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碩士論文

信評與資本結構：
以英國倫敦勞依茲保險市場為例

Rating and Capital Structure:

Evidence from the Lloyd's Market

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評等與資本結構：
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中文摘要

英國倫敦勞依茲為世界上最重要且最著名的國際保險市場， 本研究以勞依茲保險市場中業務代理人(辛迪加)為研究對象， 探討於 2004 年至 2006 年間辛迪加其評等與資本結構之關聯性。 主要分析勞依茲辛迪加其評等之優劣是否會影響財務槓桿或受其影響。 透過兩階段 ordered probit 迴歸模型， 處理評等與財務槓桿存在的內生性問題。 實證結果指出辛迪加之財務槓桿愈高則評等較低， 評等愈高則財務槓桿偏低。 此外， 將研究資料分期間及分規模進行穩建性檢定， 所得到的研究結論依舊不變。 本研究解釋辛迪加保持較低的財務槓桿是為了獲得較優評等及業務代理人是如何透過評等進而影響其財務槓桿。

關鍵字：勞依茲；辛迪加；資本結構；評等；內生性

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ABSTRACT

The Lloyd's market plays an important role in the global insurance market. In our study, we use the Lloyd's insurance market data on syndicates during the 2004-2006 periods to investigate the relationship between financial strength rating and leverage of syndicates. A two-stage ordered probit regression is employed to deal with the problem of endogeneity about the rating-leverage relation. Our empirical results indicate that syndicates with higher leverage have lower rating, and syndicates with higher rating have lower leverage. In robustness checks, we divide our sample into different subperoids and size. The conclusions remain qualitatively unchanged. Our study provides an explanation for why syndicates continue to operate with lower leverage to obtain a higher rating and why ratings would affects capital structure by managing agents.

Keywords: Lloyd's market; Syndicate; Capital structure; Rating; Endogeneity

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INTRODUCTION

Ratings provided by rating agencies are considered to be important indicators of the financial health of insurers. For instance, several statistical analysis point out that ratings aid predicting insurer insolvencies (Harmelink, 1974, p.624; Ambrose and Seward, 1988, p.241; Ambrose and Carroll, 1994, p.323). However, Cummins et al. (1995) and Lee and Urrutia (1996, p.121) refer to the fact that insolvency in insurance market has emerged and got worse since the mid-1980. This reality reflects that policyholders need more additional and essential information to identify insurers which have sufficient ability to meet debt claim when they fall due. A firm's credit rating reflects a rating agency's opinion of an entity's overall creditworthiness and its capacity to satisfy its financial obligations (Standard and Poor's 2004). Rating can influence business operations of the firm in several ways. Through ratings, regulators, consumers, insurers, and insurance brokers can realize that the financial soundness of insurance companies. In many cases, regulators and brokers do not recommend purchasing insurance for unrated or lowly rated insurers. In order to give a positive signal that they are financially healthy, insurers are generally willing to pay for being rated (Pottier and Summer, 1999, p.626; Adams et al., 2003, p.541). Since ratings are important to reflect the financial condition and the business continuity, we concerned whether insurer's capital structure could influence ratings.

One of the most important decisions confronting a firm in corporate finance is that the design of its capital structure. Ever since the work of Modigliani and Miller (1963, p.23), a central question in corporate finance asks whether firms don't have debt more intensively while debt provides large tax advantage. The trade-off theory and the pecking order theory are two most prominent academic theories of optional capital structure. From view of the trade-off theory, value-maximizing firm will trade off the

benefits of debt against the cost of debt to debt typically. The tax-deductibility of interest payments and the disciplinary effect of debt in forcing include the present value of the expected direct and indirect costs of bankruptcy, including the negative effects of risk-shifting or underinvestment incentive associated with greater leverage. The trade-off theory argues that companies devote considerable attention to credit ratings in designing their financial policy. Therefore, the impact of credit rating on capital structure decisions has become an important issue. Explicitly take account of credit ratings, we exam whether ratings would affect capital structure.

In the global insurance business, the Lloyd's market has a vital position. Lloyd's has enjoyed a 300-year history as a direct writer and a reinsurer. This market consists of tens of syndicates to support their capital. Lloyd's has capacity to write about £16.1 billion of business in 2007 and reported a profit of £3,662 millions. It is obvious that the Lloyd's market plays a crucial role in the worldwide insurance market. To our knowledge, previous literature has never discussed the topic regarding Lloyd's market. This study is the first paper to examine the relation between rating and capital structure of the syndicates in Lloyd's market.

In the light of the important of Lloyd's market, we use the Lloyd's insurance market data on syndicates to examine the relation between rating and capital structure from 2004 to 2006. We focus particularly on the association between leverage and ratings after controlling other variables; for example, profitability, size, growth, reinsurance, liquidity and capital. These factors are controlled for the possibility that levels of a syndicate's financial strength rating systematically different (e.g., Syndicates of good rating might generally have higher quality or have higher growth potential). Since the relation between rating and leverage might be endogenous, it might raise doubts about

the causality explanation. Therefore, we use instrumental variable approach and two-stage ordered probit regressions to deal with the problem of endogeneity in the rating-leverage relation. We also show that our results are robustness in subperiods and sizes of syndicates. Our results are qualitatively similar and statistically significant. Consistent with hypothesis, when syndicates have higher leverage, syndicates will tend to be assigned lower rating grades and syndicates with higher rating have lower leverage.

LITERATURE REVIEW

A number of academic studies of corporate capital structure have concluded that average public company has little debt on its balance sheet. We are interested in why firms are not more leveraged. According to the traditional trade-off theory, the cost of financial distress should offset the benefits from the tax shields. Um (2001) suggests that a high profit level gives rise to a higher debt capacity and accompanying tax shields. The literature has made a considerable effort to estimate the benefit and costs of debt. However, Graham (2000, p.1935) finds that by leveraging up to the point at which the marginal tax benefits begin to decline. A typical firm could add 7.5% to firm value, after netting out the personal tax penalty. An increase in debt also increases the probability of default and consequently the expected cost bankruptcy. Over the optimal leverage level, it will increase in the costs of financial distress and then indirect coursing lower condition of credit. Barron's (2003) report that Lear Corp. reduces its debt in order to upgrade their credit rating from Standard & Poor's, and Wall Street Journal (2002) reports that Fait was "racing" to reduce the company's debt because it is "increasingly worry about a possible downgrade of its credit rating ". On the other hand, credit ratings directly affect capital structure decisions by managers. Kisgen (2006, p. 1067) finds that firms that are near a rating change issue less debt than other firms to avoid downgrades

and achieve upgrades. Additionally, Kisgen (2007, p.34) finds that corporate is unwilling to take on more leverage may be justified in terms of the benefits of a higher credit rating since a higher credit rating can lower costs of debt.

Majority of prior studies support the fact that leverage has negative relationship with financial strength rating (Pottier and Sommer, 1999, p.634; Adams et al., 2003, p.556; Gaver and Potter, 2005, p.98). More formally, pecking order theory (Myers and Majluf (1984, p.581)) focuses on information costs and signaling effects. The theory indicates that debt is already less sensitive to information problems than issuing equity. External financing would only be carried out when there is an imbalance between internal funds and real investment opportunities. These problems directly influence company's capital structure and indirect affect the condition of financial strength rating. Graham and Harvey (2001, p.11) find that credit ratings are the second highest concern for CFOs when determining their capital structure. They point out almost 57.1% of CFOs saying that credit ratings are important or very important in how they choose the appropriate amount of debt for their firm. Graham and Harvey (2001, p.21) report that credit ratings ranked higher than many other factors suggest by traditional capital structure theories, such as trade-off theory indicates the tax advantage of interest deductibility and pecking order theory states about information cost.

Besides, rating can also provide information to investors and thereby act as signal of firm quality beyond other publicly available information. Ederington, Yawitz, and Roberts (1987, p.225) and West (1973, p.12) find that credit ratings are significant predictors of yield to maturity beyond the information contain in publicly available financial variables and other factors that would predict spreads. However, many firms may be reluctant to release information to the market, because rating agencies could

receive significant company information that is not public. Moreover, credit agencies might also specialize in the information gathering and evaluation process and thereby provide more reliable measure of a firm's creditworthiness. Boot, Milbourne, and Schmeits (2003, p.24) comment that rating agencies could be seen as information-processing agencies that may speed up the dissemination of information to financial market.

ISTITUTIONAL BACKGROUND

Lloyd's Market

Lloyd's is a unique world's largest insurance market, not a single legal insurance entity, first established in the 17th century. The London-based Lloyd's insurance market is a significant participant in insurance and reinsurance market worldwide.[1] Its major business includes commercial insurance, reinsurance, and auto insurance. The key market participants of Lloyd's are members, syndicates, managing agents, the Society of Lloyd's, brokers and member's agent. The members (or Names) include individual and corporate. Lloyd's members are the capital providers and take risks for their underwriting shares individually. Each of syndicates is run by a managing agent. A managing agents' duty is to appoint and employ underwriters.

The Society of Lloyd's charges of supervising and supporting the underwriting activities of Lloyd's members. A broker role as a facilitator between clients and underwriters dealing with insurance business. Members' agents provide managerial services and supply of predominantly capital to syndicates. Usually, syndicates' business life is couple-year, established at the beginning of each underwriting year and disbands after

[1] The Lloyd's market background will be detail introduced in the "Lloyd's market" section.

the underwriting is determined. Lloyd's financial structure has "chain of security" available to support policies, the mainly four resources come from (1) Premium Trust Funds (2) Fund at Lloyd's (3) Other Personal Wealth (from personal syndicate) (4) Central Asset. Premium Trust Funds are held at syndicate level and are the resource for the payment of policyholder claims in normal circumstances. Funds at Lloyd's (FAL) are member specific and are held under the trusteeship of Lloyd's. Central assets consist of the Central Fund, Central Fund syndicate loans, the callable layer and "other" central assets. Besides, the order of remuneration is (1) Premium Trust Funds (2) Fund at Lloyd's (3) Other Personal Wealth (from personal syndicate) (4) Central Asset. As a result, all Lloyd's policies are backed by Lloyd's common security that enables Standard & Poor's to assign an Insurer Financial Strength Rating (FSR) that applies across Market.

The rating applies to all syndicates regardless of their individual performance relative to other syndicates and Market aggregates. Standard & Poor's separately provides syndicate specific analysis through its Lloyd's Syndicate Assessment (LSA) product. Better performing syndicates contribute positively to rating than syndicates with poor performing. Additional, Standard & Poor's has maintained continuous "surveillance" over the rating since it was first assigned in 1997, This involves a review of public and confidential information, as it becomes available, ongoing dialogue with Lloyd's management.

Methodology of rating

Lloyd's is a globally respected insurance marketplace where capital providers accept insurance risk on a strictly several basis through syndicates in return for insurance

premiums. The financial risks to these capital providers are partially mutualized through the Lloyd's Central Fund, to which all underwriting members contribute. Because of the presence of the Central Fund, and the powers vested in the Council of Lloyd's to manage this fund, Standard & Poor's has been able to assign an insurer financial strength rating (FSR) to the Lloyd's Market, which applies currently and prospectively to each policy issued by Lloyd's from the 1993 year of account onward. Standard & Poor's does not believe that, under the Market's current legal and regulatory structure, FSRs on syndicates are appropriate. This view reflects the fact that syndicates are groupings of one or more capital providers, managed on their behalf by a managing agent, and are not legal entities in themselves. Furthermore, regulatory action is the arbiter of default with regard to FSRs and, due to the mutualization of Lloyd's through the Central Fund, regulatory action resulting from concerns as to ability to meet claims would be Marketwide, not syndicate specific. With these issues in mind, in order to meet the insurance and capital markets' need for a more specific view on syndicates, Standard & Poor's offers an opinion on a syndicate's business continuity characteristics in the form of an Lloyd's Syndicate Assessments (LSA). LSAs evaluate the relative dependency of syndicates on Lloyd's infrastructure and the Central Fund, reflecting their ability to offer business continuity to policyholders. Where an LSA is assigned on an interactive basis, additional and confidential information gained through discussion with syndicate management supplements the initial 'pi' analysis. A LSA can be determined on a public information (pi) basis in which case each assessment carries the "pi" subscript. A syndicate assigned an LSA of ' 5 ' is considered to have " very low dependency " and meaning strong business continuity characteristics, which Standard & Poor's views as positive. On the contrary, an LSA of ' 1 ' indicates " very high dependency " and meaning weak business continuity characteristics, which Standard & Poor's thinks as negative. The relationship between Dependency and Continuity of

Lloyd's Syndicates can be presented as Table1. Standard & Poor's has ensured consistency within the LSA product by extensive testing and calibration of the updated model and through the committee process. The updated model ' pi ' LSA model including seven weighted items to analysis syndicates' business continuity. The weighted proportions are presented as Table2.

(Insert Table1 and Table 2 Here)

RESEARCH DESIGN

Models

The first aim is to examine the relationship between rating categories and explanatory variables. Since the syndicate letter ratings are ordinal measurements and such our analysis necessitates the estimation of an *order* probit model. The model was developed by McElvey and Zavoina (1975) and used in Pottier and Sommer (1999, p.633). The rating likelihood probit models and the rating determination ordered probit model are written in general form as:

$$
\begin{aligned}
d^{*}_{it} &= \alpha\, x_{it} + \mu_{it} \\
d_{it} &= 0 \quad \text{if } d^{*}_{it} \le 0 \\
&= 1 \quad \text{if } d^{*}_{it} > 0 \qquad (1)
\end{aligned}
$$

$$
\begin{aligned}
y^{*}_{it} &= \beta\,' z_{it} + e_{it} \\
y_{it} &= 0 \quad \text{if } y^{*}_{it} \le \mu_0 \\
&= 1 \quad \text{if } \mu_0 < y^{*}_{it} \le \mu_1 \\
&= 2 \quad \text{if } \mu_1 < y^{*}_{it} \le \mu_2 \\
&= 3 \quad \text{if } \mu_2 < y^{*}_{it} \le \mu_3 \\
&= 4 \quad \text{if } \mu_3 < y^{*}_{it} \qquad (2)
\end{aligned}
$$

$$
\mu_{it}, e_{it} \sim N(0,0,1,1,\rho)
$$

In these models, the latent variables, d* and y*, are continuous and unobserved

variables. In equation (1), d* as the propensity to be rated, while in equation (2), y* represents a particular rating. The binary variable d equals 0 for non-rated and 1 for syndicates with ratings. The ordinal variable y is coded on a five-point scale from 0 to 4, where 0 represents the poorest condition (1pi) and 4 represents the strongest business continuity (5pi). We primary to examine the significance of ß' to confirm the relations between financial strength ratings and capital structure. In equation (1) and (2), x and z represent vectors of independent variables as well as a' and ß' are the vectors of coefficients to be estimated. The two error terms µ and e are assumed to be normally distributed with means equal to zero, variances equal to one and correlation coefficient equal to ?.

Data and Sample

The primary data sources for ratings were Standard & Poor's, Lloyd's Syndicate Assessments consisting of 69 syndicates, for example: Syndicate 1200. (The Appendix 1 at the end of the paper provides full syndicates). The financial strength ratings letters and financial characteristic data are collected from 2004 to 2006. There are total 170 rating and financial characteristic data except capital and growth. Since the variable of capital is positive, after omitting the negative variables, we only collected the capital variable including 110 data calculated from 2004 to 2006. Due to the limitation data, the growth variable only includes 83 calculated data between 2005 and 2006. To avoid problems with outliers, we delete any data that is not within three standard deviations of the mean variable. The following proxies of determinants in this study often be used the key ratios of LSA model.

Leverage

Leverage ratio not only provides us an indicator of the riskiness of the owner's investment in the firm but also measures the ability of company meeting financial obligations. A company with low leverage implies having low debt finance that company will be considered having enough internal funds, so that low financial uncertainly and insolvency risk (Kahane et al., 1986; Cummins, 1988, p.825; Borde et al., 1994; Gaver and Pottier, 2005, p.98). In addition, Staking and Babbel (1997, p.737) also state that leverage increase the value of firm will decrease. Because majority of prior studies (Pottier and Sommer, 1999, p.638; Adams et al., 2003, p.556; Gaver and Pottier, 2005, p.80) support that between leverage and financial strength rating has negative relationship. We consider that syndicates with relatively high level of leverage are expected to have lower business continuity and financial strength rating.

The following are explanations for setting control variables on rating in regression 1:

Profitability

Profitability is generally the making of gain in business activity for the benefit of the owner's of business. Profitability is also an important variable that many studies using to test the determinants of rating (Ederington, 1987, p.225; Pottier and Sommer, 1999, p.626; Gaver and Pottier, 2005, p.80) comment that low profitability represent a negative signal of a company. It means the more profitable the syndicate is, the higher the business continuity and financial strength rating. We use return to assets ratio (ROA) as the proxy for the profitability that is the ratio of pretax profit including unrealized gains (losses) to total assets.

Size

Company Size always estimates the company's total asset. The larger insurance usually

has more experiences and capital resource to insure their properties. Since their average cost for operating express seem to downward with size, they can accrue more effective working. It is clear that the larger the syndicates are, the higher the business continuity and financial strength rating (Pottier and Sommer (1999, p.637), Adams et al. (2003, p.547) and Gaver and Pottier (2005, p.81) indicate that there is positive impact of size on the rating. The definition of the proxy of company size is natural logarithm of total admitted asset.[2]

Reinsurance

Reinsurance is a means by which an insurance company can protect itself against the risk of losses with other insurance company. Individuals and corporations obtain insurance policies to provide protection for various risks (e.g., Hurricanes, earthquakes, lawsuits, collisions, sickness and death, etc.). Insures tend to choose their reinsures with great care as they are exchanging insurance risk for credit risk. Risk managers monitor reinsures' financial ratings (S&P, A. M. Best, etc.) and aggregate exposures between reinsurance and financial strength rating (Pottier and Sommer, 1999, p.628; Adams et al., 2003, p.548). As previous studies, the ratio of annual reinsurance cede to annual premiums written can serve as a proxy for the reinsurance factor.

Liquidity

Liquidity mainly shows that the speed of a company's assets transferring to cash. A syndicate's liquidity is considered a kind of ability to respond quickly to operational cash calls. A syndicate that has well liquidity can face the sudden emergent financial claims. Moreover, some studies point out liquidity and financial strength rating are

[2] Natural logarithm of total admitted asset to eliminate the effect of highly skewed distribution in insurance industry (Pottier and Sommer, 1997).

positive relationship (Pottier and Sommer, 1999, p.628; Adams et al., 2003, p.545; Gaver and Pottier, 2005, p.80). That means if syndicates with a high degree of liquidity are expected to have a high business continuity and financial strength rating. The proxy of liquidity can be defined as the ratio of cash plus deposit to total assets.

Capital

Capital represents wealth of an insurer has enough sufficient capital usually is considered having less possible to default. Capital evaluates whether a syndicate provides sufficient capital to meet obligation and National Association of Insurance Commissioner (NAIC) require that insurers have to satisfy fixed minimum capital acquirements to operate in an area. In some papers (Butsic, 1994, p.668; Cummins et al.,1995, p.432; Dhaene et al., 2004, p.575), as they measure the insolvency of a firm also controlling the effect of capital requirement. (Van Gestel et al., 2007) apply capital as a factor of credit rating. The proxy of capital, which is adopted from the key factors of S&P LSA model, is the ratio of member's balances plus fund's at Lloyd's (FAL) to net premium written.

Growth

Growth usually indicates a company whose earnings are expected to grow at an above average rate compared to its industry or the overall market. In Lloyd's market, the growth syndicate not only tends to have very profitable reinvestment opportunities for its own retained earning but also regarded as a healthy financial condition. Pottier and Sommer (1999, p.628) indicate the relationship between annual premium growth and financial strength ratings are positive. As a result, we think of the higher in growth the better in financial ratings than others'. We measure the percentage change in net premium written to refer to the variable of growth.

Concentration Index

Concentration Index is opposed to portfolio diversification that measures the diversity of syndicate's gross premiums written by business line. A syndicate with higher diversity of business line has lower risk exposure to specific sector underperformance and volatility (Standard & Poor's, 2006). Harrington and Niehaus (1999) also indicate that insurer can though production line diversification palliates underwriting risk. Underwriting profile investigates the earning capacity of a syndicate and performance characteristics of operation, so that we choose concentration index as a proxy of underwriting profile. We suppose that a syndicate has higher concentration index will have lower business continuity and financial strength rating. Extending the study of Cummins et al. (1999, p.23), we apply Herfindahl index in evaluating the concentration of business line. The business line concentration has definition that the sum of the square of the growth premium written shares of each business line.

(Insert Table 3 here)

The following are explanations for control variables on leverage in regression 2:

Profitability

Profitability of a firm means the amount of earnings available to be retained. A high profitability is considered as a positive signal for company. According to the pecking-order theory, Myers (1984, p.581) suggests that firms prefer to finance first from retained earnings, second from debt, and third from issuing new equity. Debt typically grows when investment exceeds retained earnings and fall when investment is less than retained earnings. It means that the pecking-order theory predicts a negative relationship between leverage and profitability (Rajan and Zingales, 1995, p.1457). Thus we expect the profitability is more likely to be negatively related to leverage for

syndicates in Lloyd's Market. Due to data limitations force us to measure profitability the ratio of Pretax Profit including Unrealized Gain (or Losses) to Total Asset rather than the ratio of operating income over total assets definition as return on assets.

Growth

Growth is regarded as a healthy financial condition and business well in operation. A high growth is positively valued, as it is generally considered as a proxy signal for the good financial health of syndicate. The version of the pecking-order theory supports the debt typically grows when investment exceeds retained earning and falls when investment is less than retained earning. (Myers, 1977, p.171) notes that agency problem is mitigated if the firm issues short-term rather than long-term debt. This suggests that short-term debt ratios might actually be positively related to growth rates if growing firms substitute short-term financing for long-term financing. (Jensen and Meckling, 1976, p.357) argue that the agency costs will be reduced if firms issue convertible debt. This suggests that convertible debt ratio may be positively related to growth opportunity. Our measure of growth is the Percentage Change in Net Premium Written that is a forward looking measure.

Size

Size effect on leverage is ambiguous. On the one hand, Titman and Wessels (1988, p.5) argue that size can be considered as a proxy for failure risk as big firms are more diversified and often fail less than small ones. (Ang, Chua and Mcconnel, 1982, p.225) document that bankruptcy costs are relatively higher for smaller firms. On the other hand, large companies may have an easier access to financial markets and benefit from better financial conditions on these markets when requesting new issuance of capital. Consequently, the relation should then be negative between leverage and size.

Following Titman and Wessels (1988, p.6), our measure of size is the Natural Logarithm of Total Asset; this notion implies that size has a positive impact on the leverage.

Liquidity

Liquidity is a measure of the ability of a debtor to pay their debts they fall due. If a firm is unable to meet its obligation in time, the company is in danger of insolvency. Generally, the higher liquidity a company has, the larger the margin of safety that the company possesses to cover short-term debts. A company's ability to turn short-term assets into cash to cover debts is of the utmost importance when creditors are seeking payment. Bankruptcy analysts and mortgage originators frequently use the liquidity ratios to determine whether a company will be able to continue as a going concern. Anderson (2002, p.19) finds a positive and significant relation between leverage and liquid asset holding. Our proxy of liquidity is defined as the ratio of cash plus deposit to total assets.

Capacity

Capacity is the term used to refer to the amount of premium income. In Lloyd's market, a syndicate may underwrite for a year of account that is the maximum amount of premium income, net of reinsurance premiums paid, that it may accept. The syndicate's capacity is itself the total of the premium limits of all the syndicate's members on that syndicate. This means that a syndicate's capacity is directly related to the amount of the capital backing provided by its members. The syndicate should therefore have sufficient capital backing for it to meet all claims by policyholders against policies written by the syndicate. Syndicates with higher capacity, their internal capital will be high. If syndicates follow pecking order theory (Myers and Majluf (1984, p.581)), syndicates enough more internal capital, they prefer internal to external financing. Therefore, the

possibilities of syndicates' capacity are negative relation with leverage. We use the ratio capacity to total assets in our empirical tests.

Sensitivity

Investment sensitivity ratio measures the sensitivity of capital to potential changes in the market value of listed investments. Uncertainty about investment sensitivity is related to the future prices of underling assets. For firms which have variability in their earnings from investment, investors will have little ability to accurately forecast future earnings based on publicly available information. This results in the cost of debt upper. Second, in order to lower the chance of issuing new risky asset, firms with more volatile cash flow tend to keep low leverage (Deangelo and Masuis (1980)). Ferrarei (1968, p.301) also contends that the greater the variability of earnings the lower the prescribed debt-equity ratio. Thus we suppose that a syndicate has higher investment sensitivity ratio will have lower leverage.

(Insert Table 4 here)

HYPOTHESIS

The business continuity and financial condition of companies impact on financial strength ratings. According to prior studies point out that several key financial factors are important in determining the business continuities of insurers. These factors including leverage (Kahane et al.,1986; Cummints, 1988, p.825; Borde et al., 1994); profitability (Ederington, 1987, p.225; Pottier and Sommer, 1999, p.626; Gaver and Pottier, 2005, p.80)); liquidity (Pottier and Sommer, 1999, p.628; Adams et al., 2003, p.545; Gaver and Pottier, 2005, p.80); growth (Pottier and Sommer,1999, p.628); company size (Pottier and Sommer, 1999, p.637; Adams et al., 2003, p.547 and Gaver and Pottier, 2005, p.81); reinsurance (Pottier and Sommer, 1999, p.628; Adams et al., 2003, p.548); capital (Butsic, 1994, p.668; Cummins et al.,1995, p.433; Dhaene et al.,

2004, p.575).

In this section, we use regression equations to test all the dependent and independent variables in our regression analysis relationship between leverage and ratings. Depending on the theory of literatures, we concern that syndicates with relatively low level of leverage are expected to have higher business continuity and financial strength rating. Examination for syndicates concern about ratings, which syndicates should be more or less concerned, and how about ratings actually affects the financial decision making of capital structure executives. So we set up our hypothesis as:

H1: Other things being equal, the higher the leverage the lower the grade of financial strength rating assigned to syndicates.

H2: Other things being equal, syndicates with the higher the grade of financial strength rating have lower leverage.

REGRESSIOIN :

$$Rating = a_1 + b_1 LEV + CV_1(PROFIT, GROWTH, SIZE, LIQ, REINS, CAPITAL, CONCEN) + e_1 ...(1)$$

$$Leverage = a_2 + b_2 RATING + CV_2(PROFIT, GROWTH, SIZE, LIQ, CAPTA, INVSEN) + e_2 ...(2)$$

EMPIRICAL RESULTS

Descriptive Data

Table 5 shows the total number of syndicates and market capacity. Apparently, we can observe that the number of syndicate has the trend to decline before recent years. The appearance of declining in numbers reflects the merger activity because the average syndicate size increased year by year. For managing agents, the advantage of merger activity can provide more efficient service by saving reinsurance costs and

administrative savings.[3] Lloyd's of National Association of Insurance Commissioner (2003) also states that "bigger syndicates can underwrite a larger of proportion of risk and invest in the resources to strengthen direct contacts with clients". In table 5, the market capacity increased from £1,073 Million in 1990 to £16,101 Million in 2007 that point out the financial capacity of Lloyd's is more soundness year by year.

(Insert Table 5 here)

Panel A of Table 6 shows the number and proportions of syndicates are signed each rating class by Standard & Poor's from 2004 to 2007. Almost Half of syndicates' rating codes are lower than 3pi (average dependency) that implies most syndicates rely on Lloyd's infrastructure and the Central Fund. The analysis of Lloyd's Syndicate Assessments concentrates on the business continuity characteristic of each syndicate in Lloyd's market and the special criteria to suitable for this market. Therefore, it is difficult to compare the rating proportion with other literature. Moreover, the majority of syndicates have room for improvement in business continuity. Panel B of Table 6 presents overall means and standard deviations of independent variables as well as the statistics of rated and non-rated syndicates, and the standard deviations of all variables are small, so the probability of estimated bias is low. In generally, the non-rated syndicates have higher leverage, liquidity, capital, capacity and investment sensitivity than rated syndicates. It's seems that non-rated syndicates' financial condition is more sensitivity than rated syndicates. Analogous with the result of Adams et al. (2003, p.551) also argue that non-rated insurers have relatively poor financial condition.

(Insert Table 6 here)

Table 7 shows the Spearman correlation coefficient matrix and variance-inflation

[3] See National Association of Insurance Commissioner, 2003, Lloyd's: A Follow-Up Review by U.S. State Insurance Regulators.

factors (VIF) of rating regression and leverage regression. Every pairs of independent variables, the correlation coefficient are lower than 0.57. We examine the collinearity among several variables by computing the variance-inflation factors to test whether these independent variables existing the problem of multicollinearity. Since multicollinearity is a sample attribute, this means that we cannot test for it in a true statistical sense. The VIF results are presents in last column of Table 7 for all the VIFs are less than 4, so we exclude the problem of multicollinearity.[4]

(Insert Table 7 here)

The Rating-Leverage Relation

Although it is widely accepted that a firm's leverage affects its financial strength rating, the empirical relation between these two variables has not been carefully examined. In previous research on ratings has neglected the fact that leverage is an endogenous variable and not suggested any source of exogenous variation that allows the true impact of leverage on ratings or ratings on leverage to be identified. Suppose that leverage and ratings are jointly affected by exogenous and unobservable shocks to syndicates' fundamental risk. These shocks are unobservable to outsider but can capture at least part of what the rating agencies call their subjective judgment. In order to use standard ordered probit analysis, like the classical linear regression model, we separate leverage into ten levels so that the variables of leverage and ratings are discrete ordinal measure. Since the mainly proxy leverage and rating are hypothesized to influence one another and have correlated errors. As leverage and rating are believed to be reciprocally related, a more complex analysis is necessary. We use the two-stage ordered probit regression to deal with the problem of endogeneity.

[4] Gujarati (1995) indicates that a high degree of collinearity as a VIFs in excess of 10.

The results of two-stage ordered probit are shown in Table 8 and Table 9, our regressions are used to test hypothesizes association between leverage and ratings after control variable. In the first stage of regression (1), we expect the coefficient on the synchronous measure of leverage is negative and statistically significant. The result of relation between ratings and leverage is consistent with the result of Adams et al. (2003, p.556) for Standard & Poor's data, so we can conclude that if the syndicate has higher leverage will lower its financial strength rating. All control variables in regression (1) are significant and the coefficients also expected except the profitability variable, it is probably that the profitability factor has not more weight in syndicates rating process. On the bottom of Panel A in Table 8, we test the null hypothesis that all coefficients on the nonconstant regressors are zero by using chi-squared statistic. The calculated value of chi-squared statistic is 78.64 so as to reject the null hypothesis.

To investigate the regression (1) from different aspect, Panel B of Table 8 reports the marginal effect in the ordered probit model. The statistics show that when the syndicates have higher leverage, reinsurance and concentration, they will be more likely to be assigned low rating class (e.g. 1 or 2)[5] instead of high rating class (e.g. 3 or 4). However, the higher the growth, liquidity, size and capital, syndicate has the higher probability assigned high rating (e.g. 3 or 4) to syndicates and the lower probability assigned low rating class (e.g. 1 or 2) to syndicates. Especially in leverage variables with higher probability in rating class 2 and 3, this appearance maybe since that the most syndicates' rating classes are to be assigned this range or the leverage variable has more vital position in syndicate rating process. Panel C in Table 8 shows a cross-tabulation of the actual and predicted value of the dependent variable. The

[5] If the syndicate is assigned a LSA of 1 that the rating takes on the value of 0; if the syndicate is assigned a LSA of 2 what the rating takes on the value of 1.

estimated model correctly predicts Lloyd's syndicate rating in 29 out of 50 that hit ratio is 0.58. The hit ratio represents the accurate ratio in ordered probit model predicts the dependent variable.

In the second stage of regression (2), we also test the null hypothesis that all coefficients on the nonconstant regressors are zero by using chi-squared statistic. Panel A in Table 9, The calculated value of chi-squared statistic is 58.56 so as to reject the null hypothesis. The statistics show that when the syndicates are assigned higher rating classes, capacity and investment sensitivity, they will be more likely to have lower debt ratio. However, the higher the growth, liquidity and size, the higher probability that syndicates are more likely to have higher leverage. Especially in rating variables, this appearance that the most syndicates' capital structure is partially subjected to its financial strength rating.

(Insert Table 8 and Table 9 here)

ROBUSTNESS CHECKS

Subperiods Test for Rating-Leverage relation

To evaluate the effects of different periods, we divide the sample into three subperiods, including 2004, 2005 and 2006. In Table 10 and Table 11 present the summary results from regression (1) and regression (2), respectively. Because of space limitation, the table of results for marginal effects that we just discuss but not shown here. We find that there is little difference among the three subperiods.

In 2004 (Panel A of Table 10), we find all variables are consistent with expected sign. Unexpectedly, only profitability and size are significant, but the chi-squared statistic is larger enough to reject the null hypothesis that all coefficients are zero. The marginal effects summarize that when the syndicates with the higher the leverage, reinsurance

and concentration are more likely to be assigned lower rating class (1pi or 2pi), while the higher the profitability, size, liquidity and capital are more likely to be assigned higher rating classes (3pi or 4pi). The estimated model correctly predicts Lloyd's syndicate rating in 25 out of 35 so the hit ratio is 0.71. The regression (2) in Table 11 of Panel A, we also test the null hypothesis that all coefficients are zero by using chi-squared statistic. The calculated value of chi-squared statistic is 55.37 so as to reject the null hypothesis. The statistics show that only profitability and investment sensitivity are significant but coefficients are opposite to our expected sing. That means when the syndicates with higher the degree of investment sensitivity, they will be more likely to have lower debt ratio. On the contrary, the higher the profitability, the higher probability that syndicates are more likely to have higher leverage. Although the rating variable is insignificant, its coefficient sign is consistent with our expected.

In 2005 (Panel B of Table 10), the significant variable including leverage, growth, size, liquidity and capital, and their coefficient signs are expected. We also rejected that the hypothesis that all coefficients are zero. As expected, the marginal effect tells us that when the syndicates with the higher the leverage, they are more likely to be assigned lower rating class (1pi or 2pi). Contrarily, the probabilities of being assigned higher rating class (3pi or 4pi) are high when growth, size, liquidity and capital are high. Lloyd's syndicate rating in 15 out of 23 is correctly predicted by the estimated model, so the hit ratio is 0.65. The regression (2) in Table 11 of Panel B, the calculated value of chi-squared statistic is 48.98; we also reject the null hypothesis that all coefficients are zero. We also find all variables are significant and coefficients are the same expected sign except profitability and growth.

In 2006 (Panel C of Table 10), rejecting the hypothesis that all coefficients are zero, the

chi-squared statistic is higher than critical value. The significant variable including leverage and size, as expected size coefficient sign is positive, while leverage coefficient sign is negative. This is consistent with our hypothesis that the higher the leverage the lower the grade of financial strength rating assigned to syndicates. The marginal effects in 2006, leverage, growth, liquidity and concentration have negative effects on syndicates that result in the higher probability of syndicates getting lower rating classes (1 pi or 2pi). The converse holds for that the higher probability of syndicates getting higher rating classes (3pi or 4pi) results from the higher value of profitability, size, reinsurance and capital. The estimated model which correctly predicts Lloyd's syndicate rating in 21 out of 27 has hit ratio of 0.77. The regression (2) in Table 11 of Panel C, we also reject the null hypothesis that all coefficients are zero and the calculated value of chi-squared statistic is 37.17 higher than critical value. We find rating, size and investment sensitivity are significant and coefficients are the same expected sign.

(Insert Table 10 and Table 11 here)

Sizes Test for Rating-Leverage relation

In this section, we separate our data into two parts. One is syndicates' total asset larger than the median, and another is syndicates' total asset smaller than the median. We want to examine whether sizes of syndicates will support our hypotheses; ratings are associated with leverage and their relation are negative.

In large syndicates (Panel A of Table 12), the significant variable are leverage and size, their coefficients are consistent with expected sign. These results also indicate that if syndicates with higher leverage will accompany with lower financial strength ratings. The marginal effects are shown that leverage and reinsurance have negative effects on

syndicates, the higher probability of syndicates getting lower rating classes (1 pi or 2pi). However, syndicates with the higher value of size and liquidity, the higher probability of syndicates getting higher rating classes (3pi or 4pi). The estimated model which correctly predicts Lloyd's syndicate rating in 19 out of 29 has hit ratio of 0.66. The second stage of regression (2) in Table 13 of Panel A, we find rating variable is significant and negative to leverage.

In small syndicates (Panel B of Table 12), the chi-squared statistic is higher than critical value, so we reject the hypothesis that all coefficients are zero. The significant variable are leverage, growth, size, capital and concentration, their coefficients are the same expected sign. These results also indicate that the relationship with leverage is negative. The marginal effects are presented that leverage, reinsurance and concentration have negative effects on syndicates' financial strength rating, the higher probability getting lower rating classes (1 pi or 2pi). While syndicates with the higher value of size, the higher probability of syndicates getting higher rating classes (3pi or 4pi). The estimated model which correctly predicts Lloyd's syndicate rating in 15 out of 21 has hit ratio of 0.71. The regression (2) in Table 13 of Panel B, we also find all variables are significant except profit and growth.

(Insert Table 12 and Table 13 here)

Our robustness check results from subperiods and sizes test for Rating-Leverage relation, we also find rating and leverage existing the strong negatively relation in different subperiods and sizes. The evidence implies that higher leverage may harm for rating in Lloyd's market and rating variable is really important for capital structure. We can recognize from the result can provide a sense of security about syndicates' financial conditions for policyholders and supervisor.

CONCLUSION

The Lloyd's market plays an important role in the global insurance market. In our study, we use a sample of 69 syndicates in Lloyd's insurance market financial strength rating data during the period from 2004 to 2006. To our knowledge, this is the first study investigates the financial strength rating associated with capital structure from Lloyd's syndicates. In this paper, we examine whether ratings are relevant to capital structure. We hypothesize that syndicates' financial strength rating is negatively relative to leverage, which means other things being equal, syndicates with higher leverage have lower rating and the higher the grade of financial strength rating assigned to syndicates the lower the leverage. We take into account the endogenous nature of the relation between rating and leverage, our method of empirical use an instrumental variable approach, and two-stage ordered probit regressions.

Our empirical results are consistent with the hypotheses. We find there are strong negative relationship between rating and capital structure. It means that if syndicates have more debt, syndicates will more probably be assigned lower grade of rating and syndicates keep higher ratings would use lower leverage. Besides, we also find that Lloyd's of syndicates' financial strength ratings are: (1) negatively associated with reinsurance and concentration; (2) positively related to profitability, liquidity, size and capital. Indicate these factors will more probably influence syndicates' ratings. Managers of syndicates also can use the determinants of rating to improve their financial condition. The information of our results are of considerable interest because the result provides the participants of Lloyd's market can rely on the financial strength rating to assess the capital structure and adjust capital structure to hold different grade of ratings.

Owing to Lloyd's market operates a three year accounting system, this feature result in the shortness of data. Our major limitation of this study is the small sample size, which may weaken the power of our test. This limitation is fine for Lloyd's market, because most syndicates in Lloyd's are property-liability insurers which have shorter underwriting period. Finally, we conduct a battery of robustness checks, using different periods and sizes to exam the rating-leverage relation whether results are consistent with our hypothesis. Except in 2004, we also find that the negative association between rating and capital structure, implying that higher leverage may harm for syndicates in Lloyd's market and ratings would affect syndicates' capital structure. Our results can provide a sense of security about syndicates' financial conditions for policyholders and supervisor.

The analysis of the rating-leverage relation presented in this paper suggests new questions that warrant additional research. For instance, the rating's influence on debt ratio is direct or indirect. Differences in rating across agencies, the rating-leverage relation results are consistent with us. There are rooms to open for future research.

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TABLE 1

Lloyd's Syndicates Rating Symbols of Standard & Poor's

Standard & Poor's Symbol	5pi	4pi	3pi	2pi	1pi
Degree of Dependency	Very Low	Low	Average	High	Very High
Business of Continuity	Very Strong	Strong	Average	Week	Very Week

TABLE 2

' pi ' LSA Model : Items of Analysis

	Model weighting (%)
Operating Performance	25
Reserves	15
Reinsurance	15
Underwriting Profile	15
Investments and Liquidity	10
Capital	10
Ownership*	10

Note: ' * ' Previous ownership and management.

(Source: Standard and Poor's insurance criteria published by 28-Jun-2006)

TABLE 3

Proxy Sources and Expected Relation to Financial Strength Rating

$$Rating = a_1 + b_1 LEV + CV_1(PROFIT, GROWTH, SIZE, LIQ, REINS, CAPITAL, CONCEN) + e_1 \ldots (1)$$

Variable Name	Sign	Definition	Reference
Leverage (LEV)	(-)	Accumulated Reserves/Total Assets	Adams et al., 2003
Profitability (PROFIT)	(+)	Pretax Profit including Unrealized Gain(Losses)/Total Asset	Pottier and Sommer, 1999; Gaver and Pottier, 2005; Kisgen, 2006; Ashbaugh-Skaife et al., 2006; Van Gestel et al.,2007
Growth (GROWTH)	(+)	Percentage Change in Net Premium Written	Pottier and Sommer, 1990
Size (SIZE)	(+)	Natural Logarithm of Total Asset	Pottier and Sommer, 1990; Adams et al., 2003; Gaver and Pottier, 2005; Ashbaugh-Skaife et al., 2006
Liquidity (LIQ)	(+)	Cash & Deposit/Total Asset	Poon et al., 1999; Gaver and Pottier, 2005; Van Gestel et al., 2007
Reinsurance (REINS)	(-)	Reinsurance Ceded/Premiums Written	Adams et al., 2003
Capital (CAPITAL)	(+)	Member's balances/Net Premium Written	S&P Lloyd's syndicate assessment: financial ratio report, 2007
Concentration Index(CONCEN)	(-)	Underwriting profile	Cummins et al., 1999 ; Harrington and Niehaus, 1999

TABLE 4

Proxy Sources and Expected Relation to Leverage

$$Leverage = a_2 + b_2 RATING + CV_2(PROFIT, GROWTH, SIZE, LIQ, CAPTA, INVSEN) + e_2 ...(2)$$

Variable Name	Sign	Definition	Reference
Rating (RATING)	(-)	Rating Criteria of S&P	S&P Lloyd's syndicate assessment: financial rating report
Profitability (PROFIT)	(-)	Pretax Profit including Unrealized Gain(Losses)/Total Asset	Sheridan Titman and Roberto Wessels, 1988; Schwiete and Weigand, 1997; Rajan and Zingales, 1995
Growth (GROWTH)	(+)	Percentage Change in Net Premium Written	Danbolt et al. 2002; Titman and Wessels, 1988
Size (SIZE)	(+)	Natural Logarithm of Total Asset	Johnson, 1997; Shuetrim et al.,1993; Kester, 1986; Toy et al.,1974 Titman and Wessels, 1988
Liquidity (LIQ)	(+)	Cash & Deposit/Total Asset	Anderson, 2002
Capacity (CAPTA)	(-)	Capacity/Total Assets	S&P Lloyd's syndicate assessment: financial ratio report, 2007
Sensitivity (INVSEN)	(-)	Investment Sensitivity	S&P Lloyd's syndicate assessment: financial ratio report, 2007

TABLE 5

Total Numbers of Syndicates, Market Capacity and Average Syndicate Size; Source: S&P Lloyd's Syndicate Assessments

Year	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007
Number of Syndicates	261	437	401	122	108	86	71	66	62	69	66
Market Capacity (£ Million)	761	3,177	10,743	10,126	11,263	12,196	14,396	14,961	13,722	14,788	16,101
Average syndicate size (£ Million)	2.9	7.3	26.8	83.9	104.3	141.8	202.8	226.7	221.3	238.5	244

TABLE 6

Descriptive Statistics for the Sample of Lloyd's Syndicates

Panel A: Coded Rating Grade Category

Rating Class / Number of Syndicate	N.A	1pi	2pi	3pi	4pi	5pi
2007	36(39%)	2(3%)	13(20%)	17(26%)	7(11%)	1(2%)
2006	16(26%)	6(10%)	13(21%)	20(32%)	6(10%)	1(2%)
2005	16(26%)	10(16%)	7(11%)	21(34%)	8(13%)	0(0%)
2004	19(29%)	13(20%)	9(14%)	18(27%)	7(11%)	0(0%)

Panel B: Key Summary Statistics for Syndicates

	Total Syndicates		Rated Syndicates		Non-Rated Syndicates	
Variable	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
LEV	0.811	0.2248	0.8027	0.2468	0.8369	0.135
PROFIT	0.0461	0.0964	0.049	0.0939	0.0372	0.1041
GROWTH	0.0931	0.3522	0.0973	0.3046	0.0794	0.4809
SIZE	12.189	1.3647	12.217	1.3748	12.0983	1.3451
LIQ	0.2136	0.1701	0.2173	0.1725	0.2020	0.1636
REINS	0.1914	0.1127	0.1969	0.109	0.1743*	0.1235
CAPITAL	0.2131	0.185	0.2116	0.1933	0.2192	0.1489
CONCEN	0.5168	0.2531	0.5259	0.2609	0.4880	0.2274
CAPTA	0.7221	0.5759	0.658	0.2895	0.8057	0.8897
INVSEN	236.92	116.49	232.01	225.46	246.05	163.52

Note: This table presents summary descriptive statistics for the sample of financial and syndicate data. There are total 129 syndicate unbalanced panel data except growth. The growth variable only includes 83 calculated data between 2005 and 2006. Panel A shows the number and proportions of syndicates are assigned each rating class by S&P from 2004 to 2007. Panel B provides key summary statistics for the sample including full syndicates, rated syndicates and non-rated syndicates for the years 2004-2006. LEV is the ratio of accumulated reserves to total assets. PROFIT is the ratio of pretax profit including unrealized gains (losses) to total assets. LIQ is the ratio of cash plus deposit to total assets. GROWTH is the percentage change in net premium written. SIZE is the natural logarithm of total admitted assets. REINS is the ratio of annual reinsurance ceded to annual premiums written. CONCEN is defined as the sum of the squares of the gross premium written shares of each business line. CAPITAL is the ratio of member' s balances to net premium written. CAPTA is the ratio capacity to total assets. INVSRN is measured by investment sensitivity.

*indicate the means between rated and non-rated syndicates are different at 10% level.

TABLE 7

Correlation Coefficient Matrix and Variance-Inflation Factors (VIF) for the Sample of Lloyd's Syndicates

Panel A: Correlation Coefficient Matrix of Rating Regression (1)

$$Rating = a_1 + b_1 LEV + CV_1(PROFIT, GROWTH, SIZE, LIQ, REINS, CAPITAL, CONCEN) + e_1 ...(1)$$

	LEV	PROFIT	GROWTH	SIZE	LIQ	REINS	CAPITAL	CONCEN	VIF
LEV	1	-0.383**	0.089	0.148	0.027	-0.129	-0.515**	-0.198*	3.750
PROFIT		1	0.106	-0.051	-0.123	-0.167	0.475**	0.089	1.821
GROWTH			1	0.154	-0.063	-0.226	-0.366**	-0.188	1.275
SIZE				1	-0.559**	0.023	-0.139	-0.501**	2.986
LIQ					1	-0.071	0.054	0.198*	2.376
REINS						1	-0.009	0.057	2.020
CAPITAL							1	0.294**	3.468
CONCEN								1	1.768

Note: This table displays the correlation coefficient matrix and variance-inflation factors (VIF) between each independent variable for the years 2004-2006. There are total 129 syndicate unbalanced panel data except growth. The growth variable only includes 83 calculated data between 2005 and 2006. LEV is the ratio of accumulated reserves to total assets. PROFIT is the ratio of pretax profit including unrealized gains (losses) to total assets. GROWTH is the percentage change in net premium written. SIZE is the natural logarithm of total admitted assets. LIQ is the ratio of cash plus deposit to total assets. REINS is the ratio of annual reinsurance ceded to annual premiums written. CAPITAL is the ratio of member's balances to net premium written. CONCEN is defined as the sum of the squares of the gross premium written shares of each business line. The correlations are calculated using the Spearman correlation model.

*, ** indicate significance at 5% and 1% levels, respectively.

TABLE 7 (continued)

Correlation Coefficient Matrix and Variance-Inflation Factors (VIF) for the Sample of Lloyd's Syndicates

Panel B: Correlation Coefficient Matrix of Leverage Regression (2)

$$Leverage = a_2 + b_2 RATING + CV_2(PROFIT, GROWTH, SIZE, LIQ, CAPTA, INVSEN) + e_2 ...(2)$$

	RATING	PROFIT	GROWTH	SIZE	LIQ	CAPTA	INVSEN	VIF
RATING	1	0.297**	0.111	0.505**	-0.319**	-0.221*	0.05	1.585
PROFIT		1	0.106	-0.051	-0.123	0.061	-0.325**	1.163
GROWTH			1	0.154	-0.063	0.048	0.042	1.119
SIZE				1	-0.559**	-0.490**	0.562**	2.91
LIQ					1	0.076	-0.292**	1.934
CAPTA						1	-0.566**	1.547
INVSEN							1	1.357

Note: This table displays the correlation coefficient matrix and variance-inflation factors (VIF) between each independent variable for the years 2004-2006. There are total 129 syndicate unbalanced panel data except growth. The growth variable only includes 83 calculated data between 2005 and 2006. RATING is the Financial Strength Rating class by Standard & Poor's. PROFIT is the ratio of pretax profit including unrealized gains (losses), to total assets. GROWTH is the percentage change in net premium written. SIZE is the natural logarithm of total admitted assets. LIQ is the ratio of cash plus deposit, to total assets. CAPTA is the ratio capacity to total assets. INVSRN is measured by investment sensitivity. The correlations are calculated using the Spearman correlation model.

*, ** indicate significance at 5% and 1% levels, respectively.

TABLE 8

Two-Stage Ordered Probit Model: Result of Rating Regression

$$Rating = a_1 + b_1 LEV + CV_1(PROFIT, GROWTH, SIZE, LIQ, REINS, CAPITAL, CONCEN) + e_1 \ldots (1)$$

Panel A: Parameter Estimates				
Variable[a]	Expected Sign	Coefficient	Standard Error	p-value
Constant		-2.0558	1.2125	0.0900*
LEV	-	-0.0013	0.0006	0.0294**
PROFIT	+	0.0002	0.0005	0.6324
GROWTH	+	0.0015	0.0005	0.0074***
SIZE	+	0.3727	0.0854	0.0000***
LIQ	+	0.0026	0.0010	0.0080***
REINS	-	-0.0045	0.0008	0.0001***
CAPITAL	+	0.0023	0.0005	0.0000***
CONCEN	-	-1.0357	0.4569	0.0234**
Log likelihood	-130.1806			
Chi squared	78.6463	(Reject hypothesis that all coefficients are zero)[b]		

Panel B: Marginal Effects					
Variable	Y=00	Y=01	Y=02	Y=03	Y=04
LEV	0.0001	0.0004	-0.0002	-0.0003	0.0000
PROFIT	0.0000	-0.0001	0.0000	0.0001	0.0000
GROWTH	-0.0001	-0.0004	0.0002	0.0003	0.0000
SIZE	-0.0204	-0.0966	0.0410	0.0685	0.0074
LIQ	-0.0001	-0.0007	0.0003	0.0005	0.0001
REINS	0.0002	0.0012	-0.0005	-0.0008	-0.0001
CAPITAL	-0.0001	-0.0006	0.0003	0.0004	0.0000
CONCEN	0.0567	0.2683	-0.1140	-0.1904	-0.0205

Panel C: Predicted and Actual Values of Dependent Variable						
			Predicted			
Actual	0	1	2	3	4	Total
0	0	0	0	0	0	0
1	1	3	12	0	0	16
2	0	1	26	0	0	27
3	0	0	5	0	0	5
4	0	0	2	0	0	2
Total	1	4	45	0	0	50

Hit Ratio 0.58

Note: The table reports estimates of rating determination ordered probit model. Panel A shows the coefficient, standard error and p-value. Panel B shows the marginal effects for each independent variable. Panel C presents cross-tabulations of predicted and actual values of dependent variable in ratings regression. The rating takes on the value of 0 if the syndicate is assigned a LSA of 1; 1 if the syndicate is assigned a LSA of 2; 2 if the syndicate is assigned a LSA of 3; 3 if the syndicate is assigned a LSA of 4; 4 if the syndicate is assigned a LSA of 5. There are total 129 rating data for 2004 to 2006.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

[a] See note to Table 6 for variable descriptions.

[b] The critical value of Chi square is 15.51.

TABLE 9

Two-Stage Ordered Probit Model: Result of Leverage Regression

$$Leverage = a_2 + b_2 RATING + CV_2(PROFIT, GROWTH, SIZE, LIQ, CAPTA, INVSEN) + e_2 \ldots (2)$$

Panel A: Parameter Estimates				
Variable [a]	Expected Sign	Coefficient	Standard Error	p-value
Constant		-1.9265	0.9152	0.0353**
RATING	-	-0.0011	0.0002	0.0000***
PROFIT	+	-0.0002	0.0006	0.6502
GROWTH	+	0.0009	0.0002	0.0003***
SIZE	+	0.3339	0.0727	0.0000***
LIQ	+	0.7533	0.2967	0.0111**
CAPTA	-	-0.7591	0.2963	0.0104**
INVSEN	-	-0.0007	0.0004	0.0860*
Log likelihood	-195.3941			
Chi squared	58.5643	(Reject hypothesis that all coefficients are zero) [b]		

Note: The table reports estimates of rating determination ordered probit model. Panel A shows the coefficient, standard error and p-value between each independent variable for the years 2004-2006. There are total 129 syndicates unbalanced panel data except growth. The growth variable only includes 83 calculated data between 2005 and 2006. RATING is the Financial Strength Rating class by Standard & Poor's. PROFIT is the ratio of pretax profit including unrealized gains (losses), to total assets. GROWTH is the percentage change in net premium written. SIZE is the natural logarithm of total admitted assets. LIQ is the ratio of cash plus deposit, to total assets. CAPTA is the ratio capacity to total assets. INVSRN is measured by investment sensitivity. The correlations are calculated using the Spearman correlation model.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

[a] See note to Table 6 for variable descriptions.

[b] The critical value of Chi square is 14.07.

TABLE 10

Two-Stage Ordered Probit Model: Result of Rating Regression in Subperiods

$$Rating = a_1 + b_1 LEV + CV_1(PROFIT, GROWTH, SIZE, LIQ, REINS, CAPITAL, CONCEN) + e_1 ...(1)$$

Parameter Estimates		Panel A: 2004		Panel B: 2005		Panel C: 2006	
Variable [a]	Expected Sign	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Constant		-10.009	3.3023***	-8.7325	2.6279***	-4.7257	3.4123
LEV	-	-1.1253	0.8669	-3.2210	0.8656***	-4.7731	1.1028***
PROFIT	+	20.7331	5.8580***	-0.0001	0.0006	2.7118	2.8437
GROWTH	+			-0.0029	0.0013**	-1.0150	0.7728
SIZE	+	0.9916	0.2697***	1.0761	0.2228***	1.0808	0.2723***
LIQ	+	1.1339	0.8672	3.2233	0.8660***	-4.1535	2.2327
REINS	-	-0.0065	0.0191	0.0009	0.0018	1.0077	0.7726
CAPITAL	+	0.0002	0.0008	0.0009	0.0004**	0.0007	0.0005
CONCEN	-	-1.2440	0.8744	-0.6363	0.8423	-1.1576	1.0774
Log likelihood		-27.2546		-40.7643		-26.7897	
Chi squared		56.2414 [b]		36.9575 [c]		47.9565 [c]	

Note: The table reports estimates of rating regression in ordered probit model. Panel A, B and C show the coefficient, standard error and p-value in 2004, 2005 and 2006, respectively. The rating takes on the value of 0 if the syndicate is assigned a LSA of 1; 1 if the syndicate is assigned a LSA of 2; 2 if the syndicate is assigned a LSA of 3; 3 if the syndicate is assigned a LSA of 4; 4 if the syndicate is assigned a LSA of 5. There are 43 rating data in 2004, 45 rating data in 2005, and 41 rating data in 2006. The results reject hypothesis that all coefficients are zero.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

[a] See note to Table 6 for variable descriptions.

[b] The critical value of Chi square is 14.07.

[c] The critical value of Chi square is 15.51.

TABLE 11

Two-Stage Ordered Probit Model: Result of Rating Regression in Subperiods

$$Leverage = a_2 + b_2 RATING + CV_2(PROFIT, GROWTH, SIZE, LIQ, CAPTA, INVSEN) + e_2 ...(2)$$

Parameter Estimates		Panel A: 2004		Panel B: 2005		Panel C: 2006	
Variable [a]	Expected Sign	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Constant		1.4543	2.0089	-5.8766	1.9200***	-8.3602	3.0073***
RATING	-	-0.3313	0.3089	-1.5481	0.2615***	-1.3293	0.2778***
PROFIT	+	-15.128	4.1116***	0.6675	0.0008	-3.1530	2.3328
GROWTH				-0.0017	0.0009*	-0.0041	0.0017**
SIZE	+	0.1164	0.2073	1.0357	0.1780***	1.1387	0.2146***
LIQ	+	0.4273	0.5591	1.5275	0.5719***	0.1314	1.8518
CAPTA	-	-0.4415	0.5583	-1.5333	0.5716***	-0.0276	0.8942
INVSEN	-	0.0064	0.0030**	-0.0021	0.0009**	-0.0012	0.0006**
Log likelihood		-41.5606		-48.3622		-56.9862	
Chi squared		55.3742 [b]		48.9826 [c]		37.1676 [c]	

Note: The table reports estimates of leverage regression in ordered probit model. Panel A, B and C show the coefficient, standard error and p-value in 2004, 2005 and 2006, respectively. RATING is the Financial Strength Rating class by Standard & Poor's. PROFIT is the ratio of pretax profit including unrealized gains (losses), to total assets. GROWTH is the percentage change in net premium written. SIZE is the natural logarithm of total admitted assets. LIQ is the ratio of cash plus deposit, to total assets. CAPTA is the ratio capacity to total assets. INVSRN is measured by investment sensitivity. The correlations are calculated using the Spearman correlation model.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

[a] See note to Table 6 for variable descriptions.

[b] The critical value of Chi square is 12.59.

[c] The critical value of Chi square is 14.07.

TABLE 12

Two-Stage Ordered Probit Model: Result of Rating Regression in Sizes

$$Rating = a_1 + b_1 LEV + CV_1(PROFIT, GROWTH, SIZE, LIQ, REINS, CAPITAL, CONCEN) + e_1 \ldots (1)$$

Parameter Estimates		Panel A: Large syndicates		Panel B: Small syndicates	
Variable [a]	Exp. Sign	Coefficient	Standard Error	Coefficient	Standard Error
Constant		-5.1302	4.0918	-1.2790	2.6539
LEV	-	-5.3639	1.6753***	-0.6584	0.1515***
PROFIT	+	-0.0002	0.0009	0.0006	0.0012
GROWTH	+	0.0005	0.0003	0.0007	0.0003**
SIZE	+	0.9531	0.2749***	0.6822	0.2592***
LIQ	+	1.5546	1.9399	-0.0009	0.0011
REINS	-	-0.9401	2.1121	-0.3713	1.3868
CAPITAL	+	0.0006	0.0004	0.0009	0.0004**
CONCEN	-	0.1079	0.7918	-2.5310	0.7326***
Log likelihood		-57.1414		-41.3935	
Chi squared		36.3588 [b]		74.2532 [b]	

Note: The table reports estimates of rating regression in ordered probit model. Panel A and B show the coefficient, standard error and p-value in large and small syndicates, respectively. The rating takes on the value of 0 if the syndicate is assigned a LSA of 1; 1 if the syndicate is assigned a LSA of 2; 2 if the syndicate is assigned a LSA of 3;3 if the syndicate is assigned a LSA of 4; 4 if the syndicate is assigned a LSA of 5. There are 65 rating data in large syndicates and 64 rating data in small syndicates. The results reject hypothesis that all coefficients are zero.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

[a] See note to Table 6 for variable descriptions.

[b] The critical value of Chi square is 15.51.

TABLE 13

Two-Stage Ordered Probit Model: Result of Rating Regression in Sizes

$$Leverage = a_2 + b_2 RATING + CV_2(PROFIT, GROWTH, SIZE, LIQ, CAPTA, INVSEN) + e_2 \ldots(2)$$

Parameter Estimates		Panel A: Large syndicates		Panel B: Small syndicates	
Variable [a]	Exp. Sign	Coefficient	Standard Error	Coefficient	Standard Error
Constant		7.7365	4.3645*	-8.0594	1.7088***
RATING	-	-0.9694	0.2219***	-0.8793	0.1679***
PROFIT	+	-0.0016	0.0009*	-0.0003	0.0011
GROWTH	+	0.0002	0.0003	-0.0001	0.0002
SIZE	+	-0.1751	0.3262	1.1221	0.1506***
LIQ	+	2.4782	1.7132	1.0687	0.3521***
CAPTA	-	-2.1418	0.8206***	-1.0741	0.3519***
INVSEN	-	0.0007	0.0006	-0.0027	0.0007***
Log likelihood		-78.5333		-88.4456	
Chi squared		41.2962 [b]		75.3738 [b]	

Note: The table reports estimates of leverage regression in ordered probit model. Panel A and B show the coefficient, standard error and p-value in large and small syndicates, respectively. RATING is the Financial Strength Rating class by Standard & Poor's. PROFIT is the ratio of pretax profit including unrealized gains (losses), to total assets. GROWTH is the percentage change in net premium written. SIZE is the natural logarithm of total admitted assets. LIQ is the ratio of cash plus deposit, to total assets. CAPTA is the ratio capacity to total assets. INVSRN is measured by investment sensitivity. The correlations are calculated using the Spearman correlation model.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

[a] See note to Table 6 for variable descriptions.

[b] The critical value of Chi square is 14.07.

APPENDIX 1

Lloyd's Syndicates' data

Number	Syndicates' Name	LSA Grade
2488	ACE Underwriting Agencies - Syndicate 2488	NA
1225	AEGIS Managing Agency - Syndicate 1225	2pi
0780	Advent Underwriting - Syndicate 0780	2/Positive
2001	Amlin Underwriting - Syndicate 2001	4/Stable
2121	Argenta Syndicate Management - Syndicate 2121	NA
3334	Argenta Syndicate Management - Syndicate 3334	NA
6101	Argenta Syndicate Management - Syndicate 6101	NA
6102	Argenta Syndicate Management - Syndicate 6102	NA
1414	Ascot Underwriting - Syndicate 1414	NA
0570	Atrium Underwriters - Syndicate 0570	3pi
0609	Atrium Underwriters - Syndicate 0609	3pi
0318	Beaufort Underwriting Agency - Syndicate 0318	3pi
0623	Beazley Furlonge - Syndicate 0623/2623	4/Stable
2987	Brit - Syndicate 2987	3pi
0044	Canopius Managing Agents - Syndicate 0044	NA
4444	Canopius Managing Agents - Syndicate 4444	2+/Positive
2010	Cathedral Underwriting - Syndicate 2010	3pi
2003	Catlin Underwriting Agencies - Syndicate 2003	4-/Positive
1084	Chaucer - Syndicate 1084	3/ Positive
1176	Chaucer - Syndicate 1176	3pi
1301	Chaucer - Syndicate 1301	NA
4242	Chaucer - Syndicate 4242	NA
1607	Creechurch Underwriting - Syndicate 1607	NA
4455	Diagonal Underwriting Agency - Syndicate 4455	NA
0218	Equity Syndicate Management - Syndicate 0218	4pi
1208	Equity Syndicate Management - Syndicate 1208	NA
0435	Faraday Underwriting - Syndicate 0435	2pi
0382	Hardy (Underwriting Agencies) - Syndicate 0382	4pi
3820	Hardy (Underwriting Agencies) - Syndicate 3820	NA
1200	Heritage Managing Agency - Syndicate 1200	3pi
3245	Heritage Managing Agency - Syndicate 3245	2pi
0033	Hiscox Syndicate 0033	NA
2525	Imagine Syndicate Management Ltd. - Syndicate 2525	2pi
4040	Illium Managing Agency - Syndicate 4040	NA

APPENDIX 1 (continued)
Lloyd's Syndicates' data

Number	Syndicates' Name	LSA Grade
2526	Imagine Syndicate Management Ltd. - Syndicate 2526	NA
0994	Imagine Syndicate Mgmt Ltd. - Syndicate 0994	NA
0994	Imagine Syndicate Mgmt Ltd. - Syndicate 0994	NA
1400	Imagine Syndicate Mgmt Ltd. - Syndicate 1400	1pi
1923	Imagine Syndicate Mgmt Ltd. - Syndicate 1923	3pi
2800	Imagine Syndicate Mgmt Ltd. - Syndicate 2800	NA
0779	Jubilee Managing Agency - Syndicate 0779	2pi
1231	Jubilee Managing Agency - Syndicate 1231	2pi
5820	Jubilee Managing Agency - Syndicate 5820	NA
0260	KGM Underwriting Agencies - Syndicate 0260	2pi
0190	Liberty Syndicate Management - Syndicate 0190/0282	NA
4472	Liberty Syndicate Management - Syndicate 4472	NA
0386	Limit Underwriting Ltd. - Syndicate 0386	5/Stable
2999	Limit Underwriting Ltd. - Syndicate 2999	3+/Stable
2791	Managing Agency Partners - Syndicate 2791	3pi
6103	Managing Agency Partners - Syndicate 6103	NA
3000	Markel Syndicate Management - Syndicate 3000	3pi
2468	Marketform Managing Agency - Syndicate 2468	2pi
1861	Marlborough Underwriting Agency - Syndicate 1861	NA
1919	Marlborough Underwriting Agency - Syndicate 1919	NA
3210	Mitsui Sumitomo Underwriting -Syndicate 3210	NA
0457	Munich Re Underwriting - Syndicate 0457	3pi
1221	Navigators Underwriting Agency - Syndicate 1221	3pi
1218	Newline Underwriting Management - Syndicate 1218	2pi
2007	Novae - Syndicate 2007	2+/Stable
0958	Omega Underwriting Agents - Syndicate 0958	3pi
4000	Pembroke Managing Agency - Syndicate 4000	NA
0308	R J Kiln and Co. - Syndicate 0308	2pi
0510	R J Kiln and Co. - Syndicate 0510	4pi
0557	R J Kiln and Co. - Syndicate 0557	3pi
0807	R J Kiln and Co. - Syndicate 0807	3pi
0727	S A Meacock & Co. - Syndicate 0727	2pi
1206	Sagicor at Lloyd's Ltd - Syndicate 1206	1pi
5000	St. Paul Travelers Syndicate Management - Syndicate 5000	3-/Stable
1183	Talbot Underwriting - Syndicate 1183	3pi
1209	XL London Market - Syndicate 1209	NA

APPENDIX 2

The Financial Data of Heritage Managing Agency -Syndicate 1200

Current LSA	3pi
Key financials	(£ thousands)
Capacity	180,000
Gross Premium Written	290,300
Net Premium Earned	178,400
Pretax Profit incl. Unrealised gains and losses	25,900
Total Assets	240,700
Members' Balances	6,600
Balance Sheet	
Assets	
Bonds	159,500
Stocks and Shares	0
Participation in Investment Pools	0
Insurance Debts	61,200
Cash and Deposits	15,900
Other Assets	4,100
Total Assets	240,700
Liabilities	
Loss Reserve	116,000
Premium Reserve	90,800
Other Technical Reserves	0
Total Technical Reserves	206,800
Other Liabilities	27,300
Total Liabilities	234,100
Capital	
Members' Balances	6,600
Total Liabilities and Capital	240,700
Income Statement	
Underwriting Profit/Loss	
Capacity	180,000
Gross Premium Written	290,300
Reinsurance Ceded	-45,800
Net Premium Written	244,500
Increase in Premium Reserve	-66,100
Net Premium Earned	178,400
Net Losses Incurred	-97,400
Underwriting Expenses	-11,400
Commission Expenses	-50,500
Other Underwriting Income	500
Underwriting Profit	19,600
Investment and Miscellaneous Profit/Loss	
Net Investment Income	6,300
Net Realised Gains	0
Other Income	0
Pretax Profit excl. unrealised gains/(losses)	25,900
Unrealised gains	-300
Pretax Profit incl. unrealised gains/(losses)	25,600

APPENDIX 2 (continued)

The Financial Data of Limit Underwriting Ltd. -Syndicate 0386

Ratio Report	**(%)**
Combined Ratio	89
Loss Ratio	54.6
Expense Ratio	34.4
Return on Revenue	15.7
Solvency Ratio	39.5
Premium Retention Ratio	84.2
Loss Retention Ratio	86.2
Reserves / NPW	84.6
Reserves / Capital	214.1
Receivables Ratio	18.5
Liquidity Ratio	128.3
Investment Yield	4
Investment Sensitivity	258.3
Business Lines	(Gross Premiums Written)
Accident and health	14,300
Motor (third party)	5,100
Motor (other classes)	6,700
Marine, aviation and transport	0
Fire and other damage to property	168,200
Third party liability	19,500
Credit and suretyship	0
Legal expense assistance	0
Miscellaneous	1,900
Total direct business	215,700
Reinsurance	74,600
Total business	290,300
Total	796,300