLS and ECMs. This can be used as an argument for full hedge, as the easiest and cheapest hedging strategy. However, variance reduction achieved by VECM-GARCH model in all Phase I hedging combinations appears to be much lower than the others (over 10 percent difference). In Phase II hedging combinations, such difference becomes much smaller and eventually VECM-GARCH outperforms the rest in CER vs Dec09 hedging horizon. In addition, unlike a fixed OHR where the hedged portfolio remains unchanged across the hedging horizon, the VECM-GARCH derived conditional optimal hedge ratio changes over the time. Thus, explicit transaction cost of rebalancing the hedged portfolio will be added if applied in practice. Therefore, based on the result in this study (worst variance reduction) and taking into account transaction costs, the utility of VECM-GARCH in EU-ETS market over the studied period is seriously questioned. Such findings are in line with Bystrom (2003), Copeland and Zhu (2006), Lien et al (2002) and Moosa (2003), where OLS was found to outperform the more complex and sophisticated models. Later in Lien (2007), it is shown that, in large sample cases, the conventional hedge ratio provides the best performance whereas for small sample cases, a sufficiently large variation in the dynamic variance of the futures return is required in order to produce favorable variance reduction by dynamic models. It is also worth to note that, the hedging effectiveness measure is based upon the unconditional variance. The conventional hedge ratio aims at minimizing the time-invariant variance while the conditional hedge ratio attempts to minimize the dynamic variance. Pure variance reduction approach of performance evaluation is criticized for not taking into account the utilities. Therefore the next section incorporates the utilities factor into the modeling.

Maximum Utility

Adopting the procedures discussed in methodology section, the following Table 7 provides the utility improvements resulted from using different models with a risk aversion of 1. Results of each hedging horizon are reported separately in a chronological order. Similarly with variance reduction, the utility improved over the unhedged position are presented both in natural numbers and percentages.

Table 7. Utility Improvement Based on Different Models

Hedging Horzion	Hedging Combo	Utility Unhedged	Utility Improvement Based On				VECM GARCH
Risk Aversion=1							
2005	EUA vs Dec05	-0.2608	-0.0702	-0.0684	-0.0720	-0.0717	-0.1189
		Utility Improved	<u>0.1905</u>	<u>0.1924</u>	<u>0.1887</u>	<u>0.1891</u>	<u>0.1418</u>
			73.07%	73.78%	72.37%	72.51%	54.39%
2006	EUA vs Dec06	-0.4623	-0.1102	-0.1116	-0.1312	-0.1354	-0.1771
		Utility Improved	<u>0.3521</u>	<u>0.3507</u>	<u>0.3311</u>	<u>0.3269</u>	<u>0.2852</u>
			76.16%	75.87%	71.63%	70.70%	61.68%
2007	EUA vs Dec07	-0.0278	-0.0001	-0.0034	-0.0071	-0.0076	-0.0021
		Utility Improved	<u>0.0277</u>	<u>0.0244</u>	<u>0.0208</u>	<u>0.0202</u>	<u>0.0258</u>
			99.67%	87.84%	74.60%	72.64%	92.62%
2008	EUA vs Dec08	-0.1618	-0.0094	-0.0105	-0.0102	-0.0102	-0.0094
		Utility Improved	<u>0.1524</u>	<u>0.1514</u>	<u>0.1517</u>	<u>0.1517</u>	<u>0.1524</u>
			94.18%	93.54%	93.73%	93.73%	94.16%
2009	EUA vs Dec09	-0.0669	-0.0099	-0.0095	-0.0095	-0.0094	-0.0152
		Utility Improved	<u>0.0571</u>	<u>0.0575</u>	<u>0.0575</u>	<u>0.0575</u>	<u>0.0517</u>
			85.22%	85.84%	85.88%	85.91%	77.27%
2008	CER vs Dec08	-0.1738	-0.0109	-0.0148	-0.0187	-0.0188	-0.0245
		Utility Improved	<u>0.1628</u>	<u>0.1590</u>	<u>0.1551</u>	<u>0.1549</u>	<u>0.1493</u>
			93.72%	91.51%	89.25%	89.16%	85.92%
2009	CER vs Dec09	-0.0460	-0.0116	-0.0105	-0.0109	-0.0108	-0.0155
		Utility Improved	<u>0.0344</u>	<u>0.0356</u>	<u>0.0351</u>	<u>0.0352</u>	<u>0.0306</u>
			74.86%	77.27%	76.36%	76.48%	66.42%

As can be seen in Table 7, under different level of investor's risk aversion, the result of utility improvement achieved by different models are extremely mixed. The following Table 8 reports the frequency distribution of the utility improvement rankings under the risk aversion equal 1.

Table 8. Frequency Distribution Chart for Ranking of Utility Improvement

Risk Aversion =1							Overall rank
	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	
Naive	4	1	1	1	0	0	First
OLS	2	2	2	0	1	0	Second
ECM	1	1	3	2	0	0	Third
VECM	1	1	1	3	1	0	Fourth
VECM-GARCH	0	2	0	0	5	0	Fifth

As observed in Table 8 with risk aversion set at 1, the model which most frequently produces the highest utility improvement over the unhedged position is naïve model followed by the OLS. This is in stark contrast to the result based on variance reduction when Naïve model was the worst performer. This is likely because Naïve strategy is easy and cheap to apply.

The result on utility improvement confirms good performance of OLS method based on variance reduction capabilities. This is in line with the in-sample results in Yang and Allen (2004). On the other hand, OHR derived by VECM GARCH most frequently produces the lowest utility improvement. This result is similar to the findings when variance reduction was used as a measure of hedge ratio effectiveness.

5. Conclusion

This paper has investigated a number of approaches towards the estimation of the optimal hedge ratios in the EU-ETS carbon market. Findings presented in this paper have discouraged the use of VECM-GARCH model for hedging of EUA price risk. If the emitter chooses the minimum variance as the objective, the hedge ratio calculated by OLS estimation should be the one to select as it provides the greatest variance reduction compared to other models. However, if the hedger (not limited to emitters) expects to incorporate the return as well as minimum variance, a choice among Naïve, OLS and ECM can be made as suggested by findings of this research that the results in terms of utility improvement are quite mixed in different hedging horizons. Nevertheless, the use of VECM-GARCH is also not recommended as it produces overall the lowest level of utility improvement.

However, due to various limitations of this study, future research is encouraged to further assess the performance of these models in EU-ETS market environment. There are a number of issues need be considered: the availability of phase II spot and futures data have restricted the analysis and testing. Once more data have become available, the accuracy of estimation would be improved.

The structure break in phase I of EU-ETS is not represented in modeling and testing of this paper. To incorporate this, other studies have used dummy variable to represent such phenomenon. Again, these issues have not been done in terms of hedging, therefore, further research is encouraged. Ultimately, from the portfolio manager's perspective, the asset allocation problem and portfolio optimization can be revised after incorporating carbon instruments. Thus, management of risk and return on such revised portfolio becomes essentially vital for possible future research.

Appendix 1

Comparisons of Carbon Hedge Ratio with Those of Other Markets

Category	Commodity	OLS	ECM	GARCH*	ECM+GARCH
Currency ¹⁸	British Pound	0.9520	0.9690		
	Canadian Dollar	0.8750	0.8910		
	Japanese Yen	0.9910	0.9990		
	Swiss Franc	0.9740	0.9760		
Stock Index	S&P500 ¹⁹	0.9473	0.9558	0.9481	0.9526
	NIKKEI ²⁰	0.7993	0.8297		
	FTSE100 ⁹	0.7495	0.8015		
	All ordinaries ²¹	0.6740	0.7290		0.7920
Agriculture	Beef ²²	0.0700		0.9800	
	Corn ¹¹	0.6100			
	Wheat ²³	0.9600			
	Canola ¹²	0.5800		0.9200	
Fixed-income	T-Bond (U.S.) ²⁴			0.4400	
Power	Crude Oil	0.9676			
Metal	Gold ¹¹	0.5000			
Emission	Carbon	0.9143	0.9403		0.9548

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¹⁸ Kroner and Sultan (1993)

¹⁹ Kenourgios, Samitas & Drosos (2008)

²⁰ Ghosh and Clayton (1996)

²¹ Yang and Allen (2004)

²² Baillie and Myers (1991)

²³ Sephton (1993a)

²⁴ Ahmed (2007)

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A Study of Grey Theory on Improving the Investment Performance of Technical Analysis Index —An Example of the DAX Index's Component Stocks

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ABSTRACT

Using the daily, weekly and monthly data of the DAX Index's Component Stocks from January 2003 to March 2009 as examples, this paper try to improve the investment performance of technical analysis indices in Germany Stocks Exchange Market. First of all, this paper whitens original data through a grey model GM (1,1), and grey technical analysis indices are obtained. We use traditional technical analysis indices like RSI, BIAS, KD, and WMS%R as agency indices; compare the investment performance between original and grey technical analysis indices. Based on the empirical results, we find:

Ten of twelve technical analysis indexes can improve the investment performance over 57% than the original ones which significant at 95%. Especially daily, weekly, and monthly BIAS can improve the investment performance over 77%. Obviously the results indicate that the investment performance after GM(1,1) treatment are better than those of pre-GM(1,1) treatment. And investors can use the grey technical analysis indexes to obtain higher investment returns in Germany Stocks Exchange Market. But due to almost the pre and post-GM(1,1) treatment of technical analysis can't obtain extra profit than the buy-and-hold strategy (BHS), the weak-form efficiency market hypothesis (EMH) in Germany Stocks Exchange Market could not be rejected significantly.

Key Words: GM (1, 1), DAX Index, Weak-form Efficiency Market Hypothesis (EMH), Technical Analysis Index, KD, RSI, BIAS, WMS%R.

1. Introduction

A large number of empirical studies conclude that stock prices appear to contradict the efficient markets hypothesis. For example, Jegadeesh and Titman (1995) document average excess returns of 12% per year, where excess returns are defined relative to a standard capital asset pricing model. Lakonishok, Shleifer, and Vishny (1994) reach a similar conclusion via buying value and selling glamour stocks identified with variables such as price earnings ratios, dividends, book-to-market values, cash flows, and sales growth. Chan, Jegadeesh, and Lakonishok (1996) confirm the excess returns of portfolios formed on the basis of past returns and earnings announcements.

According to Efficiency Market Hypothesis (EMH; Fama, 1965, 1970), investor will not have abnormal

return using technical analysis indices under weak-form efficiency market. Under this opinion, if Germany stocks market were identical to weak-form efficiency market hypothesis, technical analysis indices would be useless. But, in fact some of investors in Germany stocks market use technical analysis as an important instrument in investment. Some paper discussed EMH in Germany, found Efficiency Market Hypothesis could be challenged. (Likes Yuhn, 1997, Chen, Kang, and Lien, 2006, Strasser, 2007)

Recently, a lot of academics try to improve the investment performance by modify technical analysis indices. Most of them focus on the artificial wisdom network. (Likes Tsai, 2001; Liu, 2001; Jen, 2001; Liu, 2003; Huang, 2004) But it's not customarily to individual investors.

This study intends to eliminate noise, increase accuracy of forecasting effectiveness using a grey forecasting model. The Grey forecasting model was used in the VAR model modify first in finance study. (Chang, 1997; Chang and Wu, 1998; Chang, Wu, and Lin, 2000; Chang, 2004; 2005) The results show that the Grey forecasting model could capture the securities price impulse, made the prices discovering process more stable. And the out-of-the-period forecasting accuracy had been increased.

The Grey Theorem founded by Deng (1983) has been applied in research in agriculture, engineering (likes Deng, Kao, Wen, Chang, and Chang, 1999; Wen, 2004), but scarcely in business, especially finance.

Chang (1997) applied GM (1, 1) firstly in the study of transmission mechanism between security market, monetary market, and foreign exchange market in a VAR model. The result showed that GVAR could eliminate noise of markets, increase the accuracy of forecasting stock prices in the out-of-the-period.

The investment performance of technical indices can be increased more effectively through a grey forecasting model GM (1,1) empirical researches on stocks market of Taiwan (Chang and Lu, 2007), Hong Kong (Chow, 2008), U.S.A (Chang & Hsu, 2009), China (Chang & Lin, 2009), United Kingdom (Lee, 2009), Japan (Cheng, 2009), and Australia (Peng, 2009). The Grey Forecasting Model on the investment performance is a suited and good forecasting model.

This study wants to modify the original technical analysis indices to grey ones, increase the ex-post investment performance effectively empirical researches on Germany stocks market. Next, sector 2 presents the methodology, sector 3 describes the data, sector 4 presents the results of study, and sector 5 presents conclusion.

2. Methodology

Let $X^{(0)}$ be a discrete function at $t=1, 2, \dots, n$, such as,

$$x^{(0)} = (x^{(0)}(1), x^{(0)}(2), x^{(0)}(3), \dots, x^{(0)}(n)) = (x^{(0)}(k); k = 1, 2, 3, \dots, n) \quad (1)$$

Let $X^{(1)}$ be an accumulated generating operation (AGO) of $X^{(0)}$, and $Z^{(0)}$ be mean of $X^{(1)}$, such as,

$$Z^{(1)}(k) = 0.5X^{(1)}(k) + 0.5X^{(1)}(k-1), \forall k \in \{2, 3, \dots, n\} \quad (2)$$

AGO: $X^{(0)} \rightarrow X^{(1)}$, that is

$$AGO\{x^{(0)}(k)\} = x^{(1)}(k) = \left(\sum_{k=1}^1 x^{(0)}(k), \sum_{k=1}^2 x^{(0)}(k), \dots, \sum_{k=1}^n x^{(0)}(k) \right)$$

Suppose that GM is a modeling

$$\text{GM: } X^{(1)} \rightarrow \hat{X}^{(1)}.$$

And denotes the result of GM modeling by GM ($X^{(0)}(1)$; a, b), where a is the development coefficient of GM, b is the grey input, $X^{(0)}(1)$ is an initial value, if

$$\hat{a} = \begin{bmatrix} a \\ b \end{bmatrix} = (B^T B)^{-1} B^T Y_N \quad (4.1)$$

$$B = \begin{bmatrix} -z^{(1)}(2) & 1 \\ -z^{(1)}(3) & 1 \\ -z^{(1)}(4) & 1 \\ \dots & \\ -z^{(1)}(n) & 1 \end{bmatrix}, \quad (4.2)$$

$$Y_N = \begin{bmatrix} x^{(0)}(2) \\ x^{(0)}(3) \\ x^{(0)}(4) \\ \dots \\ x^{(0)}(n) \end{bmatrix} \quad (4.3)$$

$$\hat{x}(k+1) = \left(x^{(0)}(1) - \frac{b}{a} \right) e^{-ak} + \frac{b}{a} \Leftrightarrow \text{GM} (X^{(0)}(1); a, b) \quad (5)$$

It's said to be a sequence defined in set $k \{1, 2, \dots, n\}$.

Using inverse accumulated generating operation (IAGO), we could have a forecasting sequence.

$$\begin{aligned} x^{(1)}(k) &= x^{(1)}(k-1) + x^{(0)}(k) \Rightarrow \hat{x}^{(0)}(k) = \hat{x}^{(1)}(k) - \hat{x}^{(1)}(k-1), \\ \hat{x}^{(r-1)}(k) &= \hat{x}^{(r)}(k) - \hat{x}^{(r)}(k-1), \\ \hat{x}^{(0)}(k) &= \hat{x}^{(1)}(k) - \hat{x}^{(1)}(k-1). \end{aligned} \quad (6)$$

The sequences after GM (1, 1) above is called whiten sequences. And whiten sequences are used in the computation of technical analysis indices.

3. Data

This study samples from the DAX Index's component stocks from January 2003 to March 2009. The 30 component stocks sample of DAX Index were listed on the Germany Stocks Exchange Co. at 1 January 2008.

First of all, the raw trading data of samples are whitened using a GM (1, 1). Four technical analysis indices

RSI, Bias, WMS%R, and KD are constructed using raw and whitened trading data separately. According to the buy-sell rulers, we compare the investment performance among grey technical analysis indices strategy, original technical analysis indices strategy, and buy-and-hold strategy (BHS) separately. Three hypotheses are set as follow.

Hypothesis I: The investment performance using original technical analysis indices is better than the average return of the market.

Hypothesis II: The investment performance using grey technical analysis indices is better than the buy-and-hold strategy.

Hypothesis III: The investment performance using grey technical analysis indices is better than those using original technical analysis indices.

4. Results

4.1 The investment performance of original technical strategy v.s. market index

According to table 1, we compare the investment performance using original technical analysis indices with market index (DAX Index). The results show that,

(1) The investment performance of using original daily-RSI index strategy are better than market index by 73%, and the others are better than market index below 50%..

(2) The performances of using grey daily and daily-RSI and weekly-RSI index strategy are better than market index by 83% and 53% separately. The performance of using grey weekly- BIAS index strategy is better than market index by 60%. The performance of using grey daily and weekly a WMS%R index strategy are better than market index by 50% separately.

Based on the empirical results, a lot of grey technical analysis indices' performances are better than the return of market index. The strategy using grey technical analysis indices could beat the market, investors can get risk premium on investment.

4.2 The investment performance using original and grey technical analysis indices v.s. buy-and-hold strategy

We compare the investment performance using original and grey technical analysis indices separately with buy-and-hold strategy (BHS). According to table 2, we find almost of investment performances using original and grey technical analysis indices are not better than the buy-and-hold strategy except for those using daily-RSI index. The weak-form market hypothesis in Germany Stocks Exchange Market could not be rejected significantly.

4.3 The investment performance of grey technical strategy v.s. original technical strategy.

This study modifies the original technical analysis indices to grey ones, tries to increase the ex-post investment performance effectively. According to table 3, we compare the investment performance using grey technical analysis indices with those of original technical analysis indices. The results show that,

- (1) The investment performance of grey daily, weekly, and monthly BIAS index strategy are better than the original index by 77% , 83%, and 77% separately.
- (2) The investment performance of grey daily and weekly KD index strategy are better than the original index by 63% and 57% separately.
- (3) The investment performances of grey daily weekly, and monthly RSI index strategy are better than the original index by 57%, 63%, and 57% separately.
- (4) The investment performance of grey daily and weekly WMS%R index strategy are better than the original index by 57% and 60% separately.

Based on above results, the investment performance of technical analysis index strategy could be increased effectively using grey forecasting model.

Table 1 The investment performance of grey technical strategy and original technical strategy compared to market

	Daily BIAS	Weekly BIAS	Monthly BIAS	Daily KD	Weekly KD	Monthly KD	Daily RSI	Weekly RSI	Monthly RSI	Daily WMS%R	Weekly MS%R	Monthly WMS%R
No. of examples	30	30	30	30	30	30	30	30	30	30	30	30
No. of better than using original technical indices	4	6	0	11	0	1	22	13	2	12	10	0
Percentage of better than market using original technical indices	13%	20%	0%	37%	0%	3.30%	73%	43%	7%	40%	33%	3%
No. of better than market using grey technical indices	13	18	6	11	3	2	25	16	1	15	15	0
Percentage of better than market using grey technical indices	43%	60%	20%	37%	10%	7%	83%	53%	3.30%	50%	50%	0%

Table 2 The investment performance of grey technical strategy and original technical strategy compared to Buy and Hold Strategy

	Daily	Weekly	Monthly	Daily	Weekly	Monthly	Daily	Weekly	Monthly	Daily	Weekly	Monthly
	BIAS	BIAS	BIAS	KD	KD	KD	RSI	RSI	RSI	WMS %R	WMS %R	WMS %R
No. of examples	30	30	30	30	30	30	30	30	30	30	30	30
No. of better than BHS using original technical indices	8	9	4	9	5	8	19	10	5	10	11	5
Percentage of better than BHS using original technical indices	27%	30%	13%	3.30 %	30%	17%	63%	33%	17%	33%	37%	17%
No. of better than BHS using grey technical indices	11	13	6	10	7	8	16	11	5	11	12	7
Percentage of better than BHS using grey technical indices	37%	43%	20%	33%	23%	27%	53%	37%	17%	37%	40%	23%

Table 3 The investment performance of grey technical strategy v.s. original technical strategy

	Daily	Weekly	Monthly	Daily	Weekly	Monthly	Daily	Weekly	Monthly	Daily	Weekly	Monthly
	BIAS	BIAS	BIAS	KD	KD	KD	RSI	RSI	RSI	WMS %R	WMS %R	WMS %R
No. of examples	30	30	30	30	30	30	30	30	30	30	30	30
No. of better	23	25	23	19	17	3	17	19	17	17	18	7
Percentage of better	77%	83%	77%	63%	57%	10%	57%	63%	57%	57%	60%	23%
No. of worse	7	5	7	11	8	6	13	11	11	13	12	22
Percentage of worse	23%	17%	23%	37%	27%	20%	43%	37%	37%	43%	40%	73%

5. Concluding remark

This paper use traditional technical analysis indices like RSI, BIAS, KD and WMS %R as agency indices, try to improve the investment performance of technical analysis indices through a grey forecasting model GM (1,1). We compare the investment performance between original and grey technical analysis indices using the daily, weekly and monthly data of the DAX Index's Component Stocks from January 2003 to March 2009 as examples. Based on the empirical result we find:

1. The investment performance using the original and grey technical indices is not better than market return of the DAX Index. But some of grey technical indices is better than market return.
2. The investment performance using almost of the original and grey technical analysis indices are not better

than that of buy-and-hold strategy separately. The weak-form market hypothesis in Germany Stocks Exchange Market could not be rejected.

3. The investment performance of technical indices can be increased more effectively through a grey forecasting model GM (1,1).

The investment performance of original technical analysis indices strategy increases significantly after using a grey forecasting model GM (1, 1). Especially daily-KD, weekly-RSI, daily-BIAS, weekly-BIAS, monthly-BIAS, and weekly-WMS%R can improve the performance of investment over 60%. The results indicate that the performance of investment after GM(1, 1) treatment are better than those of pre-GM(1,1) treatment. And investors can use the technical analysis indexes of post-GM(1,1) treatment to obtain higher investment returns in Germany Stocks Exchange Market.

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Using Data Envelop Analysis to Examine the Performance and Influential Factors in Construction Industry: A Balanced Scorecard Perspective

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ABSTRACT

This research examines the performance of 27 listed construction companies in Taiwan during 2003-2007, based on Balanced Scorecard as a strategic performance measurement. The financial and customer dimensions are the results of organizational internal efforts treated as output variables. The internal process and learning & growth dimensions of organization are treated as input variables. Data Envelop Analysis is used to position companies' strategic performance, then a pooled cross-sectional time-series during 2003-2007 is used to identify influence factors of company's performance by Tobit regression analysis. We found that construction companies mostly are inefficient in scale, investing too much in inventory and land. We use pure technical efficiency and scale efficiency to classify construction companies into four groups, i.e. Outperforming, Technically efficient, Scale efficient, and Low performing companies. Two Tobit regression models, i.e. total technical efficient (TE) and pure technical efficient (PTE) models, are tested to examine causes of performance. External environment structure, organizational conduct, and organizational resources all influence the technical efficiency (TE), consistent with SCP model and RBV theory. In pure technical efficiency (PTE) model excluding scale economy, external environment and organizational conduct factors play important role to PTE but organizational resources positions are insignificant. Outperforming companies can maintain competitive advantage by a sustaining strategy such as first mover and expansion strategy. Technical efficiency companies can increase scale efficiency by reducing scale and improving inventory and scale turnover. Low performance companies can improve scale efficiency first and then pure technical efficiency such as considering external factors and organizational conduct factors i.e. strategy, organization efficiency, and employee efficiency.

Keywords: SCP, Strategic performance, Balanced Scorecard, Positioning, Strategic direction

1. Introduction

Construction industry is crucial to the economy since it is closely related to many other industries such as steel mill, glass, cement, plastic, aluminum, pipe, kitchen ware, brick, ceramic tile, bath ware etc (Wu 2003). In addition this industry is leading industry. We position strategic performance of construction company by Balanced Scorecard framework. Based on the Structure-Conduct-Performance (SCP) perspective, external environment will influence organization's strategy resulting in performance (Porter 1980; 1990). Same as business analysis, we start from analyzing business performances, then scrutinizing what causes their differences. This process is consistent with BCG Model by positioning SBU in the matrix of relative market share and

industry growth rate and identifying attractiveness and potentiality of SBUs. This is also similar with the concept of strategic group and strategic positioning (Porter, 1990). However they do not quantitatively verify the concepts. Besides the definition of performance varies and is inconsistent. In addition single input variable and output variable can not measure strategic performance appropriately. Therefore we examine strategical performance by using Balanced Scorecard. This research examines total technical efficiency, pure technical efficiency and scale economy of 27 listed construction companies in 2007 by data envelope analysis and investigates causes of performances by pooled cross-sectional time-series of Tobit regression during 2003-2007. Since the value of efficiency measured by DEA is between 0 and 1, Tobit regression is considered suitable for the truncated data.

2. Research model and methodology

We start from performance analysis then investigate causes of the performance. The concept of performance model can be described by simple SCP model, indicating performance (P) is influenced by company's conduct (C) and external environment (S) (Wu, 1998; Tai, 1994). Based on simple SCP concept model we further develop our research model by integrating resources factor of Resources-Based View (RBV) into simple SCP model as illustrated in Figure 1.

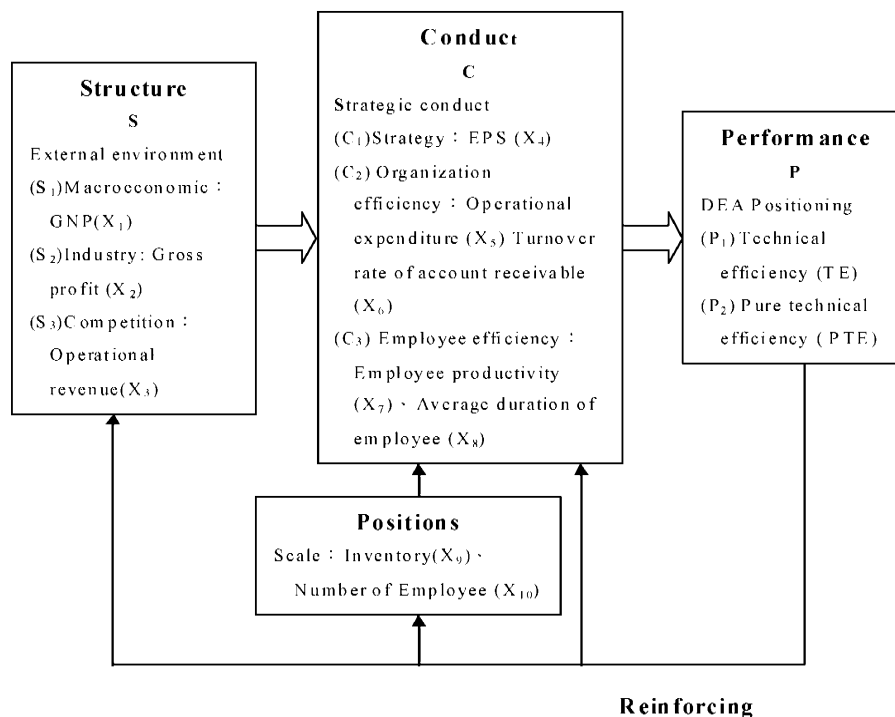


Figure 1 The research model

In this model we use Balanced Scorecard to measure strategic performance of 27 listed companies in Taiwan and compare their relative performance by Data Envelope Analysis. Companies' performance position can be measured by Total technical efficiency (TE), a number between 1 and 0 to show performance frontier of those decision making units (DMU's). Total technical efficiency is comprised by pure Technical efficiency (PTE) and Scale efficiency (SE). However based on the Industrial Organization theory and strategic planning we know that external environmental and internal resources factors impose influence on companies. A Tobit regression is used to investigate those causes related to the performance. From the model three factors are crucial to

performance, external environment, organizational behavior, and internal resources.

Theories used in this research include strategic positioning, balanced scorecard, and data envelop analysis. Strategic positioning analyzes company's external environment and assesses its internal resources to focus its niche market (Gallaugher, 2007; Porter, 1980). Through strategic performance positioning company can measure its performance position comparing with others. Same as strategic positioning, strategic group proposed by Hunt (1972) is to cluster those companies with same strategy and similar resources. Strategic performance within strategic group will be more consistent than those between groups. Strategic performance measures financial and non-financial performance as well. Companies can improve their performance by positioning their performance with others and find out the gap and reasons. Balanced Scorecard (BSC) is developed by Kaplan and Norton since 1990 (Kaplan & Norton, 1992; 1996). It uses four dimensions to depict strategy and each dimension consists of strategic objectives related to company's strategic thinking. Each strategic objective consists of performance indicators to measure how the strategy being implemented. That is why Balanced Scorecard being considered as a tool of strategy implementation rather than key performance indicators (KPI). The dimensions of Finance and customer are considered as output variables since they are laggard indicator reflecting the results of company's internal efforts. The dimensions of internal process and learning & growth are considered as input variables since they are leading indicators controlled by company. The rationale of BSC indicates that company's financial performance comes from a satisfactory customer and growing sales, which can only be achieved by internal process efficiency to produce quality services and products. However a quality internal process underpins employee's competence by learning and improving their skills. Relative research including supply chain using BSC for performance measurement (Sharma & Bhagwat, 2007); knowledge intensive industry measuring non-financial performance (Norman & Charles, 2007); applied in agency theory research (Caldart & Ricart, 2007); BSC as performance measurement connected to payment (Hu, 1998); and others (Tsai, 2002; Chen, 2000; Chang, 1999; Chang 2004; Lin 1998). BSC is a multivariate measurement of strategic performance, consistent with the special feature of Data Envelop Analysis (DEA) being a multi-input and multi-output measurement of performance.

DEA uses multi-input and multi-output to measure company's performance instead of normal single input and output production function (Tsai, 2006; Tung, 2001). The envelope line is a projected line determined by input and output variables, in order to find the most efficient companies in all DMU's. Total efficiency in the envelop line represents that the company is frontier comparing with others and its value equals 1, implying it efficiently utilizing resources, otherwise the value is 0. Company in the envelope line (frontier) indicates relative efficient. Total technical efficiency also called as constant return to scale (CRS) includes pure technical efficiency (PTE) and scale efficiency (SE). The CRS stands for the degree of maximum output with minimum input (Yang, 2006). There are two ways to measure efficiency, i.e. output orientation and input orientation. Input orientation means that under constant output the ratio of frontier input compared with non-frontier input. Output orientation means that under constant input the ratio of frontier output compared to non-frontier output. If a company is in-economy of scale, implying scale should be reduced or increased. Many researches using DEA to compare companies' performance such as Hsiao (2006) using DEA to examine franchise restaurants' performance; Huang (2004) examining semiconductor foundry's performance; Wang (2006) integrating BSC and DEA to measure international tourism performance; and others (Chang, 2004; Tsai, 2006; Yang 2006; Huang

2002).

3. Empirical study

Listed construction companies vary in their scale and revenue in Taiwan. In addition some companies fluctuated significantly in their revenue due to accounting practices resulting in anomalies, which affect the accuracy of DEA. Therefore we exclude those anomalies and reduced sample to 27 companies in 2007. It should be concerned that the increase of input and output variables will reduce the accuracy of DEA; so that we use “rule of thumb” to maintain the robustness of the DEA, the number of sample must triple the sum of the input and output variables (Peng & Cheng 2002), such as 3 input variables and 3 output variables with a sample more than 18 companies. Balanced Scorecard is recognized as effective measurement of strategic performance. Accordingly, Gross Profit and Earning per Share is used as performance indicator in financial dimension. Operational revenue represents performance in customer dimension. Operational expenditure and Inventory represent internal process dimension performance. Employee productivity measures learning and growth dimension illustrated in Table 1.

Table1 Performance variables

DEA Dimensions	BSC Dimensions	Variables	Definition
Output	Financial	Gross profit	Revenue-Cost of sales
		Earning per share	Net income/Outstand number of share
	Customer	Operational revenue	Total annual revenue
Input	Internal process	Operational expenditure	Operational expenses
		Inventory	Inventory for operation
	Learning & growth	Employee productivity	Revenue/number of employee

In addition DEA must comply with Isotonicity, meaning that output variables increase with the increases of input variables (Golany & Roll, 1989; Wang & Sang, 2004). Table 2 indicates that both input and output variables have highly positive correlation, complying with the Isotonicity. In addition collinearity test is examined with low correlation between variables within input variables and within output variables..

Table 2 Correlation coefficient

Input variables \ Output variables	Earning per share	Gross profit	Operational revenue
Operational expenditure	.353**	.721**	.593**
Inventory	.315**	.483**	.116
Employee productivity	.572**	.539**	.069

3.1 DEA Performance Positioning

Firstly, we examine the comparative performance of construction companies in 2007. The performance frontier and other relative performance position of 27 listed companies are identified by Data Envelop Analysis (Table 3). While company's total efficiency (TE) equals one, implying they are frontier and no need to change

scale such as Chung Huwa and Da Lu Co. However total efficiency is smaller than 1 implying improvement is required to increase efficiency such as Kuo Yang Co. and Ching Chen Co. Some companies have high pure technical efficiency but scale inefficiency, SE smaller than 1, indicating scale should be decreased such as Hsin Fu Fa Co. Most construction companies are scale inefficiency due to too large scale including high inventories, land, investment, and constructions. Suggestion to scale inefficiency is decreasing inventories and scale.

Table 3 Total technical efficiency (2007)

Construction Company	Total efficiency (TE)	Pure technical efficiency (PTE)	Scale efficiency (SE)	Suggesting scale
Fu I Co. (1436)	1.000	1.000	1.000	-
Ming Hseng Co. (1442)	0.612	0.971	0.630	DRS
Kuo Tai Co. (2501)	0.318	0.691	0.460	DRS
Kuo Yang Co.(2505)	0.288	0.626	0.460	DRS
Pacific Co. (2506)	0.692	0.949	0.730	DRS
Chung Kung Hsing Co. (2509)	0.503	0.932	0.540	DRS
Tai Tzu Co. (2511)	0.466	0.876	0.532	DRS
Chung Huwa Co. (2515)	1.000	1.000	1.000	-
Hsin Ya Co. (2516)	1.000	1.000	1.000	-
Kung Te Co. (2520)	0.299	0.737	0.406	DRS
Ching Chen Co. (2524)	0.272	0.784	0.347	DRS
Da Lu Co. (2526)	1.000	1.000	1.000	-
Hung Ching Co. (2527)	0.483	0.841	0.547	DRS
Huang Pu Co. (2528)	1.000	1.000	1.000	-
Ta Huwa Co. (2530)	0.375	0.772	0.485	DRS
Hung Sheng Co. (2534)	0.324	1.000	0.324	DRS
Da Hsing Co. (2535)	1.000	1.000	1.000	-
Hung Pu Co. (2536)	0.302	0.895	0.337	DRS
Chi Tai Co. (2538)	0.370	0.952	0.389	DRS
Hsing Fu Fa Co. (2542)	0.548	1.000	0.548	DRS
Huang Hsiang Co. (2545)	0.448	1.000	0.448	DRS
Zu Sheng Shen Co. (2547)	1.000	1.000	1.000	-
Huwa Ku Co. (2548)	0.342	1.000	0.324	DRS
Shung Tien Co. (5525)	0.401	0.971	0.413	DRS
Hsiang Lin Co. (5531)	0.629	1.000	0.629	DRS
Huang Ting Co. (5533)	0.503	1.000	0.503	DRS
Chang Hung Co. (5534)	0.426	1.000	0.426	DRS
Average	0.578	0.926	0.612	

Note: DRS: decrease scale; IRS: increase scale; -: sustaining scale

Total technical efficiency (TE) can be divided into pure technical efficiency (PTE) and scale efficiency (SE). Using these two variables as coordinates of strategic space we can position companies' relative efficiency illustrated in Figure 2. There are four groups of company under these two variables, i.e. Outperforming companies, Technical efficiency companies, Scale efficient companies, and Low performing companies.

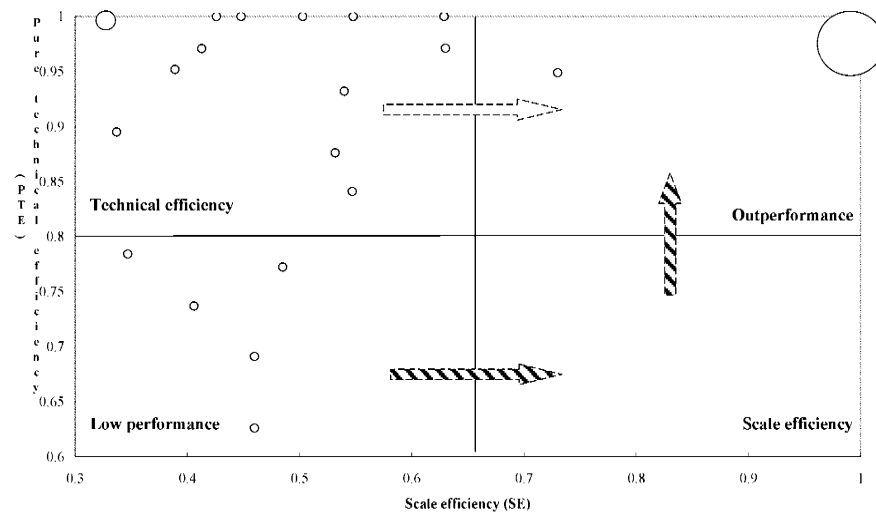


Figure 2 Performance positioning and strategic direction

Note: 1. Size of circle means number of company in this group

2. Arrow sign means strategic direction

Outperformance companies: This group indicates both high pure technical efficiency and scale efficiency, implying both productivity and scale economy are efficient. There are eight companies in this group. They are more competitive both in operational revenue and inventory turnover comparing with other group, such as Fu I Co.

Technical efficiency companies: This group shows high pure technical efficiency but low scale efficiency, implying companies being efficient in productivity but inefficient in scale economy. There are 14 companies in technical efficiency group. This group needs to reduce its scale such as inventory, investment capital, and number of employee to increase its scale economy. In particular, Hsin Fu Fa Co. has high technical efficiency (PTE = 1) but with low scale efficiency (SE = 0.548), implying a decrease of scale is needed.

Low performance companies: This group indicates both inefficiency of productivity and scale. Only five companies are in this group. This group needs to increase productivity by management efficiency and scale economy by reducing their scale. Kuo Yang Co. and Kuo Tai Co. both have higher operational expenses and inventory compared with other companies'. Scale reducing and inputs efficiency increasing are both required to increase their scale and productivity efficiency.

3.2. Tobit Regression Analysis (2003-2007)

Though Data Envelope Analysis examines company's strategic performance by multi-input and multi-output measurement, it does not explain what factors causing performance difference. Besides, one year performance positioning can not explain holistically. Therefore we use Tobit regression to analyze factors

relating to company's Technical efficiency (TE) and Pure technical efficiency (PTE). A pooled cross-sectional time-series of 27 construction companies during 2003-2007 is used in Tobit regression model to examine causes of their efficiency. Two performance models (Formulas 1 & 2) of total technical efficiency (TE) and pure technical efficiency (PTE) are tested.

Total technical efficiency model (TE) :

$$Y_1 = C_1 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \mu_1 \quad (1)$$

$$0 < Y_1 < 1 ; X_5, X_9 < 0 ; X_1, X_2, X_3, X_4, X_6, X_7, X_8 \geq 0$$

Pure technical efficiency model (PTE) :

$$Y_2 = C_2 + \beta_1^1 X_1 + \beta_2^1 X_2 + \beta_3^1 X_3 + \beta_4^1 X_4 + \beta_5^1 X_5 + \beta_6^1 X_6 + \beta_7^1 X_7 + \beta_8^1 X_8 + \beta_9^1 X_9 + \mu_2 \quad (2)$$

$$0 < Y_2 < 1 ; X_5, X_9 < 0 ; X_1, X_2, X_3, X_4, X_6, X_7, X_8 \geq 0$$

Based on the research model (Figure 1) the independent variables can be categorized into environment structure variables, organizational conduct variables, and organizational positions variables (Table 4). There are 135 observations examined by Tobit regression and result is illustrated in Table 5

Table 4 Variables of Tobit regression model

Dimension	Factor	Variable	Definition
Environment Structure	Macroeconomic	X ₁ : GNP	Gross national product
	Industry	X ₂ : Gross profit	Revenue deduct Cost of sales °
	Competition	X ₃ : Operational revenue	Total annual revenue °
	Strategy	X ₄ : Earning per share	Net income/Outstand number of share
Organization Conduct	Organization efficiency	X ₅ : Operational expenditure	Operational expenses
		X ₆ : Turnover rate of account receivable	Annual turnover of account receivable
	Employee efficiency	X ₇ : Employee productivity	Revenue/number of employee
		X ₈ : Average duration of employee	Average duration of employee
Organization Positions	Scale	X ₉ : Inventory	Inventory for operation
		X ₁₀ : Number of Employee	To measure scale and size of company

Table 5 Total technical efficiency (TE) model
Dependent variable: Total technical efficiency (Y_1)

Variables	Expected result	T value	P value
GNP(X_1)	+	7.320***	0.0000
Gross profit(X_2)	+	0.275	0.7832
Operational revenue(X_3)	+	-0.572	0.5673
Earning per share(X_4)	+	3.522***	0.0004
Operation expenditure(X_5)	-	-2.580***	0.0099
Turnover rate of account receivable(X_6)	+	-0.554	0.5799
Employee Productivity(X_7)	+	-2.618***	0.0089
Employee duration(X_8)	+	1.335	0.1818
Inventory(X_9)	-	-3.091***	0.0020
Number of employee(X_{10})	+	2.533**	0.0113

Note : * : $P < .1$, ** : $p < .05$, *** : $p < .01$

Environmental Structure factor: Macroeconomic factor (i.e. gross national product, X_1) is positively significant to total technical efficiency as expected, implying economic growth will increase company's income resulting in better performance. However, gross profit (X_2) is not significant since companies in this industry have similar asset structure so that their gross profits are same. Operational revenue (X_3) is not significant to efficiency, implying that competition within companies is not the main cause of efficiency.

Organizational Conduct factor: Earning per share (X_4) is positively significant to technical efficiency as expected, implying strategy influencing efficiency. Operational expenditure (X_5) is negatively significant to efficiency as expected, implying organizational efficiency such as cost and expense control resulting in company's total efficiency. Turnover of account receivable (X_6) is not significant to total efficiency, indicating that account receivable in construction industry is not crucial to efficiency since most payment is paid by housing loan from bank. Therefore, unlike manufacturing industry very few account receivable is in construction company. However, employee duration (X_8) is not significant to total efficiency. Yet employee productivity (X_7) is negatively significant to total efficiency, implying employee efficiency causing inefficiency of company, which differs from expectation. This may relate to massive outsourcing and network in this industry indicating that employee efficiency is not the crucial factor to total efficiency but partnership, outsourcing, and networking productivity are more critical to performance.

Organizational Positions factor: Inventory (X_9) are negatively significant to total efficiency indicating that organizational resources will influence total efficiency. Number of employee (X_{10}) is positively significant to total efficiency, showing that company's management and resources influencing performance. This is consistent with the perspectives of Resources Based View, emphasizing resources being crucial to the performance.

The result of the model is consistent with the argument that external environment structure will influence organizational conduct and performance. It also shows that organizational conduct such as strategy and

operational efficiency causes organizational efficiency. However employee productivity is not so crucial to the efficiency since massive outsourcing and network features. The resources position of organization is also crucial to total efficiency consistent with resources based perspectives. What surprises us mostly is the inventory's negative relation indicating higher inventory causing inefficiency of company, implying high inventories in this industry.

Removing scale factor from total efficiency and focusing on management efficiency, we use pure technical efficiency (PTE) as dependent variable to examine the relationship between environmental structure, organizational conduct and organizational positions factors illustrated in Table 6.

Table 6 Pure technical efficiency (PTE) model
Dependent variable: Pure technical efficiency (Y_2)

Variables	Expected result	T value	P value
GNP(X_1)	+	7.700***	0.0000
Gross profit(X_2)	+	0.900	0.3680
Operational revenue(X_3)	+	-0.619	0.5360
Earning per share(X_4)	+	6.310***	0.0000
Operation expenditure(X_5)	-	-1.668*	0.0954
Turnover rate of account receivable(X_6)	+	0.382	0.7028
Employee productivity(X_7)	+	-1.523	0.1277
Employee duration(X_8)	+	1.866*	0.0620
Inventory(X_9)	-	-1.179	0.2386
Number of employee(X_{10})	+	1.316	0.1881

Note : * : $P < .1$, ** : $p < .05$, *** : $p < .01$

Environmental Structure factor: Gross national product (X_1) is positively significant to pure technical efficiency as expected. Gross profit (X_2) and Operational revenue (X_3) are insignificant to company's pure technical efficiency. This relates to similar asset and cost structure within same industry, causing few difference of company's efficiency.

Organizational Conduct factor: Earning per share (X_4) is positively significant to pure technical efficiency indicating that strategy cause positive influence on efficiency. Operational expenditure (X_5) imposed negative impact on efficiency but not significant. Neither does turnover of account receivable (X_6) be significant to efficiency. Employee efficiency such as employee productivity(X_7) and duration of employee (X_8) is not significant to pure technical efficiency. This means that operational and employee efficiencies are not crucial in pure technical efficiency in this industry. On the contrary they concern more about value creation such as design and development rather than construction or cost control in Civil Engineering.

Organizational Positions factor: Scale factor such as inventory (X_9) and Number of employee (X_{10}) both are insignificant to pure technical efficiency, consistent with the rationale of pure technical efficiency without considering scale economy. Therefore scale factor does not influence pure technical efficiency.

Pure technical is mostly decided by environmental factor and organizational conduct factor not organizational positions such as scale, which is consistent with the theory of pure technical efficiency removing scale economy factor. Hence, the empirical results conform to the assumption of DEA and demonstrate robustness of the models.

4. Conclusion

This research demonstrates how Balanced Scorecard model is applied in measuring strategic performance of 27 listed construction companies in Taiwan. Further we use Data Envelop Analysis to position their performance by multi-input and multi-output based on Balanced Scorecard model. Construction companies are grouped into four groups, Outperforming, Technically efficient, Scale efficient, and Low performing companies by pure technical efficiency and scale efficiency. Two Tobit regression models of pooled cross-sectional time-series, total technical efficient (TE) and pure technical efficient (PTE) models, are tested to examine causes of performance. External environmental factor (e.g. macroeconomic factor), organizational conduct factor (e.g. strategy, organizational efficiency, employee efficiency), and organizational resources factor (e.g. inventories, scale) all influence total efficiency (TE) of companies, consistent with the SCP model and RBV theory. In pure technical efficiency (PTE) model excluding scale economy, external environment and organizational conduct factors are crucial to performance in construction industry but organizational resources are insignificant. This conforms the assumption of pure technical efficiency (PTE) excluding scale economy. Hence organizational positions do not affect pure technical efficiency.

This research suggests strategic directions to construction companies from the strategic space defined by pure technical efficiency and scale efficiency (Figure 2). Outperforming companies can maintain competitive advantage by a sustaining strategy such as first mover and expansion strategy. Technical efficiency companies can increase scale efficiency by reducing scale and improving inventory and scale turnover. However, Low performance companies can improve scale efficiency first and then pure technical efficiency, in particular considering external environmental factors and organizational conduct factors i.e. strategy, organization efficiency, and employee efficiency. Importantly this research demonstrates important contribution to verify the theories of Industrial Organization and Resources Based View through Balanced Scorecard model and Data Envelop Analysis.

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A Study of Tainan Consumers' Expectation and Perception Toward Buffet Restaurants

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ABSTRACT

The purpose of this study was to examine consumers' expectation and perception toward buffet restaurants in Tainan due to the raising needs of customers' expectation and higher competition in this society. This study employed 430 questionnaires and conducted descriptive and statistical inference methods to generate results. The finding revealed 37.5% of respondents demonstrated high interests on visiting buffet restaurants and willing to consuming frequently. Sixty four percentage of male respondents and 79.7% of female respondents expressed that they come for enjoying abundant meal. Chi-square test reported female participants perceived higher importance than male. Age between 26-35 reported highest visiting frequency and 41.5% of them visit 1-3 times a month. In addition, those participants who possess higher educational level demonstrated higher expectation on service quality. Researchers suggested to investigate the relationships of customers' health condition (obesity) and buffet restaurants for further study.

Keywords: Consumer Behavior, Customer Expectation, Buffet Restaurant.

1. Introduction

Customers come to buffet restaurant for enjoying its various abundant meal and joyful dinning experience as well. The increasing of buffet restaurants, market competition, or customers' expectation must be examined especially for management perspective (Cheng, 1997). How to understand consumers' behavior and expectation would be important to restaurant management (Huang, & Wu, 1999; Morrison, 2006).

After 2nd world war, buffet restaurant become very populated from USA to Asia region and other area in the world as well (Su, 2000). Many studies investigated restaurant guests' behavior mostly on pricing strategies, consumer behavior, perception, motivation, food culture, service, and comments on meals (Su, 2000; Morrison, 2006).

This study attempted to examine: First, the consumers' perceptions on Tainan buffet restaurants. Second, the consumers' acceptance level of restaurant pricing. Third, the consumers' expectation on restaurant service quality. Fourth, to provide useful information for consumers, restaurant management, and related industry practitioners (Lundberg, 1994).

2. Methodology

2.1 Questionnaire Respondents

This study investigated customers' perception toward buffet restaurants, according to their age, agenda, occupation, education level, and monthly income, to generate results whether there were significant differences.

2.2 Questionnaire design

This study employed questionnaires which included three pages and divided into three sections to inquiry questions. 1. to investigate respondents' demographical information. 2. to examine questionnaire participants' related to their consuming behaviors and satisfaction levels upon Tainan buffet restaurants.

2.3 Questionnaire issuing and response rates

This study administered questionnaires randomly at various locations such as department stores, shopping mall, automobile exhibition, and retailing stores to access sampling respondents. However, due to certain limitations of time frame, people, and cost consideration, randomly sampling was adapted to issue questionnaires evenly to various types of demographical participants from Nov. 22 to Nov. 28 in 2009.

3. Results

This study administered total 430 questionnaires randomly to participants at department stores, shopping mall, retailing stores in Tainan between Nov. 22, 2009 to Nov. 28, 2009. Finally, 400 effective questionnaires were acquired so as to generate 93% response rate, and 0.8 reliability were reported as a whole.

3.1 Descriptive statistics

Among those questionnaires, about 53.3% respondents were male, and 46.7% were female. Age of 16-25 consisted 52% and age of 26-35 consisted 23%. In addition, on education background, there were about 72% of them possessed college education or above. Sixteen percentages of respondents were high school diploma. As for household income, near 40% of participants were students and income of 20,000 NTD or less. Income of 20,000 to 40,000 NTD was 35.3% as showed at Table 1.

3.2 Respondents perception on consuming frequency

This study generated results of Chi-square = 5.576(a), degree of freedom = 4, $p = .003$. About 116 respondents, 40% of male participants, expressed visiting Tainan's buffet restaurants 1-3 times a month as showed at table 2. Besides that, there are 150 respondents expressed visiting Tainan's buffet restaurants 1-3 times a year. However, 21 of questionnaire respondents said no interests on visiting buffet restaurant.

For those participants who visit three times a month, male respondents contributed 51.8%; nevertheless, participants who visit three times a year, female respondents contributed 56%. Seventy two percentages of male

participants answered in the question of visiting three times in a week item.

3.3 Various respondent genders upon restaurant perception

This study results reported Chi-square = 17.812(a), degree of freedom = 3, $p=.000$. Among participants' responses on the major reason that visited buffet restaurant, there are 286 respondents (71.5%) expressed that they could enjoy abundant meal; within this group 64.3% were from male respondents and 79.7% were from female respondents. Next, they could eat a lots of food s as they can is the second reason for 59 respondents' motives (14.8%) of visiting restaurants; within this group 15.5% were from male respondents and 13.9% were from female respondents. When asking various respondents' gender upon restaurant perception 52% female ranked they could enjoy many different kind of foods, as for male respondents 55% of them reported that they selected the item of all they can eat as showed at table 3. However, there are 21 participants expressed that they have no interests on buffet restaurants.

Table 1 Descriptive statistics data of respondents

	Categorize	Number	Percentage		Categorize	Number	Percentage
Gender	Male	212	53.3%	Job	House keeper	16	4.0%
	Female	187	46.8%		Public sector	15	3.8%
	total	400	100%		Free lance	50	12.5%
Age	56 or above	11	2.8%		Business	60	4.0%
	46-55	38	9.5%		Manufacturing	51	12.8%
	36-45	42	10.5%		Student	162	40.5%
	26-35	91	22.8%		Other	46	11.5%
	16-25	208	52.0%		total	400	100%
	Under 15	10	2.5%				
	total	400	100%	Education	Jury. high	18	4.5%
Income	20,000 below	180	45.0%		Sen. High	63	15.8%
	20,001-40,000	141	35.3%		College	289	72.3%
	40,001-60,000	50	12.5%		Graduate	30	7.5%
	60,001-80,000	16	4.0%		total	400	100%
	80,001 above	13	3.3%				
	total	400	100%				

Table 2 Consuming frequency analysis of gender difference

		gender		total
Consuming frequency		male	female	
0 time	number	15(7.0%)*	6(3.2%)	21
	Percentage	71.4%	28.6%	100.0%
1-3/week	number	26(12.2%)	10 (5.3%)	36
	Percentage	72.2%	27.8%	100.0%
1-3/month	number	86(40.4%)	80(42.8%)	166
	Percentage	51.8%	48.2%	100.0%
1-3/year	number	67(31.5%)	83(44.4%)	150
	Percentage	44.7%	55.3%	100.0%
other	number	19(8.9%)	8(4.3%)	27
	Percentage	70.4%	29.6%	100.0%
total	number	213(100%)	187(100%)	400
	Percentage	53.3%	46.8%	100.0%

df=4 , $p=.003 < .05$

*() describes gender percentage °

Table 3 Various respondent genders upon restaurant perception

		gender		total
reason of visiting restaurant		male	female	
no interests	number	15(7.0%)*	6 (3.2%)	21
	percentage	71.4%	28.6%	100.0%
all they can eat	number	33(15.5%)	26(13.9%)	59
	percentage	55.9%	44.1%	100.0%
can eat various foods	number	137(64.3%)	149(79.7%)	286
	percentage	47.9%	52.1%	100.0%
stuffed	number	28(13.1%)	6(3.2%)	34
	percentage	82.4%	17.6%	100.0%
total	number	213(100.0%)	187(100.0%)	400
	percentage	53.3%	46.8%	100.0%

df=3, $p=.000 < .05$

*() gender percentage

3.4 Various respondent genders upon restaurant meal perception

Table 4 demonstrated female respondents perceived higher importance and expectation than male respondents ($p < .05$).

Table 4 Various respondent genders upon restaurant meal

	male	female		
Importance on restaurant food	N	N	df	P
tremendous food choice	130	147	1	.000
low fat and salt light meal	60	56	1	.696
delicious gourmet food	143	125	2	.639
seafood	55	73	1	.005
white meat	35	37	1	.384
red meat	51	42	1	.726
various vegetables	78	102	2	.001

3.5 Various respondent genders upon restaurant expectation

Table 5 revealed that female respondents perceived higher expectation on exterior decoration and interior design than male respondents ($p < 0.05$).

Table 5 Various respondent gender upon restaurant expectation

	gender	N	M	SD	F	T	p
price first consideration	male	212	3.3962	.84516	5.596	-1.853	.018*
	female	187	3.5401	.70501			
transportation convenience	male	213	3.6995	.88693	5.051	-.857	.025*
	female	187	3.7701	.75886			
importance on exterior decoration	male	213	3.5775	.80673	9.002	-2.445	.003*
	female	187	3.7647	.72456			
importance on interior design	male	213	3.7512	.79447	25.040	-2.675	.000*
	female	187	3.9412	.62369			
cleaning and neat of waiter uniform	male	213	3.9108	.79889	5.515	-2.384	.019*
	female	187	4.0856	.66652			

3.6 Various respondent household upon restaurant expectation

The results of F-test and Tukey HSD post-hoc test revealed that respondent's personal monthly income of 60,000 to 80,000NTD perceived less sensitivity on restaurant pricing than those respondents personal monthly income of 40,000 to 60,000NTD and respondents personal monthly income of 20,000 NTD or lower (Table 6). Nevertheless, for those respondents personal monthly income higher than 80,000NTD perceived more sensitivity on restaurant pricing than those respondents personal monthly income of 60,000 to 80,000NTD, even though they generated higher household income as showed at table 6. Therefore, it can be inferred that those respondents personal monthly income of 20,000 to 40,000NTD and respondents personal monthly income of 20,000 NTD or lower perceived highest sensitivity on restaurant pricing, which means these two groups of respondents expressed restaurant pricing as their first visiting consideration.

In addition, for those respondents personal monthly income of 40,000 NTD to 60,000 NTD and respondent's personal monthly income of 60,000 NTD to 80,000 NTD perceived the answer of restaurant price the lower is better are significantly lower than those personal monthly income of 20,000 NTD or lower. Meanwhile, respondent's personal monthly income of 60,000 NTD to 80,000 NTD ranked higher expectation on

transportation convenience of restaurant than that personal monthly income of 20,000 to 40,000NTD and respondents' personal monthly income of 20,000 NTD or lower. That is, respondents which have higher personal monthly income will please more importance and expectation upon transportation convenience or parking availability of visiting restaurant.

Table 6 Various respondent household upon restaurant expectation

Descriptive statistics		N	M	SD	df	F	p
first price consideration	20,000 NTD or lower.	179	3.6034	.83072	4	6.060	.000*
	20,000 to 40,000NTD	141	3.3688	.75035			
	40,000 to 60,000 NTD	50	3.3400	.55733			
	60,000 to 80,000 NTD	16	2.8125	.65511			
	80,000 NTD above	13	3.8462	.80064			
	total	399	3.4637	.78494			
cheaper is better	20,000 NTD or lower.	180	3.2556	.87243	4	5.326	.000*
	20,000 to 40,000NTD	141	3.1064	.82551			
	40,000 to 60,000 NTD	50	2.7400	.85261			
	60,000 to 80,000 NTD	16	2.5625	.96393			
	80,000 NTD above	13	3.3077	1.10940			
	total	400	3.1125	.88419			
transportation convenience	20,000 NTD or lower.	180	3.6278	.80522	4	3.641	.006*
	20,000 to 40,000NTD	141	3.7447	.85694			
	40,000 to 60,000 NTD	50	3.8000	.72843			
	60,000 to 80,000 NTD	16	4.3750	.95743			
	80,000 NTD above	13	4.0000	.70711			
	total	400	3.7325	.82925			
parking availability	20,000 NTD or lower.	180	3.9833	.81518	4	4.207	.002*
	20,000 to 40,000NTD	141	4.2270	.70070			
	40,000 to 60,000 NTD	50	4.2200	.64807			
	60,000 to 80,000 NTD	16	4.6250	.71880			
	80,000 NTD above	13	4.1538	.80064			
	total	400	4.1300	.76457			

* $p < .05$, average significant difference

Consumers' perception toward buffet restaurants:

- (1) The majority respondents demonstrated high interests on buffet restaurants in Tainan, from somewhat degree interests and very interests respondents consisted 92.8%. Besides, 50.5% participants said they would visit 1-3 times a month or more because they could enjoy tremendous delicious meal.
- (2) Various respondents gender both agreed on reasons of visiting restaurants are they could all-they-can-eat and too many selections.
- (3) Various respondents both male and female agreed that service quality is also important as food quantity, and then quality is more important than quantity ranked their second answer. Few male respondents perceived food quantity is more important than quality.
- (4) Those participants who possess high education degree expressed higher expectation than lower ones especially within the responses of monthly income of 60,000 to 80,000NTD than other groups.
- (5) Respondent's age of 16-25 and 26-35 ranked friend gathering is their major motive for visiting; for family gathering reason, age of 15 below and 46-55 selected this answer. Some age of 46-55 respondents come for business.

Consumers' perception toward pricing: Majority respondents expressed their most acceptable price is between 200-400NTD; next response is between 400-600NTD. Accordingly, the group of age between 16-35 played the major role of restaurant guests; this indicated that young generation are willing to visit related to this price range and buffet restaurants are more acceptable to them as well.

Consumers' perception toward restaurant ambient condition:

- (1) Female consumers demonstrated higher expectation than male consumers upon restaurant exterior decoration.
- (2) Customers emphasized on variously dedicated gourmet foods mostly, than on variety of vegetables and fruits.
- (3) For the majority reason of visiting restaurant, respondents ranked friend and family gathering first, because its vivid dinning experience and all-they-can eat.

4. Conclusion

Due to the raising needs of customers' expectation and higher competition in the market, more and more consumers place higher importance on service quality instead of food simply today. People are visiting restaurants are not for meal itself but the entertainment form the hosting greeters, the surrounding atmosphere, the interaction among guests and servers, the meal quality, and customer relationship management so as to increase consumers' loyalty. These mentioned above all are very essential to management perspectives for sustainable development.

Further suggestions for consumers: it had better not to waste too many foods even though within all-you-can-eat style buffet restaurant. Eating healthily is also essential to enjoying tremendous quantity amount of foods. Simultaneously eating hundreds kinds of foods doesn't really necessary mean enjoying gourmet meal. Instead, this could generate some digestion problems to body health later on. Huge quantity foods does not equal to quality dinner simply when customers paying high price for their investment of dinner. Therefore, it is a good new concept for eating good, eating smartly and healthily as well.

Further suggestions for related industry: Restaurant practitioners should keep up with the new trends

includes menu design, restaurant atmosphere, health food concept, cost control, service training, and caring service. These could improve consumers' satisfaction level and achieve high customer revisiting willingness.

As for pricing strategies, good guest perception and value upon restaurant performance could assist maintain price competitive advantage within this market. Only through reasonable price, neat dining environment, and quality food or excellent service can attract customer attention. Various types of restaurant guests' expectation should be inquired at different time of periods.

Suggestions for further study: In the near future, researchers suggest to expand the investigation area to other region outside Tainan city, such as north or middle Taiwan, or to enlarge the sizes of participants inside or outside buffet restaurants.

- (1) To compare various types of restaurant management too see any related information could provide for research.
- (2) To investigate restaurant guests perception difference upon service quality, attitudes, sanitary, and food creativity.

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Developing A Conceptual Model of Service Recovery Quality

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ABSTRACT

From the view of research methodology, these approaches loose off researchable integrity and seriousness. This research goes on with the qualitative research approach, and in-depth interviews 40 customers and 24 service staff that have ever experienced service recovery. Sampling objects focus in six service industries including retail business, cosmetics, restaurant, maintenance, medical treatment, and financial insurance & communication industry. Finally, via depth interview and conversation records, we transfer draft word for word into the written materials and conclude 14 key factors of SRQ. This study aims to construct a conceptual model of SRQ is constructed. Gaps happened among those resource entities which defined in the SRQ model are also discussed. The results are help to the researcher while undergoing gap analysis of SRQ, and support the managers planning the appropriate strategy of SRQ.

Keyword: Service Quality, Service Recovery Quality, Gap analysis

1. Introduction

The objectives of this study include formulating an original service recovery concept model and summarizing the major service recovery constructs for gap analysis, in order to further the completion of the service recovery theory. Most of the theoretical research on service recovery has been quantitative approaches based on literature review (Gilly, Stevenson and Yale, 1991; Kelley, Hoffman and Davis, 1993; Schweikhard, Strasser and Kennedy, 1993; Hoffman, Kelly and Rotalsky, 1995; Boshoff, 1997; Johnson and Hewa, 1997; Anna and Paul, 2004). This study has taken the position that service recovery quality constructs should differ from service quality constructs. Service recovery quality must be formulated on the service recovery concept model to ensure research legitimacy. Service recovery quality is a recently developed concept. It is important to examine its essence and characteristics through a qualitative research approach in order to comprehend the concept of service recovery quality and ensure the integrity of the findings. Current theories related to service recovery quality in practice, view service recovery as ex post facto salvage of service failures. Some studies (Grönroos, 1988; Hart, Heskett, and Sasser, 1990; Kelley and Hoffman, 1993) portrayed service recovery as compensation for service failures and characterized service recovery as a single independent incident. The objective of this study is to develop a service recovery quality concept model which exhibits more complete and proactive perspectives.

Over many years of conducting of research on service recovery, there still has not been any systematic, in-depth, and comprehensive study on the subject of service recovery quality. Compared to the relevant research on service quality, a preliminary study of service recovery quality is essential. Therefore, the purposes of this study include: to create a concept model for service recovery quality, define the service

recovery quality gaps between businesses and customers, and find service recovery quality criteria for customers through the gaps defined in this study. According to these critical elements, this study has formulated a comprehensive service recovery quality measurement scale to perfect/complete theories concerning service recovery, as well as to benefit further studies.

The objectives of this study include:

- (1) To create a concept model for service recovery quality and to define the service recovery quality gaps in the model;
- (2) To summarize service recovery quality criteria and to compare and contrast these criteria with those found in general research concerning service quality; and
- (3) To develop a practical service recovery quality measurement scale using service recovery quality criteria as its foundation.

2. Literature review

2.1 Service Failure and Service Recovery

Failure has always been inevitable in the process of encountering and passing along service (Boshoff, 1997). Customers dissatisfied with service providers can fight back and inflict actual damage to the service provider. Service providers must compensate for their service failures. One study (Reichheld and Sasser, 1990) has demonstrated, with every 5 percent improvement in customer retention rate, businesses may improve profitability from 25 percent to 85 percent depending on industry differences. In other words, for any business, maintaining good relationships with existing customers has always been as important as cultivating new customers (Johnston et al., 1997).

The evaluation of service quality has always been determined by the customer judging the quality of the service received. In the condition where customers have felt that the service they received did not match their expectations, it is possible that it was the service providers who had failed to properly serve their customers. Service failures have occurred, and may occur whenever service is provided. Service failures have always left negative impressions on the service provider with the customers (Goodwin and Ross, 1992). Gronroos (1998) showed that when service failures occur, actions taken by the service provider to alleviate customers' dissatisfaction have strengthened relationship between the service provider and its customers (Hart et al., 1990). Gilly (1987) demonstrated that those customers who have complained were more satisfied with greater desire to repurchase, after receiving service recovery, than did customers who did not complain. Firnstahl (1989) showed that although service recovery may be expensive, it should be viewed as an opportunity to improve service delivery. The improvements in service delivery have allowed service providers to cut cost while ensuring greater customer satisfaction. The emotional responses towards recovery actions have been as strong as the dissatisfaction with inadequate services for the customers (Smith et al., 1999). There have been two major reasons for customer dissatisfaction: service failure by the service provider, and the service provider not taking proper recovery action (Berry and Parasuraman, 1991; Bitner et al., 1990). These have been the two major causes for customers switching service providers (Keavency, 1995). In order to enhance customer satisfaction, strengthen customer relations, and prevent the loss of customers, service providers must undertake proper service

recovery actions (Fornell and Wernerfelt, 1987).

Dissatisfied and angry customers could be turned into loyal customers when adequate service recovery has been provided for service failures. The empirical research of Gary and David (1992) showed that when customer complaint resulted from lack of business response to service failure, 52 percent of the customers never purchased their products again. Customer satisfaction improved considerably when the business was willing to compensate for the customers' loss. Effective service recovery not only retained customers who were dissatisfied with service, but also left the customers with a more positive corporate image.

2.2 Service Quality and Service Recovery Quality

Earlier, the concept of quality was predominantly based on product quality. Quality control scholars began to link the concept of quality of service to that of product quality in the seventies, in tandem with the development of the service industry. The quality of the service provided by businesses has become an ever more important topic of concern. The concept of quality has been incorporated in the service industry in order to determine how customers' needs may be satisfied through service. According to one study (Parasuraman, Zeithaml and Berry, 1996), the quality of service has determined customers' actions and intentions following the purchase. Studies on service quality have become very important in the researches concerning service industry. Parasuraman et al. (1985) devised a simple formula for defining service quality: service quality (SQ) is the difference between (E) customers' expectations concerning service and (P) perception regarding service. In other words: perceived service (PS) – expected service (EP) = service quality (QS) has become the service quality concept model quoted most frequently by scholars. In 1988, based on their 1985 study, they developed a service quality measurement scale, SERVQUAL. Furthermore, Parasuraman et al., have summarized ten criteria of service quality according to customer interview findings.

Studies on service recovery quality, remain sparse in Taiwan and internationally even with the recent developments of service quality research. Shao-Cheng Cheng (2002) based his pioneering study of service recovery quality on the study of Parasuraman et al., (1985), but, his study lacked comprehensiveness and thoroughness in regard to research methodology. Within the recent development of the service quality concept, the legitimacy of service recovery quality studies has been questioned due to limitations in sampling scope. Service recovery has been defined as a passive strategy, both in practice and academically. This has not contributed greatly to the scrutiny of service recovery quality.

The earliest service recovery satisfaction measurement scale, the RECOVSAT scale, was developed by Boshoff (1999). This study conducted focus group interviews on customers of airlines, banks, medical institutions and taxis, through a qualitative approach. The first three service providers were later interviewed and the results cross-analyzed. The data collected were integrated with literature review to summarize fifteen potential causes for service recovery. Questions were developed according to these causes for the quantitative research on the measurement scale development. More comprehensive and objective findings were reached through a diversified research methodology. The reliability and validity of the scale were tested comprehensively.

This study has identified several inadequacies in the study of Boshoff (1999). First, the sample of airlines, taxis, and medical institutions all provided tangible services to their customers. Banks were the only service

provider offering intangible services to their customers. The scope of the sample was insufficient as well. Second, Boshoff used the theory of disconfirmation to observe and measure the level of customer satisfaction. Many studies have demonstrated that disconfirmation has been inadequate in regard to explicating service recovery satisfaction. If service recovery had been analyzed through perception of fairness, the explication would have been superior (Clark et al., 1992; Goodwin and Ross, 1992; Tax et al., 1998; Smith, Bolton and Wanger, 1999). Third, it is questionable whether Boshoff's RECOVSAT measurement scale would be applicable for different countries and cultures.

The service recovery quality concept should be observed through a qualitative approach since it has only been recently developed, in order to fully appreciate the comprehensive nature of the service recovery quality concept and ensure the comprehensiveness of the findings. The objectives of this study include: formulating an original service recovery quality concept model, summarizing major service recovery constructs for gap analysis, and enhancing the integrity of the service recovery theory.

3. Research methodology and design

There are three stages in the design of this study. The first stage was selecting customers for the interviews and conducting interviews. This study selected customers who had experienced service recovery from service providers, for convenience of sampling. The customer population included customers who have experienced service recovery from service providers, while the business population included businesses that offered tangible or intangible services in Taipei City, Taipei County, Kaohsiung City, and Pingtung County. Medical care and beauty/hair-styling sectors were selected as high level encounter service sectors for customer sampling; maintenance/repair and food/beverage sectors were selected for medium level of encounter service sector; and retail/financial/insurance/communication sectors were selected for low level of encounter service sector. Ten customers who had experienced service recovery in each sector were selected for in-depth interviews. The in-depth interview samples were used to design interviews for six to eight business interviewees for each sector.

Second stage, through the features of a qualitative approach in conducting interviews to ensure data quality and prevent interviewer error, interviews were conducted by several experienced interviewers. First, customers who had experienced service recovery, were interviewed with semi-structured questions. The data collected from customer interviews were used for in-depth service provider interviews. The large amount of data collected was used for building a concept model and exploring criteria. The researcher asked interviewees questions according to the content of the survey for twenty minutes to one hour. Interviews were recorded and later transcribed into texts after gaining approval from the interviewees. The text material was numbered, sentence by sentence. The quality of the numbering has been analyzed and corrected by another person to ensure numbering quality and research validity.

The outline of the questionnaire did not contain a hypothesis for the concept model due to insufficient literature being available on service recovery quality. Necessary data were collected through an exploratory approach. In-depth interviews of business and customer focus groups were used to formulate a service recovery quality concept model as well as service recovery quality gap analysis. The following questions were asked, in order to gather sufficient data for analysis:

(1). Essence of Customer Interview:

- a. What were the service failures experienced by the customers? What were the causes and processes of service recoveries? What were the sentiments?
- b. Were there other factors influencing the customer's perception of the quality of service recovery when service recovery (other than service recovery itself) was offered?
- c. What were good service recovery qualities according to the customers?

(2). Essence of Business Interview:

- a. What service failures have happened? What were the causes and service recoveries? Were the service recoveries suitable?
- b. According to the business perception, what business resources were helpful in ensuring service recovery quality? What were the actual resources used to support service recovery? Were there discrepancies? Why?
- c. Other than actual service recovery, what factors have influenced the quality of service recovery provided?

In the third stage, this study has adopted content analysis of Merriam (1998) in the analysis of collected data to investigate background of the data and describe the meaning and the essence of the topic discussed. Words or sentences broken down into units were registered in memorandum. Major concepts were integrated and named after the data had formed a specific concept.

4. Empirical analysis

4.1 Formulating a Service Recovery Quality Concept Model

4.1.1 Information source on service recovery quality concept.

Information sources on service recovery quality concept centered on consumers were derived. A service recovery quality concept model was then summarized according to Resource-Based Theory; RBT. Gap analysis was performed on the concept model. This study has discovered through the interviews that, for service industries, quality is more or less an abstract notion. The customers, as personal information source, revealed their service recovery quality concept. From the interviews conducted, this study has summarized the information sources on service recovery quality concept to include the following channels: service industry, media, third parties, as well as government and education departments. One of the important findings of this study is the discovery that according to previous studies on service recovery, the focus of service recovery has been placed on the customers or businesses. This study has discovered that before studying service recovery quality, it is necessary to understand the information source of the service recovery quality concept, including: service sectors, government, third parties, and media. Other than functioning independently, the three can complement each other and become more effective. Service sectors, government agencies, or third parties working with media have ensured wide spread service recovery quality concepts. Through government or third party publicities, the service industry can educate customers on their rights and obligations; cut down differences between businesses and customers that can lead to customers feeling that they have received poor service recovery.

4.1.2 Concept Model and Gap Analysis

After interviewing twenty-four service providers and forty customers who had experienced service recovery, this study sought to understand whether both parties had uniform perceptions towards the concept formulation of service recovery quality? The uniform perception could then be used to summarize the general concept model

for service recovery quality. This study has discovered through the interviewing process that customers were partially dissatisfied with the service recovery provided by the service providers. Some of the service recovery provided by the service providers was unwanted by the customers. Why did the service providers implement these unwanted recoveries? This study has identified several gaps in the service recovery quality concept, which has been one of the topics investigated herein. In actual service recovery operations, a smaller gap means increased customer approval for the quality of service recovery, higher-quality service recovery offered by the businesses. This study has identified four major differences and eight gaps in service recovery quality: internal differences (Gap 1, Gap 2, and Gap 3); competitive differences (Gap 4); uniform quality differences (Gap 5); and external differences (Gap 6, Gap 7, and Gap 8). The four differences and eight gaps are shown in Figure 1.

Actual resource – organizational resource gap (Gap 1) : Subjects interviewed have revealed different findings. Businesses have set “Customer First” as their goal and objectives for their staff training. The executives may understand how to improve the quality of service recovery when actually implementing service recovery. Service providers could not achieve the goal of “Customer First” due to limitations of the internal actual resource. The employees may face the dilemma of not being able to satisfy customer needs when offering service recovery. Actual resource – human resource gap (Gap 2) : Actual businesses and human resources have always been inter-related. Human resources are influenced when business resources are limited. Generally speaking, lower-wage employees have been more difficult to manage. These workers usually can not satisfy customers’ requirements when implementing service recovery. Executives have often been required to implement a second service recovery which is usually behind time. Organizational resource – human resource gap (Gap 3) : Employees must implement service and service recovery according to corporate strategies.

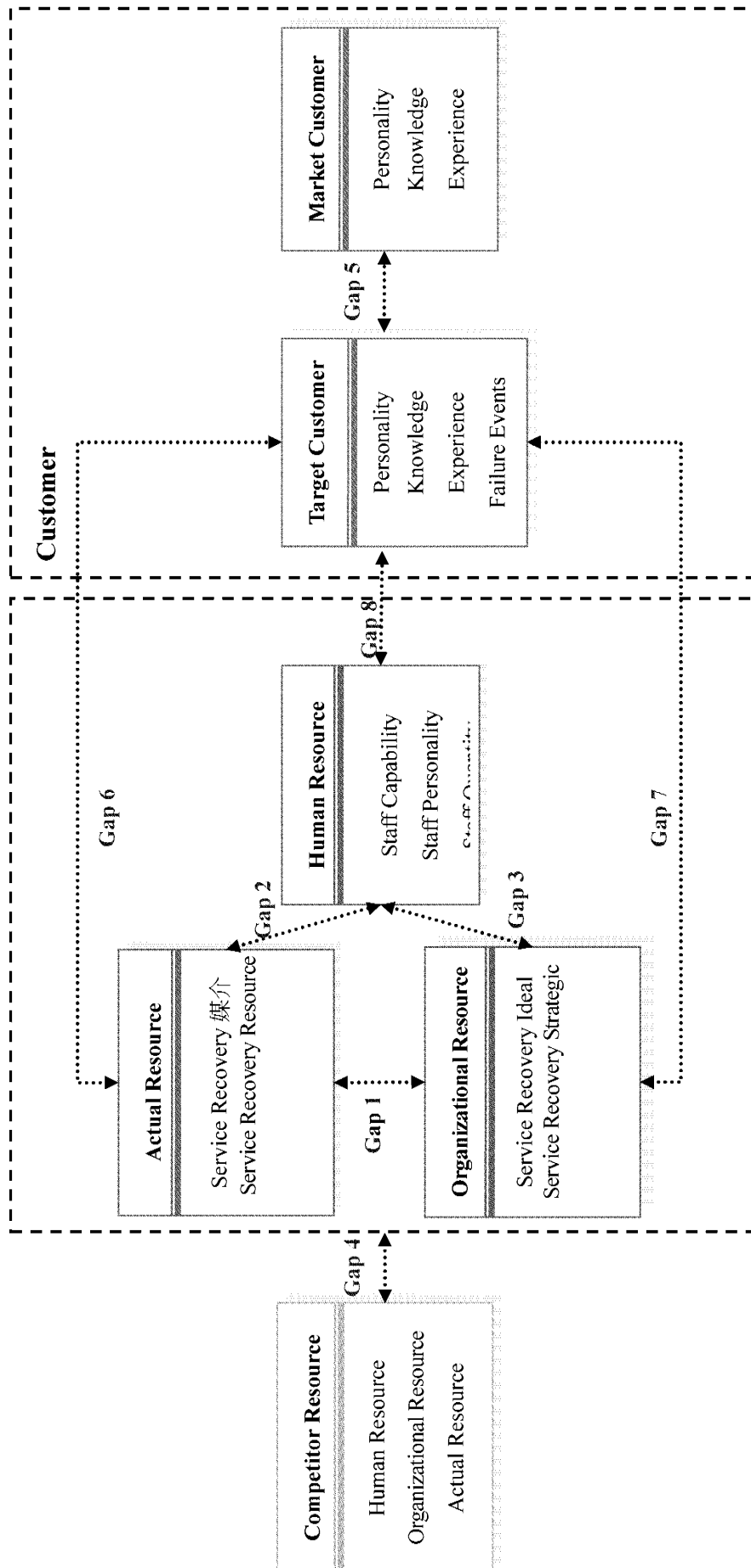


Figure 1 Service Recovery Quality Concept Model

The service recovery delivered will be different according the employee's capabilities and qualities. Sometimes, even when service recovery ideal has been close to customer needs and the strategy as detailed as can be, if the employee fails to implement recovery strategies correctly, target customer may still be dissatisfied with the service recovery. Corporate resource – competitor resource gap (Gap 4) : Interviewed subjects have mentioned that some customers were unable to receive the service recovery they requested because the business lacked resources. A service recovery quality gap has developed between the company and its competitors when competitors possess unique resources. Target customer – market customer gap (Gap 5): Service recovery quality gap may be the result of customer comparisons which may differ from person to person. Actual resource – target customer gap (Gap 6): Customers interviewed have mentioned that even when service recovery channels are available, due to service recovery media limitations and lack of convenience, customers may partly question the service recovery quality provided by the business, forming a service recovery quality gap between actual resource and target customer. Organizational resources – target customer gap (Gap 7): An organizational resource gap is formed in the minds of the target customers when the proclaimed image and ideals shows discrepancies in service recovery. Human resources – target customer gap (Gap 8): Interviews have revealed that many service providers believe that service failure occurs because of a communication gap rather than service failure. This has never occurred with the interviewed customers. Customers did not believe that the quality of communication from both sides could influence the service recovery quality received.

4.1.3 Analysis of Criteria of Service Recovery Quality

In-depth interviews on both sides revealed fourteen criteria of service recovery quality emphasized by customers and service providers. The focus of both sides on these fourteen criteria of service recovery quality may have differed due to different positions taken. The fourteen criteria of service recovery quality are Immediacy 、Care 、Pro-activity 、Convenience 、Responsibility 、Non-repetition 、Reasonableness 、Competence 、Feedback 、Psychological Recovery 、Actual Recovery 、Prevention 、Honesty and Cause finding

This study has discovered that certain correlations existed for the fourteen criteria. There have been overlaps and differences of the customer and service provider criteria on service recovery quality. Interviews with the service providers showed that there were nine criteria for service recovery quality: prevention, feedback, care, reasonableness, psychological recovery, actual recovery, pro-activity, immediacy, and competence. Customers interviewed did not mention prevention or feedback. Interviewed customers showed that the criteria not mentioned by service providers, include: cause-finding, honesty, non-repetition, responsibility, and convenience. Service providers believed that service failure prevention has been more practical than offering service recovery after failure has occurred. Internal tracking, after service recovery has been offered, has also been important.

4.1.4 The Comparison between Service Quality and Service Recovery Criteria

The hypothesis of this study has been there should be differences between service recovery

quality constructs and service quality constructs. Customers facing service and service recovery would find differences as well (Kotler, 1989). This section compares the service recovery quality criteria with the ten service quality criteria summed up by Parasuraman et al. (1985) through interviews, and examines the discrepancies between the two. Analysis shows that for service quality criteria, the unique set of service recovery quality criteria include: reasonableness, pro-activity, cause-finding, non-repetition, and feedback. Furthermore, the ten service quality criteria have all been discovered when discussing the essence of service recovery quality forming the service, and service recovery quality common criteria as shown in Table 1. This has proven that the study of service quality criteria through service quality alone has been inadequate. Service recovery quality embodied several unique characteristics. This has verified Spreng's (1995) findings that there are differences between the two.

Table 1 Service Recovery Quality and Service Quality

Item	Service Recovery Quality Key Factors	Service Quality Key Factors	Explain
1	Honesty Responsibility	Reliability Credibility	Service Quality and Service Recovery Quality
2	Prevention	Communication Understanding/Knowledge Security	
3	Immediacy	Responsiveness	
4	Competence	Competence	
5	Convenience	Access	
6	Care Psychological Recovery	Courtesy	Similar Key Factors
7	Actual Recovery	Tangibles	
8	Reasonableness Pro-activity Cause finding Non-repetition Feedback		

4.2 Formulating SERVQUAL Measurement Scale

4.2.1 Scale Purification Analysis

This study has defined fourteen service recovery quality criteria to indicate service recovery quality constructs, and used these constructs to formulate a SERVQUAL measurement scale. The design of the questions has been based primarily on in-depth interview data supplemented with service recovery research from Taiwan and abroad to generalize the fourteen constructs into sixty measurable questions. The survey has adopted the Likert five-point scale of one to five. The higher the number selected, the greater the level of agreement to the question asked. The wording and arrangement of the survey has been designed with positive and negative alternations and not presented according to the construct sequence, in order to avoid bias of the interviewed subject. Twelve pretests were conducted prior to giving formal interviews to avoid any misunderstandings due to the possibility of any unaccustomed wording of the questions affecting research findings.

The First phase survey was conducted in February, 2005 with Taipei, Taichung, Tainan, and Pingtung residents. 400 surveys were given and 348 collected with a return rate of 87 percent. 311 surveys with a valid rate of 89.37 percent were left after deleting incompletely answered surveys. The

reliability analysis revealed Cronbach's α value of 0.9518 after the first phase survey was completed. Seven questions were deleted leaving fifty-three questions to enhance reliability. The remaining fifty-three questions were evaluated before conducting item-total correlation analysis. The deletion of questions with lower correlation coefficients would have lowered the collective reliability. During this phase of analysis, no more questions were deleted. Fifty-three questions were accepted and the collective reliability value was increased to 0.9555. Data skewness and kurtosis were used to judge whether the distribution of data collected matched normal distribution for the first phase item analysis. Fifteen questions were deleted in this phase after passing the skewness and kurtosis tests, leaving thirty-eight questions. The collective reliability value was 0.9390 after fifteen questions were deleted, showing good internal consistency for the measurement scale. The survey had to be tested to see whether the data were suitable for factor analysis in order to conduct exploratory factor analysis. The resulting KMO measure was 0.936, greater than 0.9. The Chi-Square value of Bartlett's Test of Sphericity was 4747.412 and the P value was 0.000. The above two results showed goodness of fit of the exploratory factor analysis. Exploratory factor analysis was conducted on the thirty-eight questions remaining in this phase that were extracted through principal component analysis. Factor constructs were extracted through Varimax rotation. All the factors with Eigenvalue over 0.9 were kept, leaving ten factors. The cumulative explained variation of the ten factor constructs was 61.823 percent. Cronbach's α values have all exceeded 0.5 except for the ninth and tenth factor constructs. Cronbach's α value for the ninth and tenth factor constructs were 0.4841 and 0.4713, respectively. The Eigenvalue for these two constructs exceeded 0.9. Further observation would be needed for later data collection and analysis.

The second phase survey was conducted in March, 2005 with Taipei, Taichung, Tainan, and Pingtung residents. 500 surveys were given and 478 were collected for a return rate of 95.6 percent. 451 surveys with a valid rate of 94.4 percent were left after deleting incompletely answered surveys, leaving the comprehensive reliability value of 0.9518 for the survey. Three more questions were deleted to improve the reliability of the survey, leaving thirty-five questions. Item-total correlation analysis would be performed on the remaining thirty five questions. This study has discovered that although correlation coefficients of some questions were low, deleting these questions would lower the reliability value of the entire survey. No question was deleted in this phase. The remaining thirty-five questions increased the reliability value to 0.9535. Thirteen questions were deleted after passing skewness and kurtosis tests, leaving twenty-two questions for the phase two SRQ measurement scale. The survey reliability value had reached 0.9266. The resulting KMO measure of sample adequacy was 0.941 and greater than 0.9. The Chi-Square value of Bartlett's Test of Sphericity was 4671.799 and the P value was 0.000, reaching the significance level. Exploratory factor analysis was conducted on the remaining twenty-two questions in this phase, extracted through principal component analysis. Factor constructs were extracted through Varimax rotation. Three factors remained after evaluating Eigenvalue and scree plot. Question 47 showed factor loading less than 0.4 in the second factor and was deleted. Factor analysis was conducted again. The cumulative explained variation of the three factor constructs was 55.966 percent with Cronbach's α values all exceeding 0.5. Three factor constructs and twenty-one measurement scale questions were determined in the phase two

exploratory factor analysis.

4.2.2 Factor Construct Naming and Meaning

Having completed the above mentioned exploratory factor analysis this study discovered three major factors in service recovery quality, named: “service recovery ideal”, “level of staff skill and dedication”, and “service recovery essence”. Their meanings are as follows: (1) Service recovery ideal: this construct was formed by eight question items, including: sincerity of service provider as valued by the customer, pro-activity, empathy, service recovery design, customer perception and perception of both sides. The emphasis has been placed on the attitude of the service provider concerning service recovery. This construct has been named: “service quality ideal”. (2) Level of staff skill and dedication: this construct was formed by eight question items, including: the learning capabilities, judgment, and pro-activeness of service staff as valued by the customers. This construct has been named: “level of staff skill and dedication”. (3) Service recovery essence: this construct was formed by five question items all of which pertain to the process of service recovery handling and essence. This construct has been named: “service recovery essence”.

A hypothetical model has been formulated in this study. Three factor constructs have been extracted by exploratory factor analysis to build and test the model (see Figure 2). The testing of the model revealed AGFI, NFI, NNFI, CFI, and IFI results exceeding the standards showing goodness of fit for the question items in the questionnaire. GFI 0.89 was lower than the recommended value of 0.9, but the difference is small, showing ideal fit collectively. RMSEA exceeded the recommended value of 0.05, but 0.07 has been a relatively good fit. RMR value was less than the 0.8, showing very low residual quantity and great fit for the model. The measurement scale has room for further modification; a modification index was used as index for the question deletions.

This study attempted to delete topics having statistical significance in relation to factors other than its own, after judging the MI value. This study aimed to delete Questions 60, 19, and 41. This study discovered that when question 60 was deleted, only GFI value reached standard and no significant increase in goodness of fit was found after other questions were deleted. Question 60 has been a part of “service recovery ideal”: service providers must show sincerity and not shirk their responsibilities when facing customers’ complaints. Seven other questions also represented this service recovery ideal and attitude. Deletion of question 60 was feasible. The number of questions of this study was changed from twenty-one to twenty. Confirmatory factor analysis results showed all the *t* values of questions exceeding 1.96; the factor loading of the twenty questions exceeded 0.53 showing that the measurement scale had reached statistic significance. GFI, AGFI and other indices showed that this measurement scale had goodness of fit.

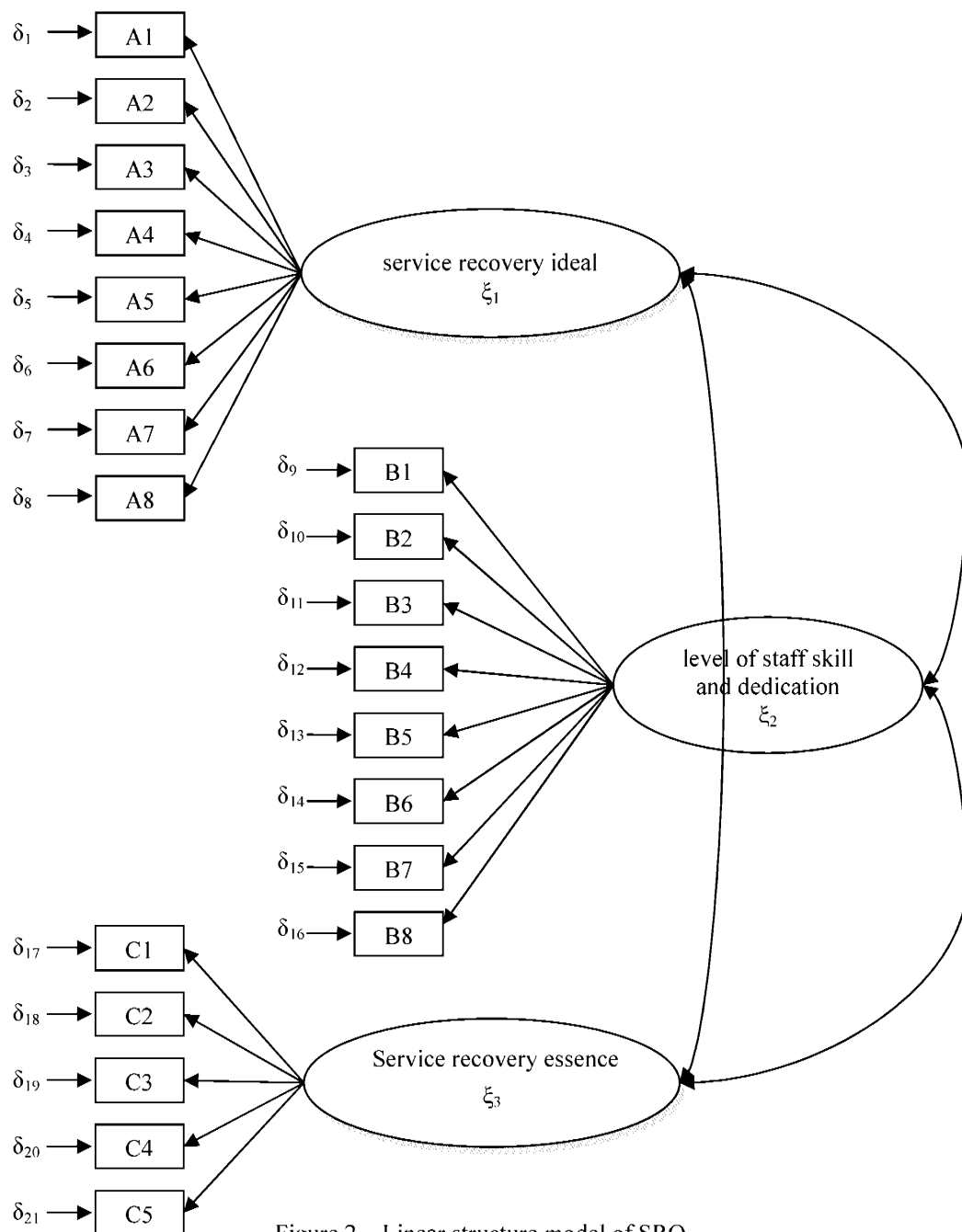


Figure 2 Linear structure model of SRQ

4.2.3 Analysis of Measurement Scale Reliability and Validity

Confirmatory Factor Analysis was conducted on the data collected from the phase one and two surveys to measure the trustworthiness, consistency, and stability of the SRQ measurement scale formulated in this study. Analysis of internal consistency of the twenty questions showed reliability value exceeding 0.7 (comprehensively and for the various factors). The measurement scale was highly reliable. In terms of content validity, the measurement scale was initially developed according to the result of service provider and customer interviews. At this stage of the study, the emphasis was placed on the SRQ criteria valued by both sides. The content of this study should be valid. In terms of construct validity, the measurement scale was formulated through exploratory factor analysis and

confirmatory factor analysis. Findings supportive of this study were formulated in the confirmatory factor analysis stage showing factorial validity. The confirmatory factor analysis is supportive of the model formulated in this study, and the construct factors have been supported by construct validity. Sixty measurement questions were formed through SRQ criteria summarized by the interview findings. Twenty questions were finalized through exploratory factor analysis and confirmatory factor analysis, and served as the measurement basis of SRQ.

5. Conclusions and suggestions

5.1 Research Contributions and Suggestions

The information source of service recovery quality concept, the formulation of service recovery quality concept model, the summary of criteria and comparison with service recovery quality of this study have completed the theoretical foundation and practice of service recovery quality by making up for the inadequacies of previous studies in regard to academic contributions. The scope of this study has been broad and diversified enough to represent service recovery offered by service providers. The findings of this study can be used as a theoretical foundation for future studies on service recovery. The service recovery quality concept model formed in this study can help service providers better understand the level of internal service recovery quality as well as the competitive advantages and disadvantages of its service recovery quality. These can be used by service providers as the basis for improving service recovery quality and service design.

This study has formulated an SRQ measurement scale based on the customers' perspectives. The scale has been the result of a series of qualitative study of a concept model and summary of criteria. This scale has been fairly comprehensive. Two phases of scale purification and confirmatory factor analysis yielded a reliable and valid measurement scale. The measurement scale measured SQR difficult to be measured directly with easily observed behaviors such as the demonstration of service recovery ideal of the service provider, skills and dedication of staff, and service recovery content received by the customers. Hofstede (1980) demonstrated that personal behavior and ideals may be affected by his or her society and national cultural features. Compared to the findings of Boshoff (1999), the benefits of this study include having a wider and more diversified sample selection. Users may modify the measurement scale questions to suit their needs by referring to analytical results such as the concept model and criteria summary.

5.2 Limitations

The scope of study was limited to service providers in Taiwan. Later studies may focus on cross cultural studies to determine whether the emphasis on service recovery quality would be different for different cultures. This study has summarized fourteen service recovery quality criteria emphasized by customers and service providers. The importance of these criteria regarded by both sides may be different. Later studies can focus on the analysis of the weighted importance of each factor in comprehensive service recovery quality. This should further the understanding of the composition of service recovery quality.

This research was supported by the National Science Council, Republic of China, Under contract NSC95-2416-H-020-004-

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The relationship between top management team commitment and alliance performance - mediator of alliance learning mechanism

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ABSTRACT

This research aims to investigate the influences of top management team (TMT) commitment and alliance learning mechanism on alliance performance. On the basis of 233 valid questionnaire surveys, the model is tested in the structural equation model. The results indicate that TMT's commitment significantly and positively affects alliance learning mechanism while alliance learning mechanism significantly and positively affects alliance performance. In addition, alliance learning mechanism plays important mediator role in alliance activities. TMT's commitment does not have significant effect in alliance performance and must accompany with the support of alliance learning mechanism in order to achieve better alliance performance.

Keywords: Top management team commitment, Alliance Learning, Alliance performance.

1. Introduction

Strategic Alliance as a new format of modern organization, has been treated by many contemporary economists as the fastest and the most economic way for enterprises to develop global strategy. It broke the traditional tenets that there is only competition among enterprises and offers a new perspective for corporate to renew their relationship with the competitors. Since 1990s, firms that engage in strategy alliance have been increased with an annual rate of more than 25 percents. For example, in U.S. software industry, the percentage of publicly traded firms that engage in alliances has increased from 32 percents to 95 percents, and the average number of alliances per firm rose from 4 percents to more than 30 percents during the 1990s (Lavie, 2007). Many cases from the real business practice have shown that strategic alliance plays an important role in corporations operating more efficiently and consequently possessing the competition advantage surpassing their rivals.

However, there has been a high failure rate in strategic alliance. Many scholars found that strategic alliance failure rate has been kept between 40 percents to 60 percents (Das and Teng, 2000b; Park and Ungson, 2001). After Chinese government jointed WTO, Chinese corporations are now in a

competitive market environment and are facing challenges from economic globalization. How can Chinese corporations grow rapidly and how can they learn from alliance partner and use alliance partner's technology and management advantages to develop their own competitiveness, is an urgent research topic. This paper employs organizational learning theory to examine the relationships between TMT commitment, alliance learning mechanism, and alliance performance. The alliance learning mechanism model will be empirically testified through large amount of questionnaires.

2. Literature review

TMT Commitment

Top management team refers to the CEO and managers of CEO's next level. Both agency theory and strategic choice approaches suggest that the top management team (TMT) plays a prominent role in directing the firm (Johnson, Hoskisson, and Hitt, 1993). The importance of management for the organizations' outcome, e.g. profitability and innovation, is usually acknowledged. The importance of TMT becomes even greater in alliance activity (Inkpen, 2005). Prior researches found that TMT's quality may be one of the most important factors that influence alliance success (Doz and Hamel, 1998). The diversity of TMT is also found to have a positive impact on alliance performance (Lee and park, 2006). Recent researches have focused on TMT's commitment in alliance activity. Commitment reflects the actions and values of key decision makers regarding continuation of the relationship, acceptance of the joint goals and values of the partnership, and the willingness to invest resources in the relationship (Beamish, 1984; Mowday, et al., 1982). Commitment at the organizational level plays an important role in a range of organization-to-organization relationships such as those between suppliers and manufacturers, manufacturers and distributors, and various forms of strategic alliances including the IJV (Cullen, Johnson, and Sakano, 1995). Porter et al., (1974) argues that commitment refers to the willingness of trading partners to exert effort on behalf of the relationship.

The organizational behavior literature recognizes two types or components of commitment relevant to international cooperative relationships (Reichers, 1985). One is behavioral commitment, which focuses on the prime behaviors of continuing the relationship and compliance to organizational rules, largely in response to cost benefit analyses (Coleman, 1990; Morris and Sherman, 1981). The other is attitudinal commitment, which focuses on acceptance of organizational goals and values, a willingness to exert effort for the organization, and a strong desire to be a part of the organization (Mowday, et al., 1982). Behavioral commitment represents the more instrumental side of the relationships. Attitudinal commitment represents the affective component. Attitudinal commitment, however, requires that partners look beyond contractual requirements and their estimates of benefits to parent companies. The attitudinally committed partner feels obliged to, and pledged to the IJV entity itself, what it is, and what it represents. Attitudinal commitment implies that, at least in the short run, IJV partners may place parent profits and other benefits secondary to the goals of their joint venture organizations (Cullen, Johnson, and Sakano, 1995). If more committed partners will exert effort and balance short-term problems with long-term goal achievement, higher levels of commitment are expected to be associated with partnership success (Angle and Perry, 1981).

In this study, TMT's commitment means that TMT joint the alliance activities to identify the common goals, cooperation methods and mutual responsibilities. At the same time, TMT have to provide the necessary resources and assistants to the members engaged in alliance activity. Accordingly, alliance with higher TMT's commitment is expected to have higher alliance success. Therefore, this study proposes the following hypothesis:

Hypothesis 1: TMT's commitment is positively related to alliance performance.

Organization Learning Theory

Organizational learning theory addresses the question of how firms learn and how it can best assimilate and accumulate knowledge from prior experiences (Vera and Crossan 2003). Organizational learning theory suggests that learning is a process that through repetition and experience allows firms to improve their working performance. In general, learning allows a firm to improve its ability to anticipate and respond to contingencies that cannot be prescribed (Anand and Khanna, 2000). Organizational learning theory has contributed to alliance research along two lines: inter-firm learning and intra-firm learning (Grant and Baden-Fuller, 2002; Zeng and Hennart, 2002). The former one emphasizes knowledge acquisition and the later one analyzes knowledge internalization (Hamel, 1991). Studies focusing on inter-firm learning paid attention to the role of the partners' ability to learn in the alliance process (for an overview see Mowery et al., 2002). Studies focuses on intra-firm learning concentrate on internalizing specific or alliance-related knowledge (Simonin, 1997). Researches have shown a positive relationship between alliance learning and alliance performance (Lyles, 1988; Simonin, 1997; Kales and Singh, 1999; Lorenzoni and Lipparini, 1999; Anand and Khanna, 2000).

Alliances are seen not only a means of trading access to each others' complementary capabilities- what might be termed quasi-internalization- but also as a learning mechanism to fully acquire or internalize partner skills or capabilities. Participants in such alliance learning would not only like to get access to some useful information or know-how from their partners, but also to internalize some complementary capabilities and skills possessed by the partner (Kale, et al. , 2000). Given the importance that firms place on forming alliances to exploit learning opportunities, researchers have begun to examine various factors that might impact the learning process (Khanna et al., 1998) and learning success (Hamel, 1991). Inkpen (2005) pointed out that one of the prominent reasons that affect organization learning is lack of leadership commitment. Successful alliance learning is determined by the amount of resources that firms allocate to learn from their alliance partners. The resource allocation is itself dependent upon the expected payoffs associated with such learning. Accordingly, alliance with higher TMT's commitment is expected to have higher organization learning efficiency. Base on the above discussion, this study propose the following hypothesis:

Hypothesis 2: TMT's commitment is positively related to alliance learning mechanism.

Hypothesis 3: Alliance learning mechanism is positively related to alliance performance.

3. Methodology

The two-stage procedure (Anderson and Gerbing, 1988) has been conducted for hypotheses testing for this research, which includes factor analysis and path analysis. In the first stage, SPSS 11.0 was used to make factor analysis in order to test whether the constructs exhibited sufficient reliability and validity. In the second stage, sample data were analyzed using AMOS 5.0.1 structural equation modeling software to evaluate the hypothesized relationships between constructs using structural equation model.

3.1 Sampling Procedure

This research is conducted with a questionnaire survey. Samples of this study were selected from companies located in Taiwan and China, which had alliance experiences. Total of 400 questionnaires are distributed between December 2008 and Feb 2009 of which 233 valid samples were collected. We purposely used a diverse sample pool to increase the generalizability of our results across different industries. The questionnaires are distributed on convenience to the participants and All respondents were assured of the anonymity of their responses.

3.2 Instrument and Measurement

A questionnaire containing 5 items for TMT's involvement (Hambrick and Mason, 1984; Malhotra, et al., 2005; Angel and Perry, 1981), 17 items for alliance learning mechanism (Malhotra, Gosain, El Sawy, 2005; Gimeno, 2004; Mohr and Spekman, 1994; Inkpen, 1996) were employed in this study. The constructs were selected based on a review of previous literatures. Respondents were asked to rate the survey questionnaires on a five-Likert scale.

The definition of *TMT's commitment* is that TMT joints the relative important activities of alliance and actively provides the resource and support to the alliance activities (Hambrick and Mason, 1984). TMT' commitment should exert effort and balance short-term problems with long-term goal achievement (Angle and Perry, 1981). TMT should decide what's the goal of alliance, how to response market, how to cooperative and how to define individual's role. If the alliance encounters serious problems, TMT can help to resolve the problem. The five items to measure the dimension of TMT's commitment were based from relevant studies (Hambrick and Mason, 1984; Malhotra, et al., 2005; Angel and Perry, 1981; Inkpen, 2005).

There are three dimensions of *alliance learning mechanism*: IT-based information system, alliance learning process, and autonomy team design. There are seventeen items to measure the alliance learning mechanism. IT-based information system refers to functions of information exchange, information access and information storage. This IT-based information system is designed and utilized for the specific alliance. The IT-based information system provides information immediately and accurately (Malhotra, Gosain, El Sawy, 2005). Base on Malhotra, Gosain & El Sawy (2005), there are seven items to measure the IT-based information system. Alliance learning process helps organization better learn, assimilate, and internalize the knowledge and information gain from the alliance partner. Kale and Singh (2007) conceptualize alliance learning process into four categories including articulate,

codify, share, and internalize. The four items to measure the dimension of alliance learning process were based from Kale and Singh (2007). Autonomy team design is measured by the discretion alliance the management had in determining the overall alliance management approach, format of progress reviews, and interim schedule targets. This scale is an adaptation of the project management autonomy measurement in the new product development context (Tatikonda and Rosenthal, 2000).

The dependent variable: Alliance performance is defined as the satisfaction of alliance's leader with the alliance goals (Anderson and Weitz, 1989; Anderson, 1990; Child and Yan, 1999; Das and Teng, 2000a; Kale, Dyer and Singh, 2002). The satisfaction focuses on the six indexes (Harrigan, 1986; Kale, et al., 2002): enhance market share, increase profits/decrease cost, increase sales, obtain key skills or resources, enhance the speed of reaction to markets, and enhance the customers' satisfaction (Mowery, et. al. , 1996; Baum et al., 2000; Baum and Oliver, 1991). The alliance leader has to rate the satisfaction with each goal by 5-point Likert type scale.

4. Analysis and results

4.1 Descriptive Statistics

Table 1 shows the breakdowns of the samples.

Insert Table 1 about here

4.2 Confirmatory factor analysis

Before testing the hypotheses, we conducted a first-order confirmatory factor analysis (CFA) to test whether the constructs in each of our measurement models (TMT's commitment and learning mechanism) exhibited evidence of convergent validity and discriminant validity.

The 5 Top Management Team commitment items were submitted to a principal axis factoring extraction with varimax rotation. It results one factor ($\alpha=0.940$). The eigenvalue is above one, and one factor explained 80.58 percent of the variance in responses. Table 2 shows the factor analysis result for TMT's commitment.

Insert Table 2 about here

For Learning mechanism, the 17 items loaded onto three factors: IT information system ($\alpha=0.930$), Alliance learning process ($\alpha=0.896$), and autonomy team design ($\alpha=0.936$). Three items are deleted because its factor loading is below 0.5. Each factor had an eigenvalue above one, and in sum the three factors accounted for 74.432 percent of the variance in data. Table 3 shows the factor analysis

result for knowledge exploration mechanism.

Insert Table 3 about here

4.3 Structural Equation Model

Table 4 shows the goodness-of-fit statistics for the final SEM model. We examined the overall fit of the model using several fit indexes. The Chi-square value is nonsignificant ($p > .1$) and the Chi-square / $df = 1.387$ indicates a good fitting between the observed and reproduced covariance matrices. Furthermore, the model shows an acceptable level of error (RMSEA = 0.041). Examination of the common fit statistics (CFI, NFI, RFI, IFI, TLI) also reveals that they all above the suggested 0.90 cut off, providing evidence that the model fits the data well. Figure 1 represents the standardized path coefficients of the final SEM model.

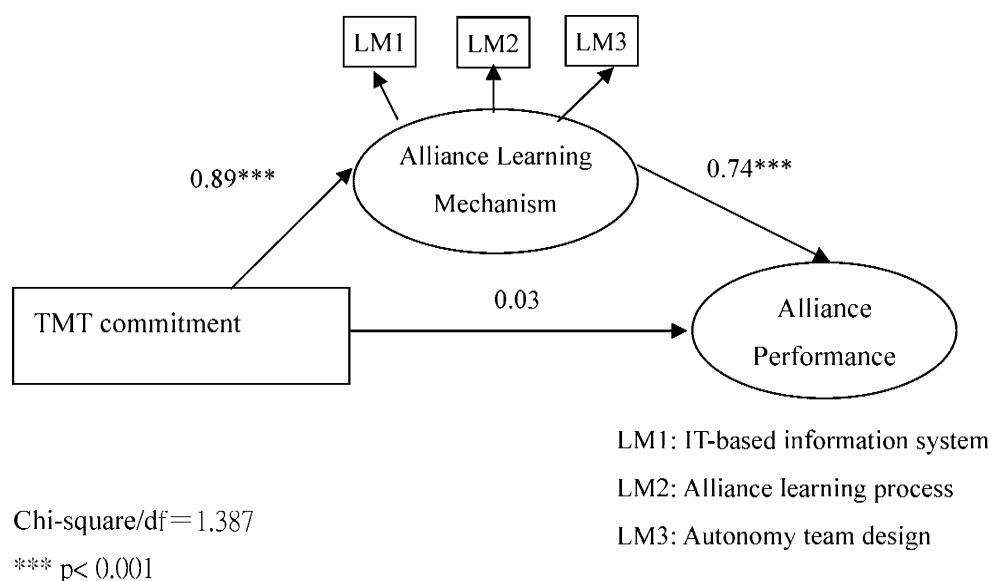


Figure 1: research result- organizational learning perspective model

Insert Table 4 about here

5. Discussion and suggestion

The empirical findings support all of our propositions. TMT's commitment is found to have significantly positive effect on learning mechanism (0.89***). TMTs are responsible for

adopting the key policies that govern an organization's activities (Hambrick and Mason, 1984). Accordingly, when there is a high commitment between key decision makers of both alliance partners, there will be a higher willingness to invest resources. In addition, the research results has once again proved that learning mechanism has significantly positive effect on alliance performance (0.74***). This is because when firms intend to learn, accumulate, and use relevant alliance management knowledge and experience, it can assist organizations better learn, absorb, and internalize knowledge and information from alliance partners, and consequently increase firm's capability and performance.

Finally, the results indicate learning mechanism plays an important role of mediator. TMT's commitment does not significantly and directly affect alliance performance (0.03) and must accompany with the support of learning mechanism in order to achieve better alliance performance (0.66***). One possible explanation is that members involve in alliance activity are the true determinant factor to the alliance performance. If members engaged in alliance activities could not efficiently learn, observe, and use the new knowledge and information, then regardless how much commitment does TMT have, the result will turn out to be far away than their expectation. Therefore, it is important that TMT needs to provide and build relevant learning process and equipment to assist members engaged in alliance activity for continuous learning and improvement.

6. Managerial implication

Yoshino and Rangan (1995) state that learning is always an implicit strategic objective for every firm that uses alliances. Learning is essential in business activity especially in alliance. Members engaged in alliance activity are not only to access some useful information or know-how from the partner, but more importantly to internalize some complementary capabilities and skills possessed by the partner. Therefore, companies intend to conduct alliance activity need to build learning mechanism to support this alliance network to encourage information and knowledge sharing between alliance partners and assist corporations better learn, absorb, and internalize knowledge and information acquired from alliance partners. In addition, TMT needs to give members adequate autonomy in order to enable members to deal with problems more flexibly and effectively and eventually lead alliance into better performance.

The top-management involvement has been stressed as an important determinant of success (Bass, 1990). Therefore, corporations conducting alliance activity shall assign headquarter executive to alliance regularly to experience first hand information in order to provide necessary resource and assistance when alliance facing any difficulties (Hambrick and Mason, 1984).

7. Limitation

This study has three potential limitations. Firstly, given that a comprehensive questionnaire such as this one requires the real alliance leaders to respond, it is difficult to follow a strictly randomized

sampling procedure. Samples are collected on a convenient basis in order to increase the response rate and ensure the quality of data. It is recommended that a larger and more randomized sample be taken for a more comprehensive future study. Secondly, samples are selected from firms in China and Taiwan that had alliance experience. Future researches are encouraged to conduct study in Western firms to see if a consistent result could be found. Future researches are also encouraged to conduct study in single industry or single alliance activity in order to reach a more rigid research conclusion. Finally, this study uses the management measurement to evaluate the alliance performance. Although the scholars had proved this method that is correlated to the financial performance, this measurement still can not replace the financial assessment completely. We hope this study has suggested fruitful avenues for future research and stimulated managerial thought about how organizations can improve alliance performance.

Table 1 Sample Profile

	characteristics	alliance firms no.= 223	percent
Nationality of company	Republic of China	158	68
	People's Republic of China	75	32
Industry	manufacture	83	35.6
	Professional, science and technology service	61	26.3
	Medical and Health Service	27	11.5
		62	26.6
Tenure (Years)	<9	61	26.2
	10-16	62	26.6
	17-27	67	28.7
	>28	43	18.5
capital (NTD)	< 3,400,000	57	24.4
	3,400,001-15,000,000	55	23.6
	15,000,001-112,000,000	56	24.0
	>112,000,001	65	28.0
Firm Size no. of employees	<41	56	24.0
	42-187	67	28.8
	188-900	56	24.0
	>901	54	23.2
alliance type	joint venture	42	18.0
	OEM	37	15.9
	joint-manufacture	30	12.9
	co-marking	48	20.6
	contract research and development	23	9.9
	licensing	10	4.3
	patent	12	5.1
	specific supplier	31	13.3

Table 2 Factor analysis—TMT's commitment

Questionnaire items	Factor loading	
	Factor 1	
5-16. The high-level managers in your company and partner company join the planning step before alliance	0.919	
5-17. The high-level managers in your company and partner company concern with the progress actively.	0.911	
5-18. The high-level managers in your company and partner company will coordinate and give assistance when alliance encounter serious problems	0.907	
5-15. The high-level managers in your company and partner company express the important and goals of this impressive alliance	0.895	
5-14. The high-level managers in your company and partner company have the same attitude to the goals and expected performance of this impressive alliance	0.855	
Eigenvalue	4.029	
Variance explained (%)	80.577	
Accumulated variance explained (%)	80.577	
Cronbach's α for each dimension	0.940	
Cronbach's α	0.940	

Table 3 Factor analysis- Alliance learning mechanism

Questionnaire items	Factor1: IT information	Factor2: alliance learning process	Factor3: autonomy team design)	Factor loading		
				Factor 1	Factor 2	Factor 3
2-2. In this impressive alliance, your company had IT system to provide the immediate and accurate information to benefit the decision making				0.852	0.238	0.251
2-1. In this impressive alliance, your company and your partner company had IT information system to exchange the required information				0.828	0.197	0.195
2-4. The employees who involved in this alliance could discuss decisions and exchange opinions through IT systems				0.811	0.275	0.255
2-3. In this impressive alliance, your company had IT system to record new services, new processes or knowledge of new productions				0.751	0.295	0.325
2-5. In this impressive alliance, your company divided the new process into several clear and understandable sub processes				0.679	0.363	0.176
2-6. The expected alliance results between you and your partner's company were defined and understood lucidly				0.632	0.471	0.206
2-7. Your company built standard operational process which enabled employees to quickly adapt to the new cooperative models				0.583	0.453	0.225
2-13 You had the power to deploy human resources in this impressive alliance				0.309	0.785	0.265
2-10. You had the power to decide the management methods of alliance in this impressive alliance				0.253	0.772	0.325
2-14. You had the power to distribute the equipments and assets in this impressive alliance				0.286	0.754	0.312
2-11 You had the power to decide the models of monitoring process in this impressive alliance				0.362	0.752	0.273
2-12 You had the power to distribute the financial budget in this impressive alliance				0.248	0.748	0.332
2-9 You had the power to decide the alliance schedule and goals in this impressive alliance				0.364	0.728	0.243
3-24 Your company possess alliance database for employees to use immediately				0.206	0.320	0.809
3-23 The spanners share their experience and what they learn through training, conference, presentation and writing.				0.239	0.362	0.791
3-22 Your company records the details that happen in this alliance into formal documents				0.275	0.365	0.762
3-21 Your company can search for the spanners with specific alliance experience through internal network				0.425	0.225	0.675
Eigenvalue				4.755	4.670	3.228
Variance explained (%)				27.972	27.469	18.991
Accumulated variance explained (%)				27.972	55.441	74.432
Cronbach's α for each dimension				0.930	0.896	0.936

Table 4 Goodness-of-fit statistics for Organizational Capital Perspective Model—overall alliance performance

Goodness-of-fit statistics	SEM model
Chi-Square	5.548
df	4
p-value	0.235
Chi-Square/df	1.387
NFI	0.993
RFI	0.983
IFI	0.998
TLI	0.995
CFI	0.998
RMSEA	0.041

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戦略選択と戦略変化-4つの多角化企業を事例として-

Strategic Selection and Strategic Change-Examples from Food Industry and Textile Industry

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ABSTRACT

This paper classify Strategic Management according to two dimensions; Content vs. Process, and Environment vs. Organization. Strategic Management can be thus partitioned into four approaches—The Planning Approach, The Positioning Approach, The Emergent Approach, The Resource Approach. In this paper we use a case-oriented comparative method to discuss the strategic selection and strategic change of four different corporations based on these four approaches. Finally, theoretical, empirical and managerial implications are drawn from this study.

Keywords: Strategic Selection; Strategic Change,

I・戦略の本質：対立と連結

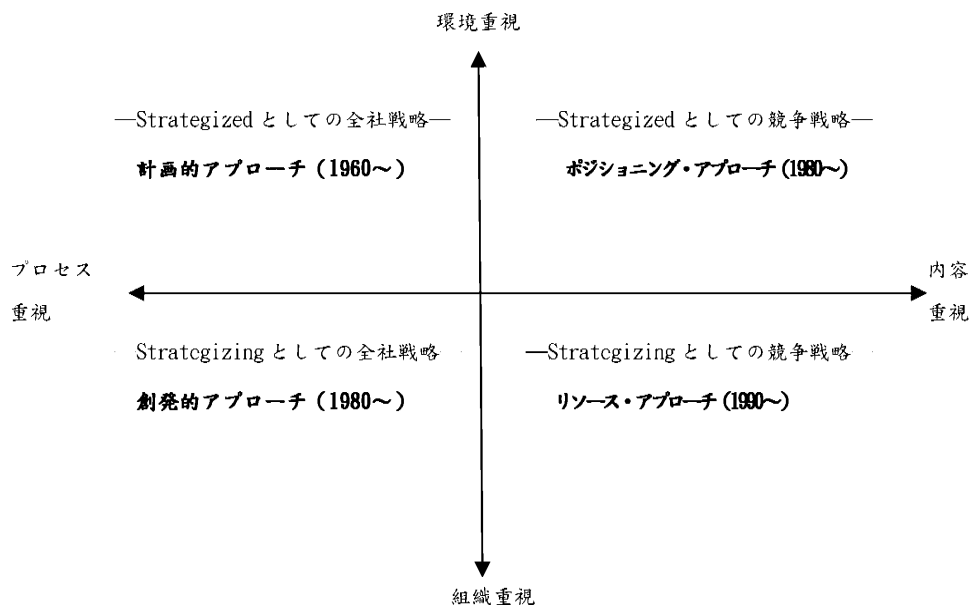
経営の目的は長期利益の追求である。長期利益を獲得するための手段としての戦略論は2つの異なる考え方がある。ひとつは企業成長に注目する視点であり、もうひとつは企業競争に注目する視点である。したがって、戦略とは、『成長と競争という2つの目的を実現するための手段である』。この定義からすると、戦略論には目的をめぐる対立と手段をめぐる対立との2つの大きな理論対立が存在している。まず、戦略の目的を企業の成長にするか、あるいは各事業領域の競争にするかという対立は、企業は戦略の重心を全社戦略と競争戦略のどちらに置くかという戦略選択を意味している。次に、手段の対立は、目的を追求する方法の違いを意味する。もちろん、従来の戦略研究者もこのパラダイム対立を意識し、激しい論争や議論を発展してきた。すなわち、成長の手段のあり方に関する論議は、アンゾフ-ミンツバーグ論争が示したように「計画性と創発性のどちらが重要であるか」という問題であり、また競争の手段のあり方に関する議論はポーターとバーニーの論争の「競争優位を獲得するための手段の源泉は外部にあるか、あるいは内部か」という対立点の問題である。いずれの対立も、戦略の本質がお互いに対峙している手段から適切な手段を選択するという点で共通している。戦略論の第二の本質は連結にある。環境変化に直面し、戦略家が常に戦略を変更し続ける。適切な戦略を選択するだけで企業の長期利益を維持することができない。企業が手段の連結や手段の相互作用の中で、長期利益が実現される。ここで言う連結とは複数の手段のつながりを意味し、企業の戦略変化プロセスを意味している。この2つの本質からすると、戦略論は戦略選択と戦略変化の理論からなる（蔡展

維, 2005)。前者の戦略選択(Strategic Selection)は静態的な研究(Strategic Selection)を意味することに対して、後者は組織の動態的なプロセスである戦略変化(Strategic Change)の研究を意味している。また、こうした動態的研究は、ダイナミクスな環境変化および複雑な戦略行動が織り成す複雑な状況を単純化したものであり、組織が環境、戦略自身および組織との間の相互関係を的確に認識し、ある時点に適切な戦略を選択し、またその相互関係が変化する際に戦略変化を管理することが戦略家にとってもっとも重要な課題である(Pettigrew, 1992; 洪世章・譚丹琪・廖曉青, 2007; Burgelman, 2007)。本稿の目的は比較事例研究方法(Case-Oriented Comparative Method)(Eisenhardt, 1989; 洪世章・譚丹琪・廖曉青, 2007)を通じて、異なる時期に企業がどのように戦略を選択し、また企業が複数の戦略選択をどのように連結しているのかを検討する。

II・理論背景：計画的アプローチ、ポジションニング・アプローチ、創発的アプローチ、リソース・アプローチ

企業の戦略行動の分類仕組みとして、本稿は蔡展維(2005)の戦略分類を採用する。蔡展維(2005)によれば、従来の戦略研究がどのようになされてきたのかという戦略研究の中身、およびそれぞれの研究者がどこから戦略を考えるのかという戦略の発生源との2点は、戦略論を正確に把握するために必要不可欠である。したがって、以上のような分析視点に立つなら、戦略論の変遷を次の4つのアプローチ(図1)に分類することができる(蔡展維, 2004; 2005)。すなわち、全社戦略のパラダイム対立として、計画的アプローチと創発的アプローチとの2つの異なる戦略手法がある。また事業戦略のパラダイム対立として、ポジションニング・アプローチとリソース・アプローチとの2つの異なる戦略手段がある。

図1：戦略論の構図



出所：(蔡展維, 2009)

2.1 全社戦略論におけるパラダイム対立

2.1.1 計画的アプローチ

戦略論の視点から見れば、計画的アプローチは環境重視とプロセス重視であり、Strategizedとしての全社戦略でもある。また、公式的な分析による戦略的意図に基づき、戦略の中身を計画的に策定していくプロセス、また手続きの開発に焦点を当てたアプローチである。特に、このアプローチはChandler(1962)の『経営戦略と組織』に触発され、あるいは強い影響を受けた。このアプローチの根底には多角化戦略(全社戦略)と事業部制組織という大前提があり、次の2つの問題と関連して発展した。第1は、会社はどんな事業に手をつけるべきなのかに関する全社戦略レベル、あるいは多角化戦略の意思決定である。第2は、本社あるいは本社計画部門は、一連の事業単位あるいは現場をどのように管理し、コントロールするのかに関する問題である。このアプローチを最初に展開したのは、第1の問題点に注目するAndrews(1971)とAnsoff(1965)である。Hoffer&schendel(1978)によれば、前者は、戦略を企業の目的とその達成のための基本政策と定義し、両者を組み合わせて考えることが有用であると主張している。また、SWOT分析を用いて組織の強みと弱み、及び環境における機会と脅威を分析し、適合的な戦略を策定するのが彼の理論の中心である。後者のアンゾフは、戦略の概念を企業の目的を達成するための手段と定義し、企業における意思決定を戦略的意思決定、管理的意思決定、業務的意思決定の3種類に区別した。特に、戦略的意思決定とは、企業と環境との関係を確立する意思決定であり、すなわちどのような事業、あるいは製品・市場を選択すべきかに関する決定、つまり多角化戦略の決定である。また「部分的な無知」のもとで行われるこのような戦略的意思決定の手続き、ルールとなるのが企業戦略であり、戦略計画の立案の手続きでもある。

第2の問題点、すなわち本社は一連の事業をどのように管理すべきかに注目したのが戦略計画論である。特に、1960年代は戦略計画論の出発点でもある。50年代後半の長期経営計画に代わって、60年代から70年代にかけて、企業戦略と結合した戦略計画の概念が急速に広まった。例えば、P. LorangeやG. A. Steinerなどの戦略計画論者は公式的な分析に基礎を置きながら、目標、予算といった戦略の計画策定の手続きの開発に注目しており、本社と本社の計画部門によるコントロールを重視する傾向がある。

要するに、このアプローチは戦略論の分野では最も古典的かつ重要な存在であり、計画性、分析による事前評価などの概念が、企業に一つの指針を与えてきたところが、このアプローチの最も大きな貢献であり、戦略によって企業の戦略行動を統制する戦略統制(Strategized)の意味が初期の戦略論研究を強く支配している。また、戦略経営やシナリオ・プランニングのような新しい理論は次々展開してきたが、Plan→Do→Seeというこのアプローチの大前提は変わらない。

2.1.2 創発的アプローチ

計画的アプローチとは異なり、創発的アプローチは組織とプロセスを重視する戦略研究であり、Strategizingとしての全社戦略でもある。すなわち、戦略を考えるときには組織内部の行動から考慮し、しかも組織における戦略形成プロセスのあり方に注目したアプローチである。計画的アプローチが規範的な視点から戦略策定プロセスの開発を重視するものであるのに対して、創発的アプローチは主に組織の戦略形成プロセスを、記述的な手法から解明する研究である。これは主に「自律的な行動から戦略を生み出す」というもので、つまり実験を先に行うことで行動の中から帰納的に戦略を導き出すという方法に注目したアプローチである。また、このアプローチの研究は主に計画的アプローチに対する批判から成り立っていた。いうまでもなく、伝統的な戦略論を最も激しく批判したのはミンツバーグである。Mintzberg(1985)は、計画としての戦略概念と行動のパターンとして記述される戦

略概念とは、必ずしも正確に一致していないことがあり、時には全く独立した2つのアプローチになる場合があると主張した。彼は戦略のタイプを、意図された戦略と実現された戦略に分け、トップによる当初の計画がすべて実現に向かう戦略の流れを計画的戦略 (Deliberate strategy)、当初意図されていない変化がなされ、実現された戦略に導く戦略行動の流れを創発的戦略 (Emergent Strategy) と名づけた。その後、Mintzberg (1990a, 1994) は計画的戦略、すなわち、アンゾフを代表とする伝統的戦略論に対する痛烈な批判を展開することによって、創発的戦略の優位性を強調している。さらに、Mintzberg (1989) は、創発的戦略の生成を促すような組織的な仕組みが必要であると主張し、戦略作成の「草の根モデル」を提示した。要するに、彼にとって、戦略とは、組織と環境ならびに組織内の相互作用のプロセスを通じて創発的に生み出されてくる行動のパターンである。したがって、戦略は、企業の変革環境変化に対処する意思決定の指針あるいは決定ルールではなく、むしろ企業内外の相互作用的な意思決定、あるいは組織学習の成果である。

ミンツバーグと同様に、現実の戦略には、2つの異なるルートを経て実現されるものがあると指摘したのは Burgelman (1983) である。彼の社内ベンチャーに対する実証研究によれば、戦略行動がデザインされるルートには、導出された戦略行動 (Induced strategic behavior) と自律的戦略行動 (Autonomous strategic behavior) との2つ異なるタイプのものがある。導出された戦略行動とは、公式的な計画プロセスを通じてデザインされる戦略である。すなわち、ミンツバーグの計画的戦略と同じように、Plan→Do→See という観点から発展したものである。これに対して、自律的戦略行動は、新しい事業を定義するために新しいカテゴリーを必要とするような戦略行動である。現場の組織メンバーは、新しい事業機会を認識し、その事業のために企業の余剰資源を獲得するための活動を展開する。社内ベンチャーはこの戦略行動の典型である。

要するに、このアプローチでは、戦略が組織の日常業務の行動に相当し、これらの行動はいずれも当初に意図したものではなく、行動の1つ1つが集積されるプロセスで戦略の一貫性やパターンが形成され、組織の創発的な行為や自律的な行動から戦略形成 (Strategizing) を説明するのが研究の共通点である。また、このアプローチは Plan→Do→See という計画的アプローチの大前提に徹底的に反対し、組織における個人の行動 (Do) から新しい戦略に導く可能性をも提示した。

2.2 競争戦略論における手段対立

2.2.2 ポジショニング・アプローチ

このアプローチは、ハーバード学派の産業組織論から影響を受けて、焦点市場における戦略的なポジションの選択に注目したアプローチである。また、戦略論の視点から見ると、環境と内容を重視するアプローチであり、Strategized としての競争戦略でもある。PPM や PIMS などの伝統的な理論もこのアプローチに含まれるが、代表的な研究としてはポーターの理論が上げられる。ポーターの研究を紹介する前に、まずこの学派の根底にある理論的なフレームワークを議論する。このフレームワークとは、「業界構造 (Market Structure) — 市場行動 (Market Conduct) — 市場パフォーマンス (Market Performance) ・モデル」、略して「SCP モデル」として知られるような産業組織論の概念である。その基本的な命題とは、市場パフォーマンスが売り手と買い手の市場行動に依存し、またその市場行動が市場の業界構造によって規定される、という概念である。すなわち、S→C→P という因果関係である。

Porter (1980) は、このような産業組織論のモデルを戦略論に持ち込んで、特定事業つまり事業部

レベルの戦略策定、いわゆる競争戦略の議論を展開した。これは、産業構造分析（5つの競争要因）を通じて企業にとってより望ましい投資利益をあげられる市場を捜し出し、そのための基本戦略のいずれかを選択し、追求しなければならないということである¹⁾。さらに、Porter（1985）は、持続的な競争優位を確保することを目的とし、そのための方法論についても論じている。これは価値連鎖という概念であり、主に事業部内の職能活動間の戦略的適合性を指している。すなわち、競争戦略によって獲得した競争優位を維持するために、組織内の整合性（内的適合）の支援がなければならないということである。2つの議論をまとめて見ると、次のようにSCPモデルと同じ因果関係を持つポーターのモデルがまとめられる。すなわち、5つの要因分析（市場構造）→基本戦略→Value Chain（組織）→持続的な競争優位（市場パフォーマンス）という因果関係である。

要するに、計画的アプローチと同様に、このアプローチも規範的な研究手法をとっており、Plan→Do→Seeという大前提を受け入れており、同じく戦略統制の側面を重視しているが、全社戦略ではなく事業戦略の視点から、市場（環境）でのポジションの確立のための戦略の重要性と戦略の内容に注目したという特徴がある。

2.2.2 リソース・アプローチ

これは組織重視と内容重視のアプローチであり、Strategizingとしての競争戦略でもある。ポジショニング・アプローチの概念とは正反対であり、競争優位の源泉を企業の内部資源に求めるResource-Based Viewはこのアプローチの中心であるが、「コア・コンピタンス²⁾」や「知識創造」などの理論もこのアプローチに属している。RBVを最初に提起したのはWernerfelt(1984)である。彼は、なぜ企業が超過利潤を獲得できるのかについて、その企業が保有する資源をライバルが獲得、模倣できないような資源障壁（Resource Position Barrier）があるからであると主張した。また、Dierickx&Cool(1989)は、資源の取引可能性に着目した。ある戦略要素である経営資源は、本質的に市場で取引可能なものではなく、企業内で蓄積されるものである。すなわち、競争優位を決定するのは、競争戦略論がいう外部環境のポジショニングではなく、企業の内部資源である。しかし、ある企業が競争優位を獲得すれば、ライバル企業はやはり資源獲得活動を通じてその優位性を中立化しようとする。そこで、Rumelt（1984）は、ライバル企業の模倣を妨げる要因を隔離メカニズム（Isolating Mechanism）と呼び、このメカニズムが働くときに企業の競争優位が維持されると主張した。さらに、Barney（1991, 2001）は模倣を困難にする要因として、①独自の歴史的条件、②因果関係のあいまい性、③社会的複雑性、④特許、の4つをあげている。以上の4つの要因のいずれか、あるいはそれらの組み合わせにより、他社による経営資源の模倣は困難となり、企業が持続的な競争優位を獲得し維持できる。

また、Grant（1991）は、「資源が組織の競争優位性を直接に規定する」というBarneyなどのRBV論者の基本命題を、「資源はケーパビリティの源であり、ケーパビリティは競争優位の源泉である」と拡張した。

要するに、リソース・アプローチでは、個別企業が独自の戦略で利潤を最大化するために、最も影響力を持つのはポーターが提唱した産業環境の構造要因ではなく、各企業が保有する内部資源であると主張される。すなわち、ポーターが競争優位を決める要因として産業構造という外部環境を重視するのに対して、リソース・アプローチは個別企業レベルの組織内部をより重視する。

3. 方法

図2は本稿の研究方法のデザインである。本稿は質的研究に属する比較ケース分析法 (Case-Oriented Comparative Method) を採用し、異なる企業が選択する戦略の一般性と特殊性を分析する。特に、本稿は一般性の特殊性を探し出すために台湾食品製造産業と建築産業からそれぞれ対比的なケースを抽出し、また事件法 (Event Frequency; Van de Ven and Huber, 1990) によって異なる企業の戦略選択と戦略変化を検討する。研究対象としてそれぞれ食品製造業と紡績産業から発展した統一と味全、および遠東と南紡、4つの企業グループを選定する。ケースの選択条件として次の2点を取り上げられる。第1に、統一と味全、および遠東と南紡はそれぞれ食品製造産業と紡績産業に属するアジア地方華人が創立する代表的な企業であり、多角化の程度が高く、戦略変化を観察するには有利である。第2に、4つの企業の歴史と規模が皆かなり巨大であり、時間序列分析に相応しい。

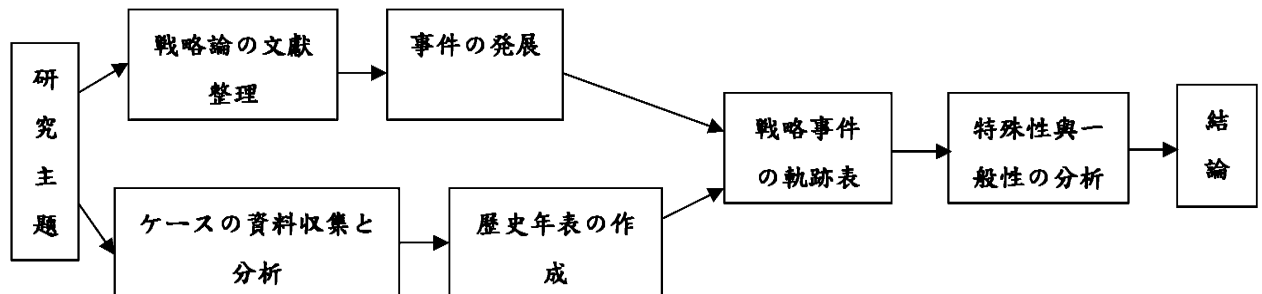


図2 研究方法

また、本稿の研究テーマは企業の戦略選択と戦略変化である。静態的な選択の概念に対して、変化が時間の前後関係を前提にし、動態的な概念である。戦略変化が論じられるとき、それにいかにして時間に沿って変化するのかに関して客観的に測量する必要がある。したがって、各企業の戦略を正確的に、且つ客観的に描き出すために、本稿では4つの戦略アプローチに属する理論や仮説から戦略事件を発展し、またフィールド調査によって各企業の歴史年表を作成し、最後にその歴史年表と戦略事件を交差分析することによって企業の戦略選択と戦略変化を描き出す。

本稿では4つのアプローチの理論や概念から戦略事件を表1のように発展する。表1の中で、既存生産工場や販売拠点の増築や新設、新しい会社を成立する、ジョイント・ベンチャー、海外投資などの戦略事件は計画的アプローチに属する事件である。新製品や戦略ポジショニングの変更などの事件はポジショニング・アプローチの事件である。自立的事業戦略、戦略的職能戦略および内部創業などは創発的アプローチの事件である。最後、リソース・アプローチの事件はアライアンス、技術イノベーションなどの概念である。

表1 戦略事件表

策 略 学 派	事 件
計画的アプローチ	1.1 既存の生産工場 / 販売拠点増築 1.2 新しい生産工場 / 販売拠点の成立 1.3 関係する分野に新しい会社を成立する 1.4 非関連の分野に新しい会社を成立する 1.5 はかの会社とジョイント・ベンチャー 1.6 はかの会社を買収する 1.7 海外投資
ポジショニング・アプローチ	2.1 同じブランドで異なっている売値の新製品 2.2 同じブランドでしかも同じ売値の新製品 2.3 異なっているブランドでしかも同じ売値の新製品 2.4 異なっているブランドしかも異なっている売値の新製品 2.5 会社の戦略ポジションの変更
創発的アプローチ	3.1 はかの同業をリードして新しい事業分野に入る 3.2 事業部は自分で海外のメーカーを導入する 3.3 戦略的な職能戦略 3.4 事業部の主導で新しい事業分野に入る 3.5 内部創業
リソース・アプローチ	4.1 はかの会社と生産技術、あるいは販売の提携を行う 4.2 はかの会社と戦略の同盟を合意する 4.3 販売通路を買い占める 4.4 事業部間で製品 / サービスを整合する 4.5 新しい製品、サービスあるいは技術の開発 4.6 革新のビジネスモデル

4. 分析

本稿でデータのソースとなるのが「卓越商情資料庫」(EBDS)、「公開資訊觀測站」(公司年報)、工商時報、商業周刊、天下雜誌、および企業のWebsiteなどであり、また4社に関する文献や著作(李仁芳, 1995; 天下編輯, 1997、1998; 莊素玉, 1999; 高麗麗、趙虹, 2001; 王樵一, 2007)を参考し、4社の戦略に関する今まですべての重大である歴史事件を年代順によって整理する。また、表1の戦略事件によって各企業の歴史事件を各戦略アプローチに分類し、次のように各事業の戦略選択と戦略変化を分析する。各時期の戦略選択を正確的に捉えるために、各時期に現れる戦略事件の比率をN(0%), L(0-25%), M(25-50%), H(50-100%)などの4つの段階に区別する。表2から表5は4つの企業の事例分析の結果である。

(1) 統一グループ

策 略 学 派								
年代	計 劃 学 派		定 位 学 派		創 發 学 派		資 源 学 派	
	策略事件	等級	策略事件	等級	策略事件	等級	策略事件	等級
	数 目		数 目		数 目		数 目	
1967-1980	16/27	H(60%)	10/27	M(36%)	0/27	N(0%)	1/27	L(4%)
1981-1990	17/73	L(23%)	53/73	H(73%)	1/73	L(1%)	2/73	L(3%)
1991-2000	22/58	M(38%)	17/58	M(29%)	12/58	L(21%)	7/58	L(12%)
2001-2008	5/58	L(9%)	9/58	L(16%)	9/58	L(16%)	35/58	H(59%)

表2 統一グループの戦略事件

(2) 味全グループ

策 略 學 派								
年代	<u>計劃學派</u>		<u>定位學派</u>		<u>創發學派</u>		<u>資源學派</u>	
	策略事件	等級	策略事件	等級	策略事件	等級	策略事件	等級
	數目		數目		數目		數目	
1953~1980	26/33	H(79%)	6/33	L(18%)	1/33	L(3%)	0/33	N(0%)
1981~1990	8/11	H(73%)	1/11	L(9%)	1/11	L(9%)	1/11	L(9%)
1991~2000	3/4	H(75%)	0/4	N(0%)	0/4	N(0%)	1/4	M(25%)
2001~2008	2/5	M(40%)	3/5	H(60%)	0/5	N(0%)	0/5	N(0%)

表 3 味全グループの戦略事件

(3) 遠東グループ

策 略 學 派								
年代	<u>計劃學派</u>		<u>定位學派</u>		<u>創發學派</u>		<u>資源學派</u>	
	策略事件	等級	策略事件	等級	策略事件	等級	策略事件	等級
	數目		數目		數目		數目	
1945~1980	37/38	H(97%)	0/38	N(0%)	1/38	L(3%)	0/38	N(0%)
1981~1990	25/32	H(78%)	1/32	L(3%)	6/32	L(19%)	0/32	N(0%)
1991~2000	61/110	H(55%)	16/110	L(15%)	10/110	L(9%)	23/110	L(21%)
2001~2008	78/154	H(51%)	34/154	L(22%)	9/154	L(6%)	33/154	L(21%)

表 4 遠東グループの戦略事件

(4) 台南紡織

策 略 學 派								
年代	<u>計劃學派</u>		<u>定位學派</u>		<u>創發學派</u>		<u>資源學派</u>	
	策略事件	等級	策略事件	等級	策略事件	等級	策略事件	等級
	數目		數目		數目		數目	
1955~1980	6/6	H(100%)	0/6	N(0%)	0/6	N(0%)	0/6	N(0%)
1981~1990	9/9	H(100%)	0/9	N(0%)	0/9	N(0%)	0/9	N(0%)
1991~2000	17/18	H(94%)	0/18	N(0%)	1/18	L(6%)	0/18	N(0%)
2001~2007	13/14	H(93%)	0/14	N(0%)	1/14	L(7%)	0/14	N(0%)

表 5 台南紡織の戦略事件

4.1 戦略変化の軌跡

各企業の戦略選択および戦略変化を分析するために、4つの企業が創立以来の戦略アプローチを表6のように整理する。

表6 戦略選択の戦略変化

時期 企業	第一時期 1945-1980	第二時期 1981-1990	第三時期 1991-2000	第四時期 2001-2010
統一グループ	計画+ポジショニング	計画+ポジショニング	計画+ポジショニング+創發	ポジショニング+創發+リソース
味全食品	計画	計画	計画	ポジショニング
遠東グループ	計画	計画+創發	計画+ポジショニング+リソース	計画+ポジショニング+リソース
台南紡織	計画	計画	計画	計画

表3から明らかにしたのは、まず創業初期に4つの企業がほとんど計画的アプローチの戦略をとっている。その原因は企業の初期の主な目的は成長を求めることにあり、既存の生産作業を含めた販売の拠点、或いは新しい生産工場を成立するなど量的な拡大や垂直統合の戦略を多用している。それ以外、ほとんどの企業はお互いに異なる戦略変化の軌跡を持っている。統一グループは計画的アプローチを取り、急成長や規模の経済性を追及してから第二の段階に入ると、ポジショニング・アプローチの戦略に戦略変換し、競争および製品の多様化を求めている。これに対して、ほかの企業は計画的アプローチの戦略をとり続けているが、計画的アプローチに属する多角化の戦略事件が増えており、範囲の経済性を追求し始めた。また、その時期には、遠東グループの創發的アプローチの戦略事件が現れ、当社の分権化が進んでいることを示唆している。第三時期に入り、味全食品と台南紡織以外の2つの企業には、戦略の多様性がさらに増大する。まず統一グループの創發的アプローチの戦略事件が急に増え、その原因としてその子グループの流通グループが企業発展の主役になっており、食品製造グループに代わって企業の核事業になった。これに対して、計画的アプローチの戦略事件も量を保っているが、計画的アプローチに属する関連事業多角化や非関連事業多角化の戦略事件がこの時期の主役である。次に、遠東グループはポジショニングとリソースアプローチの戦略を取り始めており、製品の多様化および内部資源の整合を意味している。最後に、第4段階に入り、台南紡織以外の3つの企業は新たな戦略変化を成りどけている。まず、統一グループが第三段階で創發的アプローチを取り、資源が分散したために、リソースアプローチの戦略を取り始めて、資源のまとめを追求している。味全食品がほかの企業に買収されたために、ポジショニングの戦略を取り、企業の再位置づけを求めている。遠東グループは計画的アプローチの戦略をまだ取っているが、ほかの戦略アプローチの戦略事件も第三時期より増えている。

4.2 比較分析

以上のように、4つの企業の戦略選択と戦略変化を説明したが、実証の発見として次のように事例を分析することができる。

(1) 産業分析

1. 統一 & 味全

統一と味全の共通性は創業初期にほとんど垂直戦略を取りそのあと多角化戦略に移行していく。すなわち範囲の経済より規模の経済性をより重視している。それ以外両者の相違点は統一が他の会社との提携を利用して技術と資源を獲得するのに対して、味全が内部成長の手段を通じて資源や技術を獲得する。また、戦略変化および戦略選択の多様性について味全より統一のほうがはるかに高い。

2. 遠東 & 南紡

遠東 & 南紡の共通点は両者の戦略が主に計画的アプローチにあり、それはこの産業が食品製造産業より競争が緩やかで、企業がほとんどその企業目的を企業成長に置くことにある。また遠東の戦略変化には計画的アプローチ以外の戦略も現れるが、統一グループに比べるとその比率が遥かに低い。それ以外、両者の戦略選択に差異性も存在している。南紡は垂直戦略を取り続けていることに対して、遠東は非関連多角化戦略を大量的に駆使し、企業の急成長を求めている。

(2) ケース分析

同じ産業の分析以外にも、異なる戦略変化パターンを持つ企業も発見される。特に、統一 & 遠東はそれぞれの産業好業績をもたらし、その戦略選択の多様性も存在している。両者の戦略選択と戦略変化の共通点は、その戦略事件がほとんど単一の戦略アプローチに集中していないことにある。すなわち、最初はひとつないし二つの戦略アプローチを採用し、会社の発展につれてその戦略選択の多様性も増えている傾向がある。戦略変化が単純で、戦略選択をあまり変更しない味全 & 南紡に対して、これは両者が環境変化をうまく対処し、また成長と競争という2つの対立する目的を経時的に運用し、またお互いに対立する戦略アプローチから当時の状況に応じて適切な戦略選択を行うことを意味している。

5・結論

本稿は4つの事例を通じて4つのアプローチの戦略選択と戦略変化を検証した。学問の世界では、これらの中でどのアプローチがより現実を反映しているのか、また環境変化に有効に対応できるのかといった論争がしばしば行われる。しかし、実証研究を通じてどのアプローチが優れているのかという対立の解消について次の結論が言える。

(1) 大部分の企業は異なる時期に特定の戦略アプローチを偏する現象があるが、それが各企業は異なる時期に適切な戦略選択を行うことを意味する。特に、統一は長い時期の発展プロセスにそれぞれ異なっている戦略を使用することによって異なる経営目的を追求する。本稿ではこのような現象を『戦略の完全性』を呼ぶことになる。

(2) ほとんどの企業は直面する内外環境が違っているので、各事業の戦略変化のプロセスも異なっている。共通しているのは創業段階では各事業がほとんど計画的アプローチの戦略をとり、企業の急成長を追及する。しかし、統一は多様な戦略変化プロセスを持ち、うまく戦略変革を行っており、本稿ではこのような現象を戦略変化の多様性を呼ぶことになる。

(3) 計画的アプローチと創発的アプローチの対立は、①環境が予測できるのか②公式的なトップダウン

ンか非公式的なボトムアップか③計画が先か現場の実施が先か、をめぐる論争である（蔡展維，2005）。本稿では、われわれが企業がまず計画的なアプローチを取り、そのあとうまく創発的アプローチへと移行していく企業のほうが業績高いことを発見した。それは、企業が計画的アプローチを通じて、企業の成長方向を確認してから、戦略の重心を企業の現場へと転移することを意味する。また、ポジショニングとリソースアプローチの対立は戦略的ポジショニングが競争優位の源泉か、内部資源の蓄積が競争優位の源泉かにある。本稿では、企業がまずポジショニング・アプローチをとり、いち早く産業に有利な位置づけを取り、そのあとまたゆっくり組織内部で資源の統合や蓄積をすることを発見した。

本稿では、4つの多角化している企業の事例分析を通じてその複数のアプローチの組み合わせを具体的に検証した。要するに、企業が激しく変化する環境に対して、4つの戦略アプローチそれぞれの立場に立って考える必要があるが、重要なことは、戦略変化の軌跡を構築する上で、複数の戦略アプローチをバランスよく使うことである。

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青年企業
管理評論
Ymc Management Review

Publisher and Chairman: LEE, Chun-Hsiang

Editor-in Chief: CHANG, Kung-Hsiung

Editor-in-Executive: CHEN, Tsung-Hao, TSAI, Chan-Wei

Publisher: Young Men Business Club of R.O.C.

Address: 3F/3 Lane 1041 Ta-Hsuen 1st Rd. Gue-Sun Dist.
Kaohsiung 804 TAIWAN

Phone: +886-7-5525715

E-Mail: ymcmr@yahoo.com.tw

Website: www.ymcmr.org

Press: Hung Kuan Digital Press Co.

+886-5-5315351 <http://www.pod.com.tw>

ISSN 2073-0888

Publishing date: 15 June 2010

Price: US \$ 100

Print in TAIWAN

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