The Impact of Acquisitions on Short-Run Returns and Leverage: Two Studies in Corporate Finance

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Submitted for the Degree of Doctor of Philosophy

5th February2009

Business School

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Abstract

This dissertation consists of two empirical studies in corporate finance. The first study, *The Impact of Acquisitions on the Short-Run Returns to Shareholders and Bondholders*, investigates shareholder and bondholder wealth with respect to 310 acquisitions in the UK market between 1994 and 2006. It tests the 3-day and 41-day excess security returns with an event study. The results show positive returns for target shareholders and bondholders, and negative returns for acquirer shareholders and bondholders. Moreover, the tests on value-weighted combined security returns show that stockholders lose, bondholders gain, target firms gain, acquirer firms lose, and shareholders/bondholders of target and acquiring firms as a whole lose. These results support the co-insurance hypothesis, wealth transfer hypothesis, hubris hypothesis, and bond return based on hubris hypothesis, and reject the synergy hypothesis. The univariate and multivariate analyses on the deal characteristics find that target and acquirer stock returns are higher with cash payment, acquirer stock returns are higher in friendly and industry unrelated takeovers, acquirer bond returns are higher in industry related takeovers, target firm share returns are higher when target size is smaller than the acquirer size, target and acquirer stock returns are higher in bull market period, and acquirer bond returns are higher in the bear market period.

The second study, *A Test of the Partial Adjustment Theory of Leverage Using Leverage Changes Arising from Takeovers*, investigates firms' capital structures by the event of takeovers. It examines 659 US acquiring firms which involved in acquisitions between 1962 and 2001. These acquiring firms' book leverage ratio deviations are tested in an 11-year window. This result shows that takeovers have significant impact on firms' book leverage ratios in the announcement year. The trend that firms gradually reverse their actual leverage ratios towards their optimism in the five years after the takeovers supports the dynamic trade-off theory. The partial adjustment models on the speed of adjustment further support the dynamic trade-off theory and reject the alternative capital structure theories. The tests on method of payment and source of fund demonstrate that cash payment and raise of

funds are likely to increase firms' leverage ratios at announcement and to maintain these ratios at a high level in the years after the merger.

Contents

Chapter 1 Introduction 1
1.1 Motivations 1
1.2 Contributions 2
1.3 Reviews of These Two Studies 4
Chapter 2 Theories on the Short-Run Returns 10
2.1 Introduction 10
2.2 Literature Review 15
2.2.1 Motivations for M&A 15
2.2.2 Shareholder-Bondholder Conflicts 18
2.2.2.1 Equal Compensation Principle and Agency Theory 18
2.2.2.2 Corporate Finance 20
2.3. Hypotheses 21
2.3.1 Hypothesis 1: Co-insurance Effect 21
2.3.2 Hypothesis 2: Wealth Transfer 23
2.3.3 Hypothesis 3: Synergy Effect 26
2.3.4 Hypothesis 4: Hubris Hypothesis 27
2.3.5 Hypothesis 5: Bond Return Based on Hubris Hypothesis 29
2.4. Evidence on Predictions 31
2.4.1 Shareholder Returns 31
2.4.2 Bondholder Returns 33
2.4.3 Shareholder and Bondholder Returns 34
Chapter 3 Methodology and Results on Short-Run Returns 46
3.1. Methodology 46
3.1.1 Data 46
3.1.2 Modelling 49
3.1.3 Discussion on Thin Trading 52
3.2. Results 55
3.2.1 Overall Returns 55
3.2.1.1 Stock Returns 55
3.2.1.2 Bond Returns 61
3.2.2 Combined Security Returns 67
3.2.3 Univariate Analysis 69
3.2.3.1 Method of Payment 70
3.2.3.2 Hostility 78
3.2.3.3 Industry Relatedness 84
3.2.3.4 Relative Size 89
3.2.3.5 Market Trend 94
3.2.4 Multivariate Analysis 100
3.3 Conclusion 105
Chapter 4 Theories of Leverage Ratios 109
4.1 Introduction 109
4.2 Literature Review 113
4.2.1 Modigliani and Miller Theorem 113
4.2.2 Control Hypothesis 114
4.2.3 Trade-off Theory 115
4.2.4 Pecking Order Hypothesis 119

4.2.5 Market Timing Theory 121
4.3 M&A and Capital Structure 122
4.3.1 Co-insurance and Increasing Debt Capacity 123
4.3.2 Unused Debt Capacity 124
4.3.3 Financial Slack 124
4.3.4 Commitment Device 124
4.3.5 Wealth Transfer 125
4.4 Conclusion 126
Chapter 5 Methodology and Results on Leverage Ratios 128
5.1 Data 129
5.2 Methodology 134
5.2.1 Definitions of Variables 134
5.2.2 Motives of Variables 139
5.2.2.1 Market-to-book Ratio 139
5.2.2.2 Asset Tangibility 140
5.2.2.3 Profitability 141
5.2.2.4 R&D Expense 142
5.2.2.5 R&D Dummy 143
5.2.2.6 Selling Expense 143
5.2.2.7 Firm Size 144
5.2.2.8 Industry 145
5.2.3 Optimal Capital Structure 146
5.2.4 Tobit Model 147
5.2.5 Estimation of Coefficients, Prediction, and Deviation of Optimal Leverage Ratios 151
5.3 Partial Adjustment 179
5.3.1 Dynamic Trade-off Theory and Partial Adjustment Model 180
5.3.2 Pecking Order Hypothesis and Financial Deficit 183
5.3.3 Market Timing Theory and External Finance Weighted Average 186
5.3.4 Managerial Inertia, Market Timing and Stock Returns 192
5.4 Method of Payment and Source of Fund 203
5.5 Conclusion 209
Chapter 6 Conclusion 213
References 218

List of Tables

Table 2-1 Hypotheses 30
Table 2-2 Empirical Results 45
Table 3-1 Deal Numbers and Values 48
Table 3-2 Target Firm Average Stock Returns in Event Window 56
Table 3-3 Acquirer Firm Average Stock Returns in Event Window 58
Table 3-4 Overall Stock Returns 60
Table 3-5 Target Firm Average Bond Returns in Event Window 62
Table 3-6 Acquiring Firm Average Bond Returns in Event Window 64
Table 3-7 Overall Bond Return 66
Table 3-8 Combined Excess Security Returns 69
Table 3-9 Stock Returns on Payment Method 75
Table 3-10 Bond Returns on Payment Method 77
Table 3-11 Stock Returns on Hostility 81
Table 3-12 Bond Returns on Hostility 83
Table 3-13 Stock Returns on Relatedness 86
Table 3-14 Bond Returns on Relatedness 88
Table 3-15 Stock Returns on Relative Size 91
Table 3-16 Bond Returns on Relative Size 93
Table 3-17 Stock Returns on Market Trend 97
Table 3-18 Bond Returns on Market Trend 99
Table 3-19 Correlations between Independent Variables 101
Table 3-20 Multiple Regressions on Stock and Bond Returns 104
Table 5-1 Sample Screening 132
Table 5-2 Descriptive Statistics of Sample Firms 133
Table 5-3 Data Definitions 136
Table 5-4 Variable Definitions 137
Table 5-5 Predicted Signs of Independent Variables 146
Table 5-6 Descriptive Statistics of Firm's Actual Book Leverage Ratios 154
Table 5-7 Descriptive Statistics of Independent Variables 156
Table 5-8 Correlations between Independent Variables 158
Table 5-9 Univariate Tests of the Actual Book Leverage Ratios on Actual Independent Variables 160
Table 5-10 Estimated Coefficients by Tobit Regression 164
Table 5-11 Estimated Coefficients by Multiple OLS Regression 166
Table 5-12 Descriptive Statistics of Firm's Predicted Book Leverage Ratios 168
Table 5-13 Comparison of the Actual Independent Variables before and at the M&A 171
Table 5-14 Descriptive Statistics of Firm's Book Leverage Ratio Deviations 173
Table 5-15 Dynamic Trade-off Theory 197
Table 5-16 Pecking Order Hypothesis vs. Dynamic Trade-off Theory 198
Table 5-17 Market Timing Theory vs. Dynamic Trade-off Theory (Baker and Wurgler Variable Definition) 199
Table 5-18 Market Timing Theory vs. Dynamic Trade-off Theory (Kayhan and Titman Variable Definition) 200
Table 5-19 Managerial Inertial vs. Dynamic Trade-off (Welch Variable Definition) 201

Table 5-20 Market Timing vs. Dynamic Trade-off Theory (Kayhan and Titman Variable Definition) 202
Table 5-21 Univariate Tests on Method of Payment 205
Table 5-22 Univariate Tests on Source of Fund 207

List of Figures

Chart 3-1 Cumulative Excess Stock Returns 59
Chart 3-2 Cumulative Excess Bond Returns 65
Chart 3-3 FTSE All Shares 95
Chart 5-1 Book Leverage Ratio Deviations (Median) 176
Chart 5-2 Top & Bottom Book Leverage Ratio Deviations (Median) 176
Chart 5-3 Market Leverage Ratio Deviations 177
Chart 5-4 Market Leverage Ratio Deviations (Median) 177

Acknowledgements

I would like to express my gratitude to all those who gave me assistance to completing this dissertation.

First and foremost I would like to thank my supervisor Professor Seth Armitage for his trust in me and allowing me to be his PhD student in September 2007. I would not have achieved this dissertation without his academic knowledge, intelligence, and moral support.

I would also like to thank the staff members in the Business School who gave me a great deal of help in my four years of research: Professor Falconer Mitchell and Professor David Hatherly who gave me helpful suggestions in the completion of the dissertation; Professor Richard Taffler who introduced the WRDS database to the School; Mr. James Clunie whose discussions in the early stage helped me shape my research and understanding of the Reuters 3000 Xtra database; Mr Gavin Lee Kretzschmar who gave me important feedback and advised on the Modigliani-Miller Theorem; Dr Peter Moles who suggested on the gilt-edged and on the covenant clauses; Dr Maria Michou who suggested on Datastream database; Dr. John Banasik who gave me statistical advice on non-parametric tests; Professor Andy Snell and Dr. Angelica Gonzalez who gave me vital suggestions on the tobit model; Mr Martin Adamson who helped on the Excel formulae; Mrs Deborah Morrison who helped solve my database problems; Mrs Christine Proudfoot and Ms Charis Stewart who helped on administrative matters.

I would also like to thank all my PhD colleagues who I shared discussions with and encouraged me in these four years. Especially thanks to Miss Yue Liu who gave me valuable suggestions on Compustat database, and Miss Mary Ho who spent her precious time on proof reading.

Last but not least I would also like to thank my parents for their love and support.

Declaration

I declare that, except where otherwise stated, the work contained herein is my original contribution.

Qizhi Tao

Chapter 1 Introduction

This PhD dissertation examines two topics in corporate finance, "*The Impact of Acquisitions on the Short-Run Returns to Shareholders and Bondholders*" and "*A Test of the Partial Adjustment Theory of Leverage Using Leverage Changes Arising from Takeovers*". The first study investigates shareholder and bondholder wealth with respect to 310 acquisitions in the UK market between 1994 and 2006. The second study investigates firms' capital structures with 659 US acquisitions between 1962 and 2001. Both of them are empirical studies.

1.1 Motivations

The First Topic

With the innovation of financial instruments and the development of financial markets, bondholders are playing an increasingly important role in corporate finance. It is widely observed that firms prioritise their sources of funding with bonds over shares if external financing is required. The creation of the high-yield bonds market by Michael Milken has transferred junk bonds as an effective method of payment in corporate raids, which fuelled the 1980s boom in leverage buy-outs and hostile takeovers. With the gradual recognition of corporate bonds' volatility and the failure of the merged firms, the concern of protecting bondholders' rights in takeovers is attracting increasing attention. Numerous studies have examined the influence of acquisitions on shareholders' value, but research on bondholders' wealth is limited. Some cases have shown that takeovers could damage bondholders' value by making the combined firm more risky. Verification of the bondholder wealth issue and legislation yet needs to be supplemented by more evidence. One of the most important pieces of evidence that needs to be collected is the quantitative research about the impact of M&A on bondholders' value, and the comparison of shareholders' and bondholders' wealth. Research on bondholders' wealth in respect to M&A has proceeded to some extent in the US market; however, the research in the UK market is still absent at the time of writing (April 2006). The above factors comprise the motivation for this study which is the first empirical research of bondholders' wealth in the UK market.

The Second Topic

Research on the first topic has revealed that acquisitions could influence bonds' value by changing the firms' riskiness. It signifies that acquisition as an event could have significant impact on firms' capital structure which is an important indication of firms' riskiness. Several theoretical and empirical studies have examined the link between capital structure and takeovers, and all of them conclude that takeovers increase firms' capital structures significantly. However, they cannot explain the fact that many firms actually lever down with acquisitions. Thus, I was motivated to do a more objective study to interpret the fundamental reason of leverage ratio changes by the capital structure theories with the recently developed techniques on measuring optimal leverage ratios.

1.2 Contributions

The First Topic

First, it is the first empirical research to test UK bondholders' wealth in acquisitions (at the time of writing in April 2006). Second, this research does a thorough review on existing theories which explain the shareholder and bondholder wealth in M&A, and designs out five testable hypotheses to explain the potential results. Compared with the research on shareholder wealth in the field of M&A, bondholder wealth study is much less developed, and researchers are still in the process of developing rationales to explain the expected impact. Though they have brought forward some theories to explain the bond question, they have given different or even contradictory interpretations. For example, Lewellen (1971), Kim and McConnell (1977) and Billett et al. (2004) give different explanations for co-insurance effect; in general, researchers befuddle the co-insurance effect, wealth transfer effect, incentive effect, and redistribution effect. This research contributes to describe theories and testable hypotheses through a standard and exhaustive way. Third, As MacKinlay (1997) argues, the power of event study increases substantially from reducing the sampling interval, this research utilizes daily bond price data which is much powerful than the recent studies which use monthly bond price data. This research is the second study that finds significant non-convertible bond returns for both target firms and acquiring firms (the other research is Billett et al. (2004)).

Fourth, this research finds a significantly negative *Total* security return, indicating acquisitions are value destroying, which has never been found by previous research. Fifth, this is the first research to test the effect of stock market trend on bondholder returns, and it finds significant results.

The Second Topic

First, the sample selection process is improved from previous papers. The study of takeover's impact on a firm's capital structure requires isolating one deal's influence from another in case the firm takes more than one deal in the object window. Otherwise, it is difficult to tell which deal attributes to the change of capital structure in a certain year. This research excludes firms that take more than one takeovers in the 11-year period, and avoids the overlapping problem. The studies of Ghost and Jain (2000), Harford et al. (2007) and Morellec and Zhdanov (2008) do not restrict series acquirers thus their samples are contaminated. Bruner (1988) restricts his sample to firms that are not involved in takeovers in the previous eight years, but he does not exclude firms that are involved in takeovers in the years after the first selected deals.

Second, the regression process is different. To examine the influence of M&A on capital structures, M&A is considered as an event, thus the features of capital structures after M&A should be quite different from those before M&A. As MacKinlay (1997) argues, the event period itself should not be included in the estimation period to prevent the event from influencing the normal performance model parameter estimates; otherwise, both the normal returns and the abnormal returns would capture the event impact. Previous research such as Baker and Wurgler (2002), Harford et al. (2007) and Morellec and Zhdanov (2008) estimate coefficients of capital structures by in-sample models, which could cause a problem by mixing the "estimation window" and the "event window". This research uses out-of-sample regression for the coefficients estimations and the results are more objective.

Third, the deviation tests split the sample into two groups on whether firms' deviations increase between year -1 and year 0. It is evident that M&A increases some firms' leverage ratios but decreases other firms' leverage ratios, and the trend of deviations of those two groups should be quite different. Previous research such as Harford et al. (2007) and Morellec and Zhdanov (2008) do not distinguish those two groups, therefore the leverage deviations of firms that lever up and firms that lever down cancel out with each other, and the aggregate deviation trend of the sample is noisy. Due to the above three reasons, this research shows more significant influence of takeovers at the announcement year than previous research (the previous research find M&A reverses firms' leverage ratios back to their optimism, but this research finds M&A drags firms' leverage ratios beyond their optimism to the opposite way of deviation), and gives evidence of dynamic trade-off theory that firms reverse back to their optimal leverage ratios gradually in the years after takeovers which has not been reported by other papers (see Chart 5-1 and Chart 5-2).

Fourth, despite that quite a few papers examine the method of payment on capital structures, this research is the first one to test on the source of fund on capital structures.

1.3 Reviews of These Two Studies

The First Topic

Theories of this research are based on M&A motivations and shareholder-bondholder conflicts. Motivations for M&A consist of four categories: macroeconomic motive, microeconomic motive, wealth transfer and managerialism. The macroeconomic motive includes deregulation, industrial wave, technological change and globalisation. The microeconomic motive includes economy of scale, scope and learning. Wealth transfer describes the situations that acquisitions are motivated by the wealth transfer from other stakeholders to shareholders, and from target shareholders to acquirer shareholders. Managerialism talks about the agency problem that acquisition is an effective weapon to remove uncompetitive target managers, the free cash flow theory that acquisition is a better alternative for acquiring firm managers to waste cash flows on internal projects, and the hubris hypothesis that acquiring firm managers are incorrectly motivated by the non-existent takeover gains. The shareholder-bondholder conflicts are made up of two theories: the *equal compensation principle and agency theory*, and the *corporate finance models*. Equal compensation principle and agency theory diagnose the conflict between shareholders and bondholders. It argues that it is difficult for management to equally maximise both shareholder and bondholder values. The corporate finance models investigates four financial decisions which benefit shareholders at the expense of bondholders—dividend payout, claim dilution, asset substitution and under-investment.

Based upon the above theories, this research is designed around five testable hypotheses to investigate M&A's impact on the excess security returns: the co-insurance effect, the wealth transfer hypothesis, the synergy effect, the hubris hypothesis, and the bond return based on the hubris hypothesis. These five hypotheses are not mutually exclusive. The co-insurance hypothesis tests the wealth of target bondholders and acquirer bondholders. According to this effect, the combination of two firms whose earning streams are imperfectly correlated would reduce the merged firm's default risk. Therefore, the testable hypothesis is that co-insurance effect exists if the value-weighted combination of excess returns of bond is positive. Wealth transfer hypothesis talks about six situations that could lead to wealth transfers: 1. acquisitions are motivated by shareholders' incentive to get hold of wealth at the expense of others; 2. wealth can transfer from bondholders to shareholders due to the corporate finance models; 3. shareholders may enhance their wealth at the expense of bondholders by taking risky projects; 4. the diversification effect of a merger could reduce the default risk of the combined firm, thus transfers wealth from shareholders to bondholders; 5. shareholders may transfer wealth from bondholders to themselves by levering up to utilize the tax benefits from the co-insurance effect; 6. target and acquirer bondholders transfer wealth between each other due to the maturity effect, leverage effect and risk effect. Therefore the testable hypothesis is that for the target shareholders, acquirer shareholders, target bondholders and acquiring bondholders, if one or more parties observe negative return at the same time that one or more parties observe positive return, wealth transfer is present. Synergy implies the efficiencies created from macroeconomic and microeconomic motivations. The testable hypothesis is that a synergy exists if the value-weighted sum of excess return for the target shareholders, acquirer shareholders, target bondholders and acquiring bondholders is positive. Hubris hypothesis predicts that acquiring firms overpay for the target firms and no potential synergy will be achieved through mergers. The testable hypothesis is that hubris effect exists if the excess return for acquiring firm stocks is negative, the excess return for the target firm stocks is positive, and the value-weighted combination of excess stock return is negative. The bond return based on the hubris hypothesis predicts that the acquiring firm bondholders lose from the non-synergistic merger, but the impact of merger on target bondholders is ambiguous. The testable hypothesis is: if the hubris hypothesis holds, there should be a negative acquiring firm bond return.

This study examines shareholder and bondholder wealth with respect to 310 acquisitions in the UK market between 1994 and 2006. It tests the 41-day and 3-day market-adjusted return (MAR) and abnormal return (AR) of target and acquiring firm shareholders and bondholders. The abnormal return is calculated by a short-term event study with daily data. The significant positive target stock return, negative acquirer stock return, positive target bond return and negative acquirer bond return preliminarily prove the wealth transfer hypothesis, the hubris hypothesis, and the bond return based on the hubris hypothesis. The combined security returns are studied by combining the excess returns of stock/bond and target/acquirer as value-weighted average of the excess security returns to further test the hypotheses. These combined security returns show that stockholders lose, bondholders gain, target firms gain, acquirer firms lose, and shareholders/bondholders of target and acquiring firms as a whole lose. These results support the co-insurance hypothesis, wealth transfer hypothesis, hubris hypothesis, and the bond return based on hubris hypothesis, and reject the synergy hypothesis. The univariate analysis and multivariate analysis test the influences of deal characteristics on the excess returns of stocks and bonds. The deal characteristics include method of payment, hostility, industry relatedness, relative size and market trend. The univariate and multivariate analyses on the deal characteristics find that target and acquirer stock returns are higher with cash payment, acquirer stock returns are higher in friendly and industry unrelated takeovers, the acquirer bond returns are higher in industry related takeovers, target firm share returns are higher when target size is smaller than the acquirer, target and acquirer stock returns are higher in bull market period, and acquirer bond returns are higher in the bear market period.

The Second Topic

Research on corporate finance has made substantial progress on the subject of capital structure. The *M-M* theorem proposition *I* states that a firm's value is unaffected with its capital structure in a perfect capital market. By taking the tax shield of debt into consideration, the modified *M-M* theorem proposition *I* argues that it is advantageous for a firm to be levered as high as possible. The control hypothesis argues that debt helps shareholders reduce agency costs of free cash flow and promote managers' efficiency, thus debt is a potential determinant of capital structure; the optimal capital structure is the point at which the marginal costs of debt equal to its marginal benefits. Based on the *M-M* theorem and control hypothesis, the trade-off theory considers that companies make financial decisions as a trade-off between interest tax shields and the costs of financial distress. Specifically, the static-trade off theory considers that the leverage ratio is determined by a single period trade-off; the adjustment costs make the leverage ratios among firms having the same optimal leverage ratio randomly dispersed. The dynamic trade-off theory maintains that firms adjust their leverage ratios, and the deviations from their optimal leverage ratios are gradually removed over time. The pecking order theory disputes that firms do not have optimal capital structures, instead, they prioritise the financing sources according to the degree of effort and resistance—first with internal funds, then debt, last equity. The market timing theory believes that there is no optimal capital structure, and managers time the stock market by issuing (repurchasing) equity when their stocks are overvalued (undervalued). As a result, a firm's observed capital structure is the cumulative outcome of historical equity performance.

Based on the dynamic trade-off theory, a bunch of hypotheses link capital structure research with the event of takeovers, and forecast significant leverage ratio changes with takeovers. The *co-insurance hypothesis* advises that when two firms' earnings are not perfectly correlated, a merger can increase the debt capacity of the combined firm, so the combined firm takes advantage of the debt benefits and levers up. The *unused debt capacity hypothesis* explains that the combined firm levers up to consume the unused debt capacity from either the acquirer or target before the merger. The *financial slack hypothesis* suggests that the slack-rich acquiring firm actively searches for the slack-poor target firm with valuable investment opportunities, therefore the acquiring firm with low leverage ratio before the merger increases its leverage ratio with the merger. The *commitment device hypothesis* proposes that low leverage ratio plays a role of commitment device for the acquiring firm to deter its bidding rivals; after the merger, since debt loses its strategic value, the acquiring firm levers up to take the tax shield advantage. The *wealth transfer hypothesis* supposes that the acquiring firm levers up in takeover to expropriate wealth from existing bondholders to offset shareholders' loss from the increasing debt capacity.

This empirical research utilizes takeover as an event to investigate its potentially significant influences on acquiring firms' book leverage ratios. It probes each acquiring firms' book leverage ratio deviations in a standard 11-year window [-5, +5]. The deviations are computed in three stages. At the first stage, the tobit model runs a pooled cross-sectional regression on a number of lagged independent variables for firm-year [-5, -1] to estimate the coefficients of independent variables. At the second stage, the estimated coefficients are substituted into the tobit model to predict the optimal leverage ratios of firms in each of the eleven years. At the third stage, each firm's optimal leverage ratio is subtracted from its actual book leverage ratio to get its deviation in each of the eleven years. The trend of the deviations in the 11-year window demonstrates that M&A changes firms' leverage ratios dramatically at the announcement year, which fits the hypotheses that links takeovers and firms' capital structures. The trend also illustrates that firms gradually converge their leverage ratios towards the optimisms in the years after merger, which is consistent with the prediction of dynamic trade-off theory.

This research then analyses the speed with which firms reverse back to their optimal leverage ratios by a standard partial adjustment model with OLS regression. It discovers a low but persistent adjustment speed, which is consistent with Fama and French (2002) and Flannery and Rangan (2006). In order to examine whether this low adjustment speed is caused by adjustment costs or by alternative theories that competing with the dynamic trade-off theory, variables proxy for pecking order theory, market timing theory and managerial inertial are added into the partial adjustment model for further tests. These tests reject all the alternative theories and find consistent evidence of dynamic trade-off effects, thus give indirect evidence that the low adjustment speed is caused by the adjustment costs. These results are consistent with Flannery and Rangan (2006). Last, this research tests the influences of method of payment and source of fund on leverage ratios. It reports that cash payment and raise of debt are inclined to increase leverage ratios at announcement, and to maintain leverage ratios at a high level in the post-merger period.

Chapter 2 Theories on the Short-Run Returns

2.1 Introduction

This study is an empirical research which examines shareholders' and bondholders' wealth with respect to 310 mergers and acquisitions in the UK market between 1994 and 2006.

Numerous studies have examined the influence of acquisitions on shareholders' value, but the studies on bondholders' wealth are limited. With the innovation of financial instruments and the development of financial markets, bondholders are playing an increasingly important role in corporate finance. It is widely observed that firms prioritise their sources of funding with bonds over shares if external financing is required, which is explained by the pecking order theory and signalling hypothesis. The creation of the high-yield bonds market by Michael Milken has transferred junk bonds as an effective method of payment in corporate raids, which fuelled the 1980s boom in leverage buy-outs and hostile takeovers. With the gradual recognition of corporate bonds' volatility and the failure of the merged firms, the concern of protecting bondholders' rights in takeovers is attracting increasing attention (McDaniel, 1988).

Corporate restructuring could change the contracting relationship that exists between shareholders and bondholders through altering the firm's operating performance, leverage ratio, cash flow variance, collateral and liquidation value (Renneboog and Szilagyi, 2008). Though it is controversial among economists, lawyers and politicians as to whether bondholders lose money from corporate restructuring, the legislation has confirmed that bondholders should be equally protected for their investment as shareholders. Specifically, in corporate takeovers, the management of a firm should not only try to get the best price for its shareholders, but also try to shield existing bondholders against capital losses (McDaniel, 1988).

Some cases have shown that takeovers could damage bondholders' value by making the combined firm more risky. For example, the Spanish firm Grupo Ferrovial launched a hostile bid for BAA plc on 8th February 2006. The announcement surprised the market and sent the BAA share up by 14.9% percent (from 655 pence on 7th February to 752.5 pence on 8th February)[1]. In fear that the takeover would make BAA bonds more risky (investors predicted that the Spanish raider would load BAA with debt should it take control), BAA's newly issued bond with amount of £2bn dropped to 95.16 euro from its 99.754 euro sale price 6 days ago[2]. Meanwhile, Standard & Poor's said it was likely to put BAA on credit watch with negative implications as long as a formal bid was on the agenda. Bondholders of this new bond reacted straight away—they co-ordinated a plan of action via the Association of British Insurers, demanding BAA insert a change of control clause guaranteeing that they would be bought back at par value if the company is taken over. Under big pressure, BAA agreed to buy back the £2bn of bonds at the issue price, plus interest, within 90 days of any takeover that saw them downgraded to below investment grade status. Analysts said that the change of control clause could increase acquirer's financing needs by £2bn therefore acted as the "poison bill", which would be upsetting to both acquirer and target shareholders. In the same month, the big European companies Scania AB and Svenska Cellulosa AB were forced to provide similar guarantees to sell their bonds.

Verification of the bondholder wealth issue and legislation yet need to be supplemented by more evidence. One of the most important pieces of evidence that needs to be collected is the quantitative research about the impact of M&A on bondholders' value, and the comparison of shareholders' and bondholders' wealth. Research on bondholders' wealth in respect to M&A has proceeded to some extent in the US market; however, the research in the UK market is still absent at the time of writing (April 2006). The above factors comprise the motivation for this topic which is the first empirical research of bondholders' wealth in the UK market.

Theories of this research are based on M&A motivations and shareholder-bondholder conflicts. Motivations for M&A consist of four categories: macroeconomic motive, microeconomic motive, wealth transfer and managerialism.

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[1] Datastream Advance.
[2] Bloomberg (28 February 2006): http://www.bloomberg.com/apps/news?pid=10000006&sid=apDmfjuggVBY&refer=home.

The macroeconomic motive includes deregulation, industrial wave, technological change and globalisation. The microeconomic motive includes economy of scale, scoop and learning. Wealth transfer describes the situations that acquisitions are motivated by the wealth transfer from other stakeholders to shareholders, and from target shareholders to acquiring firm shareholders. Managerialism talks about the *agency problem* that acquisitions is an effective weapon to remove uncompetitive target managers, the *free cash flow theory* that acquisitions is a better alternative for acquiring firm managers to waste cash flows on internal projects, and the *hubris hypothesis* that acquiring firm managers are incorrectly motivated by the non-existent takeover gains. The shareholder-bondholder conflicts are made up of two theories: the *equal compensation principle and agency theory,* and the *corporate finance models*. Equal compensation principle and agency theory diagnose the conflict between shareholders and bondholders. It argues that it is difficult for management to equally maximise both shareholder and bondholder values. The corporate finance models investigates four financial decisions which benefit shareholders at the expense of bondholders—dividend payout, claim dilution, asset substitution and under-investment.

Based upon the above theories, this research is designed around five testable hypotheses to investigate M&A's impact on the excess security returns: the co-insurance effect, the wealth transfer hypothesis, the synergy effect, the hubris hypothesis, and the bond return based on the hubris hypothesis. These five hypotheses are not mutually exclusive. The co-insurance hypothesis tests the wealth of target bondholders and acquirer bondholders. According to this effect, the combination of two firms whose earning streams are imperfectly correlated would reduce the merged firm's default risk. Therefore, the testable hypothesis is that co-insurance effect exists if the value-weighted combination of excess returns of bond is positive. Wealth transfer hypothesis talks about six situations that could lead to wealth transfers: 1. acquisitions are motivated by shareholders' incentive to get hold of wealth at the expense of others; 2. wealth can transfer from bondholders to shareholders due to the corporate finance models; 3. shareholders may enhance their wealth at the expense of bondholders by taking risky projects; 4. the diversification effect of a merger could reduce the default risk of the combined firm, thus transfers wealth from shareholders to bondholders; 5. shareholders may transfer wealth from bondholders to themselves by levering up to utilize the tax benefits from the co-insurance effect; 6. target and acquirer bondholders transfer wealth between each other due to the maturity effect, leverage effect and risk effect. Therefore the testable hypothesis is that for the target shareholders, acquirer shareholders, target bondholders and acquiring bondholders, if one or more parties observe negative return at the same time that one or more parties observe positive return, wealth transfer is present. Synergy implies the efficiencies created from macroeconomic and microeconomic motivations. The testable hypothesis is that a synergy exists if the value-weighted sum of excess return for the target shareholders, acquirer shareholders, target bondholders and acquiring bondholders is positive. Hubris hypothesis predicts that acquiring firms overpay for the target firms and no potential synergy will be achieved through mergers. The testable hypothesis is that hubris effect exists if the excess return for acquiring firm stocks is negative, the excess return for the target firm stocks is positive, and the value-weighted combination of excess stock return is negative. The bond return based on the hubris hypothesis predicts that the acquiring firm bondholders lose from the non-synergistic merger, but the impact of merger on target bondholders is ambiguous. The testable hypothesis is: if the hubris hypothesis holds, there should be a negative acquiring firm bond return.

This study examines shareholder and bondholder wealth with respect to 310 acquisitions in the UK market between 1994 and 2006. It tests the 41-day and 3-day market-adjusted return (MAR) and abnormal return (AR) of target and acquiring firm shareholders and bondholders. The abnormal return is calculated by a short-term event study with daily data. These excess returns are used to test the co-insurance hypothesis, the wealth transfer hypothesis, the synergy hypothesis and the hubris hypothesis. The combined security returns are studied by combining the excess returns of stock/bond and target/acquirer as value-weighted average of the excess security returns to further test the hypotheses. The univariate analysis and multivariate analysis test the influences of deal characteristics on the excess returns of stocks and bonds. The deal characteristics include method of payment, hostility, industry relatedness, relative size and market trend.

Contributions of this study are as follows. First, it is the first empirical research to test UK bondholders' wealth in acquisitions. Second, this research does a thorough review on existing theories which explain the shareholder and bondholder wealth in M&A, and designs out five testable hypotheses to explain the potential results. Compared with the research on shareholder wealth in the field of M&A, bondholder wealth study is much less developed, and researchers are still in the process of developing rationales to explain the expected impact. Though they have brought forward some theories to explain the bond question, they have given different or even contradictory interpretations. For example, Lewellen (1971), Kim and McConnell (1977) and Billett et al. (2004) give different explanations for co-insurance effect; in general, researchers befuddle the co-insurance effect, wealth transfer effect, incentive effect, and redistribution effect. This research contributes to describe theories and testable hypotheses through a standard and exhaustive way. Third, As MacKinlay (1997) argues, the power of event study increases substantially from reducing the sampling interval, this research utilizes daily bond price data which is much powerful than the recent studies which use monthly bond price data. This research is the second study that finds significant non-convertible bond returns for both target firms and acquiring firms (the other research is Billett et al. (2004)). Fourth, this research finds a significantly negative *Total* security return, indicating acquisitions are value destroying, which has never been found by previous research. Fifth, this is the first research to test the effect of stock market trend on bondholder returns, and it finds significant results.

The reminder of this thesis is organised as follows. Section 2.2 investigates the literature. Section 2.3 comes up with hypotheses. Section 2.4 reviews the evidences on prediction. Section 3.1 describes data and methodology. Section 3.2 discusses the results. Section 3.3 concludes.

2.2 Literature Review

Acquisition usually refers to a company takes over another (usually smaller) and becomes the new owner; the target company ceases to exist post-transaction and stock of the acquiring company continues to be traded in the market (Lott and Loosvelt, 2005). *Merger* usually denotes two companies of the equal size combine to create a new company; both companies' stocks are tendered or given up post-transaction, and new company stock is issued in its place. *Takeover* usually refers to hostile transactions. In this thesis, acquisition, merger and takeover follow the definition of acquisition above and are interchangeable with each other.

2.2.1 Motivations for M&A

Motivations for M&A are divided into four categories—*macroeconomic motive, microeconomic motive*, *wealth transfer* and *managerialism*.

The macroeconomic motive includes *deregulation, industrial wave, technological change* and *globalisation* (Sudarsanam, 2003). Deregulation introduces competition and inspires the merger wave. Industrial wave denotes the emergence of new industries, the retrenchment of old industries, and the rise and fall within industries' longevity which causes M&A and divestitures. Technological change enables corporations to adjust themselves to react to the changes and to absorb the achievements of technology in industry, transportation and communication. Globalisation incorporates the regional economy (i.e., European Union, North American Free Trade Agreement) and global economy (World Trade Organization) and opens new territory for corporate business. Globalisation makes M&A an effective weapon for firms to exploit chances in the overseas market and to confront challenges in the domestic market. The macroeconomic motive can lead to co-insurance effect and synergy effect which are discussed in the hypothesis section.

The microeconomic motive consists of *economy of scale, economy of scope* and *economy of learning* (Sudarsanam, 2003). The first factor is economy of scale. Takeover enables a firm to achieve a competitive advantage by spreading fixed costs over a larger number of products, and to improve competitive sales positions in the course of enlarged monopoly power. The second motive is economy of scope. M&A makes the total costs of producing and selling several products by the multi-product firm less than the sum of the costs of producing and selling the same products by individual firms specializing in each of those products. The third motive is economy of learning. A firm can cut the costs of producing the same volume of output in successive production periods through the process of learning. Through a merger, one firm may learn from the experiences of success and failure of another firm. The microeconomic motive can also lead to co-insurance effect and synergy effect.

Wealth transfer describes M&A motivate by two situations. Wealth can be transferred to shareholders from other stakeholders: shareholders (both bidder and target) benefit from reneging on compensations for target managers and pensions for target employees. Wealth can also be transferred from target firm shareholders to acquiring firm shareholders if the target firm is under-valued by the financial market. This under-valuation may come from the weak management of the target firm which causes a discount in its current market price, or come from the market imperfection of information so that the investing public temporarily undervalues this firm. When the investing public becomes aware of this under-estimate and re-appraise the target firm asset, the share price of acquiring firm will increase at the takeover announcement (Lewellen, 1971). In this situation, the target firm share price could increase as well.

Managerialism can be classified as the *agency problem*, *free cash flow theory* and *hubris hypothesis*.

In an agency relationship the principal(s) engage the agent to perform some service on their behalf which involves delegating some decision making power to the agent (Jensen and Meckling, 1976). If both parties are utility maximizers, there is good reason to believe that the agent’s interests depart from the principals’. In a corporation, shareholders as principal appoint manager as agent to run the firm for the benefit of them. The separation of ownership and control creates the agency problem: since the management’s interest deviates from that of the shareholders and its action cannot be monitored efficiently, it has the incentive to behave adversely to shareholders' interests. A possible solution to the agency problem is for shareholders to design a comprehensive contract to direct the management's actions. However, the transaction costs make the comprehensive contract hard to carry out due to the costs of preparing for all eventualities, costs of negotiating, and costs of writing down the plans that can be enforced by a third party (Hart, 1995). Takeover is an efficient tool to diminish the agency costs. The under-performing firms run by incumbent management are likely to be the target of a takeover and the managers face the hazard of being replaced. In order to protect themselves from the threat of acquisition and get support from shareholders in case of a hostile takeover, managers must operate the firm efficiently and maximize shareholder values. Takeovers motivated by the intention to remove incompetent target management can result in synergy effect and wealth transfer from target firm shareholders to acquiring firm shareholders (because target firm is undervalued).

Free cash flow is defined as "cash flow in excess of that required to fund all of a firm's projects that have positive net present values when discounted at the relevant cost of capital" (Jensen, 1988: 28). The agency problem causes conflicts between the managers and the shareholders upon the payout of free cash flow. When the firm is efficient, free cash flow should be paid to shareholders in order to maximize shareholders value. On the one hand, the payment of cash flow will directly shrink the managers' powers. On the other hand, after cash is paid out, managers have to fund new projects on the capital market. This will put mangers' behaviour under the surveillance of legislation, which is not what they want. For that reason, instead of paying out free cash flow to shareholders, managers desire to expand the firm size by investing internally in order to control more resources and increase compensation, even if the firm size is adverse to shareholders' wealth maximization. M&A is one alternative to investing internally. Firstly, the free cash flow of the acquiring firm can be paid to target shareholders rather than wasted by acquiring firm's managers. Secondly, even if an acquisition does not create profit for the acquiring firm, it involves less waste of resources than the internal investment. Consequently, target shareholders gain and bidder shareholders lose less; thus, a takeover might increase the aggregate social welfare (the aggregate value of target firm and acquiring firm) than if the takeover had not happened. Thus wealth is transferred from acquiring firm shareholders to target firm shareholders. Thirdly, in the industries with low growth rate and large cash flow, M&A creates value by facilitating exit and mitigating the excess of capacity. Accordingly, M&A plays the role of synergy.

Roll (1986) argues in his hubris hypothesis that bidding firms are incorrectly motivated by the non-existent takeover gains. Roll presumes the strong-form market efficiency that management talent is in its best use, industrial reorganization brings no gains in an aggregate output, and asset prices reflect all information about individual firms. Thereafter, the positive takeover premium brings no benefit to the purchasers but a winner’s curse. The empirical evidence shows that if the bid is unanticipated and conveys no information about the bidder except that it is seeking a combination with a particular target, the stock price of the bidding firm will decline with the announcement of the bid and with the consequence of winning a bid, and will increase on abandoning of the bid or losing a bid.

2.2.2 Shareholder-Bondholder Conflicts

This part talks about two theories, *the equal compensation principle and agency theory*, and *the corporate finance*.

Equal compensation principle and agency theory diagnose the conflict between shareholders and bondholders. It argues that it is difficult for management to simultaneously serve both shareholder and bondholder. The corporate finance models investigates four financial decisions which benefit shareholders at the expense of bondholders—dividend payout, claim dilution, asset substitution and under-investment.

2.2.2.1 Equal Compensation Principle and Agency Theory

Milgrom and Roberts (1992) utilize the equal compensation model to prove that when an agent's allocation of time or attention between two different activities cannot be monitored by the principal, then either the marginal rate of return to the agent from time or attention spent in each of the two activities must be equal, or the activity with the lower marginal rate of return receives no time or attention.

This principle is applicable to corporate governance whereas the management is the agent, and shareholders and bondholders are the two principles. The management is assigned two tasks: to maximise shareholders' value and to protect bondholders' value. In existence of the agency problem, the management's ultimate goal is to maximise his own utility. It is unlikely for the management to serve both shareholders and bondholders equally. The management measures the benefits and costs of different investment decisions and prioritises either principal's interest to maximise his own utility function. This principle identifies two agency relationships. First, the management's interest stands with shareholders, therefore bondholders become the principal and management-shareholders become the agent. Because equity value is positively correlated with the variability of firm's earnings, the agent is likely to undertake risky projects—the projects with high failure probabilities in which the payoff is high if it succeeds. As a result, shareholders seize the gains and bondholders bear the risks, and wealth is redistributed from bondholders to shareholders. Second, the management's interest stands with bondholders, thereafter shareholders become the principle and management-bondholders become the agent. Renneboog and Szilagyi (2008) comment that as management prefers to build less risky, diversified firms with lower leverage so as to reduce uncertainty of his human capital investment and to lessen the probability of bankruptcy and employment risk, he is likely to pass up profitable but risky investment opportunities at the expense of shareholders. Thus, management is naturally allied with bondholders. Under this circumstance, wealth transfers from shareholders to bondholders.

According to the equal compensation principle and the agency theory, any corporate decisions are made by the management to serve one principal at the expense of the other principal in order to maximise the management's own utility. Takeover as a kind of corporate decisions could change the existing contracting relationship between shareholders and bondholders by altering the firm's underlying collateral and the riskiness of firm's cash flows (Renneboog and Szilagyi, 2008), thus results in the co-insurance effect (or opposite effect) and wealth transfer effect.

2.2.2.2 Corporate Finance

Developed on the equal compensation principle and agency theory, this section further discusses how management-shareholders could expropriate wealth from bondholders. Copeland, Weston and Shastri (2005) argue that financial decisions of *dividend payout*, *claim dilution*, *asset substitution* and *under-investment* are made by the manager benefiting shareholders at the expense of bondholders.

Dividend payout: this analysis is based on Black and Scholes' theory (1973) that corporate equity is a European call option (one which can be exercised only at the maturity date) on the assets of the firm, i.e., assuming the value of call option as criteria of share price. A firm's unexpected increase of dividend payment adds value to shareholders but lowers assets and planned investments; therefore bondholders lose with the decrease of firm assets. If a merger involves the payment of reserved cash, it has the same effect of unexpected dividend payout that the acquiring firm bondholders lose control over its cash flows (assets). As a result, wealth transfers from acquirer bondholders to target shareholders.

Claim Dilution: on assumption that the future firm is not safer, if the firm does not issue new debt, the existing bondholders have exclusive claim on the firm's assets and revenues; if firm issues new debt with the same or more advanced claim, the value of the put option is higher than that without issuing new debt, but the claim of existing bondholders is diluted in case the firm value is below the promised payment, so there is a decline in existing bond value. Consequently, shareholders have the incentive to finance takeovers with issuing new debt with the same or more advanced claim than existing debt; hence wealth transfers from bondholders to shareholders.

Asset Substitution: when firm substitutes existing asset with a riskier one, bondholders face higher risk, accordingly bond price falls, and at the same time put option value increases. When two firms have different riskiness, a merger between them equals to substitute the safer firm's assets with a riskier one, and the wealth transfers from the safer firm's bondholders to its shareholders, and to the riskier firm's bondholders.

Under-investment: Myers (1977) comes up with this problem. If a firm gives up a chance to invest in a project with potential positive net present value, bondholders may suffer from such opportunity loss. If the return of investment is not enough for payment to bondholders, shareholders are likely to pass up the investment opportunity; however, bondholders would prefer the investment as soon as the net present value of investment is positive. The interpretation is that for their own sake, shareholders quit certain investment opportunities, so bondholders lose the potential opportunities of earning. If the acquiring firm gives up a chance for organic growth but involves in a takeover, wealth transfers from its bondholders to shareholders.

2.3. Hypotheses

Based on the theories in M&A motivations and shareholder-bondholder conflicts, this research designs out five testable hypotheses to investigate the excess returns of acquiring firm shareholders and bondholders, and target firm shareholders and bondholders. These five hypotheses are not mutually exclusive.

2.3.1 Hypothesis 1: Co-insurance Effect

Testable hypothesis: the co-insurance effect exists if the value-weighted combination of excess returns of bonds is positive.

Lewellen (1971) argues that if earnings of two firms are less than perfectly correlated, their merger will create values for the joint firm. He considers takeovers as a portfolio of income streams between the bidding and target corporations. He argues that the benefit of this portfolio on merger comes from the operational advantages which could not be realized by individual investors' portfolio of two firms' shares on the stock market. He believes this factor will contribute to the new firm's income stream, and the unused debt capacity of the target firm could increase the borrowing power of the combined firm.

Kim and McConnell (1977) quote this notion as co-insurance effect. They argue that the portfolio diversification of two or more firms whose earnings streams are imperfectly correlated would reduce the merged firm's default risk and increase debt capacity; hence the merged firm's bondholders benefit. If the combined firm increases its financial leverage after merger and if bondholders do not lose, co-insurance exists.

Billett et al. (2004) further this theory and argue that when merging firms have imperfectly correlated cash flows, the one with risky debt benefits and the other loses. Furthermore, they argue that based on Galai and Masulis (1976), when the merger is a non-synergistic one, the increase in bondholder wealth via co-insurance comes exactly from stockholders' losses. Regarding Shastri's (1990) hypotheses of risk effect, leverage risk and maturity risk, and his prediction that targets are riskier than acquirers (which is contradict to Lewellen's prediction), they conclude that the fact that target bondholders gain while acquirer bondholders lose is evidence of co-insurance.

The above arguments can be supported by the theories of M&A motivations. The macroeconomic motives of deregulation, industrial wave, technological change and globalisation enable firms to engage in conglomerate mergers and cross-border mergers, to absorb new technologies, and to hedge risk against economic cycles. The microeconomic motives of economy of scale, scope and learning enable firms to achieve competitive advantage, to enlarge market share and to reduce costs. All of these behaviours could reduce the riskiness of the combined firms and make their cash flows less volatile, thus bondholders as a whole benefit.

Lewellen (1971), Kim and McConnell (1977) and Billett et al. (2004) agree that if two firms' income streams are imperfectly correlated, the corporate merger should have impact on the combined firm's debt capacity and bondholders' wealth.

However, they deviate from each other on the testable hypothesis of co-insurance effect. These conflicting explanations of the co-insurance effect might be confusing for empirical tests. Lewellen (1971) considers that under the co-insurance effect, takeovers provide a protection for bondholders which is not available under loan they would make to the prospective merger partners as independent identities, thus bondholders as a whole benefit. Kim and McConnell (1977) emphasize the co-insurance effect exist if the merged firm's bondholder do not lose, and the combined firm levers up. The later constriction is more like an incentive effect under which the managers have the incentive to raise leverage. Billett et al. (2004)'s opinion on co-insurance involves shareholder wealth, and focus more on wealth transfer. Actually, co-insurance effect could have compound effects on shareholders' wealth. By taking share price as a positive function of the variability of firm's cash flows, the co-insurance effect decreases the combined firm's default risk, thus reduces shareholders' wealth. In contrary, the takeover enables the firms to negotiate the method of payment, and they could use this mechanism to consume the debt capacity raised by the co-insurance (tax shield), which should increase shareholders' wealth.

By bringing together the theories of M&A motivations and the opinions of the three papers, this research designs a more logical testable hypothesis: the co-insurance effect exists if the value-weighted combined excess returns of acquiring firm bonds and target firm bonds are positive.

2.3.2 Hypothesis 2: Wealth Transfer

Testable Hypothesis: for the acquirer shareholders, acquirer bondholders, target shareholders and target bondholders, if one or more parties observe negative excess return at the same time that one or more parties observe positive excess return, wealth transfer is present.

Wealth transfer is a complex phenomenon in takeovers and it attributes to many factors. First, it is directly caused by shareholders' incentive to get hold of wealth at the expense of others. Target shareholders and acquirer shareholders can benefit from reneging on target firms' contracts with stakeholders such as managers, employees, customers and suppliers. Second, shareholders can also transfer wealth to them by taking over an under-valued firm due to the imperfection of financial market; although target firm shares may increase at the announcement because investors realised its true value, at least part of target shareholders' wealth has already been transferred to acquirer shareholders by that time. Third, when a target firm is under-valued owing to existence of agency problem, the merger could also transfer its shareholders wealth to the acquiring firm shareholders. Fourth, under the free cash flow theory, when managers pay out free cash flow to acquire another firm (suppose the synergy does not exist) other than distributing dividends to its shareholders, wealth is transferred from acquirer shareholders to target shareholders.

Second, wealth can transfer from bondholders to shareholders due to the corporate finance models of dividend payout, claim dilution, asset substitution and under-investment. If an M&A deal involves cash payment, it has the same effect of dividend payout that the acquiring firm bondholders lose control on its cash flows (assets) thus wealth transfers to target firm shareholders. Furthermore, if the cash payment is financed with issuance of new debt, bondholders (for both acquiring firms and target firms) suffer a loss due to the claim dilution. When the two firms have difference riskiness, the merger equals to substitute the safer firm's assets with a riskier one, and the wealth transfers from safer firm's bondholders to its shareholders, and to the riskier firm's bondholders. In case of under-investment, suppose the acquiring firm gives up a chance for organic growth but involves in a takeover, the wealth transfers from acquiring firm bondholders to shareholders.

Third, as discussed in equal compensation principle, because equity value is positively correlated with the variability of firm's earnings, managers may have the incentive to transfer wealth from bondholders to shareholders by undertaking investment projects which increase the firm's riskiness (specifically, to increase the financial leverage), and merger is such kind of corporate investment. Settle et al. (1984) quote this as "incentive effect".

Fourth, the diversification effect of a merger could reduce the default risk of the combine firm, which in turn increases bondholder's value but decreases shareholders' value. As a result, wealth transfers from shareholders to bondholders. Eger (1983) and Maquieira et al. (1998) refer this as "redistribution" effect.

Fifth, if the merger increases debt capacity (it is the break-even point at which the marginal benefit of debt equals to the marginal cost of debt) for the combined firm due to co-insurance, the new firm will have the incentive to make use of this benefit (say, tax shield) by raising leverage, hence wealth transfers from bondholders to shareholders.

Sixth, Shastri (1990) comes up with the *maturity effect*, *leverage effect* and *risk effect* which predicts the wealth transfer between bondholders. If there are bonds with different maturity length, wealth transfer applies: the value of bonds with a shorter maturity goes up and the value of bonds with a longer maturity goes down. Shastri advances the notion of maturity effect. Assume there are two bonds belonging to the acquirer and target firm, respectively. Bond *A* has a shorter maturity, and bond *B* has a longer maturity. To bond *B*, the merger is equivalent to the firm issuing a new debt with shorter maturity. Suppose the merger authorizes the two bonds with equal priority. If at the time of bond *A*'s redemption, the firm value is higher than the bond's par value, bond *A* is paid in full. Therefore bond *A* is to some extent senior to bond *B*, which affects positively on bond *A* and negatively on bond *B*. In the case that the firm goes bankrupt, the equal priority clause comes into play. Bond *A* has to share the liquidated firm with bond *B*, and the maturity difference is meaningless, having a negative effect on bond *A* and positive effect on bond *B*. In each situation, the values of the two bonds are negatively related, which is the evidence of wealth transfer. Shastri argues that by considering the above two situations, bond *A*'s value is jointly influenced by the probability of bankruptcy at maturity date and the bankruptcy sharing rule. For "reasonable" firm value and bond *A*'s par value, the probability of bankruptcy is small, i.e., negative component of the maturity effect (with probability p) is smaller than the positive component (with probability $1- p$), hence the overall maturity effect on bond *A* is positive. For bond *B*, Shastri deems that since the “new” issue of bond *A* is followed by a change of firm value, and the change is generally greater than the par value of bond *A*, the maturity effect on bond *B* is ambiguous. I do not agree with this point of view because of its contradiction. If the change of firm value is greater than the par value of bond *A*, there would be two results—when the change is negative, the new firm goes bankrupt, hence bond *A* loses and bond *B* gains; when the change is positive, bond *A* is paid in full, so bond *A* gains and bond *B* loses. Shastri’s argument that the probability of bankruptcy is small suggests that the second result dominates, so it should expect the overall maturity effect on bond *B* to be negative instead of ambiguous.

As the acquiring firm and acquired firm have different leverage ratios, a merger will make the combined firm’s leverage ratio greater than one firm and less than the other. Therefore, the bondholders of the lower-leveraged firm suffer a wealth transfer to the bondholders of the higher-leveraged firm (Shastri, 1990).

If the two firms’ risks (weighted average bond credit rating) are different, there is a wealth transfer from bondholders of a higher rating firm to bondholders of a lower rating firm.

Above discussions cannot exhaust all the possibilities of wealth transfer in takeovers because some outsiders whose wealth cannot be monitored by this study. By considering all the above situations and the validity of data, this research designs a testable hypothesis: for the acquirer shareholders, acquirer bondholders, target shareholders and target bondholders, if one or more parties observe negative return at the same time that one or more parties observe positive return, wealth transfer is present.

2.3.3 Hypothesis 3: Synergy Effect

Testable Hypothesis: synergy effect exists when the value-weighted sum of excess return for the acquirer shareholders, acquirer bondholders, target shareholders and target bondholders is positive.

Synergy implies "possible or actual good effects of the joining together of two companies in terms of higher efficiency or productivity"[3]. It is usually a core negotiating point between the acquirer and target managers and shareholders, which has a big influence on deal value. A potential synergy can increase revenue and decrease cost for the combined firm.

In the macroeconomic level, mergers motivated by deregulation, industrial wave, technological change and globalisation could bring together two firms' relative advantages, and achieve a sustainable growth. Co-insurance effect between bondholders is a special example of synergy. In the microeconomic level, takeovers stimulated by economy of scale, scope and learning help the combined firm to reduce cost, share distribution channels, increase market share, promote R&D and enhance attractiveness to customers. Penas and Unal (2004) suggest both shareholders and bondholders gain from synergistic mergers because firm value can increase by achieving economies of scale and scope. In the free cash flow model, synergy works by facilitating exit and mitigating the excess of capacity of firms in the industries with low growth rate and large cash flow through mergers.

This research devises a testable hypothesis for the synergy effect to sum up all the above factors: a synergy exists if the value-weighted sum of excess return for the acquirer shareholders, acquirer bondholders, target shareholders and target bondholders is positive.

2.3.4 Hypothesis 4: Hubris Hypothesis

Testable Hypothesis: if the excess return for the acquiring firm stock is negative, the excess return for the target firm stock is positive, and the value-weighted combination of excess stock return is negative, hubris effect exists.

Roll (1986) posits the hubris hypothesis as the explanation of the motivations for takeovers. According to the hubris hypothesis, managements of bidding firms simply pay too much for their targets. This hypothesis regards all markets as strong-form

[3] Oxford Advanced Learner's English-Chinese Dictionary (Extended fourth edition), Hong Kong: The Commercial Press and Oxford University Press, 2002, p 2003.

efficient. In financial markets, all investors are investment specialists, they have costless access to currently available information about the future, and they observe the market prices closely and adjust their holdings promptly (the market efficiency means that the market prices in average reflect rational behaviour; there is no evidence to indicate that every individual behaves rationally). In product markets, there is perfect competition and prices of goods well reflect supply-demand equilibrium. In labour markets, managers are competent and operate firms efficiently. Accordingly, corporations' efficiencies are maximized and their market share values substantially represent their intrinsic values. Under such circumstances, there is no potential synergy or other sources of gains, but bidding firm management believes such gains exist. Thus the takeover premium overstates the increase in economic value of the combination, and at least part of the target share gains at the announcement period present a simple wealth transfer from bidding firm shareholders.

The hubris hypothesis predicts that at the announcement period, 1) the value of target firm should increase, 2) the value of acquiring firms should decrease, and 3) the combined firm value should fall slightly. Previous research shows large increase for target shares in announcement period and mixed results for the acquiring firm value and thus combined firm value. Roll (1986) interprets the complex acquiring firm return results by three reasons: 1) the bid can convey contaminating information (for instance, information about bidder's cash flows which are not predicted by the market) other than the takeover itself, 2) the anticipation of the bid results in an announcement effect smaller in absolute value than the true economic effect, 3) the overwhelming size of acquirer on target buries the effect of bid in the noise of acquirer's return volatility.

In this research, the testable hypothesis for hubris effect is: the excess returns for acquiring firm stock is negative, the excess return for the target firm stocks is positive, and the value-weighted combination of excess stock return is negative.

2.3.5 Hypothesis 5: Bond Return Based on Hubris Hypothesis

Testable Hypothesis: if the hubris hypothesis holds, there should be a negative acquiring firm bond return.

Roll's hubris hypothesis only considers the excess stock return. It can be developed into a new hypothesis to explain the excess bond return: when hubris hypothesis holds, the acquiring firm bondholders lose from the anticipation of bond market on the bad financial and operational performance of the new firm (there will be no synergy); the target firm bondholders benefit from the decrease of leverage ratio as a result of share price increase, but lose from the anticipation of combined firms' bad operation; thereafter the impact of merger on target bondholders is ambiguous. Hence, the testable hypothesis is: if the hubris hypothesis holds, there should be a negative acquiring firm bond return.

Table 2-1 summarises the five testable hypotheses with respect to excess security returns. S_A stands for acquiring firm share return, B_A stands for acquiring firm bond return, S_T stands for target firm share return, and B_T stands for target firm bond return. The co-insurance effect exists if the value-weighted combination of excess returns of bonds is positive: $B_A + B_T > 0$. Wealth transfer exists if for the acquirer shareholders, acquirer bondholders, target shareholders and target bondholders, one or more parties observe negative excess return at the same time that one or more parties observe positive excess return. Synergy exists if the value-weighted sum of excess return for the acquirer shareholders, acquirer bondholders, target shareholders and target bondholders is positive: $S_A + B_A + S_T + B_T > 0$. Hubris hypothesis exists if the excess return for acquiring firm stock is negative, the excess return for the target firm stock is positive, and the value-weighted combination of excess stock return is negative: $S_A < 0$, $S_T > 0$ and $S_A + S_T < 0$. Bond return based on hubris hypothesis exists if the hubris hypothesis holds, and the acquiring firm bond return is negative: $S_A < 0$, $S_T > 0$, $S_A + S_T < 0$, and $B_A < 0$.

Table 2-1 Hypotheses

Co-insurance: the co-insurance effect exists if the value-weighted combination of excess returns of bonds is positive. Wealth transfer: for the acquirer shareholders, acquirer bondholders, target shareholders and target bondholders, if one or more parties observe negative excess return at the same time that one or more parties observe positive excess return. Synergy: if the value-weighted sum of excess return for the acquirer shareholders, acquirer bondholders, target shareholders and target bondholders is positive. Hubris hypothesis: if the excess return for acquiring firm stock is negative, the excess return for the target firm stock is positive, and the value-weighted combination of excess stock return is negative. Bond return based on hubris hypothesis: if the hubris hypothesis holds, there should be a negative acquiring firm bond return.

Hypotheses	S_A	B_A	S_T	B_T	S_A+S_T	B_A+B_T	$S_A+B_A+S_T+B_T$
1. Co-insurance						+	
2. Wealth Transfer	One or more loses while one or more gains						
3. Synergy							+
4. Hubris Hypothesis	-		+		-		
5. Bond Return Based on Hubris	-	-	+		-		

S_A —acquiring firm share return; B_A —acquiring firm bond return;
S_T —target firm share return; B_T —target firm bond return

2.4. Evidence on Predictions

2.4.1 Shareholder Returns

Previous studies on short-term target shareholder wealth find persistent evidences of significant positive returns at the announcement period, despite capital market variation, deal characteristics and firm characteristics. Studies on short-term acquirer shareholder wealth find diversified results. The research of Jensen and Ruback (1983) on 7 papers of tender offer reports 2-day weighted-average abnormal returns of 3.81% for successful bidders and -1.11% for unsuccessful bidders; 3 papers of mergers report 2-day weighted-average abnormal returns of -0.05% for successful bidder and 0.15% for unsuccessful bidders; 5 papers of mergers on announcement month show weighted-average abnormal returns of 1.37% for successful bidders and 2.45% for unsuccessful bidders; besides, 3 papers of total abnormal returns from offer announcement through outcome report -1.77% for successful bidders and -4.28% for unsuccessful bidders. According to the survey of Bruner (2004) on 54 papers published between 1978 and 2003 of acquirer shareholder returns, 26% (14) reports value destruction, 31% (17) show value conservation, and 43% (23) show value creation.

Mulherin and Boone (2000) study the 3-day abnormal returns for 281 acquisitions (with available data) from 1990 through 1999. They find that an average target return of 20.2% offset the bidder return of -0.37% with a 3.56% value-weighted return for the combined stock return. Burch (2001) studies 4-day abnormal returns of 2067 mergers announced between 1988 and 1995. He finds 25.6% return for targets with lockup option, 16.3% for targets without lockup option, -2% return for bidder with lockup option and -0.4% for bidder without lockup option. Andrade et al. (2001) study 3-day abnormal returns of 3688 mergers that were announced between 1973 and 1998 and report target returns between 15.9% and 16.0% (sub-sample of 4 decades), acquirer returns between -0.3% and -1.0%, and combined returns between 1.5% and 2.6%. Fuller et al. (2002) study the 5-day abnormal returns of 3135 takeovers between 1990 and 2000. They find -1.07% return for acquirers if the targets are public firms. Officer (2003) explores the 7-day abnormal returns of 2511 acquisition bids from 1988 to 2000. He discovers 22.16% return for targets and

-1.16% return for acquirers. Goergen and Renneboog (2004) test 5-day abnormal returns of 187 bids between 1993 and 2000, reporting 12.96% return for target firms and 1.18% return for acquiring firms. Danbolt (2004) examines 389 domestic and 96 cross-border acquisitions between 1986 and 1991. He reports the 4-day abnormal returns of targets are 24.37% for domestic deals and 30.71% for cross-border deals (market model). Gregory and McCorriston (2005) investigate the 5-day abnormal returns of 333 acquisitions between 1985 and 1994, and find -0.022% for acquiring firms overall. Moellera et al. (2005) test 28182 acquisitions between 1980 and 2001, and report 3-day abnormal returns between 0.64% and 1.20% for each of the decades for acquiring firms. They discover a negative aggregate dollar return of $-429897 million for all the acquiring firms. They also discover the aggregate combined values of target and acquiring firms are positive for deals between 1980 and 1997, and negative for deals between 1998 and 2001 ($-134 billion). They argue the large loss of acquiring firm shareholders from 1998 through 2001 is the result of a small number of acquisition announcements with extremely large losses, which attributes to the agency problem that “high valuations increase managerial discretion, making it possible for managers to make poor acquisitions when they have run out of good ones”, and investors are aware of this at the announcement time. Fan and Goyal (2006) look at 2162 completed mergers from 1962 to 1996, and they report 0.019% value-weighted 3-day return for the combination of targets and acquirers. Campa and Hernando (2006) study the 3-day abnormal returns of 172 mergers took place between 1998 and 2002, and discover 3.24% return for target firms and -0.87% return for acquiring firms. Wang and Xie (2008) examine the 11-day abnormal returns of 396 completed mergers and acquisitions between 1990 and 2004. They report 21.52% return for the targets, -2.91% for the acquiring firms, and 0.97% for the value-weighted portfolio of targets and acquirers.

Overall, these empirical results demonstrate significant positive returns for target shareholders and slight negative returns for acquirer shareholders, which support the wealth transfer hypothesis. The positive combined values from Mulherin and Boone (2000), Andrade et al. (2001), Fan and Goyal (2006) and Wang and Xie (2008) support the synergy hypothesis. The negative aggregate combined value from Moellera et al. (2005) support the hubris hypothesis.

2.4.2 Bondholder Returns

Kim and McConnell (1977) do the first research on the influence of M&A on bondholder wealth. They investigate 37 US conglomerate merger deals announced between 1960 and 1973 involving 21 acquiring firms with 24 bonds and 18 target firms with 20 bonds. They attain the bond price data from the Standard & Poor's Bond Guide. They use a long-term event study with monthly bond data to compute the abnormal bond returns by a paired-comparison technique and the two-index market model. They use the merger date as the event date, which is unlikely to capture the market reaction as accurate as the announcement date. In the paired-comparison test, the normal bond return is measured by a non-merging firm which matches each of the bonds of the merging firms based on bond rating, term to maturity, coupon interest rate and industries. The abnormal return of bond is calculated as the price difference between the non-merging firm bond and the merging firm bond. The event window is a 48 month window. In the two-index market model, they employ a market model with both a stock index and a bond index to measure the normal bond return. The abnormal return of bond is calculated as the price difference between the individual bond price and the market indexes. The event window is a 36 month window. They report the combined abnormal returns of both target and acquirers. For the paired-comparison model, the announcement month abnormal return is -0.507% and the 48 months cumulative abnormal return is 1.002%; for the two-index market model, the announcement month abnormal return is -0.45% and the 36 month cumulative abnormal return is -1.53%. None of the returns are statistically significant. Thus they find no abnormal returns to the bondholders of mergers. Furthermore, they find firms tend to make greater use of leverage after merger than the combination of individual firms did before the merger. In the absence of co-insurance effect, the increase of financial leverage should transfer wealth from bondholders to shareholders. Since bondholders do not suffer windfall losses due to the increase of leverage ratio, this is the indirect evidence that co-insurance effect did take place.

Settle et al. (1984) base their research on Kim and McConnell (1977) and Asquith and Kim (1982), and intend to examine the bondholder wealth and the incentive effect (leverage changes). They look at 53 mergers announced between 1961 and 1977, involving 58 firms with 90 bonds (they do not specify how many acquiring firms and how many target firms). They collect the bond price from the Moody's Bond Record and the Commercial and Financial Chronicle. They use a long-term event study with monthly bond data to calculate the excess bond returns of all the firms. They employ a term-adjusted technique (remove components related to the term structure of interest rates) to compute the excess bond returns. Normal return for each corporate bond is based on the return of a hypothetical government bond which has the same duration with the corporate bond; excess return is the difference between the actual return of a corporate bond and the hypothetical return of a government bond. The event window is a 21 month window. They find 4.27% cumulative abnormal bond returns (significant) for the 21 month window. They attribute the difference of results from Asquith and Kim (1982) to sample and methodology. Settle et al. then examine the relationship between bondholder gains and both the pre-merger debt ratios and post-merger changes in debt ratios, and find the evidence for the incentive effect is negligible. Inclusion, their research supports the co-insurance effect.

Walker (1994) examines the announcement month abnormal returns of 65 takeovers involving 92 firms with 260 bonds between 1980 and 1988. He reports return of the 33 target firms as 0.83%, return of the 35 acquiring firms with cash offers as -0.73%, return of the 12 acquiring firms with stock offers as 1.39%, and return of the total 92 firms as 0.31%. None of these returns are statistically significant. He also discovers that bond returns are inversely related to issuer default risk (statistically significant), which supports the wealth transfer hypothesis.

2.4.3 Shareholder and Bondholder Returns

Some empirical studies have been done on the impact of M&A on both shareholder and bondholder wealth, and they mainly focus on the US market. Renneboog and Szilagyi (2008) summarise the results of seven papers on US bondholder wealth effects of merger and acquisitions. They conclude that the results for acquiring firms are ambiguous, but bondholders do not gain; the results on target firms are unanimous, and bondholders earn normal returns. Due to the extent that target firms are usually smaller and lower rated, the normal return from target bondholders does not support the co-insurance hypothesis and wealth transfer hypothesis which expect higher abnormal return for them. Rathinasamy et al. (1991) argue that mergers have no noticeable impact on bondholder wealth because wealth transfer from stockholders to bondholders are neutralised by incentive effects that managers increase the leverage ratios after merger. Asquith and Kim (1982) and Dennis and McConnell (1986) ascribe the mild bondholder returns to bond covenants which effectively protect bondholder wealth.

Early research obtains bond data from diversified databases, and their sample sizes are relatively smaller. Owing to the sample size limit, they either test the target and acquirer bonds together or only test the acquirer bonds. Their methods of calculating abnormal returns are more complex than later research.

Asquith and Kim (1982) follow Kim and McConnell (1977) to study the influences of conglomerate mergers on bondholder wealth. There are three developments from their study: first, this is the first study of both bondholder and shareholder wealth on M&A (the examination of both security returns is necessary in order to distinguish wealth transfer effect from synergy effect); second, they use announcement date as the event date (the variable time lag of merger date creates noise for the test); third, they utilize both long-term and short-term event studies (daily study is more accurate than monthly study). They study 28 acquiring firms with 38 non-convertible bonds and 22 target firms with 24 non-convertible bonds which involved in mergers between 1960 and 1978. They collect monthly bond price from the Bank and Quotation Record, daily bond price from the Wall Street Journal, and matching monthly and daily bond prices from the Standard and Poor's Bond Guide. They use a variety of models for the event studies. They choose the paired-comparison technique to test the monthly abnormal return of bond with a 25 month event window. They use the raw return as the daily abnormal return of bond with a

21 day event window. For the daily study, since many bonds do not trade more than once during these 21 days, the number of firms is reduced to 11 for acquiring firms and 6 for target firms. They use the Capital Asset Pricing Model to check the monthly abnormal return of stock whereas the estimate of the expected rate of return on the market portfolio is the equal weighted average return of all stocks on New York Stock Exchange. The event window for acquiring firms is a 25 month window, and the event window for target firms is a 13 month window. As stock returns which are summed over several event time periods may overlap in calendar time periods, Asquith and Kim modify the CAPM model by forming a portfolio in each calendar time period that covers several relative time periods. For this method, the event window for acquiring firms is a 15 month window, and the event window for target firms is a 3 month window. They test the daily abnormal return of stock by a market model and the event window is a 20 day window. The expected rate of return on each stock is estimated by grouping annually all securities on the New York Stock Exchange and the American Stock and Options Exchange into 10 equal-size portfolios according to their market risk. The abnormal return of a stock is calculated as the difference between the actual stock return and the return to its counterpart portfolio. They report 1.13% abnormal bond return (insignificant) for the acquiring firms, 1.51% abnormal bond return (insignificant) for the target firms, and 1.29% abnormal bond return (insignificant) for all firms of the 25 months event window. They also report 0.203% abnormal bond return (insignificant) for the acquiring firms, 1.391% abnormal bond return (insignificant) for the target firms, and 0.622% abnormal bond return (insignificant) for all firms of the 2-day event window (-1,0). They do not report the long-term cumulative abnormal stock returns for either acquirers or targets and their statistics; they do not report the combined stock returns either. The announcement month abnormal stock return is 1.54% for the acquiring firms (insignificant) and 18.29% for the target firms (significant). The two-day announcement period abnormal stock returns are 1.0% for acquiring firms (insignificant) and 11.0% for target firms. In conclusion, target stockholders gain, acquiring stockholders, acquiring bondholders, and target bondholders neither gain nor lose. The four securityholders of the merging firms gain as a whole. It concludes that mergers have no noticeable impact on bondholder returns, and there is no

noticeable wealth transfer between shareholders and bondholders. This confirms the synergy effect. They attribute the results to an efficient market which has resolved conflicts of interest between shareholders and bondholders.

Eger (1983) suggests that a non-synergistic merger transfers wealth from stockholders to bondholders as a result of decreased cash flow variance of the combined firm (he calls this “redistribution” theory). The wealth transfer theory is specific to mergers through pure stock exchange because there is no systematic bias in the change in financial leverage which dilutes the wealth transfer. A merger involving new issues of debt or cash payment could offset the effect of wealth transfer[4]. He assigns the failures of Kim and McConnell (1977) and Asquith and Kim (1982) to detect significant bondholder wealth effect to the inclusion of non-exchange mergers in their samples. Eger (1983) analyses the effects of pure exchange M&A announcements between 1958 and 1980. 38 deals with 41 bonds satisfy his selection criteria, involving 33 acquiring firms and 6 target firms whilst in each deal either the acquirer or the target firm has publicly traded non-convertible bonds. He obtains bond prices as well as control portfolio bond prices from the Wall Street Journal. Eger takes a short-term event study with daily stock and bond data to measure the excess returns. He uses a paired-comparison technique to calculate the 51-day excess bond return. The expected return for each bond is estimated as the return on a portfolio of 10 bonds which have similar rating and maturity date to the sample bond. The excess bond return is the difference of the actual return of bond and the return of its corresponding portfolio. Then he utilizes a mean-adjusted model to test the 51-day excess stock return. The expected return for each stock is the mean return for the stock during the estimation window. For the thin trading problem, he tested two assumptions, the jump returns assumption (it assumes there is no change in the price of a bond in the absence of a trade) and the continuous returns assumption (it assumes the value changes associated with a price change have occurred uniformly over the days between two trades), and finds the former one

[4] Eger (1983, page 548): A merger involves new issues of debt can be viewed as two concurrent transactions: a merger through pure stock exchange and the exchange of some outstanding stock for debt. An exchange of stock for debt reduces outstanding debt values. A merger involves cash payment can be viewed as a merger through pure stock exchange followed by a repurchase of some outstanding shares. When a repurchase of shares was announced, there is slight decrease in the value of debt.

preferable. Eger reports the cumulative abnormal returns and statistic tests in a chaotic pattern, which is difficult to interpret and cannot be compared with other event studies. The 30-day pre-announcement cumulative abnormal bond returns are 0.886136% (significant) on jump assumption and 0.948605% (significant) on continuous assumption for the acquirer bonds. He does not report target bonds cumulative abnormal returns in the consistent way as the acquirer bonds on the same event window, and he does not report the statistic test either. His footnote states that the 51-day cumulative abnormal bond returns for targets are 3% for both assumptions. The 30-day cumulative abnormal stock returns are -0.3061% for the acquirers (insignificant) (N=37) and 9.985% for targets (significant). Consequently, the results support the co-insurance hypothesis and synergy hypothesis.

Dennis and McConnell (1986) test the effects of M&A announcements on the prices of common stock, convertible preferred stock, non-convertible preferred stock, convertible bond, and non-convertible bond between 1962 and 1980. Their primary purpose of research is to detect the impact of merger on the market value of merging firms' various securities. 132 deals satisfy their selection criteria, involving 94 acquiring firms and 81 target firms where in each deal either the acquirer or target firm has publicly and actively traded senior securities. There are 42 deals that both the acquiring and target firms have senior securities. The target firms have 25 convertible preferred stock, 40 convertible bonds, 21 nonconvertible preferred stock, and 27 nonconvertible bonds; the acquiring firms have 70 convertible preferred stock, 33 convertible bonds, 32 nonconvertible preferred stock, and 67 nonconvertible bonds. This sample is large enough to enable them to test target and acquirer bonds separately. They acquire convertible and non-convertible stock prices from the Standard and Poor's, and convertible and non-convertible bond prices from the Wall Street Journal. They utilize a short-term event study with daily security returns to compute the abnormal returns of securities for the acquiring firms and target firms respectively. For each firm, the securities are divided into five groups—*common stock*, *convertible preferred stock*, *non-convertible preferred stock*, *convertible bond*, and *non-convertible bond*. They employ both a mean-adjusted return technique and a market-adjusted return technique to test the abnormal security returns. The mean-adjusted return technique compares the returns in the event window with returns in the estimation window. The market-adjusted return compares the return in the event window with the return of an appropriate market index. Due to these two methods get the same results, Dennis and McConnell only describe the market-adjusted return procedure in their paper. The market indexes for common stock, convertible preferred stock and convertible bond are the value-weighted indexes of the New York Stock Exchange and the American Stock and Options Exchange; the market indexes for non-convertible preferred stock and non-convertible bond are the Dow-Jones Industrial Bond Index. The event window for common stock is a 40 day event window, and the event window for the other four securities is a 28 day window. They find out for the target corporations, common shareholders, convertible and non-convertible preferred stockholders, and convertible bondholders gain significantly, while non-convertible bondholders neither gain nor lose; for the bidding firms, convertible preferred stockholders gain significantly and common stockholders gain, while preferred stockholders, convertible and non-convertible bondholders neither gain nor lose. Dennis and McConnell notice their result of acquiring firm common stock return is different from a number of previous studies. They explain that acquirer shareholders approve mergers because some class of securityholders will gain, which motivates shareholders to pursue the merger. Therefore no single class of securityholders always gain, but the acquirer securityholders as a whole gain. They discover that on average, the total value of the combined firm increases statistically significantly. Moreover, the cross-sectional test shows that the returns to common stock and the returns to senior securities are positively correlated, hence there is no wealth transfer. In summary, their results support the synergy hypothesis.

Travlos (1987) looks into the role of method of payment in M&A announcements on the prices of stock and bond of acquiring firms from 1972 through 1981. Of the 167 deals, there are 30 firms with a total of 58 non-convertible bonds. He obtains non-convertible bond price from the Moody’s Bond Record. Travlos applies a short-term event study with daily stock and bond data to gauge the abnormal returns of stocks and bonds for the acquiring firms, respectively. For either test, he divides the firms into three groups according to the means of payment—common stock, cash, and the combination of common stock and cash (he does not report results for the combination group). He employs a market model to test the abnormal returns of stocks for each group. The normal return is defined as the return for the CRSP equally weighted market index. The abnormal return is the price difference between the return of each common stock and the market index. The event window is a 21 day window. Then he uses a mean-adjusted model to test the abnormal returns of non-convertible bonds for each group. The event window is an 11-day window. The 2-day cumulative abnormal stock return of acquirers is -1.47% (significant) for stock exchange offers and 0.24% (insignificant) for cash offers. For bondholder wealth, the -1 day abnormal bond return of acquirer is -0.90% (significant) and announcement day abnormal bond returns is -0.18% (insignificant) for stock exchange offers; bond returns for cash offers are positive and insignificant. Both shareholders and bondholders lose by stock exchange offers as against cash offers. Inclusion, there is no evident wealth transfer from stockholders to bondholders.

Maquieira et al. (1998) base their research on Eger (1983) to examine the pure stock-for-stock mergers. They refer that pure stock exchange mergers provide an ideal opportunity to test for wealth transfer (the “redistribution” effect) from shareholders to bondholders because there are no cash outflows or asset changes. By analysing the wealth effects of conglomerate and non-conglomerate mergers, they aim to give indirect evidence on the economic benefits of focus-increasing versus focus-decreasing mergers. They study 260 mergers announced between 1963 and 1995, involving 78 nonconvertible preferred stock, 83 convertible preferred stock, 535 nonconvertible bond, and 67 convertible bond. The sample size of bonds is larger than all the previous studies. They do not specify where to collect the preferred stock and bond data. They use a modified long-term monthly event study. They compute the valuation prediction errors (abnormal returns) of securities as the percentage difference from predicted market value of securities (normal returns without a merger) from two months before announcement date through two months after the effective date (in their sample, it takes 11 to 31 months to finish a merger). Predicted market values are computed based on overall market movements in the same classes of securities over the measurement period (month t-2 to month t+2). For the conglomerate mergers, they find -4.79% valuation prediction errors for acquirer common stock (significant)[5], 41.65% for target common stock (significant), 3.55% for acquirer nonconvertible preferred stock (significant), 20.31% for target nonconvertible preferred stock (significance level N/A because there is only 1 observation), 2.04% for acquirer convertible preferred stock (insignificant), 3.10% for target convertible preferred stock (insignificant), 0.33% for acquirer nonconvertible bond (insignificant), 1.22% for target nonconvertible bond (insignificant), 22.15% for acquirer convertible bond (significant), and 17.44% for target convertible bond (significant). For the non-conglomerate mergers, they report 6.14% valuation prediction errors for acquirer common stock (significant), 38.08% for target common stock (significant), 5.47% for acquirer nonconvertible preferred stock (significant), 7.30% for target nonconvertible preferred stock (significant), 24.30% for acquirer convertible preferred stock (significant), 56.33% for target convertible preferred stock (significance N/A), 1.90% for acquirer nonconvertible bond (significant), 0.50% for target nonconvertible bond (insignificant), 12.45% for acquirer convertible bond (insignificant), and 23.94% for target convertible bond (significant). They attribute the high average convertible securityholder returns to a relatively small fraction of in-the-money convertibles that experience very large wealth increases as a result of merger, and the even higher gains for convertible bonds than preferred stocks is driven by outlier bonds that have more favourable conversion terms. They also report a combined firm-security gain of 3.91% for conglomerate mergers (insignificant) and of 6.91% for non-conglomerate mergers (significant). In conclusion, conglomerate mergers support the wealth transfer hypothesis (lose of acquirer common stockholders and gain of other securityholders) and co-insurance hypothesis; the non-conglomerate mergers support co-insurance hypothesis and synergy hypothesis.

The later research from Penas and Unal (2004) and Billett et al. (2004) employ Lehman Brothers Fixed Income Database (LBFID) for the bond data. Billett et al. (2004) argue that previous studies fail to find significant wealth effects for target bonds may attribute to their bond database: first, due to the difficulty of obtaining

[5] Maquieira et al. (1998) only report significance levels up to 5%. In order to compare with other studies, I interpret their significance levels up to 10% for convention.

bond price data, existing studies have very small samples of bonds, which is unlikely to have sufficient statistical power to reject the null hypothesis of zero excess returns; second, existing studies use the matrix prices which may dilute the wealth effects of bonds in a merger. Hong and Warga (2000) summarises strengths for LBFID. First, this database provides a significant amount of bond-specific diagnostic and descriptive information including bond ratings, yields, and coupons. Second, Lehman Brothers directly collects bid quotes from its dealers on a majority of the bonds it trades or bonds that are of interest to its investor clientele, thus trader quotes other than matrix price dominate the database. However, LBFID also have weaknesses. First, Elton et al. (2001) and Penas and Unal (2004) argue that the data errors problem in LBFID requires examination of data with unusually high or low returns. Second, Billett et al. (2004) state that roughly 1/3 of the month-end bond prices in LBFID are matrix prices, thus time should be spent to sort them out. Third, Maxwell and Rao (2003) mention that LBFID contains only monthly data which could bias the study against finding any significant effects. Both Penas and Unal (2004) and Billett et al. (2004) calculate the excess bond returns by the market-adjusted model: excess return as the difference between a bond’s monthly raw return (change in price plus interest accrued) and the monthly return on an index with similar rating and remaining maturity.

Penas and Unal (2004) study the monthly abnormal security returns of 66 bank mergers with 282 bonds between 1991 and 1997 (15 deals have bond data for both target and acquirer). They report 0.704% return for the target firm bondholders (significant) and 0.074% return for the acquiring firm bondholders (insignificant) at the announcement month. They find positive return for target firm shareholders and negative return for acquiring firm shareholders at the announcement month (they do not report the return value and statistics). They further find that both bondholders and shareholders realise positive returns at the announcement month, and the relation between bond and equity returns is positive and statistically significant. Therefore, their research supports the co-insurance hypothesis, wealth transfer hypothesis (from acquiring firm shareholders to target firm shareholders) and the synergy hypothesis.

Billett et al. (2004) examine 940 M&A deals announced between 1979 and 1997. Their study has great improvement on the sample size. The acquiring firms have 3083 bonds in total and the target firms have 818 bonds in total. There are 141 deals that both the acquiring and target firms have bonds with valid announcement period returns. For the two-month excess returns, they discover 22.15% return for target stock, 0.15% for acquirer stock (insignificant), 1.09% for target bond and -0.17% for acquirer bond. The negative excess return of acquirer bonds denies the co-insurance hypothesis, and supports the wealth transfer hypothesis. By splitting the sample according to whether target firm bonds are investment grade or below investment grade, they find strong evidence of wealth transfer between bondholders (from low risk bondholders to high risk bondholders). They further test the wealth transfer effects by the risk effect, leverage effect and maturity effect, and find correct signs but none of them are statistically significant. At last, they test the combined excess security returns and report positive excess returns for the combined bonds value of acquiring firm and target firms, which is the evidence of synergy hypothesis.

Renneboog and Szilagyi (2007) publish the first working paper on bondholder wealth effects of M&A on European countries. They examine the monthly abnormal security returns of 225 M&A deals announced from 1995 through 2004. They collect Eurobond prices from the Reuters Fixed Income Database, which is a mix of matrix price and transaction price. The database and sample size problems of bond research outside of US are well known. Although Renneboog and Szilagyi (2007) broaden their sample to include both public and private companies and both domestic and cross-border announcements of all European countries, their search returns only 24 target firms with bonds (they do not report security returns for target firms), which cannot compete with the sample sizes of Maxwell and Stephens (2003), Maxwell and Rao (2003) and Billett et al. (2004) who focus on US public firms with LBFID database. Renneboog and Szilagyi (2007) follow Penas and Unal (2004) and Billett et al. (2004) to calculate the monthly abnormal bond returns by the market-adjusted model except that they use bond duration instead of remaining maturity for the index portfolio benchmark, and they add currency (euro vs. sterling) into the benchmark as well. For the two-month excess returns, they discover 0.73% for acquirer stock (insignificant), and 0.56% for acquirer bond with equal-weighed matching portfolio (significant). Due to the lack of target firm returns, their results cannot be interpreted with hypotheses.

Table 2-2 summarises the empirical results of prior studies with respect to hypotheses in this research. Asquith and Kim (1982) find positive target firm stock return hence positive total security return, which is supportive of the synergy effect. Eger (1983) finds positive acquiring firm bond return, positive target firm stock return, positive total bond return and hence positive total security return, which is supportive of the co-insurance hypothesis and synergy effect. Dennis and McConnell (1986) report positive acquiring firm stock return, positive target firm stock return, and hence positive total security return, which is supportive of the synergy effect. Travlos' (1987) study does not fit with any of the hypotheses. Maquieira et al. (1998) report that for conglomerate mergers, there are negative acquiring firm stock return, positive acquiring firm bond return, positive target firm stock return and positive target firm bond return, hence positive total bond return, which is supportive of the co-insurance hypothesis and wealth transfer hypothesis; for non-conglomerate mergers, all the returns are positive, which is supportive of the co-insurance hypothesis and the synergy hypothesis. Penas and Unal (2004) discover negative acquiring firm stock return, positive target firm stock return, positive target firm bond return, and hence positive total bond return and total security return, which is supportive of the co-insurance hypothesis, wealth transfer hypothesis and synergy hypothesis. Billett et al. (2004) reports negative acquiring firm bond return, positive target firm stock return, positive target firm bond return, and hence positive total security return, which is supportive of the wealth transfer hypothesis and synergy hypothesis. Renneboog and Szilagyi's (2007) result does not fit with any of the hypotheses.

Table 2-2 Empirical Results

This table reviews the empirical results of previous researches about the impact of M&A on shareholders and bondholders wealth in regarding to the five hypotheses: co-insurance effect, wealth transfer, synergy effect, hubris hypothesis and bond return based hubris hypothesis.

Authors	S_A	B_A	S_T	B_T	$S_A + S_T$	$B_A + B_T$	$S_A + B_A + S_T + B_T$	Conclusion
Asquith and Kim(1982)	~	~	+	~			+	synergy
Eger(1983)	~	+	+	~		+	+	co-insurance synergy
Dennis and McConnell(1986)	+	~	+	~		~	+	synergy
Travlos(1987)								
· stock exchange	-	-						-
· cash payment	~	~						-
Maquieira et al. (1998)								
· conglomerate	-	+	+	+	~	+	~	co-insurance wealth transfer
· non-conglomerate	+	+	+	+	+	+	+	co-insurance synergy
Penas and Unal (2004)	-	~	+	+	+	+	+	co-insurance wealth transfer synergy
Billett et al. (2004)	~	-	+	+	+	~	+	wealth transfer synergy
Renneboog and Szilagyi (2007)	~	+						-

S_A —acquiring firm share price; B_A —acquiring firm bond price;

S_T —target firm share price; B_T —target firm bond price

"~" means there is no significant change on return of securities

Chapter 3 Methodology and Results on Short-Run Returns

3.1. Methodology

This chapter includes four research questions: the overall security returns, the combined security returns, the univariate analysis and the multivariate analysis. The overall security returns and the combined security returns rely on the five hypotheses in Section 2.3. The univariate analysis and the multivariate analysis rely on hypotheses stated in Section 3.2.3.

In the overall security returns section, the market-adjusted return (MAR) and abnormal return (AR) of stocks and bonds are examined in a forty-one day event window (-20, +20) and a three day event window (-1, +1). The abnormal return is based on an event study with a two-hundred day estimation window (-230, -31). The market index of stock is *FTSE all share* and the market index of bond is *FT fixed interest*. These excess returns are used to test the co-insurance hypothesis, the wealth transfer hypothesis, the synergy hypothesis, the hubris hypothesis, and the bond return based on hubris hypothesis. The combined security returns are studied by combining the excess returns of stock/bond and target/acquirer as value-weighted average of the excess security returns to further test these hypotheses. The univariate section tests the influences of deal characteristics on the excess returns of stocks and bonds. The deal characteristics include method of payment, hostility, industry relatedness, relative size and market trend. Hypotheses of the influences of these deal characteristics are discussed in detail in Section 3.2.3. The multiple analysis section tests the influences of the above deal characteristics on excess security returns by a multiple regression (OLS).

3.1.1 Data

The initial task of an event study is to define the event and to identify the event window. In this research the event is the announcement of M&A and the measurable financial variables are stock and bond prices. This research focuses on the daily return of stocks and bonds, labelling the announcement day of M&A as the event date day 0, the previous day of the announcement as day -1 and the next day of the announcement as day 1. The estimation window is a 200 day window (-230,-31) and the event windows are a three day window (-1, +1) and a 41 day window (-20, +20). Given that event windows are shorter than 1 calendar year, this study is a short-term event study.

M&A announcements information are obtained from Thomson One Banker (TOB). The screen criteria for inclusion of a firm are set as following:

- Database: All Mergers & Acquisitions
- Acquirer Nation: United Kingdom
- Target Nation: United Kingdom
- Acquirer Public Status: Public
- Target Public Status: Public
- Deal Value (Pounds Sterling in Millions): 10 or more
- Deal Announced: between 1st Jan 1994 and 31st Dec 2006
- Deal Status: Completed
- Percent of Shares Held by Acquirer at Announcement: less than 50%
- Percent of Shares Owned by Acquirer after Transaction: 50% or more

These criteria ensure that all firms are British domestic firms listed on the London Stock Exchange. The start time is set to 1994 because the UK's aggregate acquisitions value increased significantly from 1994 (Sudarsanam, 2003), though there was a decline between 2001 and 2003. Characteristically, the acquirer owns less than 50% of target shares before the announcement and owns more than 50% after the deal, makes the transaction a typical M&A.

TOB identifies 392 deal announcements which satisfy the selection criteria. By eliminating 12 self-tender deals, 3 reverse-takeover deals, 67 deals where either the target firm or acquiring firm has no stock data, finally 310 deal announcements meet the research criteria. The number of deals increases steadily between the year 1994 and 1999, from 16 deals to 60, and decreases between the years 2000 and 2006, from 39 to 6, although there is an increase in 2005. The distribution of the mean value of deals ascends between the year 1994 and 2000, from 186.111 to 1994.148 million pounds, and descends afterwards to 247.232 million pounds in the year 2006. The change of deal numbers and values reflects the wave of M&A macro economy.

Table 3-1 Deal Numbers and Values

This table describes the statistics of M&A deal numbers and values. The sample comes from M&A deals announced between 1994 and 2006 and both the target firms and acquiring firms are UK public firms with valid daily stock price data.

Year	No.	Min	Med	Max	Mean	Std. Dev
1994	16	15.200	54.715	796.000	186.111	247.047
1995	23	10.280	121.040	8987.000	802.780	1962.235
1996	30	10.400	59.998	2527.000	370.183	659.505
1997	35	11.000	44.300	1296.280	140.661	234.677
1998	38	10.120	52.825	6757.457	486.867	1266.725
1999	60	11.676	76.453	23785.050	682.618	3082.747
2000	39	12.230	135.589	46479.133	1994.148	7501.499
2001	19	10.708	62.057	10358.221	664.351	2353.630
2002	11	12.433	192.240	6482.976	864.610	1889.018
2003	10	14.971	74.937	2982.336	397.973	913.600
2004	5	40.307	248.242	540.125	243.575	210.278
2005	18	15.828	81.710	2941.804	385.783	708.444
2006	6	11.531	167.473	560.819	247.232	250.354
Total	**310**	**10.120**	**76.109**	**46479.133**	**678.899**	**3168.080**

Data Source: Thomson One Banker (Deal Values are in million of sterling pounds).

To count the target firms and the acquiring firms separately, the 310 deal announcements involve 310 target firms and 266 acquiring firms. For target firms only, each firm appears just once; for acquiring firms only, 230 firms engage in just one deal, 30 firms engage in two deals, 4 firms engage in three deals and 2 firms engage in four deals.

To combine the target firm and the acquiring firm lists, 553 different firms are involved in the deals; 496 firms appear only once (account for 89.70% of 553), 49 firms appear twice (8.86%), 6 firms appear three times (1.08%) and 2 firms appear four times (0.36%), and among them 23 firms come out as both the acquirer and the target. For firms involved in more than one deal, 10 firms (1.81% of 553 firms) have successive deals within 250 trading days. The weak overlapping effect of the event windows of individual securities enables the assumption of the absence of clustering.

The daily stock price and the daily stock index for the market (*FTSE all shares*), and the daily bond price and the daily bond index for the market (*FT fixed interest*) are from Datastream Advance.

3.1.2 Modelling

An *event study* is an empirical study examines the influence of a specific event on the behaviour of a particular financial variable. The usefulness of event studies arises from the fact that the magnitude of abnormal performance of the financial variables provides a measure of the unanticipated impact on the wealth of the firm's securityholders (Kothari and Warner, 2004). It assumes an efficient financial market so that the effect of an event will be reflected immediately in security prices (MacKinlay, 1997).

In accounting and finance research, events can be M&A, share split, share repurchase, asset sale, announcement of earnings, issues of new securities, and so on; in the field of law and economics, events can be a change in regulation (MacKinlay, 1997). Stock prices or bond prices are the most frequently selected variables.

This research analyses the excess returns of stocks and bonds by the market adjusted return model and the market model.

The daily security price can be measured by various benchmarks such as the opening price, the closing price, the daily high price, the daily low price, and so on. This research uses Datastream total return index (*RI*) as the closing price of stocks and corporate bonds[6]. By defining $P_{i\tau}$ as the closing price for security *i* and for trading day τ, the actual return of security *i* on trading day τ is defined as:

$$R_{i\tau} = ln(\frac{P_{i\tau}}{P_{i(\tau-1)}})$$

Normal return is defined as the return that would be expected without the event; the abnormal return is the actual ex post return of the security over the event period minus the normal return of this security over that period (Campbell, Lo and MacKinlay, 1997). For firm i and event date τ the abnormal return is expressed as:

[6] Datastream: for stocks, *RI* shows a theoretical growth in value of a security holding over a specified period, assuming that dividends or coupons are re-invested to purchase additional units of a security at the closing price applicable on the ex-dividend date. For bonds, *RI* is the return on investment, including interest payments, as well as appreciation or depreciation in the price of the bond.

$$AR_{i\tau} = R_{i\tau} - E(R_{i\tau} \mid X_\tau)$$

where $AR_{i\tau}$, $R_{i\tau}$ and $E(R_{i\tau} \mid X_\tau)$ are abnormal return, actual return and normal return respectively; X_τ is the conditioning information for the normal return model.

Market adjusted return model (or the index model) assumes that security *i* on trading day τ earns the market rate of return $R_{m\tau}$, so the abnormal return $AR_{i\tau}$ is the difference between $R_{i\tau}$ and $R_{m\tau}$: $AR_{i\tau} = R_{i\tau} - R_{m\tau}$. Market adjusted return model is an approximation to the market model assuming α_i =0 and β_i =1 for all firms.

Market model relates the return of any given security to the return of the market portfolio, and its linear specification follows from the assumed joint normality of asset returns. It assumes that asset returns are jointly multivariate normal and independently and identically distributed through time (Campbell, Lo and MacKinlay, 1997). The model is specified as:

$$R_{i\tau} = \alpha_i + \beta_i R_{m\tau} + \varepsilon_{i\tau}$$

Where $R_{i\tau}$ = period τ returns on security *i*

$R_{m\tau}$ = period τ returns on market portfolio

$\varepsilon_{i\tau}$ = zero mean disturbance term, $E(\varepsilon_{i\tau}) = 0$, $Var(\varepsilon_{i\tau}) = \sigma^2_{\varepsilon_i}$

$\alpha_i, \beta_i, \sigma^2_{\varepsilon_i}$ = parameters of the market model

Ordinary least squares (OLS) method is used to estimate parameters of the market model. Regressions are based on the data from estimation window. For the i^{th} firm in the event time, OLS estimators of parameters are (MacKinlay, 1997):

$$\hat{\beta}_i = \frac{\sum_{\tau=T_0+1}^{T_1} (R_{i\tau} - \hat{\mu}_i)(R_{m\tau} - \hat{\mu}_m)}{\sum_{\tau=T_0+1}^{T_1} (R_{m\tau} - \hat{\mu}_m)^2}$$

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_i \hat{\mu}_m$$

$$\hat{\sigma}^2_{\varepsilon i} = \frac{1}{L_1 - 2} \sum_{\tau=T_0+1}^{T_1} (R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau})^2$$

where $\hat{\mu}_i = \frac{1}{L_1} \sum_{\tau=T_0+1}^{T_1} R_{i\tau}$

$\hat{\mu}_m = \frac{1}{L_1} \sum_{\tau=T_0+1}^{T_1} R_{m\tau}$

L_1 is the length of estimation window starts on $T_0 + 1$ and ends on T_1

The abnormal return is the disturbance term of the market model calculated on an out-of-sample basis for the i th firm at period τ :

$$AR_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau}$$

The abnormal return observations must be aggregated through time and across securities (it is equivalent aggregate firstly either by time or by securities) so as to draw overall inferences for the event of interest (MacKinlay, 1997). By aggregating an individual security's abnormal return through time to get the cumulative abnormal return (CAR):

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau}$$

where $\tau = T_1 + 1$ to $\tau = T_2$ represents the event window ($T_1 < \tau_1 \leq \tau_2 \leq T_2$), and the variance of CAR_i is:

$$\sigma_i^2(\tau_1, \tau_2) = (\tau_2 - \tau_1 + 1)\sigma_{\varepsilon_i}^2$$

By aggregating on time and on security, the cumulative average abnormal return (CAAR) is:

$$CAAR(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^{N} CAR_i(\tau_1, \tau_2)$$

The null hypothesis is that the cumulative average abnormal return will be jointly normally determined with a zero conditional mean and conditional variance, $CAAR(\tau_1, \tau_2) \sim N[0, \sigma^2(CAAR(\tau_1, \tau_2))]$, i.e.,

$$E[CAAR(\tau_1, \tau_2)] = 0$$

$$\sigma^2(CAAR(\tau_1, \tau_2)) = \frac{1}{N^2} \sum_{i=1}^{N} \sigma_i^2(\tau_1, \tau_2)$$

The significance of the cumulative average abnormal return is tested by a one-sample *t*-statistic and a *Z*-statistic:

$$t = \frac{CAAR(\tau_1,\tau_2) - E[CAAR(\tau_1,\tau_2)]}{SE[CAAR(\tau_1,\tau_2)]} \sim N(0,1)$$

$$Z = \frac{CAAR(\tau_1,\tau_2) - E[CAAR(\tau_1,\tau_2)]}{\sqrt{\sigma^2(CAAR(\tau_1,\tau_2))}} \sim N(0,1)$$

whereas the distribution result of *Z* is asymptotic with respect to the estimation window length L_1 and the number of securities *N* (MacKinlay, 1997).

Because the market model takes explicit account of both the risk associated with the market and the mean returns, it is the most widely used method (Weston and Weaver, 2001) and "no better alternative has yet been found despite the weak relationship between beta and actual returns" (Armitage, 1995: 25).

3.1.3 Discussion on Thin Trading

It is quite common that securities are traded in an irregular frequency but their prices are recorded with a factitiously regular frequency. The factual trading frequency can be either higher or lower than the recording frequency.

In the first situation that the securities' trading frequency is higher than the recording frequency, there rises the question that which kind of sampling intervals is optimal in the event study. Suppose in a perfect state that the database allows research on various sampling intervals—hourly, daily, weekly, monthly, yearly, and so on, researchers have to decide whether the more frequent sampling or the less frequent sampling is better. MacKinlay (1997) tests the abnormal return of 1 percent for 1 to 200 securities by comparing the tests of daily, weekly and monthly data, and concludes that "there is a substantial payoff in terms of increased power from reducing the sampling interval". Hence in an event study, data with the shortest interval (or with the highest frequency) is the most favourable.

By employing data with a high recording frequency, researches unsurprisingly fall into the second situation that the trading frequency is lower than the recording frequency, which is called an infrequent trading, or non-synchronous trading, or thin trading. The effect of the thin trading on the variances and covariances of individual securities leads to biased and inconsistent estimation of the coefficient of systematic risk, β, for the market model (MacKinlay, 1997): for frequently traded securities, the β is biased upward; for infrequently traded securities, the β is biased downward (Dimson, 1979). A biased β estimate may result in biased abnormal return and misspecified test statistics in the event studies (Strong, 1992).

Quite a few attempts have been made to justify the bias in Ordinary Least Square (OLS) estimates of β. Two dominant methods are introduced by Scholes and Williams (1977) and Dimson (1979), respectively.

Scholes and Williams (1977) define the estimate of β for the i^{th} firm as:

$$\hat{\beta}_i = \frac{\beta_i^{-1} + \beta_i^{0} + \beta_i^{+1}}{1 + 2\hat{\rho}_m}$$

where β_i^{-1} =estimator of the slope coefficient in a simple regression by regressing the contemporary return on the i^{th} security against the previous return on the market index;

β_i^{0} =estimator of the slope coefficient in a simple regression by regressing the contemporary return on the i^{th} security against the current return on the market index;

β_i^{+1} =estimator of the slope coefficient in a simple regression by regressing the contemporary return on the i^{th} security against the subsequent return on the market index;

$\hat{\rho}_m$ =the estimated first-order autocorrelation coefficient for the market index.

Scholes and Williams apply their consistent estimate of β to the daily returns from securities listed on the New York Stock Exchange (NYSE) and American Stock Exchange (ASE) between January 1963 and December 1975. They allocate each security into 1 of the 5 portfolios according the level of the security's trading volume, and compare these estimated betas with those corresponding betas derived from the

OLS. They find out that the portfolio of securities with the lowest level of trading volume generates a larger β than the corresponding OLS estimate β; the portfolio of securities with the highest level of trading volume generates a smaller β than the corresponding OLS estimate β.

Dimson's aggregated coefficients method (1979) describes the estimate of β for the i^{th} firm as:

$$\hat{\beta}_i = \sum_{\tau=-n}^{+n} \hat{\beta}_{i\tau}$$

where $\hat{\beta}_{i\tau}$ =estimators of the slope coefficients in a multiple regression by regressing the contemporary return on the i^{th} security against the previous, current and subsequent returns on the market index with time period $\tau = -n, -n+1, ..., -1, 0, 1, \ldots, n-1, n$.

Dimson apply his aggregated coefficients method to the monthly returns from a one-in-three random sample of all stocks listed on the London Stock Exchange (LSE) between January 1955 and December 1974. He allots each stock into 1 of the 10 portfolios according to the average age of its month-end price (trading frequency), and then compare these estimated betas with those corresponding betas derived from the OLS. Dimson draws the same conclusion as Scholes and Williams that the aggregated coefficients estimate of β is larger than the OLS estimate of β when the trading frequency is low, and vice versa.

Brown and Warner (1985) examine 50 randomly selected securities with daily return data from the CRSP, and compare the coefficient estimators ($\hat{\alpha}$ and $\hat{\beta}$) obtained through the OLS market model, the Scholes-Williams procedure and the Dimson aggregated coefficient method, respectively. They conclude that in the occurrence of thin trading, procedures other than the OLS for estimating the market model "convey no clear-cut benefit in detecting abnormal performance".

Later researches affirm the same outcome. Dyckman et al. (1984) consider that neither the Scholes-Williams nor the Dimson method of estimating β improves the specification or power of the tests (the Brown and Warner 1985 paper is in fact published earlier than the Dyckman, et al. 1984 paper). Jain (1986) finds out that the Scholes-Williams corrections for thin trading do not improve the distributions of β over the OLS method. Campbell and Wasley (1993) discover that the Scholes-Williams adjustment does not yield significant improvement in either Type I error or the power of the test beyond the OLS estimation. Bartholdy and Riding (1994) claim that neither the Scholes-Williams nor the Dimson bias-correcting procedures provide incremental benefits over OLS estimation; moreover, “from the perspective of bias, efficiency and consistency, none of the most commonly used correction procedures is superior to OLS estimation”. Consistency of these empirical results may attribute to the factor that although the OLS market model estimation might be biased for sub-estimation-periods or for individual securities, in an event study, the bias may average out to zero for the whole sample (Strong, 1992).

3.2. Results

3.2.1 Overall Returns

3.2.1.1 Stock Returns

In this section the overall excess returns of stocks are examined. Based on the 41 day event window (-20, +20) and the 3 day event window (-1, +1), the results of MAR and AR are reported for target firms and acquiring firms.

Table 3-2 shows the average excess stock returns and cumulative average excess stock returns for 310 target firms assembling on each day of the event window (-20, +20). MAR is for market adjusted return, CMAR is for cumulative market adjusted return, AR is for abnormal return and CAR is for cumulative abnormal return. From event day -8 to +1, the daily average aggregate MARs and ARs of the target firms are positive and statistically significant. On day 0, the MAR is 10.213% and the AR is 10.303%. The cumulative average returns for the 41 day event window (-20, +20) are all positive: CMAR is 20.631% and CAR is 22.507%.

Table 3-2 Target Firm Average Stock Returns in Event Window

The average MAR and AR for 310 target firms are reported assembling on each day of the event window (-20, +20). The sample comes from M&A deals announced between 1994 and 2006 and both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is for market adjusted return, CMAR is for cumulative market adjusted return, AR is for abnormal return and CAR is for cumulative abnormal return. The one-sample *t*-statistic examines whether MAR and AR are statistically different from zero. ***, ** and * denotes the significance level at 1%, 5% and 10%.

Day	MAR%	*t*	CMAR%	AR%	*t*	CAR%
-20	0.379	1.819*	0.379	0.374	1.784*	0.374
-19	0.106	0.683	0.486	0.109	0.707	0.483
-18	-0.123	-0.807	0.363	-0.064	-0.429	0.419
-17	0.205	1.055	0.568	0.264	1.400	0.683
-16	0.146	1.182	0.715	0.218	1.938**	0.901
-15	-0.005	-0.024	0.710	0.025	0.131	0.926
-14	0.300	1.487	1.010	0.442	2.203**	1.368
-13	0.500	2.653***	1.511	0.554	3.051***	1.922
-12	0.126	0.622	1.637	0.225	1.101	2.147
-11	0.179	1.188	1.816	0.276	1.868*	2.424
-10	0.191	1.191	2.007	0.240	1.537	2.664
-9	0.087	0.508	2.094	0.176	1.060	2.839
-8	0.386	1.779*	2.480	0.398	1.857*	3.237
-7	0.581	2.899***	3.061	0.559	2.784***	3.796
-6	0.640	2.950***	3.700	0.641	3.012***	4.437
-5	0.599	2.815***	4.299	0.622	2.927***	5.059
-4	0.847	3.152***	5.146	0.919	3.495***	5.978
-3	0.543	2.403**	5.689	0.613	2.731***	6.592
-2	0.734	2.681***	6.423	0.759	2.811***	7.351
-1	2.085	6.177***	8.508	2.087	6.203***	9.438
0	10.213	12.681***	18.721	10.303	12.747***	19.741
1	0.638	2.572***	19.359	0.673	2.728***	20.414
2	0.127	0.901	19.486	0.141	1.047	20.555
3	-0.048	-0.509	19.438	0.001	0.015	20.557
4	0.116	0.984	19.554	0.186	1.680*	20.743
5	0.071	0.722	19.624	0.168	1.892*	20.911
6	0.005	0.046	19.630	0.077	0.716	20.987
7	0.047	0.471	19.677	0.054	0.569	21.042
8	-0.189	-0.755	19.488	-0.141	-0.571	20.901
9	0.157	1.939**	19.645	0.138	1.954**	21.039
10	0.230	1.570	19.875	0.181	1.293	21.221
11	0.039	0.374	19.914	0.141	1.489	21.361
12	-0.167	-1.800*	19.747	-0.089	-1.097	21.272
13	-0.024	-0.263	19.724	0.069	0.868	21.341
14	0.162	1.654*	19.886	0.190	2.201**	21.531
15	0.087	0.840	19.973	0.117	1.293	21.648
16	0.182	2.088**	20.155	0.226	2.785***	21.875
17	0.219	1.772*	20.374	0.303	2.559***	22.177
18	0.115	0.744	20.489	0.111	0.745	22.288
19	0.190	2.134**	20.679	0.179	2.286**	22.467
20	-0.048	-0.491	20.631	0.040	0.494	22.507

Table 3-3 shows the average excess stock returns and cumulative average excess stock returns for 310 acquiring firms assembling on each day of the event window (-20, +20). The MARs are negative and statistically significant on day 0 and day +1; the ARs are negative and statistically significant from day -2 through day +2. On event day 0, MAR is -0.892% and AR is -0.904%. The cumulative average returns for the 41 day event window (-20, +20) are -0.728% for CMAR and -1.938% for CAR.

Table 3-3 Acquirer Firm Average Stock Returns in Event Window

The average MAR and AR for 310 acquiring firms are reported assembling on each day of the event window (-20, +20). The sample comes from M&A deals announced between 1994 and 2006 and both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is for market adjusted return, CMAR is for cumulative market adjusted return, AR is for abnormal return and CAR is for cumulative abnormal return. The one-sample *t*-statistic examines whether MAR and AR are statistically different from zero. ***, ** and * denotes the significance level at 1%, 5% and 10%.

Day	MAR%	*t*	CMAR%	AR%	*t*	CAR%
-20	0.086	0.674	0.086	0.007	0.061	0.007
-19	-0.110	-0.903	-0.025	-0.150	-1.293	-0.143
-18	-0.064	-0.506	-0.088	-0.058	-0.467	-0.200
-17	-0.164	-1.685*	-0.252	-0.168	-1.770*	-0.368
-16	0.053	0.513	-0.199	0.003	0.036	-0.365
-15	-0.173	-1.897*	-0.372	-0.247	-2.751***	-0.612
-14	-0.010	-0.079	-0.382	0.029	0.252	-0.584
-13	0.223	1.564	-0.158	0.133	0.936	-0.451
-12	-0.113	-0.858	-0.272	-0.142	-1.133	-0.593
-11	-0.020	-0.149	-0.292	-0.057	-0.427	-0.650
-10	0.186	1.386	-0.106	0.186	1.438	-0.464
-9	-0.026	-0.243	-0.132	-0.041	-0.395	-0.505
-8	0.004	0.031	-0.128	-0.035	-0.313	-0.539
-7	-0.150	-1.131	-0.279	-0.191	-1.498	-0.730
-6	0.280	2.353**	0.002	0.229	2.006**	-0.502
-5	0.072	0.637	0.073	0.052	0.479	-0.450
-4	0.209	1.907*	0.283	0.190	1.792*	-0.260
-3	0.021	0.182	0.303	-0.018	-0.164	-0.278
-2	-0.172	-1.739*	0.132	-0.187	-1.957**	-0.465
-1	-0.167	-1.446	-0.035	-0.209	-1.894*	-0.674
0	-0.892	-2.881***	-0.927	-0.904	-2.936***	-1.578
1	-0.439	-2.795***	-1.366	-0.516	-3.419***	-2.094
2	-0.220	-1.572	-1.586	-0.247	-1.753*	-2.341
3	-0.063	-0.558	-1.649	-0.101	-0.962	-2.442
4	0.297	2.425**	-1.353	0.266	2.264**	-2.176
5	-0.044	-0.311	-1.397	-0.042	-0.304	-2.219
6	0.086	0.921	-1.310	0.087	0.990	-2.132
7	0.010	0.090	-1.300	-0.049	-0.471	-2.181
8	0.058	0.532	-1.242	0.042	0.397	-2.138
9	0.380	3.695***	-0.862	0.284	2.916***	-1.855
10	-0.108	-0.773	-0.969	-0.197	-1.421	-2.052
11	-0.166	-1.551	-1.136	-0.166	-1.597	-2.218
12	0.060	0.346	-1.075	0.051	0.294	-2.167
13	0.013	0.095	-1.063	0.018	0.142	-2.149
14	-0.051	-0.308	-1.113	-0.043	-0.267	-2.192
15	0.045	0.402	-1.069	-0.023	-0.215	-2.214
16	0.004	0.042	-1.065	0.002	0.024	-2.212
17	0.066	0.550	-0.999	0.077	0.680	-2.135
18	0.000	0.002	-0.999	-0.037	-0.349	-2.172
19	0.223	1.988**	-0.776	0.168	1.563	-2.004
20	0.048	0.462	-0.728	0.066	0.686	-1.938

Chart 3-1 illustrates the cumulative MARs and ARs of the target and acquiring stocks from event day -20 to event day +20. It shows positive cumulative returns around 20% for target firms and negative cumulative returns around -1% for acquiring firms.

Chart 3-1 Cumulative Excess Stock Returns

This figure illustrates the cumulative MARs and ARs of the target and acquiring stocks from event day -20 to event day 20.

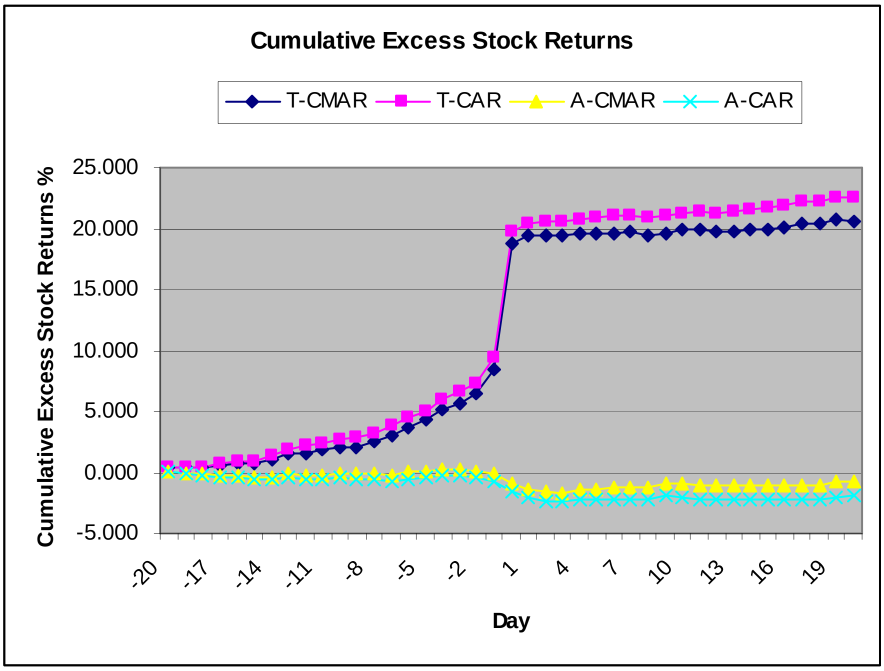

Table 3-4 utilizes the *t*-test (two-tailed) and *Z*-test to examine the null hypotheses that in the event window, the cumulative average MARs and ARs are zero. For target firms, all the returns are positive and statistically significant at 1% level. MAR (-20, +20) is 20.631%, AR (-20, +20) is 22.507%, MAR (-1, +1) is 12.936% and AR (-1, +1) is 13.063%. For acquiring firms, all the returns are negative and their absolute values are much smaller than target returns. Except MAR (-20, +20), all the other three returns are statistically significant. MAR (-20, +20) is -0.728%, AR (-20, +20) is -1.938%, MAR (-1, +1) is -1.498% and AR (-1, +1) is -1.629%. These results are consistent with previous studies on the shareholder wealth that target shareholders invariably gain from M&A and acquiring shareholders lose slightly, which does not support the synergy hypothesis but supports the wealth transfer from acquiring shareholders to target shareholders.

Table 3-4 Overall Stock Returns

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is market adjusted return and AR is abnormal return. The one-sample *t*-statistic (two-tailed) and *Z*-statistic examines whether MAR and AR are statistically different from zero. ***, ** and * denotes the significance level at 1%, 5% and 10%.

	Target Stocks (N=310)				Acquirer Stocks (N=310)			
	Return Value%	t-statistic	Z-statistic	N of Positive Returns	Return Value%	t-statistic	Z-statistic	N of Positive Returns
MAR(-20,+20)	20.631	16.075***		272	-0.728	-0.864		146
AR(-20,+20)	22.507	16.793***	24.529***	266	-1.938	-2.030**	-2.677***	147
MAR(-1,+1)	12.936	14.850***		264	-1.498	-3.839***		123
AR(-1,+1)	13.063	15.035***	52.631***	265	-1.629	-4.205***	-8.317***	126

3.2.1.2 Bond Returns

In this section the overall excess returns of bonds are examined. Among the 310 M&A deals, 37 bonds of 11 target firms and 131 bonds of 49 acquiring firms have valid data. Each firm is treated as a separate observation. If one firm has more than one bond, the excess bond returns of the firm is calculated as the value-weighted average (according to amount of issue) of the bonds to facilitate the high correlation between returns of bonds issued by the same firm. This approach avoids the inflated *t*-statistics and diminishes the effect of heavily weighted firms with multiple issues in the sample (Maxwell and Stephens, 2003). Kahle et al. (2008) argue that the economic significance of abnormal bond returns should be lower given the lower market risk premium that bonds earn relative to shares. Thus I predict the wealth effects on bondholders are less than on shareholders.

Table 3-5 shows the average excess bond returns and cumulative average excess bond returns for 11 target firms assembling on each day of the event window (-20, +20). Due to the small sample size, the one-sample *t* test is replaced by a non-parametric alternative. A parametric test assumes that the data are samples from a population with a specified distribution; the non-parametric tests do not make specific assumptions about population distributions and are therefore referred to as distribution-free tests (Kinnear and Gray, 2004). If the data set is small and there are some highly deviant outliers which can inflate the values of the denominators of the parametric tests, the parametric tests are likely to give misleading results, but non-parametric tests are able to overcome this problem. Basically, there is at least one nonparametric equivalent for each parametric general type of test. Here the Wilcoxon signed-rank test (Siegel, 1956) is used to examine the null hypothesis if the average excess returns assembling on each day is zero. It considers information about both the sign of the differences and the magnitude of the differences between pairs. On the event day 0, the daily average aggregate MAR and AR are positive and statistically insignificant. MAR is 3.441% and AR is 3.532%. The cumulative average returns for the 41 day event window (-20, +20) are 7.682% for CMAR and 7.404% for CAR.

Table 3-5 Target Firm Average Bond Returns in Event Window

The average MAR and AR for 11 target firms are reported assembling on each day of the event window (-20, +20). The sample comes from M&A deals announced between 1994 and 2006 and both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is for market adjusted return, CMAR is for cumulative market adjusted return, AR is for abnormal return and CAR is for cumulative abnormal return. If one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. The Wilcoxon signed-rank test is applied to test if MAR and AR are statistically different from zero. ***, ** and * denotes the significance level at 1%, 5% and 10%.

Day	MAR%	W	CMAR%	AR%	W	CAR%
-20	0.198	-2.134**	0.198	0.135	-1.067	0.135
-19	0.153	-1.245	0.351	0.098	-0.622	0.233
-18	0.092	-0.051	0.443	0.037	-0.445	0.270
-17	-0.040	-0.663	0.403	-0.057	-0.356	0.213
-16	0.003	-0.267	0.406	0.065	-0.800	0.278
-15	-0.196	-1.778*	0.210	-0.050	-0.356	0.228
-14	-0.185	-1.682*	0.026	-0.148	-1.600	0.080
-13	-0.063	-0.866	-0.037	0.026	-0.178	0.106
-12	-0.047	0.000	-0.084	-0.031	-0.445	0.075
-11	0.256	-0.978	0.172	0.173	0.000	0.248
-10	0.110	-0.968	0.282	-0.018	-0.711	0.230
-9	-0.238	-0.356	0.044	-0.265	-0.978	-0.035
-8	-0.090	-1.511	-0.046	-0.131	-2.134**	-0.166
-7	0.105	-0.889	0.059	0.039	-0.445	-0.126
-6	-0.065	-0.445	-0.007	-0.065	-0.445	-0.191
-5	-0.341	-0.267	-0.348	-0.287	-1.245	-0.478
-4	0.134	-0.978	-0.214	0.143	-0.356	-0.335
-3	0.108	-0.178	-0.107	0.203	-0.622	-0.131
-2	-0.528	-0.153	-0.635	-0.495	-1.245	-0.627
-1	1.023	-0.889	0.389	1.117	-1.245	0.491
0	3.441	-1.511	3.830	3.532	-1.600	4.022
1	0.618	-0.889	4.448	0.629	-0.889	4.651
2	0.110	-0.089	4.557	0.108	-0.711	4.760
3	-0.017	-0.178	4.541	-0.060	-0.533	4.700
4	0.152	-1.600	4.693	0.046	-0.267	4.746
5	0.096	-1.245	4.788	-0.012	-0.178	4.733
6	0.012	-0.445	4.800	-0.045	-0.356	4.688
7	0.310	-0.051	5.110	0.301	-0.978	4.990
8	-0.402	-1.600	4.708	-0.417	-2.312**	4.572
9	0.475	-0.178	5.183	0.368	0.000	4.941
10	1.448	-0.178	6.632	1.410	-0.178	6.351
11	-0.113	-1.778*	6.518	-0.032	-1.067	6.319
12	-0.083	-0.356	6.436	0.040	-0.445	6.360
13	0.054	-0.051	6.490	0.063	-0.267	6.422
14	0.958	-2.934***	7.448	0.907	-2.401**	7.329
15	-0.119	-1.156	7.329	-0.106	-0.978	7.223
16	-0.008	-0.089	7.321	-0.008	-0.089	7.215
17	0.013	-0.533	7.334	0.004	-0.622	7.219
18	0.088	-0.711	7.422	0.058	-0.622	7.277
19	0.061	-1.067	7.483	0.014	-0.178	7.291
20	0.199	-1.956**	7.682	0.114	-0.267	7.404

Table 3-6 shows the average excess bond returns and the cumulative average excess bond returns for 49 acquiring firms assembling on each day of the event window (-20, +20). The one-sample *t*-statistic examines whether MAR and AR are statistically different from zero. On the event day 0, the MAR and AR are negative and statistically insignificant. MAR is -0.092% and AR is -0.148%. The cumulative average returns for the 41 day event window (-20, +20) are -0.768% for CMAR and -0.961% for CAR.

Table 3-6 Acquiring Firm Average Bond Returns in Event Window

The average MAR and AR for 49 acquiring firms are reported assembling on each day of the event window (-20, +20). The sample comes from M&A deals announced between 1994 and 2006 and both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is for market adjusted return, CMAR is for cumulative market adjusted return, AR is for abnormal return and CAR is for cumulative abnormal return. If one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. The one-sample *t*-statistic examines whether MAR and AR are statistically different from zero. ***, ** and * denotes the significance level at 1%, 5% and 10%.

Day	MAR%	W	CMAR%	AR%	W	CAR%
-20	-0.056	-2.466***	-0.056	-0.027	-1.597	-0.027
-19	0.009	-0.201	-0.047	-0.004	-0.274	-0.031
-18	0.021	-0.025	-0.026	0.028	-0.254	-0.003
-17	0.001	-0.475	-0.025	-0.011	-1.010	-0.014
-16	-0.110	-0.431	-0.135	-0.081	-0.035	-0.096
-15	-0.080	-0.444	-0.215	-0.070	-0.532	-0.166
-14	0.014	-0.544	-0.201	0.024	-0.522	-0.142
-13	0.055	-0.562	-0.146	0.043	-0.214	-0.099
-12	-0.105	-1.354	-0.251	-0.076	-1.427	-0.175
-11	0.038	-0.612	-0.213	0.031	-0.602	-0.145
-10	-0.023	-0.646	-0.235	-0.014	-0.244	-0.159
-9	-0.046	-0.671	-0.282	-0.043	-0.403	-0.201
-8	0.001	-0.522	-0.281	-0.013	-0.045	-0.215
-7	-0.100	-1.069	-0.380	-0.118	-1.776*	-0.333
-6	-0.009	-0.761	-0.389	-0.055	-0.303	-0.387
-5	0.006	-1.097	-0.384	-0.047	-0.413	-0.434
-4	-0.000	-0.592	-0.384	-0.035	-0.204	-0.469
-3	0.137	-0.463	-0.246	0.170	-0.831	-0.299
-2	0.022	-0.944	-0.225	0.020	-0.612	-0.279
-1	-0.060	-0.010	-0.285	-0.070	-0.492	-0.349
0	-0.092	-1.000	-0.376	-0.148	-0.035	-0.497
1	-0.055	-0.283	-0.431	-0.076	-1.517	-0.573
2	-0.037	-0.065	-0.468	-0.016	-0.592	-0.589
3	-0.122	-1.378	-0.590	-0.073	-0.124	-0.662
4	-0.035	-0.124	-0.625	-0.022	-0.154	-0.684
5	-0.017	-0.174	-0.642	-0.050	-0.443	-0.734
6	0.046	-1.149	-0.596	0.013	-0.204	-0.721
7	0.054	-0.055	-0.541	0.062	-0.124	-0.659
8	-0.045	-0.373	-0.586	-0.050	-0.224	-0.709
9	-0.039	-0.113	-0.625	-0.046	-0.532	-0.755
10	-0.071	-0.246	-0.696	-0.090	-0.005	-0.845
11	-0.103	-0.960	-0.798	-0.069	-0.811	-0.914
12	0.058	-0.913	-0.741	0.080	-1.159	-0.834
13	0.149	-2.297**	-0.592	0.117	-1.477	-0.717
14	-0.075	-0.980	-0.667	-0.064	-0.751	-0.782
15	0.018	-0.492	-0.649	-0.009	-0.612	-0.790
16	-0.037	-0.562	-0.686	-0.036	-1.189	-0.826
17	0.036	-0.642	-0.650	0.006	-0.671	-0.820
18	-0.149	-1.417	-0.798	-0.139	-1.288	-0.959
19	0.007	-0.482	-0.791	0.004	-0.264	-0.955
20	0.023	-1.020	-0.768	-0.006	-1.616	-0.961

Chart 3-2 illustrates the cumulative MARs and ARs of the target and acquiring bonds from event day -20 to event day +20. It shows positive cumulative returns around 7% for target firms and negative cumulative returns around -0.8% for acquiring firms. The trend is similar to stocks.

Chart 3-2 Cumulative Excess Bond Returns

This figure illustrates the cumulative MARs and ARs of the target and acquiring bonds from event day -20 to event day 20.

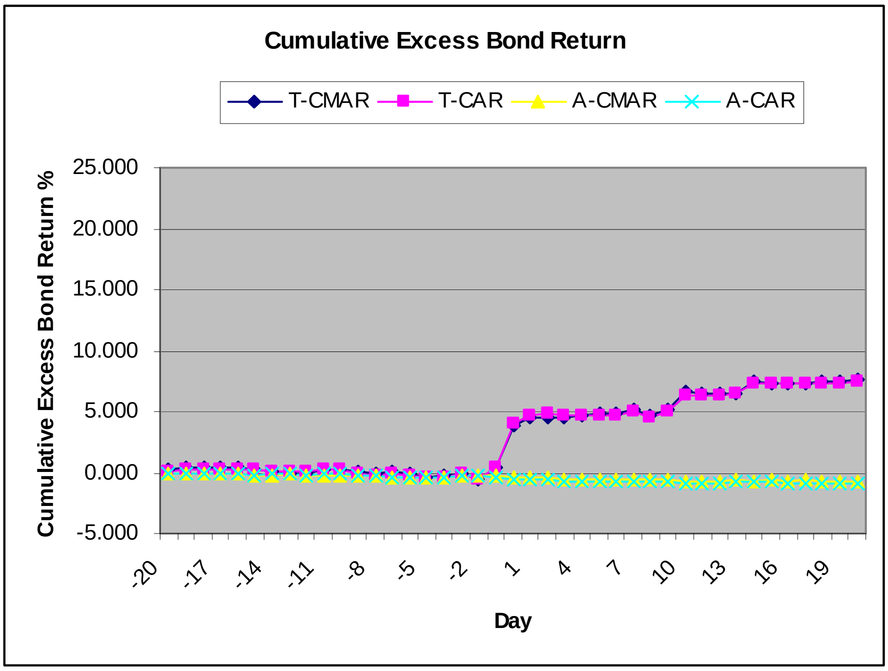

Table 3-7 utilizes the *Z*-test and the Wilcoxon signed ranks test to examine the null hypotheses that in the event window, the cumulative average MARs and ARs are zero. For target firms, all the returns are positive. Both *Z*-tests for AR (-20, +20) and AR (-1, +1) are significant at 1% level. The Wilcoxon tests for MAR (-1, +1) and AR (-1, +1) are significant at 5% level. For acquiring firms, all the returns are negative. The Wilcoxon test for AR (-20, +20) is significant at 5% level. These results indicate that target firm bondholders gain while acquiring firm bondholders lose, and these wealth effects are smaller than shareholder wealth effect as predicted by Kahle et al. (2008). These results are consistent with Billett (2004). The significant wealth gain for target bondholders and significant (the AR (-20, +20)) loss for acquirer bondholders supports the wealth transfer from acquiring bondholders to target bondholders.

Table 3-7 Overall Bond Return

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. The sample is made up of 11 target firms with 37 bonds and 49 acquiring firms with 131 bonds. MAR is market adjusted return and AR is abnormal return. If one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. The *Z*-test and Wilcoxon signed ranks test examines whether MAR and AR are statistically different from zero. ***, ** and * denotes the significance level at 1%, 5% and 10%.

	Target Firms (N=11)				Acquirer Firms (N=49)			
	Return Value%	Z-statistic	Wilcoxon	N of Positive Returns	Return Value%	Z-statistic	Wilcoxon	N of Positive Returns
MAR(-20,+20)	7.682		-1.156	6	-0.768		-0.721	22
AR(-20,+20)	7.404	6.048***	-1.067	6	-0.961	-0.747	-1.965**	16
MAR(-1,+1)	5.082		-2.045**	9	-0.206		-0.313	23
AR(-1,+1)	5.278	15.939***	-2.045**	9	-0.294	-0.845	-1.099	22

3.2.2 Combined Security Returns

This section examines the combined excess security returns based on the method of Billett et al. (2004). The combined stock/bond and target/acquirer total excess returns are calculated as value-weighted average of the excess security return in the combination. When one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. The weights of stocks are based on the market value of firms 40 trading days before the announcements; the weights of bonds are based on the fiscal-year-end book value of long-term debt of firms before the announcements. The formulation assumes that the excess returns of a firm's short-term debt and debt-like instruments are zero, and all of a firm's long-term debt has the same excess return as the firm's bonds been tracked.

Table 3-8 reports the results for: (1) *Stock*: the value-weighted aggregate excess stock returns of both target firms and acquiring firms; (2) *Bond*: the value-weighted aggregate excess bond returns of both target firms and acquiring firms; (3)*Target*: the value-weighted aggregate excess stock and bond returns of target firms; (4)*Acquirer*: the value-weighted aggregate excess stock and bond returns of acquiring firms; (5) *5 Deals*: the value-weighted aggregate stock and bond return of 5 deals that both the target firms and acquirer firms have valid bond data; (6)*Total*: the value-weighted aggregate return of target and acquirer total excess stock and bond returns for the entire sample. Wilcoxon signed rank test examines whether MAR and AR are statistically different from zero.

The combined *Stock* returns in Table 3-8 are negative and statistically significant. The explanation is that the large gains of target shareholders are offset by the small losses of acquirer shareholders due to the larger size of acquirer firms compared with target firms when the excess returns are calculated as value-weighted. The negative acquiring firm stock return (Table 3-4), the negative acquiring firm bond return (Table 3-7), the positive target firm stock return (Table 3-4), and the negative combined stock return (Table 3-8) are consistent with the hubris hypothesis and the bond return based on hubris hypothesis. It implies that the target firm is operated efficiently and the merger brings no operational synergy. The acquiring firm believes the existence of gains and overpays for the transaction. Thus the target shareholders gain at the announcement period, presenting a simple wealth transfer from acquiring firm shareholders.

The combined *Bond* returns are positive and the MAR (-1, +1) is statistically significant. This result is consistent with the co-insurance hypothesis. It implies that the merger brings together two firms whose earning streams are imperfectly correlated, therefore reduces the default risk and increase debt capacity, and the merged firms' bondholders as a whole benefit. However, the co-insurance effect predicts shareholders' losses from the reduced default risk of the firm. The negative combined *Stock* returns are consistent with this wealth transfer from shareholders to bondholders.

The combined *Target* returns are positive and statistically significant where the combined *Acquirer* returns are negative and statistically significant. These results are consistent with the results of target shareholder returns, acquiring shareholder returns, target bondholder returns and acquirer bondholder returns. These results are consistent with the wealth transfer hypothesis that target firm gains at the expense of acquiring firms.

The *5 deals* returns are negative and statistically insignificant. Though lack statistical power due to the small sample size, these returns do not support the synergy hypothesis and they show that M&As are value destroying for these 5 deals /10 firms. For the entire sample of 310 deals/620 firms, the combined *Total* returns are negative and statistically significant. They do not support the synergy hypothesis either, and they further imply that M&As are valued destroying at the announcement period by combining stock/bond and target/acquirer as a whole.

Table 3-8 Combined Excess Security Returns

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is market adjusted return and AR is abnormal return. When one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. The weights of stocks are based on the market value of firms 40 trading days before the announcements; the weights of bonds are based on the fiscal-year-end book value of long-term debt of firms before the announcements. It assumes that the excess returns of a firm's short-term debt and debt-like instruments are zero; moreover, it considers all of firm's long-term debt has the same excess return as the firm's bonds been tracked. *Stock* is the value-weighted aggregate excess stock returns of both target firms and acquiring firms; *Bond* is the value-weighted aggregate excess bond returns of both target firms and acquiring firms; *Target* is the value-weighted aggregate excess stock and bond returns of target firms; *Acquirer* is the value-weighted aggregate excess stock and bond returns of acquiring firms; *5 Deals* is the value-weighted aggregate stock and bond return of 5 deals that both the target firms and acquirer firms have valid bond data; *Total* is the value-weighted aggregate return of target and acquirer total excess stock and bond returns. Wilcoxon signed rank test examines whether AR and AR are statistically different from zero. ***, ** and * denotes the significance level at 1%, 5% and 10%.

	MAR(-1, +1)		**AR(-1, +1)**		**N**
	Return Value%	Wilcoxon	Return Value%	Wilcoxon	
Stock	-0.00103	-4.949***	-0.00141	-4.946***	620
Bond	0.00448	-1.736*	0.00331	-0.619	60
Target	0.01401	-11.562***	0.01415	-11.658***	321
Acquirer	-0.00445	-3.177***	-0.00521	-3.698***	359
5 Deals	-0.14135	-1.045	-0.13735	-0.821	20
Total	-0.00077	-5.371***	-0.00109	-5.166***	680

3.2.3 Univariate Analysis

This section tests the influences of deal characteristics on the excess returns of stockholders and bondholders by univariate analysis. The deal characteristics include method of payment, hostility, relatedness, relative size and market trend. Economic rationales of these deal characteristics are presented, followed by results of tests.

As each of these deal characteristics divides the sample into two sub-groups, the independent sample *t*-test and its non-parametric alternative the Mann-Whitney test are used. When the individual factor results in two sub-samples of data, a *t*-test is applicable for comparing the significance of difference between the two sample means. It assumes that data are gained from normally distributed populations and data are measured at least at the interval level (Field, 2005). It is of importance to decide whether these two samples are independent or related. If the dependent variable is assigned to either one of the two samples, the test is known as the Independent Samples *t*-Test, or a Between Subjects Experiment, or an Independent

Means *t*-Test. If the same dependent variable takes part in both of the two samples, the test is known as the Paired Samples *t*-Test, or a Within Subjects Experiment, or a Dependent Means *t*-Test. In addition to the general assumptions of the *t*-test, the independent samples *t*-test assumes that variances in these two samples are roughly equal (homogeneity of variance) and the dependent variables are independent from each other. It rests on the hypothesis that the two sample means are equal. The non-parametric counterpart of the Independent Samples *t*-Test is the Mann-Whitney Test which assumes the breach of normal distributions of the populations.

3.2.3.1 Method of Payment

The influences of method payment on security returns are explained by the signalling hypothesis, the tax hypothesis, the control hypothesis and the riskiness hypothesis.

Signalling Hypothesis

From the economic implication of the choices, method of payment can be categorised as fixed payments, contingent payments and side payments (Bruner, 2004). *Fixed payments* include cash and senior debt securities. The aim of this payment is to reduce the uncertainty about the value being conveyed. However, this payment can also have negative signalling effects that the target lack confidence for the long-term integration of the transaction (so target shareholders would not keep acquiring firm’s equity), and positive signalling that the acquirer is confident for the long-term performance of the combined firm (so acquiring firm shareholders will keep the equity to themselves). This signalling effect predicts that cash payment is associated with lower target stock returns and higher acquirer stock returns.

Contingent payments include mezzanine or junk bonds, preferred stock and common stock. The value of these securities is less certain than the fixed payments because the share price of the acquirer constantly changes with the progress of the acquisitions (it often falls in the announcement period). Contingent payments have an incentive effect on the target firm that if the target firm performs well in the future, its shareholders will receive extra payoff. This payment also hedges risk for both sides of the transaction by attached derivatives (e.g. caps, collars, floors, earnouts, warrants, convertible bonds, contingent value rights, puts, guarantees). The incentive effect predicts higher returns for target shareholders by equity payment (optimistic targets are more likely to accept equity offers). This payment may signal adverse information that the acquirer does not have the cash or senior debt capacity to finance the acquisition. Moreover, Shleifer and Vishny (2003) present a behavioural finance model of mergers and acquisitions based on stock market misevaluations of the combining firms: acquirers are likely to offer stock when they believe their stocks are over-valued and cash when under-valued. Managers have private information about the intrinsic value of their stock. If they know the firm is over-valued, they have the incentive to enhance their wealth by selling stocks, i.e., they use the firm's stock to acquire a target firm which is under-valued. Finally, the market realises the stock is over-valued and the market value of the acquiring firm falls. If target shareholders receive the equity offer, these negative returns on acquirer stock may result in low returns to target stocks (Danbolt, 2004). This theory explains why acquiring firms experience negative stock returns at the announcement period and in the post-merger period. It also predicts higher excess stock returns associated with the cash payment for both acquiring firms and target firms. According to this hypothesis, the higher an acquiring firm's market to book ratio is, the more likely it is going to issue stock than cash or mixed offers. This phenomenon has been identified by the empirical studies of Travlos (1987), Martin (1996), Chang and Mais (2000), and Heron and Lie (2002). Andrade et al. (2001) point out that this signal may also deteriorate bondholder wealth because of market's bad expectation on firm's future cash flows.

Side payments are the payments to parties other than target shareholders. These parties are those who may have some influence in the design and consummation of the transaction, or in the post-merger integration which include target firm management, work union, municipalities, national government, bank lenders, etc. The cost of side payments is usually ignored by the acquirer for its smaller value compared with fixed payments and contingent payments.

Tax Hypothesis

Cash and stock payments differ significantly in their tax exposures for both the acquirer shareholders and target shareholders. In a pure cash payment deal, the target shareholders are obliged to pay tax on capital gains immediately, but the acquirer can raise the depreciation basis of acquired assets to their market value (Travlos, 1987). In a pure stock payment deal, the tax payments of target shareholders are postponed until the shares of the new firm are sold, but the depreciation basis of acquired assets remains unchanged. Gaughan (2002) proposes security may be more attractive to some of the target stockholders because under certain circumstances the transaction may be tax free. Hayn (1989) compares the returns to acquirers and targets in taxable and non-taxable deals and finds higher returns for taxable deals. Since taxable deals are often for cash, non-taxable deals are often for equity, the higher target share returns attached with cash payment could be the compensation for target shareholders' immediate loss on tax liability and the reward from acquirer for the larger tax shield they gain.

Control Hypothesis

Bruner (2004) argues that the method of payment is also influenced by the control consideration. A cash offer will not change the composition of acquirer's equity ownership but a stock transaction could impose a large change. As control is precious to acquirer, and the acquirer must trade off this effect with the cost and benefit of other factors. It predicts a higher return for acquirers in cash payment.

Riskiness Hypothesis

Renneboog and Szilagyi (2007) argue that a cash offer is usually associated with debt financing since most acquiring firms have limited cash flows. Moreover, shareholders may seek to reverse bondholder gains from co-insurance effect by issuing debt. The debt issue tends to increase firm's leverage ratio and default risk, but reduce collateral available to bondholders, which has the same effect of dividend payout and claim dilution talked in the hypotheses section (Hypothesis 2: Wealth Transfer). In contrary, an equity offer does not change firm's assets and financial distress costs are reduced. Therefore, this hypothesis predicts a higher bondholder wealth if the method of payment is equity.

Evidence on Prediction

For shareholder wealth, Bruner (2004) summarises 12 studies of announcement returns segmented by the method of payment, and conclude: target shareholders earn generally large positive announcement returns, and the returns for cash payment are materially higher than returns for stock payment; acquirer shareholders basically break even at announcement, and the returns for cash payment are zero to positive, and the returns for stock payment are significantly negative. Travlos (1987), Andrade et al. (2001), Officer (2004), and Bhagat et al. (2005) and also find pure cash payment results in higher returns than pure stock payment or mixture payment for both target and acquirer shareholders. Fuller et al. (2002), Moellera et al. (2004), Mitchell et al. (2004), Moellera et al. (2005), Fan and Goyal (2006), Wang and Xie (2008) find acquiring firm shareholders gain more in cash offers. Goergen and Renneboog (2004) discover target shareholders gain higher return for cash payment and acquirer shareholders gain higher return for equity payment. Billett et al. (2004), Renneboog and Szilagyi (2007) do not find method of payment has statistically significant impact on share returns.

For bondholder wealth, Billett et al. (2004) and Renneboog and Szilagyi (2007) do not find statistically significant effect of payment on bondholder wealth.

Results

In this research, method of payment is categorised as if it is "pure cash" or "otherwise". Payment information is taken from TOB.

Table 3-9 demonstrates the impact of method of payment on shareholders' excess returns. For target firms, all the excess returns show higher value for pure cash payment than otherwise. The independent sample *t*-tests are significant for MAR (-20, +20) and AR (-20, +20); the Mann-Whitney tests are significant for all the excess returns. For acquiring firms, MAR (-20, +20) and AR (-20, +20) show lower value for pure cash payment than otherwise, but neither is statistically significant. MAR (-1, +1) and AR (-1, +1) illustrate higher value for pure cash payment than otherwise, and both are significant for the *t*-test, and AR (-1, +1) is significant for Mann-Whitney test. These results indicate that method of payment has significant impact on stock returns, and pure cash payment is associated with higher returns. These results are consistent with the signalling hypothesis about fixed payments that when acquiring firms are confident for the long-term performance of the combined firm, they pay by cash; the signalling hypothesis about contingent payments that acquiring firms offer stock when they believe their stocks are over-valued, hence the stock market reacts negatively on both target stocks and acquirer stocks; the tax hypothesis that acquirers gain from the tax shield on cash payment, and targets gain from the compensation on immediate loss on tax liability and reward from acquirers for the tax shield they gain; control hypothesis that cash payment keeps the control power of acquirers. These results are consistent with most previous empirical studies.

Table 3-9 Stock Returns on Payment Method

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is market adjusted return and AR is abnormal return. For payment method, the excess returns of target firms and acquiring firms are divided into two independent samples according to whether the payment is in "pure cash" or "otherwise". The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples *t*-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Stocks N(1)=101 N(2)=209			Acquirer Stocks N(1)=101 N(2)=209		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:pure cash	25.436	2.627***	-3.339***	-2.254	-1.261	-1.511
	2:otherwise	18.309			0.009		
AR(-20,+20)	1:pure cash	25.977	1.807*	-2.332**	-3.029	-0.794	-1.115
	2:otherwise	20.830			-1.410		
MAR(-1,+1)	1:pure cash	14.676	1.390	-1.646*	-0.298	2.383**	-1.611
	2:otherwise	12.095			-2.077		
AR(-1,+1)	1:pure cash	14.858	1.439	-1.764*	-0.322	2.631***	-2.045**
	2:otherwise	12.195			-2.260		

Table 3-10 illustrates the impact of method of payment on bondholders' excess returns. These results do not show that method of payment has significant impact on bond returns, which are consistent with the results of Billett et al. (2004) and Renneboog and Szilagyi (2007).

Table 3-10 Bond Returns on Payment Method

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. The sample is made up of 11 target firms with 37 bonds and 49 acquiring firms with 131 bonds. MAR is market adjusted return and AR is abnormal return. If one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. For payment method, the excess returns of target firms and acquiring firms are divided into two independent samples according to whether the payment is in "pure cash" or "otherwise". The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples t-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Bonds N(1)=2 N(2)= 9			Acquirer Bonds N(1)=17 N(2)=32		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:pure cash	-0.471	-0.688	-0.943	-1.395	-0.834	-1.554
	2:otherwise	9.494			-0.435		
AR(-20,+20)	1:pure cash	1.858	-0.446	0.000	-1.506	-0.646	-0.315
	2:otherwise	8.637			-0.672		
MAR(-1,+1)	1:pure cash	0.538	-0.826	-0.707	-0.045	0.722	-0.021
	2:otherwise	6.092			-0.292		
AR(-1,+1)	1:pure cash	0.749	-0.791	-0.943	-0.109	0.813	-0.294
	2:otherwise	6.285			-0.393		

3.2.3.2 Hostility

Hostile takeovers are the acquisitions of a publicly held company over the opposition of its management. Practically, a takeover is defined hostile if it is initially rejected by the target management (Jenkinson and Mayer, 1994). Morck et al. (1988) investigate the ownership characteristics of the 1980 Fortune 500 firms that were acquired in the subsequent five years and conclude that "the mangers' incentive to sell" is a factor in deciding if the takeover is hostile. *Friendly takeovers* are acquisitions through negotiation without any defences.

Hypotheses

According to Sudarsanam (2003), a friendly takeover has several advantages to the acquiring firms. First, it is less risky: because the acquirer has better access than a hostile takeover to information about the target in due diligence, the future status of the target firm is certain. Second, it is less expensive: because it involves less defence from the target, the duration of takeover is short and the expense is low. Third, the co-operation from target firm's management is conducive to a more successful post-merger integration. These three reasons predict higher excess returns for acquirer shareholders by friendly takeovers than hostile ones. However, acquirers still benefit in hostile takeovers from a greater clarity of purpose, clearer identification of sources of value creation, and better pre-bid planning. Moreover, the hostile deals are subject to much greater public scrutiny, which reduces the overpayment problem and forces acquirers work more efficiently on the post-acquisition integration. This factor predicts a higher return for acquirer shareholders by hostile takeovers.

Ruback (1988) argues that there are three reasons for target managers to resist a takeover: they believe the firm has hidden values; they believe the resistance will increase bidding premium; or they want to retain their positions. Target shareholders only concern the market value of the firm. The market value of any firm is the sum of two components: the value of the firm conditional on keeping the same management, and the expected change in value of the firm from a corporate control change. The latter component equals the probability of a takeover multiplies the change in value from a takeover.

market value of the firm	=	value of the firm with current managers	+	probability of a control change	×	change in value from a control change

A takeover defence may lower the probability of being acquired, increase the offer price, and also affect the value of the firm even if it is not acquired. Thus, the defence could have complex effects on target firm shareholders[7].

According to above hypotheses, bondholders are expected to have qualitatively the same wealth effect on hostility as the shareholders.

Evidence on Prediction

For shareholder wealth, Schwert (2000) argues that empirical tests show that most deals described as hostile in the press are not distinguishable from friendly deals in economic terms, except that hostile transactions involve publicity as part of the bargaining process. Burch (2001) and Officer (2003) do not find hostility have statistically significant effect on either target or acquirer stockholders. Danbolt (2004) find hostility does not have significant effect on targets shareholders, whereas Moellera et al. (2004), Gregory and McCorriston (2005) and Moellera et al. (2005) report hostility does not have significant impact on acquirers shareholders. Bhagat et al. (2005) and Renneboog and Szilagyi (2007) discover higher returns for acquirers if the deal is friendly. Billett et al. (2004) find higher target share returns in hostile takeovers. Goergen and Renneboog (2004) report target stockholders experience higher return if the deal is hostile but acquirer stockholders experience higher return if the deal is friendly.

For bondholder wealth, Billett et al. (2004) and Renneboog and Szilagyi (2007) do not find significant influence of hostility on target and acquirer bondholders.

[7] Ruback (1988) page 50: if a defence allows incumbent management to completely block all takeovers, the probability of a control change will reduce to zero and the expected takeover premium is eliminated, the market value of the firm could decrease because managers enjoy the leisure that the isolation from being fired provides, and the market value could increase because managers stop wasting time and corporate resources worrying about a hostile bid.

Results

In this research, hostility is categorised as if it is “friendly” or “hostile”. Hostility information is taken from TOB.

Table 3-11 demonstrates the impact of hostility on shareholders’ excess returns. For target firms, none of the tests are significant. For acquiring firms, MAR (-1, +1) and AR (-1, +1) show higher value for friendly deals than hostile deals, and the Mann-Whitney tests are significant. These results imply that acquiring firms face less risk, incur fewer costs, and receive better co-operation in friendly takeovers.

Table 3-11 Stock Returns on Hostility

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is market adjusted return and AR is abnormal return. For hostility, the excess returns of target firms and acquiring firms are divided into two independent samples according to whether the deal is "friendly" (neutral deals are considered as friendly) or "hostile". The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples t-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Stocks N(1)=293 N(2)=17			Acquirer Stocks N(1)=293 N(2)=17		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:friendly	20.782	0.486	-0.452	-0.432	1.459	-1.521
	2:hostile	18.038			-5.820		
AR(-20,+20)	1:friendly	22.705	0.614	-0.310	-1.601	1.467	-0.920
	2:hostile	19.089			-7.740		
MAR(-1,+1)	1:friendly	12.830	-0.505	-0.413	-1.424	0.786	-1.902*
	2:hostile	14.764			-2.771		
AR(-1,+1)	1:friendly	12.977	-0.412	-0.274	-1.550	0.848	-2.064**
	2:hostile	14.549			-2.992		

Table 3-12 demonstrates the impact of hostility on bondholders' excess returns. None of the tests are significant, thus hostility has no influence on target and acquirer bondholder wealth. This finding is consistent with Billett et al. (2004) and Renneboog and Szilagyi (2007).

Table 3-12 Bond Returns on Hostility

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. The sample is made up of 11 target firms with 37 bonds and 49 acquiring firms with 131 bonds. MAR is market adjusted return and AR is abnormal return. If one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. For hostility, the excess returns of target firms and acquiring firms are divided into two independent samples according to whether the deal is "friendly" (neutral deals are considered as friendly) or "hostile". The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples t-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Bonds N(1)=9 N(2)=2			Acquirer Bonds N(1)=45 N(2)=4		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:friendly	9.134	0.546	0.000	-0.627	0.864	-0.657
	2:hostile	1.149			-2.355		
AR(-20,+20)	1:friendly	8.738	0.484	0.000	-0.737	1.238	-0.949
	2:hostile	1.401			-3.482		
MAR(-1,+1)	1:friendly	5.828	0.600	-0.236	-0.091	0.885	-0.548
	2:hostile	1.724			-1.507		
AR(-1,+1)	1:friendly	6.064	0.610	0.000	-0.180	0.861	-0.073
	2:hostile	1.740			-1.579		

3.2.3.3 Industry Relatedness

Hypotheses

Whether an acquisition is horizontal, vertical or conglomerate, it may affect the level of operating synergies of the combined firm, and possibly also on the shareholder abnormal returns (Danbolt, 2004). It is usually considered that since a related merger (horizontal or vertical) happens in the same industry, the combined firm is more likely to achieve operational synergies on economy of scale and scope. In contrast, an unrelated merger (conglomerate) is usually associated with the agency problem that acquiring firm managers use the free cash flow to build their empire. From this prediction, target and acquirer shareholders should earn more in related mergers than unrelated mergers. However, unrelated mergers enable acquirers to diversify their risk against the industrial wave (the emergence of new industries, the retrenchment of old industries, and the rise and fall within industries' longevity) and economic circle; moreover, merging firms benefit from economy of learning even though they belong to difference industries. In addition, since unrelated mergers are associated with the co-insurance effect, shareholders are likely to increase leverage to expropriate wealth from bondholders (the incentive effect). From these predictions, target and acquirer shareholders should receive higher returns in unrelated mergers.

From bondholders' point of view, when two firms' earnings streams are imperfectly correlated, the merger would reduce the combined firm's default risk and increase debt capacity; hence the co-insurance effect is likely to be stronger in diversifying or unrelated mergers. As a result, the unrelated mergers increase bondholder's value but decreases shareholders' value. Nevertheless, the opposite situation could still happen because shareholders have the incentive to increase leverage to expropriate bondholders' wealth gained from the co-insurance.

Evidence on Prediction

For shareholder wealth, Fuller et al. (2002) and Gregory and McCorriston (2005) report industry relatedness does not have significant impact for acquirer shareholders; Officer (2003) reports relatedness does not have significant impact for both target and acquirer shareholders. Moellera et al. (2004) and Moellera et al. (2005) discover higher acquirer stock returns for related deals. Danbolt (2004) finds higher target stock returns for related (vertical) deals. Bhagat et al. (2005) reported higher stock return for both target and acquirer stockholders for related acquisitions. Fan and Goyal (2006) find mixed effects of relatedness.

For bondholder wealth, Walker (1994) report target bondholder returns are negatively associated with related mergers, and acquirer bondholder returns are insignificant on relatedness. This result is consistent with the co-insurance hypothesis. Maquieira et al. (1998) discover the combined non-convertible bondholder wealth of targets and acquirers are positively correlated with related (non-conglomerate) mergers. They explain that non-conglomerate mergers create more value (for the firm) than conglomerate mergers. Billett et al. (2004) and Renneboog and Szilagyi (2007) do not find significant evidence of the impact of relatedness (diversifying deal) on shareholder and bondholder wealth.

Results

In this research, industry relatedness is classified as “related” or “unrelated”. The relatedness depends on firms’ first two digits of primary SIC code. The SIC code information is taken from TOB.

Table 3-13 shows the impact of industry relatedness on shareholders’ excess returns. For target firms, none of the tests are significant. For acquiring firms, the *t*-test is significant for MAR (-1, +1) and the Mann-Whitney test is significant for both MAR (-1, +1) and AR (-1, +1). These two excess returns show higher value for unrelated deals than related deals. This could be explained by the hypotheses of diversifying, economy of learning and incentive effect.

Table 3-13 Stock Returns on Relatedness

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is market adjusted return and AR is abnormal return. For relatedness, the excess returns of target firms and acquiring firms are divided into two independent samples according to whether the deal is "related" or "unrelated". Relatedness is measured by the first 2 digits of the Primary SIC code. The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples t-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Stocks N(1)=155 N(2)=155			Acquirer Stocks N(1)=155 N(2)=155		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:related	19.937	-0.540	-0.552	-0.098	0.748	-0.809
	2:unrelated	21.325			-1.358		
AR(-20,+20)	1:related	22.422	-0.063	-0.307	-1.601	0.352	-0.886
	2:unrelated	22.591			-2.275		
MAR(-1,+1)	1:related	12.776	-0.183	-0.762	-2.157	-1.696*	-2.046**
	2:unrelated	13.096			-0.838		
AR(-1,+1)	1:related	12.893	-0.195	-0.884	-2.257	-1.625	-1.829*
	2:unrelated	13.232			-1.001		

Table 3-14 depicts the impact of industry relatedness on bondholders' excess returns. For target firms, none of the tests are significant. For acquiring firms, the Mann-Whitney test is significant for MAR (-20, +20), and the bondholder return is higher in related deals. According to the prediction of co-insurance effect, bondholders should experience higher returns in unrelated deals; the lower returns here may due to the wealth transfer from bondholder to shareholders due to the incentive effect.

Table 3-14 Bond Returns on Relatedness

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. The sample is made up of 11 target firms with 37 bonds and 49 acquiring firms with 131 bonds. MAR is market adjusted return and AR is abnormal return. If one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. For relatedness, the excess returns of target firms and acquiring firms are divided into two independent samples according to whether the deal is "related" or "unrelated". Relatedness is measured by the first 2 digits of the Primary SIC code. The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples t-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Bonds N(1)=4 N(2)=7			Acquirer Bonds N(1)=29 N(2)=20		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:related	14.523	0.708	-0.189	-0.490	0.610	-0.671
	2:unrelated	3.774			-1.172		
AR(-20,+20)	1:related	15.021	0.760	-0.189	-0.515	0.878	-1.892*
	2:unrelated	3.052			-1.608		
MAR(-1,+1)	1:related	6.771	0.481	0.000	-0.038	1.063	-0.203
	2:unrelated	4.117			-0.450		
AR(-1,+1)	1:related	6.986	0.468	-0.189	-0.110	1.163	-0.346
	2:unrelated	4.302			-0.561		

3.2.3.4 Relative Size

Hypotheses

Renneboog and Szilagyi (2007) argue that acquirers have limited capacity to absorb the target, so the takeover of a large target creates more uncertainties for the realisation of synergy thus is harder to implement successfully. Moreover, larger acquisitions are more driven by managerial hubris aimed at building large and diversified firm (Renneboog and Szilagyi, 2007), and are inefficient on removal of target firm's incumbent management (Bhagat et al. 2005). As a result, shareholder as well as bondholder returns should be negatively related with the target size.

Conversely, large targets create greater scope for co-insurance effect and contribute more assets to the combined firm, adding debt capacity, so bondholder returns should be positively related with the target size (Renneboog and Szilagyi, 2007).

Evidence on Prediction

For stockholder wealth, Danbolt (2004) reports log of market value of target does not have significant impact on target shareholder returns, Fuller et al. (2002) find log of relative size and log of target size do not have significant influence on acquirer shareholders, and Burch (2001) and Goergen and Renneboog (2004) find relative size does not have significant effect on both targets and acquirers. Billett et al. (2004) find relative size negatively related with target firm stock returns. Officer (2004) reports log of relative size (target / acquirer) negatively related to acquirer stock returns, and Officer (2003) finds log of target firm market value is negatively related to both target and acquirer stock returns. Bhagat et al. (2005) find the log of relative size (target over acquirer) is negatively related with target shareholder returns and positively related with acquirer shareholder returns. They argue that if the gains from takeovers are derived solely from target improvements such as removal of bad management, then a smaller (larger) relative size of the target (acquirer) would not increase the gains. They also find the log of target size is negatively related with both target and acquirer shareholder returns. Campa and Hernando (2006) discover relative size is positively related with target shareholder returns, but insignificant for acquirer shareholder returns. Moellera et al. (2005) find target firm market value is positively related with acquirer returns. Moellera et al. (2004) also report relative size is positively related to acquirer (for all sample) stock returns. Fan and Goyal (2006) find relative size (target / acquirer) positively related with the combined firm values.

Billett et al. (2004) and Renneboog and Szilagyi (2007) discover the relative size is negatively related with acquirer bond returns.

Results

Table 3-15 depicts the impact of relative size on shareholders' excess returns. Relative size is measured as the ratio of target size over acquirer size, where the size dependents on market value of firms 40 trading days before the announcement date. "T<A" stands for the target size is smaller than the acquirer size and "T>A" stands for the target size is larger than the acquirer size. Market value information is obtained from Datastream.

For target firms, all the excess returns show higher values for T<A. The *t*-tests are significant at 1% level for MAR (-20, +20) and AR (-20, +20). The Mann-Whitney tests are significant for all the returns. For acquiring firms, none of the tests are significant. These results indicate that the acquisition of a small target is more likely to realise synergy, to remove incumbent management, and less likely to be motivated by managerial hubris of the acquirer.

Table 3-15 Stock Returns on Relative Size

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is market adjusted return and AR is abnormal return. The relative size dependents on market value of firms 40 trading days before the announcement date. “T<A” stands for the target size is smaller than the acquirer size and “T>A” stands for the target size is larger than the acquirer size. The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples t-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Stocks N(1)=284 N(2)=26			Acquirer Stocks N(1)=284 N(2)=26		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:T<A	21.718	2.830***	-2.608***	-0.510	0.681	-0.869
	2:T>A	8.761			-3.106		
AR(-20,+20)	1:T<A	23.643	2.835***	-2.567***	-1.766	0.593	-0.105
	2:T>A	10.092			-3.810		
MAR(-1,+1)	1:T<A	13.325	1.478	-1.749*	-1.438	0.501	-0.382
	2:T>A	8.689			-2.144		
AR(-1,+1)	1:T<A	13.430	1.398	-1.630*	-1.593	0.301	-0.283
	2:T>A	9.054			-2.015		

Table 3-16 depicts the impact of relative size on bondholders' excess returns. None of the tests are significant.

Table 3-16 Bond Returns on Relative Size

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. The sample is made up of 11 target firms with 37 bonds and 49 acquiring firms with 131 bonds. MAR is market adjusted return and AR is abnormal return. If one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. The relative size dependents on market value of firms 40 trading days before the announcement date. "T<A" stands for the target size is smaller than the acquirer size and "T>A" stands for the target size is larger than the acquirer size. The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples t-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Bonds N(1)=10 N(2)=1			Acquirer Bonds N(1)=47 N(2)=2		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:T<A	8.459	0.432	-0.632	-0.720	0.419	-1.112
	2:T>A	-0.081			-1.886		
AR(-20,+20)	1:T<A	8.167	0.410	-0.316	-0.984	-0.184	-0.101
	2:T>A	-0.219			-0.410		
MAR(-1,+1)	1:T<A	5.578	0.595	-0.949	-0.216	-0.279	-0.253
	2:T>A	0.119			0.015		
AR(-1,+1)	1:T<A	5.797	0.599	-0.632	-0.302	-0.227	-0.202
	2:T>A	0.090			-0.110		

3.2.3.5 Market Trend

Hypotheses

Rhodes-Kropf and Viswanathan (2004) argue that merger waves can be rationally driven by periods of over- and undervaluation of the stock market. In the model, managers of acquirer have private information about the stand-alone value of their firm and the potential value of a merger; managers of target have private information about the stand-alone value of their firm. Both firms' market value may not reflect their intrinsic values. The misvaluation has two components—a firm-specific component and a market-wide component. The rational target knows whether it is overvalued or undervalued, but it cannot decide whether this misvaluation is a market effect or a firm effect. For a given offer value, the target managers decide whether to accept the offer based on their private information of the target's true value and their assessment of the synergy.

$$\text{Offer Value} = \text{Target True Value} \times (1+\text{Synergy})$$

Target managers attempt to filter out the market-wide misvaluation effect because the target's true value and the offer value both positively related to the market-wide misvaluation. The target correctly adjusts the offer value for potential market-wide overvaluation, but being a Bayesian updater, it assigns some weight on high synergy as well (for a given offer, the target must decide the probability that the acquirer is overvalued versus the probability that the firm has a large synergy, and it usually puts some weight on synergy, thus the discount factor of market misvaluation is diminished). So when the market-wide overvaluation is high, the estimated error associated with synergy is high, too. Thus, the more the market is overvalued, the larger is the target's expectation of its firm-specific misvaluation (for given total misvaluation of target, if the market effect is underestimated, the firm effect is therefore enlarged). Accordingly, the target filters out of the bid offer too little of the market-wide effect in case the market is overvalued, and the offer value seems to be favourable to both target and acquirer shareholders. This hypothesis predicts higher value of excess shareholder returns when the market is overvalued.

Since mergers in overvalued market is likely to be associated with the agency problem that acquirer managers use the firm's source to build their empire, where mergers in undervalued market is more associated with industry restructuring and the discipline of bad target management, and create more synergy, it is expected that mergers in undervalued market produce higher excess returns for acquiring firm bondholders.

Evidence on Prediction

There are not many empirical studies test the relationship between market trend and stockholder returns in regard to M&A. Bhagat et al. (2005) find that US target firms attain higher stock returns for mergers announced after March 2000. To my best knowledge, there has not been any study on bondholders' wealth with market trend.

Results

A bull market is likely to be an overvalued market and a bear market is likely to be an undervalued market. This research measures the market trend according to the market index of *FTSE All Shares*. Chart 3-3 illustrates the market trend of this index. Sample firms are split into groups of a bull market between 1994 and September 2000, and after March 2003, and a bear market between September 2000 and March 2003. The index information is from Datastream.

Chart 3-3 FTSE All Shares

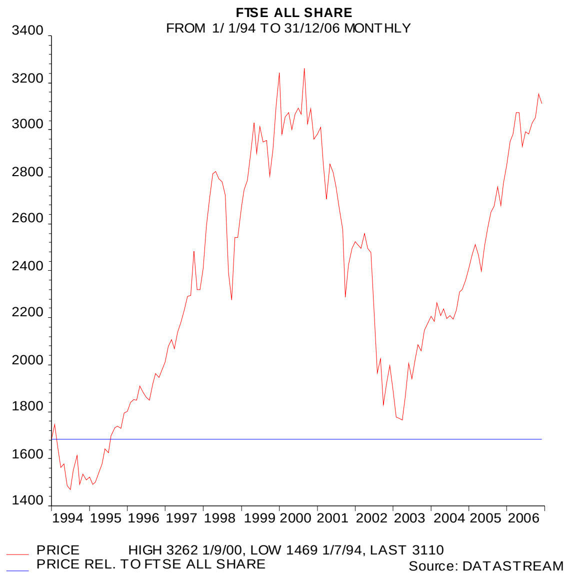

Table 3-17 describes the impact of market trend on shareholders' excess returns. For target firms, MAR (-1, +1) shows higher values for the bull market and is significant for the Mann-Whitney test. For acquiring firms, all the excess returns show higher value for bull market, and all the *t*-tests are significant and the Mann-Whitney test for AR (-20, +20) is significant. These results are consistent with the prediction of the merger wave hypothesis.

Table 3-17 Stock Returns on Market Trend

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is market adjusted return and AR is abnormal return. The market trend splits the sample into bull market period (announcement before 4 September 2000 and after 12 March 2003) and bear market period (announcement between 4 September 2000 and 12 March 2003) according to the trend of *FTSE All Shares*. The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples t-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Stocks N(1)=40 N(2)=270			Acquirer Stocks N(1)=40 N(2)=270		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:bear market	18.397	-0.670	-0.259	-5.896	-2.380**	-1.597
	2:bull market	20.962			0.038		
AR(-20,+20)	1:bear market	20.370	-0.613	-0.847	-6.461	-1.831*	-2.034**
	2:bull market	22.823			-1.267		
MAR(-1,+1)	1:bear market	10.491	-1.081	-1.682*	-3.564	-2.050**	-0.973
	2:bull market	13.298			-1.191		
AR(-1,+1)	1:bear market	10.810	-0.998	-1.575	-3.509	-1.876*	-0.922
	2:bull market	13.397			-1.350		

Table 3-18 describes the impact of market trend on bondholders' excess returns. For target firms, none of the tests are significant. For acquiring firms, MAR (-1, +1) and AR (-1, +1) demonstrate positive and higher values for bear market than the bull market. The *t*-test is significant for MAR (-1, +1) and the Mann-Whitney tests are significant for both MAR (-1, +1) and AR (-1, +1). These results are consistent with the hypothesis that mergers in bear market create more synergy than in bull market.

Table 3-18 Bond Returns on Market Trend

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. The sample is made up of 11 target firms with 37 bonds and 49 acquiring firms with 131 bonds. MAR is market adjusted return and AR is abnormal return. If one firm has more than one bond, the excess bond returns of the firm are calculated as the value-weighted average of the bonds. The market trend splits the sample into bull market period (announcement before 4 September 2000 and after 12 March 2003) and bear market period (announcement between 4 September 2000 and 12 March 2003) according to the trend of *FTSE All Shares*. The Independent Samples *t*-test (two-tailed) examines the equality of means between the two samples; the Mann-Whitney Test (*Z*-test) is the non-parametric counterpart of the Independent Samples t-test. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

		Target Bonds N(1)=1 N(2)=10			Acquirer Bonds N(1)=9 N(2)=40		
	Code	Return Value%	t-statistic	Mann-Whitney	Return Value%	t-statistic	Mann-Whitney
MAR(-20,+20)	1:bear market	-2.076	-0.547	-1.265	-1.200	-0.372	-0.103
	2:bull market	8.658			-0.671		
AR(-20,+20)	1:bear market	-1.716	-0.493	-0.949	-1.270	-0.145	-0.181
	2:bull market	8.316			-0.892		
MAR(-1,+1)	1:bear market	1.686	-0.403	0.000	0.358	1.686*	-2.324**
	2:bull market	5.422			-0.333		
AR(-1,+1)	1:bear market	1.681	-0.411	-0.316	0.219	1.488	-2.040**
	2:bull market	5.638			-0.409		

3.2.4 Multivariate Analysis

This section studies the relation between excess security returns and the deal characteristics variables discussed in the univariate analysis section. The excess stock and bond returns are each categorized into MAR (-20, +20), AR (-20, +20), MAR (-1, +1) and AR (-1, +1). The independent variables include method of payment, hostility, industry relatedness, relative size, and market trend. Method of payment is the dummy variable set to 1 if the payment is pure cash and 0 as otherwise. Hostility is the dummy variable set to 1 if the deal is friendly and 0 as hostile. Industry relatedness is measured by the first 2 digits of the primary SIC code of target and acquiring firms. If the target and acquiring firms' first 2 digits are the same, the deal is labelled as related and otherwise as unrelated. The dummy variable is set to 1 for unrelated deals and 0 for related deals. Relative size measures the log ratio of target firm size over acquiring firm size: $lg(\frac{targetMV}{acquirerMV})$, and the sizes are market value of firms 40 trading days before the deal announcements. Market trend assesses where the deals are announced in the period of bull market or bear market. According to the trend of FTSE All Shares index, the dummy variable is set to 1 for bull market periods which are before 4 September 2000 and after 12 March 2003, and 0 for bear market period which is between 4 September 2000 and 12 March 2003. The formula of the multivariate analysis (OLS) is expressed as:

$$\textbf{Excess Return} = \alpha + \beta_1 \textbf{ Payment} + \beta_2 \textbf{ Hostility} + \beta_3 \textbf{ Relatedness} + \beta_4 \textbf{ Size} + \beta_5 \textbf{ MarketTrend} + \varepsilon$$

Table 3-19 illustrates the correlations between these independent variables. Low correlations between variables support the robustness of regression. The highest correlation in absolute value is between method of payment and relative size with a value of -0.383. The negative correlation between method of payment (pure cash) and relative size (log ratio of target over acquirer) means that the larger the target size, the more likely the deal is paid by stock, which shows that acquirers' cash reserve (as well as debt capacity) is limited. The lowest correlation in absolute value is between relative size and market trend with a value of -0.018.

Table 3-19 Correlations between Independent Variables

This table demonstrates the correlations between independent variables. The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. The sample consists of 310 deals. Method of payment, hostility, relatedness and market trend are dummy variables equal to 1 if the deal is pure cash payment, friendly, unrelated and announced before 4 September 2000 and after 12 March 2003. Industry relatedness is measured by the first two digits of firms' primary SIC code. Relative size is the log ratio of target firm size over acquiring firm size. Firm size is market value of firms 40 trading days before the announcement day.

	Payment	Hostility	Relatedness	Size	Market Trend
Payment		0.137	0.062	-0.383	0.020
Hostility	0.137		0.071	-0.051	0.050
Relatedness	0.062	0.071		-0.106	-0.115
Size	-0.383	-0.051	-0.106		-0.018
Market Trend	0.020	0.050	-0.115	-0.018	

Table 3-20 reports the results of multiple regressions (OLS) on stock and bond excess returns. These excess returns include MAR (-20, +20), AR (-20, +20), MAR (-1, +1) and AR (-1, +1). For the reports of target stock return, acquirer stock return and acquirer bond return, the adjusted *R*-squares are low, which means the models do not explain a large percentage of the multiple regressions in excess returns. However, these values of adjusted *R*-squares are similar to the empirical results of Maxwell and Stephens (2003) and Billett et al. (2004).

For target stock, all these four excess returns show significance for the model (see the *F*-statistic). The coefficient for relative size is significant at 1% level for all the four excess returns. The negative sign of this coefficient shows that the smaller the target firm is, the higher the stock returns for target firm, which is consistent with the hypothesis and results in the univariate analysis. The coefficients of the other independent variables are insignificant. For acquirer stock, MAR (-20, +20), MAR (-1, +1) and AR (-1, +1) show significance at 5% for the model (see *F*-statistics). The coefficients of hostility and market trend are significant at 5% level for MAR (-20, +20); the coefficients of market trend is significant at 5% level for MAR (-20, +20) and at 10% level for AR (-20, +20); the coefficients of payment method are significant for MAR (-1, +1) and AR (-1, +1) at 5% and 1% levels, respectively. The implications are that excess acquirer stock returns are higher if the deal is friendly, announced in bull market, and paid by pure cash, which are consistent with the hypotheses in univariate analysis.

For target bond, none of the model is significant. The coefficient of payment method is significant at 10% level and negative for all the four excess returns, implying that bond returns are higher with equity payment, which is consistent with the riskiness hypothesis in univariate analysis. The coefficients of size are significant at 10% level and negative for MAR (-20, +20) and AR (-20, +20), which is consistent with the hypothesis that large targets create greater scope for co-insurance effect. The adjusted *R*-squares for MAR (-1, +1) and AR (-1, +1) are negative, which implies that the model uses more information than it reveals (the observation size is small but regressor size is big). For acquirer bond, MAR (-1, +1) and AR (-1, +1) show significance for the model. The coefficient of size is significant for MAR (-20, +20) at 5% level. The implication is the same as for target bond returns. The coefficient of market trend is significant at 5% level for MAR (-1, +1) and AR (-1, +1). It implies that acquirer bond returns are higher in bear market, which is consistent with hypothesis in univariate analysis.

Table 3-20 Multiple Regressions on Stock and Bond Returns

The sample comes from M&A deals announced between 1994 and 2006 with deal values over 10 million pounds. Both the target firms and the acquiring firms are UK public firms with valid daily stock price data. MAR is market adjusted return and AR is abnormal return. The stock sample consists of 310 target firms and 310 acquiring firms. The bond sample is made up of 11 target firms with 37 bonds and 49 acquiring firms with 131 bonds. When one firm has more than one bond, the excess bond return of the firm is calculated as the value-weighted average of the bonds. The multiple regression tests the deal characteristics which could influence the excess returns: method of payment, hostility, industry relatedness, relative size and market trend. Method of payment, hostility, relatedness and market trend are dummy variables equal to 1 if the deal is pure cash payment, friendly, unrelated and announced before 4 September 2000 and after 12 March 2003. Industry relatedness is measured by the first two digits of firms' primary SIC code. Relative size is the log ratio of target firm size over acquiring firm size. Firm size is market value of firms 40 trading days before the announcement day. *t*-statistics are computed using White's correction for Heteroskedasticity. ***, ** and * denotes the significance level at 1%, 5% and 10%.

Stock	**Target Stock Returns**								**Acquirer Stock Returns**							
Estimated Coefficient	MAR(-20, +20)		AR(-20, +20)		MAR (-1, +1)		AR(-1, +1)		MAR(-20, +20)		AR(-20, +20)		MAR(-1, +1)		AR(-1, +1)	
	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*
Constant	0.104	1.545	0.108	1.555	0.095	2.337**	0.095	2.316**	-0.110	-2.729***	-0.116	-1.959**	-0.054	-2.795***	-0.052	-2.678***
Payment	0.025	0.686	-0.006	-0.178	0.003	0.136	0.004	0.177	-0.025	-1.307	-0.011	-0.527	0.017	2.053**	0.020	2.505***
Hostility	0.010	0.191	0.027	0.485	-0.024	-0.703	-0.021	-0.599	0.069	2.392**	0.073	1.369	0.009	0.642	0.009	0.624
Relatedness	-0.002	-0.088	-0.016	-0.618	-0.005	-0.281	-0.005	-0.267	-0.018	-1.096	-0.010	-0.538	0.010	1.329	0.010	1.307
Size	-0.088	-2.578***	-0.109	-3.393***	-0.048	-2.561***	-0.048	-2.586***	0.000	0.025	0.017	0.953	-0.000	-0.047	0.003	0.493
Mar_Trend	0.030	0.702	0.032	0.694	0.030	1.178	0.028	1.093	0.064	2.092**	0.055	1.724*	0.023	1.559	0.021	1.459
***F*-test**		5.138***		5.865***		2.950***		2.883**		2.309**		1.656		2.229**		2.300**
Adj. R^2		0.063		0.073		0.031		0.030		0.021		0.011		0.019		0.021
N	310		310		310		310		310		310		310		310	
Bond	**Target Bond Returns**								**Acquirer Bond Returns**							
Estimated Coefficient	MAR(-20, +20)		AR(-20, +20)		MAR (-1, +1)		AR(-1, +1)		MAR(-20, +20)		AR(-20, +20)		MAR(-1, +1)		AR(-1, +1)	
	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*
Constant	-0.030	-0.250	0.002	0.013	0.010	0.005	-0.003	-0.039	-0.027	-0.933	-0.037	-1.038	-0.008	-0.594	-0.009	-0.685
Payment	-0.370	-2.350*	-0.353	-2.153*	-0.168	-2.292*	-0.169	-2.105*	-0.003	-0.242	-0.004	-0.294	0.002	0.780	0.002	0.768
Hostility	-0.033	-0.245	-0.066	-0.493	0.001	0.010	0.004	0.049	0.032	1.363	0.041	1.544	0.013	0.964	0.013	0.929
Relatedness	-0.024	-0.171	-0.033	-0.226	0.014	0.211	0.013	0.181	-0.004	-0.314	-0.010	-0.612	-0.005	-1.267	-0.006	-1.367
Size	-0.265	-2.034*	-0.293	-2.211*	-0.099	-1.517	-0.099	-1.416	0.013	2.027**	0.010	1.531	0.000	0.150	0.000	-0.075
Mar_Trend	0.067	0.412	0.043	0.262	0.015	0.187	0.019	0.227	0.007	0.380	0.007	0.263	-0.006	-2.297**	-0.005	-2.134**
***F*-test**		1.846		1.977		0.755		0.698		0.955		0.787		2.289*		2.162*
Adj. R^2		0.297		0.328		-0.140		-0.178		-0.005		-0.013		0.118		0.108
N	11		11		11		11		49		49		49		49	

3.3 Conclusion

This thesis examines shareholders' and bondholders' wealth in respect to 310 mergers and acquisitions in the UK market between 1994 and 2006.

Based on the theories of M&A motivations and the theories of shareholder-bondholder conflicts, this research is designed around five testable hypotheses: the coinsurance effect, the wealth transfer, the synergy, the hubris hypothesis and the bond return based on the hubris hypothesis. The excess security returns are tested in four sections: the overall security returns, the combined security returns, the univariate analysis and the multivariate analysis.

In the overall security returns section, the market-adjusted return (MAR) and abnormal return (AR) of stocks and bonds are examined in a forty-one day event window (-20, +20) and a three day event window (-1, +1). The overall stock returns are 20.631% for MAR (-20, +20), 22.507% for AR (-20, +20), 12.936% for MAR (-1, +1) and 13.063% for AR (-1, +1) of target firms, and -0.728% for MAR (-20, +20), -1.938% for AR (-20, +20), -1.498% for MAR (-1, +1) and -1.629% for AR (-1, +1) of acquiring firms. Except for MAR (-20, +20) of the acquiring firm, all the other returns are statistically significant. The positive target stock returns and negative acquirer stock returns are consistent with many previous studies. The overall bond returns are 7.682% for MAR (-20, +20), 7.404% for AR (-20, +20), 5.082% for MAR (-1, +1) and 5.278% for AR (-1, +1) of target firms, and -0.768% for MAR (-20, +20), -0.961% for AR (-20, +20), -0.206% for MAR (-1, +1) and -0.294% for AR (-1, +1) of acquiring firms. The target AR (-20, +20) and AR (-1, +1) are significant for the *Z*-test at 1% level, MAR (-1, +1) and AR (-1, +1) are significant for the Wilcoxon test at 5% level, and the acquirer AR (-20, +20) is significant for the Wilcoxon test at 5% level. The number of studies on bondholder wealth regarding M&A is limited, and among them only Billett et al. (2004) and this study are able to find significant non-convertible bond returns for both target and acquiring firms. Kim and McConnell (1977), Asquith and Kim (1982), Dennis and McConnell (1986) and Walker (1994) do not find significant returns for bondholders; Settle et al. (1984) report a significantly positive combined bondholder returns but do not distinguish the wealth effect on target and acquirer; Eger (1983), Maquieira (1998) and Renneboog and Szilagyi (2007) report a significantly positive bond return for acquiring firms, and Travlos (1987) report a significantly negative bond return for acquiring firms, but no significant evidence for target firm bonds; Penas and Unal (2004) find significantly positive bond return for target firms, but acquiring firm bond return is insignificant. The significant positive target stock return, negative acquirer stock return, positive target bond return and negative acquirer bond return preliminarily support the wealth transfer hypothesis and the hubris hypothesis. However, the complete conclusion on the five hypotheses can be drawn only after the combined security return tests are done.

The second section examines the combined stock/bond and target/acquirer excess returns. These combined returns are calculated as value-weighted average of the excess security return in the combination. The combined *Stock* returns are -0.00103% for MAR (-1, +1) and -0.00141% for AR (-1, +1), and statistically significant. This result is consistent with the hubris hypothesis that acquisitions are value destroying for stockholders as a whole. The combined *Bond* returns are 0.00448% for MAR (-1, +1) and statistically significant, and 0.00331% for AR (-1, +1) and statistically insignificant. The positive bondholder return is consistent with the co-insurance hypothesis. The combined *Target* returns are 0.01401% for MAR (-1, +1) and 0.01415% for AR (-1, +1), and statistically significant; the combined *Acquirer* returns are -0.00445% for MAR (-1, +1) and -0.00521% for AR (-1, +1), and statistically significant. These two results are consistent with the wealth transfer hypothesis that M&A transfers wealth from acquiring firms to target firms. The *5 deals* returns are -0.14135% for MAR (-1, +1) and -0.13735% for AR (-1, +1), and statistically insignificant; the *Total* returns are -0.00077% for MAR (-1, +1) and -0.00109% for AR (-1, +1), and statistically significant. These results are inconsistent with the synergy hypothesis. Billett et al. (2004) reports a significant positive return for combined *Stock*, an insignificant positive (mean) return for combined *Bond*, a significant positive return for combine *Target*, an insignificant positive return for *Acquirer*, and a significant positive return for *Total*. The *Total* return difference between these two studies comes from the acquiring firm stock return, which in the

Billett et al. (2004) study is insignificantly positive but in this study is significantly negative.

The univariate analysis section tests the influences of deal characteristics on the excess returns of stockholders and bondholders. The deal characteristics include method of payment, hostility, industry relatedness, relative size and market trend. The method of payment is measured by whether the payment is in pure cash or otherwise. Stock returns show higher value in cash payment than otherwise, which support the signalling hypothesis, tax hypothesis and control hypothesis, and are consistent with most previous studies. The method of payment does not have significant impact on bond returns, and this result is consistent with Billett et al. (2004) and Renneboog and Szilagyi (2007). Hostility is measured by whether the deal is friendly (including neutral deals) or hostile. The acquiring firm stocks show higher value for friendly deals than hostile deals, which implies the hypothesis that acquiring firms face less risk, incur fewer costs, and receive better co-operation in friendly takeovers. Hostility does not have significant impact on bond returns, and this result is again consistent with Billett et al. (2004) and Renneboog and Szilagyi (2007). Industry relatedness measures whether the target and acquiring firms belong to the same industry. The acquiring firm stock returns show higher value for unrelated mergers, which could be explained by the hypotheses of diversifying, economy of learning and incentive effect. The acquiring firm bond returns are higher for related mergers, which may attribute to the incentive effect that transfers wealth from bondholders to shareholders. Relative size measures the ratio of target size over acquirer size. Target firm share returns are higher if target is smaller than the acquirer, which indicates the hypotheses that acquisition of small target is more likely to realise synergy, to remove incumbent management, and less likely to be motivated by managerial hubris of the acquirer. None of the bond returns are affected by relative size. Market trend measures if the overall stock market is overvalued or undervalued. Not many previous studies have examined the effect of market trend on stockholder returns. There has not been any study on bondholder wealth with market trend. This research divides the announcement period into bull market period and bear market period according to the trend of *FTSE All Share* between 1994 and 2006.

Both target and acquirer stock returns show higher value for bull market, which supports the merger wave hypothesis of Rhodes-Kropf and Viswanathan (2004). The acquirer bond returns are higher in the bear market, which maintains the hypothesis that mergers in bear market create more synergy than in bull market.

The multivariate analysis section studies the relation between excess security returns and the deal characteristics variables discussed in the univariate tests, and shows qualitatively the same results.

Chapter 4 Theories of Leverage Ratios

4.1 Introduction

Capital structure is the mix of different securities issued by a firm (Brealey and Myers, 2003). The amount of debt that a firm uses to finance its assets is called leverage. The firm can issue dozens of distinct securities in countless combinations—when the firm is financed entirely by equity, its entire stream of cash flows goes to the shareholders; when the firm is financed partly by equity and partly by debt, the relatively safe stream goes to the debtholders and the more risky stream goes to the shareholders. The management makes choice of capital structure in order to maximise the firm's overall market value.

Research on corporate finance has made substantial progress on the subject of capital structure. The *M-M* theorem proposition *I* states that a firm's value is unaffected with its capital structure in a perfect capital market. By taking the tax shield of debt into consideration, the modified *M-M* theorem proposition *I* argues that it is advantageous for a firm to be levered as high as possible. The control hypothesis argues that debt helps shareholders reduce agency costs of free cash flow and promote managers' efficiency, thus debt is a potential determinant of capital structure; the optimal capital structure is the point at which the marginal costs of debt equal to its marginal benefits. Based on the *M-M* theorem and control hypothesis, the trade-off theory considers that companies make financial decisions as a trade-off between interest tax shields and the costs of financial distress. Specifically, the static-trade off theory considers that the leverage ratio is determined by a single period trade-off; the adjustment costs make the leverage ratios among firms having the same optimal leverage ratio randomly dispersed. The dynamic trade-off theory maintains that firms adjust their leverage ratios, and the deviations from their optimal leverage ratios are gradually removed over time. The pecking order theory disputes that firms do not have optimal capital structures, instead, they prioritise the financing sources according to the degree of effort and resistance—first with internal funds, then debt, last equity. The market timing theory believes that there is no optimal capital structure, and managers time the stock market by issuing (repurchasing) equity when their stocks are overvalued (undervalued). As a result, a firm’s observed capital structure is the cumulative outcome of historical equity performance.

Based on the dynamic trade-off theory, a bunch of hypotheses link capital structure research with the event of takeovers, and forecast significant leverage ratio changes with takeovers. The *co-insurance hypothesis* advises that when two firms’ earnings are not perfectly correlated, a merger can increase the debt capacity of the combined firm, so the combined firm takes advantage of the debt benefits and levers up. The *unused debt capacity hypothesis* explains that the combined firm levers up to consume the unused debt capacity from either the acquirer or target before the merger. The *financial slack hypothesis* suggests that the slack-rich acquiring firm actively searches for the slack-poor target firm with valuable investment opportunities, therefore the acquiring firm with low leverage ratio before the merger increases its leverage ratio with the merger. The *commitment device hypothesis* proposes that low leverage ratio plays a role of commitment device for the acquiring firm to deter its bidding rivals; after the merger, since debt loses its strategic value, the acquiring firm levers up to take the tax shield advantage. The *wealth transfer hypothesis* supposes that the acquiring firm levers up in takeover to expropriate wealth from existing bondholders to offset shareholders’ loss from the increasing debt capacity.

This empirical research utilizes takeover as an event to investigate its potentially significant influences on acquiring firms’ book leverage ratios. It probes each acquiring firms’ book leverage ratio deviations in a standard 11-year window [-5, +5]. The deviations are computed in three stages. At the first stage, the tobit model runs a pooled cross-sectional regression on a number of lagged independent variables for firm-year [-5, -1] to estimate the coefficients of independent variables. At the second stage, the estimated coefficients are substituted into the tobit model to predict the optimal leverage ratios of firms in each of the eleven years. At the third stage, each firm’s optimal leverage ratio is subtracted from its actual book leverage ratio to get its deviation in each of the eleven years. The trend of the deviations in the 11-year window demonstrates that M&A changes firms’ leverage ratios dramatically at the announcement year, which fits the hypotheses that links takeovers and firms' capital structures. The trend also illustrates that firms gradually converge their leverage ratios towards the optimum in the years after merger, which is consistent with the prediction of dynamic trade-off theory. This research then analyses the speed with which firms reverse back to their optimal leverage ratios by a standard partial adjustment model with OLS regression. It discovers a low but persistent adjustment speed, which is consistent with Fama and French (2002) and Flannery and Rangan (2006). In order to examine whether this low adjustment speed is caused by adjustment costs or by alternative theories that competing with the dynamic trade-off theory, variables proxy for pecking order theory, market timing theory and managerial inertial are added into the partial adjustment model for further tests. These tests reject all the alternative theories and find consistent evidence of dynamic trade-off effects. These results are consistent with Flannery and Rangan (2006). Last, this research tests the influences of method of payment and source of fund on leverage ratios. It reports that cash payment and raise of funds are inclined to increase leverage ratios at announcement, and to maintain leverage ratios at a high level in the post-merger period.

Contributions of this research are as follows. First, the sample selection process is improved from previous papers. The study of M&A's impact on a firm's capital structure requires isolate one deal's influence from another in case the firm takes more than one deals in the object window. Otherwise, it is difficult to tell which deal attributes to the change of capital structure in a certain year. This research excludes firms that take more than one takeovers in the 11-year period, and avoids the overlapping problem. The studies of Ghosh and Jain (2000), Harford et al. (2007) and Morellec and Zhdanov (2008) do not restrict series acquirers thus their studies are noisy. Bruner (1988) restricts his sample to firms that are not involved in takeovers in the previous eight years, but he does not exclude firms that are involved in takeovers in the years after the first selected deals.

Second, the regression process is different. To examine the influence of M&A on capital structures, M&A is considered as an event, thus the features of capital structures after M&A should be quite different from those before M&A. As MacKinlay (1997) argues, the event priod itself should not be included in the estimation period to prevent the event from influencing the normal performance model parameter estimates; otherwise, both the normal returns and the abnormal returns would capture the event impact. Previous research such as Baker and Wurgler (2002), Harford et al. (2007) and Morellec and Zhdanov (2008) estimate coefficients of capital structures by in-sample models, which could cause a problem by mixing the "estimation window" and the "event window". This research uses out-of-sample regression for the coefficients estimations and the results are more objective.

Third, the deviation tests split the sample into two groups on whether firms' deviations increase between year -1 and year 0. It is evident that M&A increases some firms' leverage ratios but decreases other firms' leverage ratios, and the trend of deviations of those two groups should be quite different. Previous research such as Harford et al. (2007) and Morellec and Zhdanov (2008) do not distinguish those two groups, therefore the leverage deviations of firms that lever up and firms that lever down cancel out with each other, and the aggregate deviation trend of the sample is noisy. Due to the above three reasons, this research shows more significant influence of takeovers at the announcement year than previous research (the previous research find M&A reverses firms' leverage ratios back to their optimism, but this research finds M&A drags firms' leverage ratios beyond their optimism to the opposite way of deviation), and gives evidence of dynamic trade-off theory that firms reverse back to their optimal leverage ratios gradually in the years after takeovers which has not been reported by other papers (see Chart 5-1 and Chart 5-2).

Fourth, despite that quite a few papers examine the method of payment on capital structures, this research is the first one to test on the source of fund on capital structures.

The rest of the study is organised as follows. Section 4.2 reviews the classic capital structure theories. Section 4.3 motivates the argument for examining capital structures associated with M&A. Section 4.4 concludes. Section 5.1 describes the data. Section 5.2 explains the methodology and regression results in detail. Section 5.3 tests dynamic trade-off theory against alternative theories by partial adjustment models. Section 5.4 probes the impact of method of payment and source of fund on capital structure. Section 5.5 is conclusion.

4.2 Literature Review

4.2.1 Modigliani and Miller Theorem

Modigliani and Miller (*M-M*) set up the basis of modern thinking on capital structure research. The *M-M theorem* proposition *I* shows that in a perfect capital market without taxes, costs of bankruptcy and asymmetric information, the market value of a firm is unaffected by its capital structure. Proposition *II*, derived from proposition *I*, shows that the cost of equity increases with the debt to equity ratio, which keeps the weighted-average cost of a firm's capital constant (Modigliani and Miller, 1958). Although the traditional *M-M* theorem is based on unreal assumptions, it sheds light on where to look for determinants of optimal capital structure and how those factors might affect optimal capital structure.

In a well-functioning capital market where the government levies corporate income tax, the financial decision on capital structure does affect the firm's market value. Since the interest that a firm pays for its debt is a tax-deductible expense whereas dividend for equity is not, the debt financing provides an interest tax shield for the firm (Brealey and Myers, 2003). By taking taxes into consideration, the modified *M-M* theorem proposition *I* argues that it is advantageous for firms to be levered as the interest payment on debt is deductible (Modigliani and Miller, 1958 and 1963). Therefore the firm's market value and shareholders' wealth will continue to go up as the leverage increases, and the optimal capital structure for a firm should be 100 percent debt-financed (Brealey and Myers, 2003). However, this optimal capital structure does not apply in practice. The modified *M-M* theorem proposition *II* emphasises that the costs of equity rise with leverage because higher leverage is accompanied with higher risk.

The costs of equity led by risk are also called the costs of financial distress. These costs are made up of costs of bankruptcy and costs without bankruptcy. The direct costs of bankruptcy come from the legal and administrative fees, and the indirect costs of bankruptcy come from the stakeholders' (such employees, customers, supplier, etc) reluctance to do business with a firm that may not be around for long (Brealey and Myers, 2003). The financial distress without bankruptcy is such a situation that a firm on the edge of bankruptcy can scrape up enough cash to pay the interest on its debt and may be able to delay the bankruptcy for many years. Under such circumstance both the shareholders and the bondholders want the firm to recover, but in other respects their interests might be in conflict and the conflict is costly (Brealey and Myers, 2003). The high odds of default create the costs of financial distress through the behaviours of undertaking risky projects and under-investment. For the former one, shareholders are tempted to undertake riskier projects—projects with higher failure probabilities and the payoff is higher if succeeds—at the expense of bondholders, thus the excess profits accruing to the shareholders but risks borne by bondholders. For the later one, if the business risk is held constant, any increase in firm value is shared among shareholders and bondholders, as a result the shareholders are inclined to give up an opportunity to invest in a project with potential positive net present value—the investment decreases the probability of default and if default occurs the payoff to the bondholders is larger, but the stream of cash flow to shareholders is reduced (Brealey and Myers, 2003). Bondholder might suffer from such opportunity losses.

4.2.2 Control Hypothesis

Jensen (1986) argues that the optimal capital structure "is the point at which firm value is maximised, the point where the marginal costs of debt just offset the marginal benefits". Free cash flow generates agency costs because there are conflicts of interest between the shareholders and managers over payout policies. To avoid current cash being invested in low-return projects or being wasted by managers, debt creation is an effective substitute for dividends and share repurchase. Debt creation forces managers to maintain the interest and principal payments; in case they fail to make such payments, the firm will be taken into bankruptcy court. As a result, debt helps to reduce the agency costs by reducing the cash flow available to spend at managers' discretion, thus it benefits shareholders by motivating managers to run firms more efficiently. Jensen calls this effect of debt the *control hypothesis* and considers it as a potential determinant of capital structure. Jensen and Smith (2001) and Smith (1986) examine stock price changes at announcements of transactions which change firms' leverage ratio. Jensen (1986: 325) summarises that "most leverage-increasing transactions, including stock repurchases and exchange of debt or preferred for common, debt for preferred, and income bonds for preferred, result in significantly positive increases in common stock prices", and "most leverage-reducing transactions, including the sale of common, and exchange of common for debt or preferred, or preferred for debt, and the call of convertible bonds or convertible preferred forcing conversion into common, result in significant decreases in stock prices". Jensen (1986) discovers that debt creation does not always have positive effects on firms: the control function of debt is more important in firms with low growth prospects and large cash flows, but less important in firms with high growth opportunities and no free cash flow.

4.2.3 Trade-off Theory

The original version of the *trade-off theory* is founded on the modified *M-M* theorem and the control hypothesis, which explains how companies make financial decisions as a trade-off between the benefits and costs of borrowing (Brealey and Myers, 2003). The benefits of debt include interest tax shields of debt and the reduction of free cash flow problems; the costs of debt include potential costs of financial distress and agency conflicts between shareholders and bondholders (Fama and French, 2002). Fama and French (2002) propose the interest tax shields have two offsetting effects on the optimal leverage ratio: the deductibility of corporate tax interest payments lead high optimal leverage ratios for firms; the higher level of personal tax rate on debt comparing with equity tempts firms to have low optimal leverage ratios.

The development of the trade-off theory can be broken into two stages. The *static trade-off theory* is developed in an early stage. Though a number of scholars contributed to its development, it is Bradley et al. (1984) who construct a standard model on it, arguing the static trade-off theory holds if a firm's leverage ratio is determined by a single period trade-off between the tax advantage of debt and the present value of bankruptcy costs. Since there are costs and delays for firms to adjust to their optimal leverage ratio, firms cannot immediately offset the random events that bump them away from the optimal leverage ratio, the leverage ratio among firms having the same optimal leverage ratio should be randomly dispersed (Myers, 1984).

In a later stage, as the high demand on removing some unrealistic assumptions of the single-period model (such as the ignorance of the tax code, the expectation, and the adjustment costs), a dynamic trade-off model is generated. The *dynamic trade-off theory* holds if a firm has an optimal leverage ratio and the deviations from that optimal ratio are gradually removed over time (Frank and Goyal, 2008). Kane et al. (1984) and Brennan and Schwartz (1984) come up with the first dynamic models to measure the trade-off between tax savings and bankruptcy costs. Their models take into account of taxes, bankruptcy costs, and uncertainty. Since their assumptions exclude transaction costs, firms are able to rebalance capital structures immediately. Fischer et al. (1989) proposes a dynamic model by bringing in transaction costs. They predict that firms allow their capital structures to swing over time, and firms rebalance their capital structures only if the drift is beyond the optimal leverage ratio boundary. According to this model, persistently good performance will eventually cause firms to raise debt if their leverage fluctuations reach their lower limits. This prediction causes a controversy because in the real world, profitable firms seldom go out to raise debt. Alternatively, these firms might involve in mergers and acquisitions and lever up significantly (Frank and Goyal, 2008).

The static trade-off theory predicts a negative relation between leverage ratio and the market-to-book ratio: as high market-to-book ratio is usually associated with good investment opportunities (Hovakimian et al., 2001), firms with high market-to-book ratio are likely to keep the leverage ratio down in order to avoid the high cost of debt financing which is adverse on firms' investment opportunities. The dynamic trade-off theory anticipates that firms adjust the leverage ratio to offset the influence of market-to-book ratio in the long run.

The static trade-off theory expects a positive relationship between leverage ratio and asset tangibility. Brealey and Myers' (2003) argue that companies with tangible assets favour debt financing. Rajan and Zingales (1995) explain that tangible assets are considered as collateral which diminishes debtholders' risk of financial distress and tangible assets retain more value in case of liquidation, therefore lenders are willing to lend more to firms with large proportion of tangible assets.

In general, the static trade-off theory predicts a positive relationship between the optimal leverage ratio and profitability due to a number of reasons: higher profitability implies potentially higher tax shield from debt, lower probability of bankruptcy, and potentially higher overinvestment, hence a higher optimal leverage ratio (Hovakimian et al., 2004). This relationship well explains the industry differences in capital structure, reflecting the differential benefits and costs of debt—companies with safe, tangible assets and abundant taxable income to shield favour debt financing; unprofitable companies with risky, intangible assets should prefer equity financing (Brealey and Myers, 2003). In contrary, the dynamic trade-off theory predicts a negative relationship between the optimal leverage ratio and profitability: when firms passively accumulate earnings and losses, the firms that were highly profitable in the past are likely to be under-levered, and the firms that experienced losses are likely to be over-levered (Hovakimian et al., 2004). Under this hypothesis, the negative relationship between the actual leverage ratio and profitability is explained by the effects of profitability on the deviation of actual leverage ratio from the optimal leverage ratio, not by the effects of profitability on the optimal leverage ratio.

The research and development expense and selling expense are usually considered as the indicators of firms' uniqueness. The static trade-off theory predicts a negative relationship between leverage ratio and them. Titman and Wessels (1988) comment that R&D expense measure uniqueness because the more a firm spends on

R&D, the more difficult for its competitors to duplicate its innovations and products; firms with unique products are likely to advertise more in selling their products. Titman (1983), Titman and Wessels (1988), Grinblatt and Titman (2002), Hovakimian et al. (2004) expect the negative relationship because firms with specialised assets and products (higher R&D and selling expense) have greater stakeholder costs, potentially more shareholder-bondholder conflicts, little earnings, and these assets and products cannot be treated as collateral. The R&D expense is also deemed as an indicator of non-debt tax shields. Since a higher R&D expense is connected with no taxable income, a lower expected corporate tax rate, and a lower expected payoff from interest tax shields, leverage ratio is negatively related with R&D expense (DeAngelo and Masulis, 1980; Fama and French, 2002).

The static trade-off theory also foresees a positive relationship between leverage ratio and firm size. Firms make financial decisions by balancing the interests and costs of debt regarding to firm size. Since large firms have better access to capital markets and their cash flow is less volatile, they have low cost of financial distress. As a result, they can afford high leverage ratios.

Furthermore, the static trade-off theory explains the influence of industry characteristics on the leverage ratio, and Grinblatt and Titman (2002) argue that firms in industries producing durable goods tend to be less levered than firms producing nondurable good because customers avoid buying durable goods of distressed firms.

Welch (2004), Leary and Roberts (2005) and Kayhan and Titman (2007) find the evidence of trade-off theory in their empirical studies. Leary and Roberts (2005) dispute that “firms actively rebalance their leverage to stay within an optimal range” in respond to their equity value changes after the price shocks or equity issuance. However, the adjustment costs often postpone the adjustment process. Welch (2004) finds firms that wander away from the industry average debt-equity ratio seek to move back, and firms which just acquired other firms are inclined to increase their leverage. Kayhan and Titman (2007) discover that although firms’ capital structures are strongly influenced by firms' history, firms do move back towards their target debt ratio, though with slow pace. However, the trade-off theory fails to explain why the most profitable companies commonly borrow the least (Brealey and Myers, 2003). As an alternative, the pecking order theory functions to explain this capital structure puzzle.

4.2.4 Pecking Order Hypothesis

Myers (1984) proposes the *pecking order hypothesis* based on Donaldson's (1961) study of the financing practices of a sample of large firms. Pecking order theory considers that firms prioritise the sources of financing according to the degree of effort and resistance—investment is financed first with internal funds, then by new issues of debt, and finally with new issues of equity (Brealey and Myers, 2003). In this theory, there is no well-defined optimal capital structure, instead, "there are two kinds of equity, internal and external, one at the top of the pecking order and one at the bottom" (Myers, 1984: 581). According to this hypothesis, since the most profitable companies have sufficient internal funds and this way of funding is the cheapest, they are likely to borrow the least; for those companies which assets are mostly intangible and the costs of financial distress are high, the only way to grow rapidly and to low down the leverage ratio is to finance with equity (Brealey and Myers, 2003). The pecking order behaviour may attribute to six reasons.

I. The agent theory: Myers (1984) argues that firms rely on internal finance to avoid the discipline of capital market.

II. The asymmetric information: Myers (1984), and Myers and Majluf (1984) explain that the capital structure decision is stimulated by the costs of adverse selection as a result of asymmetric information. Managers choose to issue debt when investors undervalue the firm, and equity when investors overvalue the firm. Fama and French (2002) declare shareholders are aware of this asymmetric information problem and they react by discounting the firms' existing and new risky equities at the time of new issue. Managers assume if they do issuing new equity, shareholders' discounts could forgo the profitable investments. In order to maintain the investment opportunities, managers finance their projects following pecking order to avoid the asymmetric information costs. The asymmetric information also explains the market timing theory which will be discussed later.

III. The stakeholder theory: Grinblatt and Titman (2002) recommend that more profitable firms may expect expansion and in turn will want to keep low leverage ratio to attract strategic partners and employees; less profitable firms may anticipate shrinking and in turn will want to keep a higher leverage ratio in order to gain favourable concessions from suppliers and employees.

IV. The shareholder – bondholder conflicts: Grinblatt and Titman (2002) suggest that for the financially distressed firms, the new stock issue is less attractive to shareholders (both existing and new shareholders) because as the risk on bond is replaced by the risk on share, wealth is transferred from shareholders to bondholders.

V. The taxes: Grinblatt and Titman (2002) argue that the combination of corporate tax deductibility of interest payments and the personal taxes on dividends implies that the US tax code favours funding new investment with retained earnings and debt over issuing new equity.

VI. Transaction costs: Fama and French (2002) advise that transaction costs are the costs associated with new issues: the pecking order arises if the costs of issuing new risky debt or equity overwhelm other costs and benefits of retained earnings and safe debt.

Considering market-to-book ratio as a major proxy for expected investment opportunities, Fama and French (2002) predict a positive relationship between the investment opportunities and book leverage ratio by a simple pecking order theory, and a negative relationship by a complex pecking order theory. They explain that in the simple version of pecking order, leverage ratio is determined by the accumulative differences between retained earnings and investment, if profitability and investment outlays are persistent, for given profitability, leverage ratio is positively related with investment opportunities. In the complex version of pecking order, firms balance current and future financing costs, so firms with larger investment opportunities are likely to maintain low-risk debt capacity in order to finance future investments; hence there is negative relation between leverage ratio and investment opportunities.

Grinblatt and Titman (2002) consider the pecking order theory anticipate a strong negative relationship between firms' profitability and leverage ratio: the most profitable firms tend to use a substantial amount of their retained earnings to repay the debt rather than to repurchase equity, and these firms are likely to experience an increase in share price, hence their leverage ratio is low; the least profitable firms that in demand of external funds are likely to raise debt rather than issue equity, and these firms are tend to experience an decrease in share price, hence their leverage ratio is high. In the long run, if firms follow pecking order, the negative relationship between profitability and the leverage ratio will be persistent because firms have no incentive to offset the effects of profitability on leverage ratios (Hovakimian et al., 2004).

The pecking order theory also predicts a positive relationship between leverage ratio and firm size, which coincides with the trade-off theory prediction. Fama and French (2002) suggest firm size measured as the natural logarithm of total assets is an inverse symbol of volatility. Since small size firms usually have volatile cash flows, in order to avoid issuing new risky equities or forgoing investment opportunities, they tend to keep lower leverage ratios.

Titman and Wessels (1988) find that profitable firms have relatively lower debt ratio. Leary and Roberts (2005) discover evidence of pecking order in their paper that firms with sufficient internal funds are less likely to use external capital, but are more likely when they have large investment opportunities.

4.2.5 Market Timing Theory

Market timing theory argues that there is no optimal capital structure and the capital structure is the cumulative outcome of a series of market-timing-motivated financing decisions (Baker and Wurgler, 2002). Managers of firms aim to maximise the interests of ongoing shareholders. The managers believe that they can time the market by issuing stocks when their stocks are overvalued or by repurchasing stocks when their stocks are undervalued; outside investors will under-react to issue or repurchase announcements, which leaves some space to exploit the perceived mispricing hence the ongoing shareholders benefit. Since the optimal capital structure does not exist, there is no need for managers to reverse their financial decisions in later period; the influence of financial decisions on capital structure will be permanent.

The market timing theory makes no prediction about the effect of profitability, but its prediction on the negative effect of market-to-book ratio coincides with the pecking order hypothesis: firms time the market by issuing equity (repurchase equity) when the market-to-book ratios are high (low), which results in decreased (increased) leverage ratios (Myers, 1984; Hovakimian et al., 2004). Baker and Wurgler (2002) argue that the temporary fluctuations in market-to-book ratio would have a permanent influence on leverage ratio. They find that firms do not have optimal capital structure and the capital structure depends strongly on past market valuations.

4.3 M&A and Capital Structure

This thesis examines capital structure by the event of mergers and acquisitions. Based on the trade-off consideration between the tax advantages of debt and the expected bankruptcy costs, several hypotheses have forecasted the significant leverage ratio changes around M&A.

The *co-insurance hypothesis* advises that when two firms' earning streams are less than perfectly correlated, a merger between them can increase the debt capacity of the combined entity; then the combined firm takes advantage of the debt benefits and levers up. The *unused debt capacity hypothesis* explain that the combined firms levers up because either the acquiring firm or the target firm has unused debt capacity before the merger. The *financial slack hypothesis* suggests that the slack-rich acquiring firm actively searches for the slack-poor target firm with valuable investment opportunities and about which investors have limited information, therefore the acquiring firm with low leverage ratio before the merger is observed to increase its leverage ratio after the merger. The *commitment device hypothesis* proposes that leverage ratio plays a role of commitment device for the growth firm, and deters its rival in the merger contest; since debt loses its strategic value after the merger, the acquiring firm levers up after merger to take the tax shield advantage. The *wealth transfer hypothesis* supposes that the acquiring firm levers up after takeover in order to expropriate wealth from existing bondholders to offset shareholders' loss from the increasing debt capacity.

4.3.1 Co-insurance and Increasing Debt Capacity

Lewellen (1971) proposes that if earnings of two firms are not perfectly correlated, their merger will create values for the joint firm. Lewellen considers takeovers as a portfolio of income streams between the bidding and target firms. He argues that the benefit of this portfolio on merger comes from the operational advantages which could not be realized by individual investors' portfolio of two firms' shares on the stock market. He believes this factor will contribute to the new firm's income stream, and the unused debt capacity of the target firm could increase the borrowing ability of the combined firm. Kim and McConnell (1977) quote this concept as co-insurance effect. They develop Lewellen's theory, arguing that the portfolio diversification of two or more firms whose earning streams are imperfectly correlated would reduce the merged firm's default risk and increase debt capacity (Kim and McConnell, 1977).

Ghosh and Jain (2000) develop the co-insurance hypothesis and come up with the increasing debt capacity hypothesis. When two firms merge, the variability of the combined firm's earnings is smaller than the weighted average of the variability of the earnings of the two merging firms as long as the correlation between the earnings of the two merging firms is less than one. The reduction in the variability of the combined firm's earnings therefore reduces the firm's expected bankruptcy costs, making its debt safer and creating extra capacity for debt. The combined firm makes use of the increased debt capacity and levers up, and shareholders benefit from the tax deductibility of interest payments on corporate debt generated from the additional debt.

4.3.2 Unused Debt Capacity

Ghosh and Jain (2000) advise that the increase in leverage ratio could come from the unused debt capacity of either the acquiring or target firms, or both, from pre-takeover period. For that reason, either the acquiring or target firms should be observed under-levered before the acquisition. Weston and Mansinghka (1971), Lev and Mandelker (1972), Melicher and Rush (1973), Kim and McConnell (1977), Shrieves and Pashley (1984), Bruner (1988) and Ghosh and Jain (2000) find evidence that the acquiring firms build up debt capacity in advance of acquiring.

4.3.3 Financial Slack

Myers and Majluf (1984) and Bruner (1988) come up with the financial slack hypothesis based on information asymmetry. Financial slack refers to sum of cash on hand and marketable securities, or the sum of cash and unused debt capacity. In circumstances of asymmetric information, a firm (the target) with insufficient financial slack is unable to raise fund by issuing equity directly to investors because investors will discount this equity; thus, this firm may pass up all valuable investment opportunities. Another firm (the acquirer) with plenty of slack pursues this type of target firm (the target firm is with good investment opportunities and limited slack, and about which investors have limited information) and initiates a merger which creates value through the additional investment opportunities with positive net present value. As a result, the acquiring firms with low leverage increase their leverage ratios significantly after the merger.

4.3.4 Commitment Device

Morellec and Zhdanov's (2008) theoretical research develops a dynamic model of takeovers in which the timing and terms of acquisitions, and financing strategies of the acquiring firms are jointly determined. In their model, the leverage ratio plays a role of commitment device, and determines the outcome of the takeover contest. In the asymmetric equilibrium, one potential acquirer makes a decision to have a lower leverage ratio in order to receive some of the NPV of the target firm's investment opportunity; the other potential acquirer makes up for the loss of the investment opportunity by picking a higher debt level with greater tax benefits. Hence, two ex ante identical firms rationally go for asymmetric strategies: one firm selects a lower leverage ratio and invests, and becomes a growth firm; the other firm selects a higher leverage ratio and does not invest, and becomes a value firm. In this equilibrium the growth firm ends up with a lower leverage ratio and is more likely to deter the rival bidders (the bidding premium is a negative function of the acquirer's leverage ratio, and the acquirer with a lower leverage is likely to pay higher premium and win the contest). The model predicts that the leverage of the winning bidder is below the industry average. It also predicts that the winner should lever up after the acquisition consummation: the low leverage ratio loses its strategic role after the acquisition; hence the winner will logically want to lever up to utilize the tax benefits of debt. Bruner (1988), Ghosh and Jain (2000) and Morellec and Zhdanov (2008) find empirical evidence that the acquiring firms are under-levered before the takeovers and their leverage ratios increase significantly after the takeovers.

4.3.5 Wealth Transfer

Galai and Masulis (1976), Kim and McConnell (1977), Asquith and Kim (1982) and Bruner (1988) recommend that shareholders have the opportunity to transfer the value of co-insurance (increasing debt capacity) to themselves by increasing the leverage after merger. Ghosh and Jain (2000) give explanation that the combined firm levers up in order to expropriate wealth from existing bondholders because the shareholders need to offset the loss from the increasing debt capacity. Because equity is a call option granted by creditors on firm's assets and the exercise price of option is the face value of outstanding debt, equity's value is positively correlated with the variability of the earnings, as the merger lowers down the variability of the combined firm's earnings, the value of equity declines. Hence, shareholders of the combined firm protect themselves from the potential loss by levering up and transferring wealth from the bondholders. This explains why the leverage ratio increasing acquisitions are usually connected with higher abnormal stock returns and downgrade of bonds of the acquiring firms. Assuming that the stock market incorporates future benefits from the anticipated increases in financial leverage at the announcement period, Ghosh and Jain (2000) report that the stock returns at the announcement period are positively related to increases in financial leverage following mergers.

4.4 Conclusion

This chapter reviewed the key capital structure theories and a bunch of hypotheses which link capital structure research with the event of takeovers.

The *M-M* theorem states that a firm's value is unaffected with its capital structure in a perfect capital market. The control hypothesis argues that the optimal capital structure is the point at which the marginal costs of debt equal to its marginal benefits. The trade-off theory considers that companies make financial decisions as a trade-off between interest tax shields and the costs of financial distress. The pecking order theory disputes that firms prioritise the financing sources according to the degree of effort and resistance. The market timing theory argues that a firm's observed capital structure is the cumulative outcome of historical equity performance.

Based on the dynamic trade-off theory, a bunch of hypotheses forecast significant leverage ratio changes with takeovers. The *co-insurance hypothesis* advises that when two firms' earnings are not perfectly correlated, a merger can increase the debt capacity of the combined firm, so the combined firm takes advantage of the debt benefits and levers up. The *unused debt capacity hypothesis* explains that the combined firm levers up to consume the unused debt capacity from either the acquirer or target before the merger. The *financial slack hypothesis* suggests that the slack-rich acquiring firm actively searches for the slack-poor target firm with valuable investment opportunities, therefore the acquiring firm with low leverage ratio before the merger increases its leverage ratio with the merger. The *commitment device hypothesis* proposes that low leverage ratio plays a role of commitment device for the acquiring firm to deter its bidding rivals; after the merger, since debt loses its strategic value, the acquiring firm levers up to take the tax shield advantage. The *wealth transfer hypothesis* supposes that the acquiring firm levers up in takeover to expropriate wealth from existing bondholders to offset shareholders' loss from the increasing debt capacity.

The next chapter will do empirical tests of the leverage ratio deviation and the partial adjustment upon these theories and hypotheses.

Chapter 5 Methodology and Results on Leverage Ratios

This chapter includes two research questions, the leverage ratio deviation and the partial adjustment. The leverage ratio deviation is used to test the dynamic trade-off theory. The hypothesis of this test is that firms deviate away from their optimal leverage ratios at the acquisition announcement, but they gradually converge the deviations in the post-merger period. The leverage ratio deviations are computed by three stages. At the first stage, the actual book leverage ratios are regressed on a number of lagged independent variables by a tobit model to get the estimates for the coefficients. These independent variables include the market-to-book ratio, asset tangibility, profitability, R&D expense, R&D dummy, selling expense and firm size. The sample is made up of 659 acquiring firms that each firm has valid financial data for an 11 year period: from 5 years before the merger announcement to 5 years after the merger announcement. Since merger is considered as an event which could impact the leverage ratio, the five years before announcement is considered as the estimation window. The tobit regression is run based on the sample of 3295 firm-year in the estimation window. At the second stage, the estimated regression equation is used for predicting the value of optimal leverage ratios for given values of independent variables by substituting the estimated coefficients into each year of the 11 years. At the third stage, the predicted leverage ratios are subtracted from the actual leverage ratios to get the leverage ratio deviations. The trend of the deviations in the 11 year period supports the dynamic trade-off theory.

The standard partial adjustment model is used to test the speed of adjustment a firm moves towards the optimal leverage ratio in the post-merger period on the dynamic trade-off theory. The hypothesis is that partial adjustment effect (dynamic trade-off theory) holds if the coefficient of trade-off variable is between 0 and 1 and statistically significant. The result approves the hypothesis. Partial adjustment effect (against the complete adjustment effect) could be caused by either the adjustment cost or by the influence of alternative capital structure theories. In order to distinguish these two factors, several modified partial adjustment models are utilized to test the influences of competing theories on the adjustment speed. The financial deficit variable is added into the standard partial adjustment model to test the pecking order hypothesis, the external finance weighted average variable and its alternative variables are added into the model, respectively, to test the market timing hypothesis, and two different stock return variables are added into the model, respectively, to test the managerial inertial hypothesis and market timing hypothesis. All of these modified models reject the effect of alternatively hypothetical variables and support the dynamic trade-off hypothesis. Thus it gives indirect evidence that the partial adjustment effect could be caused by the adjustment cost.

5.1 Data

Sample acquiring firms (deals) are selected from Thomson One Banker (TOB). The screen criteria for inclusion of a firm (deal) are set as following:

- Acquirer Nation: United States of America
- Acquirer Public Status: Public
- Date Announced: between 1st Jan 1962 and 31st Dec 2001
- Deal Type: Disclosed Value M&A[8]
- Deal Status: Completed
- Deal Value: *Band 1*: $10 million or above
  Band 2: $100 million or above
  Band 3: $1000 million or above

All the acquiring firms are US nation public firms (listed globally, majority of them are listed on the New York Stock Exchange or NASDAQ). The reason that this research focuses on the US companies other than UK companies is because of data availability on Compustat.[9] The beginning date of announcement is set to 1st Jan 1962 which is the earliest record date on the TOB; the end date of announcement is set to 31 Dec 2001 because this research tracks each acquiring firm's leverage ratio up to 5 years after the announcement, and the leverage ratio data on Compustat[10] is

[8] Thomson One Banker categorises M&A deals into two macro types: 1)M&A Transaction for Majority / Remaining Interest and 2)Specific Transaction Types. The first macro type is sub-categorised as 1.1)Disclosed Value M&A and 1.2)Undisclosed Value M&A. The second macro type is sub-categorised as 2.1)Minority Stake Purchases, 2.2)Acquisitions of Remaining Interest, 2.3)Privatisations, 2.4)Leveraged Buyouts, 2.5)Tender Offers, 2.6)Spinoffs, 2.7)Recapitalisations, 2.8)Self-Tenders, 2.9)Exchange Offers and 2.10)Repurchases.

[9] A comparison study has been taken for UK companies with Datastream, but ended up with the invalidity of the financial variables for leverage regression.

[10] At the time of doing this research, only FTP version of data is available on Compustat which is up to 2006. In a later time the Fundamental Annual version of data provides more recent data up to 2007.

valid up to 2006. Deal values are classified into 3 bands thus TOB returns 3 groups of acquiring firms (deals). These 3 groups of acquiring firms (deals) are merged to build up the sample of this research. The rationale of searching acquiring firms with 3 bands and combining them is discussed later.

The financial data for testing acquiring firms' book leverage ratios are obtained from Compustat North America (from WRDS). The research examines the deviations of acquiring firms' leverage ratios in an 11-year period thus it collects each firm's financial data from 5 years before the announcement to 5 year after the announcement [-5, +5]. The most recent data with record in Compustat is in year 2006 (FTP version).

If a firm involves into two or more successive acquisitions in the [-5, +5] window, the inclusion of this firm will cause overlapping problem. In the research undertaken by Harford et al. (2007), the acquiring firms involve into two or more acquisitions in the 6-year period are not excluded, therefore the tests on leverage ratios can be seriously damaged by noise: one deal's influence on the firm's leverage ratio in the announcement year can be offset or enlarged by the successive deal(s); moreover, the impact of the successive deal(s) also obstructs the detection of dynamic trade-off trend. There are two solutions for the overlapping problem: one is to shorten the research period, however, it loses the power to see the entire map of leverage ratio changes in a long period; the other solution is to eliminate the firms with overlapping and it decreases the sample size. This research adopts the second solution: the acquiring firms which involve into two or more mergers are removed from the sample. The exclusion of companies could cause the survivorship bias that the remaining companies are infrequent acquirers. However, since the purpose of this research is to test firms' capital structures by using takeover as an event, not testing the impact of takeovers on firms' growth/survivorship, the exclusion of companies does not biases the sample.

The removal of overlapping deals causes a firm size issue: large acquiring firms take low value acquisitions very frequently therefore they are removed if the TOB search criteria set the deal value low (some firms may take mergers with deal value over $10m for several times a year); small acquiring firms do not involve in deals with large values so they are excluded from sample if the TOB search criteria set the deal value high (some firms never involve into mergers with deal value over $100m). Searching acquiring firms with 3 bands of deal values and combining them helps solve this problem.

This research categorises the deal values of the search criteria in TOB as *Band 1*($\geq$\$10m), *Band 2*($\geq$\$100m) and *Band 3*($\geq$\$1000m) and creates three groups of acquiring firms. By eliminating the firms which involve in successive acquisitions within the [-5, +5] window in each group, the remaining firms (deals) of the three groups are merged together. The firms (deals) appear more than once between/among these groups are deleted. Then, the financial firms with primary SIC code between 6000 and 6999[11] and the regulated utilities with primary SIC code between 4900 and 4999[12] are excluded because their capital structures may reflect special factors. Moreover, firms with total assets less than $10m are dropped because these are very tiny companies or else formerly larger companies in great financial and economic distress, so their capital structures are moving around for reasons unrelated to standard theory of capital structure[13]. Last, firms are restricted to include those with the market-to-book ratio between the 0.5th and 99.5th percentiles to avoid the influence of outliers. This leaves a sample of 659 acquiring firms (deals) each with 11-year data for all the required variables on Compustat North America. Table 5-1 reports the sample screening process.

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[11] Rajan and Zingales (1995) propose three reasons for the elimination of financial firms: 1). their leverage is strongly influenced by explicit (or implicit) investor insurance schemes such as deposit insurance. 2.) their debt-like liabilities are not strictly comparable to the debt issued by nonfinancial firms; 3.) regulations such as minimum capital requirements may directly affect capital structure.

[12] Morellec and Zhdanov (2008) explain that in the regulated industries the conflicts of interests between stockholders and debtholders are less extensive, so firms in regulated industries are expected to have higher leverage ratios.

[13] Flannery and Rangan (2006) explain that small companies' adjustment costs may be unusually large or their leverage determinants might be sigifnicantly different.

Table 5-1 Sample Screening

This table describes how the 659 firms are constructed.

Original Search	**Firm No.**
Band 1: Deal Value ≥$10m	20128
Band 2: Deal Value ≥$100m	6543
Band 3: Deal Value ≥$1000m	928
Delete firms with successive deals within year [-5,+5]	**Remaining Firm No.**
Band 1: Deal Value ≥$10m	3994
Band 2: Deal Value ≥$100m	1770
Band 3: Deal Value ≥$1000m	468
Combination of Band 1, 2 & 3	**6232**
Reason for deletion	**Remaining Firm No.**
Delete Repeated Deals in the Combined Group	5296
Delete Firms with SIC Code between 4900-4999 & 6000-6999	3958
Delete Firms without 11-year Successive Data in Compustat	736
Delete Firms with data12=0 (for data12 definition, see Table 5-3)	723
Delete Firms with Total Assets < $10m	687
Delete Firms with M/B outside of 0.5th and 99.5th Percentile	**659** (final sample)

Table 5-2 describes the *book leverage*, *market leverage*, *market value* and *deal value* of the 659 sample firms (deals). The data of *book leverage* ratio, *market leverage* ratio, and *market value* are the fiscal-year-end data of firm in the previous year of the M&A announcement (year -1). It shows that the median book leverage ratio is 0.166 and the mean book leverage ratio is 0.192; the median market leverage ratio is 0.122 and the mean market leverage ratio is 0.153.

Table 5-2 Descriptive Statistics of Sample Firms

This table describes the *book leverage*, *market leverage*, *market value* and *deal value* of the 659 sample firms (deals). The data of *book leverage* ratio, *market leverage* ratio, and *market value* are the fiscal-year-end data of firm in the previous year of the M&A announcement (year -1).

	Book Leverage	**Market Leverage**	**Market Value ($m)**	**Deal Value ($m)**
Min	0.000	0.000	5.756	10.000
Max	1.345	1.131	144439.716	11864.608
Med	0.166	0.122	468.563	104.352
Mean	0.192	0.153	2288.519	493.928
Std. Dev.	0.167	0.151	8125.713	1261.523

Data Source: Thomson One Banker (Deal Values are in millions of US dollars) and WRDS Compustat North America (Market Values are in millions of US dollars).

5.2 Methodology

A Tobit regression is used to predict acquiring firms' optimal book leverage ratios. These optimal book leverage ratios are then subtracted from the actual leverage ratios to obtain the deviations of book leverage ratios.

5.2.1 Definitions of Variables

It is disputable on what is the appropriate measure of leverage ratio. The ratio of total liabilities over total assets and the ratio of total debt over total assets are the two widely used definitions. The ratio of total liabilities over total assets is the broader definition of leverage ratio, which is a proxy for what is left for shareholders in case of liquidation. Because it includes the non-debt liabilities such as trade creditors and pension liabilities, it may exaggerate the amount of leverage and does not provide a good indication of firms' default risk (Rajan and Zingales, 1995). To avoid the dilution of non-debt liabilities' influences on the leverage movement, this research adopts the total debt (short-term debt + long-term debt)[14] over total assets as the proxy of book leverage.

There are arguments on whether book leverage ratio or market leverage ratio is a better measurement of capital structure. Myers (1977) argues that since book value of equity refers to assets already in place while a certain part of market value of equity is counted by assets not yet in place (by the present value of future growth opportunities, and the amount of debt 'supported by' growth opportunities will be less than is supported by assets already in place), book leverage ratio is more practical than market leverage ratio. In the category of M&A, book leverage ratio is considered as a better measurement because it is unaffected by the dramatic stock price changes of the acquiring firms around the M&A announcement period.

The data definitions from Compustat North America and variable definitions are listed in Table 5-3 and Table 5-4. The model for regression is given in Section 5.2.5. Give an example to illustrate the calendar of data. Texas Instrument Inc acquired Burr-Brown Corp. in year 2000. Hence, the dependent variable *Book Leverage Ratio*

[14] This follows the practices of Bruner (1988), Ghosh and Jain (2000), and Morellec and Zhdanov (2008).

gets data (data 6, data 9 and data 44) in year 2000; the independent variables gets data in year 1999 for the *Market-to-book Ratio* (data 6, data 10, data 25, data 35, data 79, data 181 and data 199), the *Asset Tangibility* (data6 and data 8), the *Profitability* (data 6 and data 13), the *R&D Expense* (data 12 and data 46), the *Selling Expense* (data 12 and data 189), and the *Firm Size* (data 12).

Table 5-3 Data Definitions

DATA6: **Assets—Total (MM$)**
This item represents current assets plus net property, plant, and equipment plus other noncurrent assets (including intangible assets, deferred charges, and investments and advances).

DATA8: **Property, Plant & Equipment (Net) (MM$)**
This item represents the cost, of tangible fixed property used in the production of revenue, less accumulated depreciation.

DATA9: **Long-Term Debt—Total (MM$)**
This item represents debt obligations due more than one year from the company's Balance Sheet date or due after the current operating cycle.

DATA10: **Preferred Stock—Liquidating Value (MM$)**
This item represents the total dollar value of the net number of preferred shares outstanding in the event of involuntary liquidation.

DATA12: **Sales (Net) (MM$)**
This item represents gross sales (the amount of actual billings to customers for regular sales completed during the period) reduced by cash discounts, trade discounts, and returned sales and allowances for which credit is given to customers. The result is the amount of money received from the normal operations of the business (i.e., those expected to generate revenue for the life of the company).

DATA13: **Operating Income before Depreciation (MM$)**
This item represents Sales (Net) *minus* Cost of Goods Sold and Selling, General, and Administrative expenses before deducting Depreciation, Depletion and Amortization.

DATA25: **Common Shares Outstanding (MM)**
This item represents the net number of all common shares outstanding in year-end for the annual file, and as of the Balance Sheet date for the quarterly file excluding treasury shares.

DATA35: **Deferred Tax & Invest Tax Credit (MM$)**
This item represents the accumulated differences between income expense for financial statements and tax forms due to timing differences and investment tax credit.

DATA36: **Retained Earnings (MM$)**
This item represents the cumulative earnings of a company minus total dividend distributions to shareholders. The stock adjustments made to this item relate to unissued shares.

DATA44: **Debt—Due in One Year (MM$)**
This item represents the current portion of long-term debt (included in Current Liabilities).

DATA46: **Research and Development Expense (MM$)**
This item represents all costs that relate to the development of new products or services. The amount reflects the company's contribution to research and development.

DATA79: **Debt—Convertible (MM$)**
This item represents all costs that relate to the development of new products or services. The amount reflects the company's contribution to research and development.

DATA181: **Liabilities—Total (MM$)**
This item represents the *sum* of: 1. Current Liabilities – Total; 2. Deferred Taxes and Investment Tax Credit (Balance Sheet); 3. Liabilities – Other; 4. Long-Term Debt – Total; 5. Minority Interest

DATA189: **Selling, General & Administrative Expenses (MM$)**
This item represents all commercial expenses of operation (i.e., expenses not directly related to product production) incurred in the regular course of business pertaining to the securing of operating income.

DATA199: **Price—Fiscal Year—Close ($&c)**
These items represent the absolute close transactions during the period for companies on national stock exchanges and bid prices for over-the-counter issues. Annual prices are reported on a calendar year basis, regardless of the company's fiscal yearend.

Source: Compustat North America (WRDS: http://wrds.wharton.upenn.edu/ds/comp/inda/)
N.B. MM$ means the unit is in millions of dollars; $&c means the unit is in dollars and cents.

Table 5-4 Variable Definitions

Book Leverage = $\frac{TotalDebt}{TotalAssets} = \frac{data9 + data44}{data6}$

Book Equity= $TotalAssets - (TotalLiabilities + PreferredStock) + DeferredTaxes + ConvertibleDebt$

$= data6 - (data181 + data10) + data35 + data79$

M/B (market-to-book ratio)= $\frac{CommonSharesOutstanding \times Price}{TotalAssets - (TotalLiabilities + PreferredStock) + DeferredTaxes + ConvertibleDebt}$

$= \frac{data25 \times data199}{data6 - (data181 + data10) + data35 + data79}$

Asset Tangibility (net property, plant and equipment / total assets) = $\frac{data8}{data6}$

Profitability (EBITD / total assets) = $\frac{data13}{data6}$

R&D Expense (R&D / net sales) = $\frac{data46}{data12}$

R&D Dummy = 1 if the firms do not report the R&D expense

Selling Expense (selling expense / net sales) = $\frac{data189}{data12}$

Firm Size (logarithm of net sales) = $log_{10}(data12)$ [15]

Dividend Payments= $data127$

Investments= $data113 + data128 + data129 + data219 - data107 - data109$ for firms reporting format codes 1-3

$= data113 + data128 + data129 - data107 - data109 - data309 - data310$ for firms reporting format codes 7

Change in Working Capital

$= data236 + data274 + data301$ for firms reporting format code 1

$= data274 - data236 - data301$ for firms reporting format code 2 and 3

$= data274 - data301 - data302 - data303 - data304 - data305 - data307 - data312$ for firms reporting format code 7

Internal Cash Flow= $data106 + data123 + data124 + data125 + data126 + data213 + data217 + data218$ for firms reporting format code 1 to 3

$= data106 + data123 + data124 + data125 + data126 + data213 + data217 + data314$ for firms reporting format code 7

[15] The logarithm of net sales is used to assure the relationship between leverage ratio and nets sales is linear.

Financial Deficit by Frank and Goyal (2003), Flannery and Rangan (2006)

$$= \frac{DividendPayments + Investments + ChangeInWorkingCapital - InternalCashflow}{TotalAssets}$$

Financial Deficit (net amount of equity and debt / total assets) by Kayhan and Titman (2007)

$$= \frac{\Delta equity + \Delta debt}{TotalAssets}$$

$$= \frac{(\Delta BookEquity - \Delta RetainedEarnings) + (\Delta TotalAssets - \Delta equity)}{TotalAssets}$$

$$= \frac{(\Delta BookEquity - \Delta RetainedEarnings) + [\Delta TotalAssets - (\Delta BookEquity - \Delta RetainedEarnings)]}{TotalAssets}$$

$$= \frac{[(data6 - data181 - data10 + data35 + data79)_t - (data6 - data181 - data10 + data35 + data79)_{t-1}] - (data36_t - data36_{t-1})}{data6_t} +$$

$$\frac{(data6_t - data6_{t-1}) - \{[(data6 - data181 - data10 + data35 + data79)_t - (data6 - data181 - data10 + data35 + data79)_{t-1}] - (data36_t - data36_{t-1})\}}{data6_t}$$

Financial Deficit Dummy = 1 if Financial Deficit is positive

Source: Compustat North America (WRDS: http://wrds.wharton.upenn.edu/ds/comp/inda/)

5.2.2 Motives of Variables

5.2.2.1 Market-to-book Ratio

A number of empirical studies have documented evidence on the negative relationship between the leverage ratio and the market-to-book ratio. The static trade-off theory, the complex pecking order hypothesis and the market timing theory give interpretation on this relationship.

As high market performance is usually associated with the presence of good growth/investment opportunities (Hovakimian et al., 2001), static trade-off theory considers market-to-book ratio as the proxy of firms’ growth/investment opportunities, and the firms make financial decisions as a trade-off between the interest tax shields of debt and the costs of financial distress. It is generally believed that growth opportunities play an important role in determining a firm's financial decision, and firms with good growth opportunities are expected to have low debt (Goyal et al., 2002). In the existence of greater underinvestment problems, rational bondholders are likely to require a higher cost of debt financing, which prevents new fund from being raised or leads to an inefficient bankruptcy negotiation during which some future growth opportunities are lost forever (Baker and Wurgler, 2002). Rajan and Zingales (1995), Houston and James (1996), Hovakimian et al. (2001), Hovakimian (2006), Flannery and Rangan (2006), Alti (2006), and Kayhan and Titman (2007) find a negative relation between market-to-book ratios, used as a proxy for its growth opportunities, and leverage ratios.

Fama and French (2002) proxy market-to-book ratio as firms’ expected investment opportunities, and they predict its relationship with leverage ratio by the pecking order theory. They argue that in the simple pecking order world, leverage ratio is determined by the accumulative differences between retained earnings and investment, in case profitability and investment outlays are persistent, for given profitability, book leverage ratio is positively related with investment opportunities. In the complex pecking order world, firms balance current and future financing costs, so firms with larger investment opportunities are likely to maintain low-risk debt capacity in order to finance future investments; thereby the relation between book leverage ratio and investment opportunities is negative. They discover a positive relation between book leverage ratio and market-to-book ratio, and a negative relation between market leverage ratio and market-to-book ratio.

Market timing theory considers market-to-book ratio as proxy of time measure, suggesting that firms are likely to decrease (increase) their leverage ratio by issuing (repurchasing) equity when their stocks are overvalued (undervalued), i.e., when the market-to-book ratio is high (low) (Rajan and Zingales, 1995; Baker and Wurgler, 2002). Baker and Wurgler (2002) find that leverage ratio is strongly negative related to firms' historical market-to-book ratios; Leary and Roberts (2005) replicate Baker and Wurgler's (2002) analysis and report a negative relationship between leverage ratio and market-to-book value. Baker and Wurgler (2002) argue the trade-off theory predicts that firms adjust the capital structure to offset the influence of market-to-book ratio, while the market timing theory predicts that temporary fluctuations in market-to-book have permanent effects on leverage ratio.

5.2.2.2 Asset Tangibility

The control hypothesis and static trade-off theory expect a positive relationship between the leverage ratio and firms' tangible assets—companies with safe, tangible assets and abundant taxable income to shield favour debt financing; unprofitable companies with risky, intangible assets should prefer equity financing (Brealey and Myers, 2003). Rajan and Zingales (1995) make further explanation on this relationship: when a large proportion of a firm's assets are tangible, these assets are considered as collateral which diminishes the risk of the lender who suffering the agency costs of debt; moreover, assets retain more value in liquidation; hence, lenders are more willing to supply loans to the firms the greater proportion of tangible assets are. Titman and Wessels (1988) and Berger et al. (1997) proxy the ratio of inventory plus gross plant and equipment to total assets as the collateral value of assets; Rajan and Zingales (1995) and Morellec and Zhdanov (2008) use the ratio of fixed assets to book value of total assets as the assets tangibility; Hovakimian et al. (2001), Baker and Wurgler (2002), Hovakimian et al. (2004), Leary and Roberts (2005), Hovakimian (2006), Flannery and Rangan (2006), Alti (2006) and

Kayhan and Titman (2007) appoint net property, plant and equipment over total assets as the assets tangibility. All of them find positive relationship between leverage ratio and asset tangibility.

However, Grossman and Hart (1982) make an opposite prediction on this relationship in the framework of information asymmetry: because the agency costs of debt are increasing with the intangible assets, and the bondholders of highly levered firms are inclined to monitor such firms closely on managers' consumption on perquisites, firms with more intangible assets may choose high leverage ratio to limit managers' consumption of perquisites.

5.2.2.3 Profitability

The static trade-off theory expects a positive relationship between the optimal leverage ratio and profitability: profitable firms tend to have higher tax shield of debt, lower probability of financial distress, and potentially higher overinvestment, and they are in favour of debt financing, so their leverage ratios are higher. The control hypothesis also predicts a positive relationship between leverage ratio and profitability because high leverage ratio acts to prevent managers of firms with significant free cash flows from overinvesting. In contrary, the dynamic trade-off theory predicts a negative relationship between the optimal leverage ratio and profitability: firms that were highly profitable in the past tend to be under-levered because they cannot immediately offset the profitability that bumps them away from the optimal leverage ratio.

The pecking order theory anticipates a strong negative relationship between leverage ratio and profitability: profitable firms are likely to use a substantial amount of the internal fund to repay the debt rather than to repurchase equity, and they are likely to experience share price increase, hence their leverage ratio is low. Since firms have no incentive to offset the effects of profitability on leverage ratios, the negative relationship between leverage ratio and profitability will be persistent in the long run.

Titman and Wessels (1988) employ the ratios of operating income over sales, and operating income over total assets as indicators of profitability, Fama and French (2002), and Flannery and Rangan (2006) use EBIT over total assets as indicator of profitability, Rajan and Zingales (1995), Hovakimian et al. (2001), Hovakimian et al. (2004), Leary and Roberts (2005), and Alti (2006) proxy EBITDA over total assets as profitability, and Berger et al. (1997), Baker and Wurgler (2002), Hovakimian (2006), and Kayhan and Titman (2007) use EBITD over total assets as a proxy of profitability; all of them find negative relationship between the leverage ratio and profitability.

5.2.2.4 R&D Expense

The research and development expense and selling expense are usually considered as the indicators of firms' uniqueness, and their relationships with leverage ratio are explained by the static trade-off theory. Titman and Wessels (1988) postulate that R&D expense measures the uniqueness for the reason that the more a firm spends on R&D, the more difficult for its competitors to duplicate its innovations and products. Titman (1983), Titman and Wessels (1988), Grinblatt and Titman (2002), Hovakimian et al. (2004) expect a negative relationship by four reasons. First, specialised assets and products imply greater stakeholder costs: the workers of such firms have job specific skills, the suppliers have specific knowledge and capital, and customers may find it difficult to find alternative servicing for the unique products. Second, specialised assets and products imply potentially more shareholder-bondholder conflicts: firms with large R&D and selling expense are likely to be growth firms, the uncertainty faced by the growth firms creates severe shareholder-bondholder problems (high bankruptcy costs), thus these firms have few chances to approach sizable amount of debt financing. Third, firms with high R&D and selling expense may have little taxable earnings; as a result they are unable to use debt tax shields. Four, R&D and selling expense are usually considered as immediately expensed capital goods and they cannot be treated as collateral. DeAngelo and Masulis (1980) and Fama and French (2002) regard R&D expense as non-debt tax shields. They argue that since higher non-debt tax shields imply no taxable income, a lower expected corporate tax rate, and a lower expected payoff from interest tax shields, leverage ratio is negatively related with R&D expense.

Fama and French (2002) use the ratio of R&D over total assets as the expected investment and the non-debt tax shields, Flannery and Rangan (2006) and Alti (2006) use R&D as a proportion of total assets as the R&D expense, Titman and Wessels (1988) utilize R&D over sales as the R&D expense; Berger et al. (1997) utilize R&D over sales as the asset uniqueness; Hovakimian et al. (2001), Hovakimian et al. (2004), and Kayhan and Titman (2007) employ R&D over net sales as R&D expense. All of them find negative relation between leverage ratio and R&D expense.

5.2.2.5 R&D Dummy

Since the missing data of *R & D Expense* does not mean that firms do not have R&D spending, the *R&D Dummy* is adopted to distinguish firms that do not report R&D spending from the firms report very low spending. The dummy is set to 1 if the firm does not report R&D expense. Fama and French (2002), Flannery and Rangan (2006), Alti (2006) and Kayhan and Titman (2007) set the R&D dummy variable to one if firms did not report R&D expense, and they find positive relationship between leverage ratio and R&D dummy.

5.2.2.6 Selling Expense

Besides R&D expense, selling expense is another indicator of uniqueness. It is expected to have a negative relationship with the leverage ratio, explained by the static trade-off theory. “Firms with relatively unique products are expected to advertise more and, in general, spend more in promoting and selling their products” (Titman and Wessels, 1988).

Titman and Wessels (1988) proxy selling expense over sales for the selling expense. They find a positive relation between selling expense and uniqueness, and a negative relation between the uniqueness and leverage ratio, thus there is indirect negative relationship between selling expense and leverage ratio. Berger et al. (1997) appoint selling, general and administrative expenses over sales as the asset uniqueness; Hovakimian et al. (2004) use selling and administrative expenses over net sales as the selling expense; Hovakimian et al. (2001), and Kayhan and Titman (2007) utilize selling expense over net sales as the selling expense. All of them find evidence of negative relationship between leverage ratio and selling expense.

5.2.2.7 Firm Size

Control hypothesis and static trade-off theory foresee a positive relationship between leverage ratio and firm size: firms make financial decisions by considering the interests and costs of debt regarding to the size factor. Fischer et al. (1989), Baker and Wurgler (2002), Hovakimian et al. (2004), Flannery and Rangan (2006), and Kayhan and Titman (2007) argue that large firms may have high optimal leverage ratios because they have greater access to capital markets, have less volatile cash flows, and are less likely to become financially distressed. However, Rajan and Zingales (1995) expect the effect of firm size on leverage ratio to be ambiguous: on the one hand, since large firms tend to be more diversified and fail less often, firm size, as an inverse proxy for the probability of bankruptcy, is positively related with leverage ratio; on the other hand, size might be a proxy for the information outside investors have, which increases the outside investors' preference for equity. Titman and Wessels (1988) and Grinblatt and Titman (2002) supplement that small firms pay much more than large firms to issue new equity, which means by raising fund in the same way they may be more levered than large firms; small firms use significantly more short-term debt than long-term debt because the transaction costs of issuing long-term debt and the adverse incentive costs associated with long-term debt are higher for small firms than for large firms.

Fama and French (2002) suggest firm size measured as the natural logarithm of total assets is also an inverse symbol of volatility, and they explain the relationship between leverage ratio and firm size by pecking order theory. Since firm size is an adverse indicator of cash flow's volatility, small firms are usually with volatile cash flows; in order to avoid issuing new risky equities or forgoing investment opportunities, small firms tend to keep lower leverage ratios.

Berger et al. (1997), Hovakimian et al. (2001), Fama and French (2002), and Flannery and Rangan (2006) measure firm size by the natural logarithm of total assets. Rajan and Zingales (1995), Titman and Wessels (1988), Baker and Wurgler (2002), Hovakimian et al. (2004), Leary and Roberts (2005), Hovakimian (2006), Alti (2006), Kayhan and Titman (2007) and Morellec and Zhdanov (2008) use the natural logarithm of net sale as firm size. Titman and Wessels (1988) discover a high correlation (0.98) between the log of total assets and log of total sales as the proxy for firm size in an unreported model. Fischer et al. (1989) select the average of the quarterly total liabilities plus common equity market value as the firm size. All of them prove the positive relation between the leverage ratio and the firm size.

5.2.2.8 Industry

Industry variable is utilized to capture the industry-specific characteristics of leverage ratios not captured by other explanatory variables. Hovakimian et al. (2001) and Hovakimian et al (2004) utilize firms' industry median leverage ratio as the industry variable, and the industry classification is based on the three-digit SIC code; Flannery and Rangan (2006) use firms' lagged industry median market debt ratio as the industry vairable. All of them find positive relation between leverage and the industry variable. Berger et al. (1997) use the first 2-digit of SIC code as industry dummies, and Kayhan and Titman (2007) introduce 47 industry dummies to represent the industry nature, and the industry classification is based on Fama and French 48-industry classification; they do not report the results of these industry dummies. This research has tested the industry dummies according to above authors on the 2-digit SIC code, 3-digit SIC code and the Fama and French 48-industry classification, and found serious singular problem due to the fact that many industries in the category claim no sample firm for them. So in the reported model the industry dummy is dropped and the impact of industry is represented by a constant variable, and the result for the regression is robust.

Table 5-5 describes the predicted signs of the above independent variables by different capital structure hypotheses.

Table 5-5 Predicted Signs of Independent Variables

	Static Trade-off	Dynamic Trade-off	Pecking Order	Market Timing
Market-to-Book	-		Simple + Complex -	-
Asset Tangibility	+			
Profitability	+	-	-	
R&D Expense	-			
Selling Expense	-			
Firm Size	+		+	

5.2.3 Optimal Capital Structure

The optimal leverage ratio can be derived by different methods. It can be obtained in dimensions of cross-sectional, time-series or panel data. A relatively simple method is to get the optimal leverage ratio from the firm's industry average, or from the firm's own historical average in the sample period (Shyam-Sunder and Myers, 1999), or a mixture. A relatively complex method is to get the optimal leverage ratio by running regressions on a number of determinant variables from one of these three dimensions. Three models are the most popular ones in the regression method: OLS regression, tobit regression, and the Fama-MacBeth regression. OLS is easy to manipulate and empirical evidences have proved that it adapts to various circumstances. Fama-MacBeth is used to avoid understating coefficient standard errors (Flannery and Rangan, 2006). A firm's leverage ratio can be above one if its value of debt is negative, value of equity is positive, and the absolute value of debt is larger than its value of equity, which is typical of cases of financial distress or large contingent claims (Bruner, 1988). A firm's leverage ratio can be below zero if its value of debt is negative, value of equity is positive, and the absolute value of debt is smaller than the value of equity, which is untypical of operating company with abnormal high reservation of cash or unused debt capacity (Bruner, 1988). Some authors consider it is most common for the leverage ratio to be between 0 and 1, therefore the tobit model is adopted to censor leverage outliers. These three regression models are widely used in the study of optimal leverage ratio, and there is no evidence that any one model outperforms the other two.

Berger et al. (1997), Fama and French (2002) and Alti (2006) make use of the OLS model in their studies; Hovakimian et al. (2001) utilize tobit model with double censoring at 0 and 1 for their test; Leary and Roberts (2005) use the Fama–MacBeth regression in their study. Rajan and Zingales (1995) use the tobit model which is left censored at -1, Hovakimian (2006), and Kayhan and Titman (2007) use the tobit model which is double censored at 0 and 1, and they notice the tobit model results are very similar to the OLS model results. Flannery and Rangan (2006) employ both the Fama-MacBeth model and the OLS, and yield similar estimates. Baker and Wurgler (2002) make use of all the three models (the tobit model is censored at 0 and 1) and confirms the same results. Hovakimian et al. (2004) uncover that the results from the OLS model do not change when they use a truncated regression model or a censored regression model (tobit).

5.2.4 Tobit Model

James Tobin proposes the most popular econometric model for censored data about the relationship between household income and expenditure of durable goods. In economic surveys of households, the expenditures on automobiles or durable goods have a lower limit of zero for some respondents, but take on a wider range of values above the limit for the other respondents. Tobin (1958) recommends that when estimating statistical relationship of a limited variable to other variables and testing hypotheses about the relationship, the concentration of observations at the limiting value should be considered. Under the circumstances, the explanatory variable influences not only the probability of limit explained variable but also the size of non-limit explained variable. Although the *probit analysis* takes the probability of limit and non-limit explained variable into account, it ignores information on the value of the explained variable when it is available; though the *multiple regression* (OLS) considers the value of the explained variable, it is unable to deal with the probability of limit explained variable. Tobin thus presents a model as a hybrid of probit analysis and multiple regression. This model is named the *tobit* *model* after Tobin's name. It is also know as a censored normal regression model (Maddala, 2001).

The tobit model expresses the explained variable (dependent variable) in terms of a latent variable:

$$y_i^* = \alpha + \beta x_i + \varepsilon_i \quad \varepsilon_i \sim \text{IN}(0, \sigma^2)$$

The latent variable y_i^* satisfies the classical linear model assumption with a normal, homoskedastic distribution and a linear conditional mean. x_i can be in the forms of either a single variable or a vector. y_i^* is observed if $y_i^*>0$ and is not observed if $y_i^* \le 0$. The observed y_i is defined as

$$y_i = y_i^* = \alpha + \beta x_i + \varepsilon_i \qquad \text{if } y_i^* > 0$$

$$y_i = 0 \qquad \text{if } y_i^* \le 0$$

The likelihood function for the tobit model is a combination of two parts. For all observations that $y_i^*>0$, the contribution to the likelihood is:

$$\text{prob}(y_i^*>0) \times \phi(y_i^* \mid y_i^*>0) = \Phi(\frac{\alpha+\beta x_i}{\sigma}) \times \frac{1}{\sigma} \frac{\phi[(y_i - \alpha - \beta x_i)/\sigma]}{\Phi[(\alpha+\beta x_i)/\sigma]}$$

$$= \frac{1}{\sigma}\phi(\frac{y_i - \alpha - \beta x_i}{\sigma})$$

because $(y_i - \alpha - \beta x_i)/\sigma$ has a standard normal distribution.

For all observations that $y_i^* \le 0$, the contribution to the likelihood is

$$\text{prob}(y_i^* \le 0) = 1 - \Phi(\frac{\alpha+\beta x_i}{\sigma})$$

because $\frac{\varepsilon_i}{\sigma}$ has a standard normal distribution. Putting both parts together, the likelihood function is

$$L = \prod_{y_i>0} \frac{1}{\sigma}\phi(\frac{y_i - \alpha - \beta x_i}{\sigma}) \prod_{y_i \le 0} [1 - \Phi(\frac{\alpha+\beta x_i}{\sigma})]$$

The first part resembles the multiple regression and the second part resembles the probit analysis. The log-likelihood function for the tobit model is

$$l=\sum_{y_i>0}\log[\frac{1}{\sigma}\phi(\frac{y_i-\alpha-\beta x_i}{\sigma})]+\sum_{y_i\leq 0}\log[1-\Phi(\frac{\alpha+\beta x_i}{\sigma})]$$

Greene (2000) finds out that the ordinary least squares (OLS) estimates are smaller than the maximum likelihood (ML) estimates, and empirically the ML estimates can often be approximated by dividing the OLS estimates by the fraction of non-limit observations in the sample: $\hat{\beta}_{OLS}/\hat{\beta}_{ML}=n_1/N$

whereas n_1 is the number of un-limit observations, and N is the number of total observations.

The expected value of y_i is

$$E(y_i)\text{=prob}(y_i=\alpha+\beta x_i+\varepsilon_i)\times E(y_i\,|\,y_i=\alpha+\beta x_i+\varepsilon_i)\text{+prob}(y_i=0)\times E(y_i\,|\,y_i=0)$$

$$=\text{prob}(y_i^*>0)\times E(y_i^*\,|\,y_i^*>0)\text{+prob}(y_i^*\leq 0)\times 0$$

$$=\Phi(\frac{\alpha+\beta x_i}{\sigma})\times\{\alpha+\beta x_i+\sigma\frac{\phi[(\alpha+\beta x_i)/\sigma]}{\Phi[(\alpha+\beta x_i)/\sigma]}\}$$

$$=\Phi(\frac{\alpha+\beta x_i}{\sigma})(\alpha+\beta x_i)+\sigma\phi[(\alpha+\beta x_i)/\sigma]$$

The marginal effects of a change in a continuous explanatory variable on the latent variable y_i^* is:

$$\frac{\partial E(y_i^*\,|\,x_i)}{\partial x_j}=\beta_j \qquad j\in(1,i)$$

The marginal effects of a change in a continuous explanatory variable on the observed variable y_i is:

$$\frac{\partial E(y_i\,|\,x_i)}{\partial x_j}=\beta_j\times\text{prob}(y_i^*>0)=\beta_j\times\Phi(\frac{\alpha+\beta x_i}{\sigma}) \qquad j\in(1,i)$$

More general, for the latent variable $y_i^*=\alpha+\beta x_i+\varepsilon_i$ and observed variable y_i if they satisfy

$$y_i=\text{m} \qquad \text{if } y_i^*\leq\text{m}$$

$$y_i=y_i^*=\alpha+\beta x_i+\varepsilon_i \qquad \text{if m}<y_i^*<\text{n}$$

$$y_i = \text{n} \qquad \text{if } y_i^* \geq \text{n}$$

whereas m<n, the marginal effects on the observed variable y_i is

$$\frac{\partial E(y_i \mid x_i)}{\partial x_j} = \beta_j \times \text{prob}(\text{m} < y_i^* < \text{n})$$

The marginal effects of the explanatory variable on the observed variable y_i, conditional on y_i^*>0 is

$$\frac{\partial E(y_i \mid x_i, y_i^* > 0)}{\partial x_j} = \beta_j \times \{1 - \frac{\alpha + \beta x_i}{\sigma} \times \frac{\phi(\frac{\alpha + \beta x_i}{\sigma})}{\Phi(\frac{\alpha + \beta x_i}{\sigma})} - [\frac{\phi(\frac{\alpha + \beta x_i}{\sigma})}{\Phi(\frac{\alpha + \beta x_i}{\sigma})}]^2 \}$$

therefore

$$\frac{\partial E(y_i \mid x_i)}{\partial x_j} = \{ \Phi(\frac{\alpha + \beta x_i}{\sigma}) \beta_j \times \{1 - \frac{\alpha + \beta x_i}{\sigma} \times \frac{\phi(\frac{\alpha + \beta x_i}{\sigma})}{\Phi(\frac{\alpha + \beta x_i}{\sigma})} - [\frac{\phi(\frac{\alpha + \beta x_i}{\sigma})}{\Phi(\frac{\alpha + \beta x_i}{\sigma})}]^2 \}\}$$

$$+\{ \frac{\beta_j}{\sigma} \times \phi(\frac{\alpha + \beta x_i}{\sigma}) \times [\alpha + \beta x_i + \frac{\phi(\frac{\alpha + \beta x_i}{\sigma})}{\Phi(\frac{\alpha + \beta x_i}{\sigma})}] \}$$

$$= \text{prob}(y_i^* > 0) \times \frac{\partial E(y_i \mid x_i, y_i^* > 0)}{\partial x_j} + \frac{\partial prob(y_i^* > 0)}{\partial x_j} E[y_i \mid x_i, y_i^* > 0]$$

The above equation shows that the change in the expected value of y_i with respect to x_j has two effects: the first part affects the conditional mean of y_i^*, and the second part affects the probability that the observation will be positive.

Quite a few earlier papers have employed the tobit regression for their leverage ratio research. Rajan and Zingales (1995) run one single regression with the dependent variables in year 1991 and all the explanatory variables by four year averages between 1987 and 1990[16]; Hovakimian et al. (2001) run one single regression for a sample of 39387 firm-year with the event period between 1979 and 1997; Hovakimian et al. (2004) run two single regressions for a sample of 1679 firm-

[16] They average the explanatory variables to reduce the noise and to account for slow adjustments (Rajan and Zingales, 1995, p1452).

year and a sample of 21823 firm-year between 1982 and 2000; Hovakimian (2006) runs a single regression for a sample of 56259 firm-year between 1983 and 2002; Kayhan and Titman (2007) run one pooled regression on 109283 firm-year for the period between 1960 and 2003; Harford et al. (2007) run 20 separate annual regressions between 1981 and 2000, and the annual sample sizes are different subject to the availability of M&A announcements in each year.

5.2.5 Estimation of Coefficients, Prediction, and Deviation of Optimal Leverage Ratios

In this research, the book leverage ratio deviations are computed by three stages. At the first stage, the actual book leverage ratios (at time *t*) are regressed on the independent variables (at time *t-1*) to get the estimates for the coefficients: all the sample firms are standardised into an 11 year window [-5, +5] and the tobit regression is run based on a sample of 3295 firms (deals) of the five years before the announcement year[17] [-5, -1]. At the second stage, the estimated regression equation is used for predicting the value of optimal book leverage ratios for given values of independent variables: the estimated coefficients are substituted into each year of the 11 years for actual values of independent variables to predict the optimal book leverage ratios. At the third stage, the predicted book leverage ratios are subtracted from the actual book leverage ratios to get the deviation.

Stage 1: Estimation

At this stage, the actual book leverage ratios are regressed on the independent variables to get the estimates for the coefficients by the tobit model. The dependent variable, the book leverage ratio (at time *t*) is regressed on a number of lagged independent variables (at time *t-1*): the *Market-to-book Ratio*, the *Asset Tangibility*, the *Profitability*, the *R&D Expense*, the *R&D Dummy*, the *Selling Expense*, and the *Firm Size*. These independent variables are lagged one period to reduce the problem of simultaneity: using contemporaneous variables may reduce explanatory power if the firm does not have enough time to respond to most recent changes in explanatory variables as suggested by Rajan and Zingales (1995), Baker and Wurgler (2002), and

[17] In each year there are 659 firms, so combining the firms between year -5 and year -1 the sample for regression is made up of 659*5=3295 firms.

Alti (2006)[18]. There are 659 firms in each year of the standardised 11-year window. The tobit model runs a pooled cross-sectional regression on the firm-year [-5, -1] and the sample is made up of 3295 firms. The reason for the regression sample selection between year -5 and -1 is upon the assumption that firms' leverage ratios are stable and unaffected by the event of M&A before the announcement year (year 0), therefore an out-of-sample regression should be a better estimation than the in-sample regression to capture the impact of M&A on firms' capital structure changes. The regression model is stated below.

$$ActualLeverageRatio_t = \alpha + \beta_1 \ (M/B)_{t-1} + \beta_2 \ AssetTagibility_{t-1} + \beta_3 \ Profitability_{t-1} + \beta_4 \ R\&DExpense_{t-1} + \beta_5 \ R\&DDummy_{t-1} + \beta_6 \ SellingExpense_{t-1} + \beta_7 \ FirmSize_{t-1} + \varepsilon_t$$

Table 5-6 reports the descriptive statistics of actual leverage ratios over the 11 year window [-5, +5]. It divides the 659 sample firms into two groups according to whether the actual book leverage ratios increase or decrease between year -1 and year 0. The Increase Group consists of 397 firms. In the 11-year period, this group shows minimum actual book leverage ratio of 0, and maximum ratio lower than 1 in years [-5, +1] and higher than 1 in years [+2, +5]. The median of actual book leverage ratios keeps decreasing between year -5 and -1, experiences a sudden jump from 0.160 in year -1 to 0.283 in year 0 (76.9% increase), and keeps decreasing again afterwards. The mean of actual book leverage shows the same tendency and there is a jump from 0.178 in year -1 to 0.301 in year 0 (69.1% increase). The Decrease Group consists of 262 firms. In the 11-year period, this groups shows minimum actual book leverage ratio of 0. It shows maximum ratios lower than 1 in years [-5, -3], between 1 and 2 in years [-2, +1], and higher than 2 in years [+2, +4]. The median fluctuates slightly between 0.173 and 0.183 in years [-5, -1], drops between year -1 and 0 from 0.179 to 0.146 (18.4% reduce), surges between year 0 and 1 from 0.146 to 0.199 (36.3% increase), and keeps stable afterwards. The mean shows the same tendency. For both groups, the median and mean approve the assumption that M&A changes

[18] Thanks to Professor Wurgler, Professor Alti and Professor Flannery's replies of E-mails by explaining this to me.

firms' actual book leverage ratios dramatically at the announcement year, and the leverage ratio revert back in the years after the M&A.

Table 5-6 Descriptive Statistics of Firm's Actual Book Leverage Ratios

This table describes the statistics of sample firms' actual book leverage ratios in the 11 year window [-5, +5]. The announcement year is set to 0, the previous year of the announcement year is set to -1, and the next year of the announcement year is set to 1. The sample is made up of 659 acquiring firms (deals). According to whether the actual book leverage ratios increase or decrease between year -1 and year 0, the sample is divided into two groups, the Increase Group and Decrease Group. Book Leverage ratio is defined as total debt/total assets.

	-5	**-4**	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**4**	**5**
					Panel A (Increase Group) N=397						
Min	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
Max	0.915	0.847	0.777	0.742	0.789	0.930	0.962	1.452	1.516	1.790	1.778
Med	0.184	0.177	0.166	0.165	0.160	0.283	0.271	0.265	0.253	0.244	0.230
Mean	0.208	0.200	0.191	0.188	0.178	0.301	0.291	0.288	0.275	0.267	0.262
Std. Dev.	0.160	0.155	0.154	0.151	0.147	0.159	0.168	0.189	0.189	0.189	0.206
					Panel B (Decrease Group) N=262						
Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Max	0.671	0.729	0.796	1.484	1.345	1.130	1.125	2.207	2.158	2.056	1.959
Med	0.173	0.183	0.180	0.183	0.179	0.146	0.199	0.196	0.193	0.203	0.194
Mean	0.195	0.206	0.205	0.212	0.214	0.175	0.220	0.224	0.222	0.219	0.221
Std. Dev.	0.152	0.161	0.167	0.194	0.193	0.170	0.184	0.222	0.220	0.216	0.229

Data Source: WRDS Compustat North America.

Table 5-7 describes the statistics of the variables of the whole 3295 firm-year sample. The *market-to-book ratio* ranges between -3.148 and 18.295 with a mean of 2.032; the asset tangibility ranges between 0.006 and 0.946 with a mean of 0.371; the profitability ranges between -0.956 and 0.548 with a mean of 0.159; the R&D expense ranges between 0 and 10.216 with a mean of 0.040; the R&D dummy takes the value of either 0 or 1 and with a mean of 0.514; the selling expense ranges between 0.060 and 9.343 with a mean of 0.518; the firm size ranges between -0.438 and 4.839 with a mean of 2.622.

Table 5-7 Descriptive Statistics of Independent Variables

This table describes the statistics of independent variables for the tobit regression. The sample is made up of 3295 firm-year between year -5 and year -1. The independent variables include *Market-to-book Ratio*, the *Asset Tangibility(net PPE/ total assets)*, the *Profitability(EBITD/total assets)*, the *R&D Expense(R&D/net sales)*, the *R&D Dummy(set to 1 if the firms do not report R&D)*, the *Selling Expense(selling expense/net sales)*, and the *Firm Size(logarithm of net sales)*.

	M/B	**Asset Tangibility**	**Profitability**	**R&D Expense**	**R&D Dummy**	**Selling Expense**	**Firm Size**
Min	-3.148	0.006	-0.956	0.000	0.000	0.060	-0.438
Max	18.295	0.946	0.548	10.216	1.000	9.343	4.839
Med	1.564	0.335	0.157	0.000	1.000	0.369	2.621
Mean	2.032	0.371	0.159	0.040	0.514	0.518	2.622
Std. Dev.	1.707	0.206	0.090	0.317	0.500	0.588	0.741

Data Source: WRDS Compustat North America.

Table 5-8 illustrates the correlations between the independent variables by the Spearman correlation test and the Pearson correlation test. Spearman's rank correlation coefficient (or Spearman's rho), which is a nonparametric version of the Pearson correlation, measures the association between two variables based on the ranks of the data. Pearson correlation coefficient, which assumes the data are normally distributed, measures the association between two variables at interval level. For the Spearman test, there are higher correlations between profitability and Market-to-book ratio with a value of 0.470, between R&D expense and R&D dummy with a value of -0.931, and between selling expense and profitability with a value of -0.409. As the independent variables are interval rather than ordinal, the Pearson test is more reliable than the Spearman test. The Pearson test shows low correlations between variables, which supports the robustness of regression. The highest correlation in absolute value is between market-to-book ratio and profitability with a value of 0.355; the lowest correlation in absolute value is between profitability and R&D dummy with a value of -0.026. Market-to-book ratio has positive correlation with profitability, R&D expense and firm size; asset tangibility has positive correlation with profitability, R&D dummy, selling expense and firm size; profitability has positive correlation with market-to-book ratio, asset tangibility and firm size; R&D expense has positive correlation with market-to-book ratio and selling expense; R&D dummy has positive correlation with asset tangibility and selling expense; selling expense has positive correlation with asset tangibility, R&D expense and R&D dummy; firm size has positive correlation with market-to-book ratio, asset tangibility and profitability.

Table 5-8 Correlations between Independent Variables

This table demonstrates the correlations between independent variables. The sample is made up of 3295 firm-year between year -5 and year -1. The independent variables include *Market-to-book Ratio*, the *Asset Tangibility(net PPE/ total assets)*, the *Profitability(EBITD/total assets)*, the *R&D Expense(R&D/net sales)*, the *R&D Dummy(set to 1 if the firms do not report R&D)*, the *Selling Expense(selling expense/net sales)*, and the *Firm Size(logarithm of net sales)*.

Spearman / Pearson	M/B	Asset Tangibility	Profitability	R&D Expense	R&D Dummy	Selling Expense	Firm Size
M/B		-0.154	0.470	0.180	-0.105	-0.165	0.060
Asset Tangibility	-0.151		0.113	-0.244	0.211	0.261	0.208
Profitability	0.355	0.090		0.071	-0.077	-0.409	0.120
R&D Expense	0.102	-0.106	-0.281		-0.931	-0.042	0.007
R&D Dummy	-0.084	0.249	-0.026	-0.130		0.046	-0.079
Selling Expense	-0.048	0.219	-0.332	0.121	0.150		0.050
Firm Size	0.045	0.162	0.196	-0.180	-0.069	-0.115	

Data Source: WRDS Compustat North America.

In order to check the robustness of the regressions, univariate tests are undertaken to probe the relations between the book leverage ratio and each of the independent variables. Table 5-9 reports the results of these univariate tests. The sample is the same as the one for the regressions, which is made up of 3295 firms (deals) of the five years before the M&A announcement. The independent variables include *Market-to-book Ratio*, the *Asset Tangibility (net PPE/ total assets)*, the *Profitability (EBITD/total assets)*, the *R&D Expense (R&D/net sales)*, the *R&D Dummy (set to 1 if the firms do not report R&D)*, the *Selling Expense (selling expense/net sales)*, and the *Firm Size (logarithm of net sales)*.

In Panel *A*, the independent variables are divided into 3 independent groups according to the percentile of values in **ascending** order (Group 1 with the lowest values, Group 2 with intermediate values, and Group 3 with highest values). The One-way *ANOVA* (Levene's *F*-test) examines the equality of means (the means of actual book leverage ratios) among the three samples. The null hypothesis is that the three sample means are equal. For the market-to-book ratio (M/B), Group 1 (low value) is with mean of 0.244, Group 2 (mid value) is with mean of 0.195 and Group 3 (high value) is with mean of 0.157, and the One-way ANOVA test is significant at the 1% level. This result illustrates that M/B indeed has an impact on the book leverage ratio, and the relationship is negative. In addition, profitability and R&D expense show significance and negative relation with the book leverage ratio. In contrast, the asset tangibility and selling expense show significance and positive relation with the book leverage ratio. The univariate test on firm size does not show a trend on the sample means and is statistically insignificant.

In Panel *B*, the R&D dummy is divided into 2 groups according to its dummy value 0 and 1, and the Independent-Samples *t*-test (two-tailed) examines the equality of means (the means of actual book leverage ratio) between the two samples. The null hypothesis is that the two sample means are equal. Being consistent with the regressions, this univariate test indicates the positive relation between book leverage ratio and the R&D dummy and the *t*-test is statistically significant.

Table 5-9 Univariate Tests of the Actual Book Leverage Ratios on Actual Independent Variables

This table reports the univariate tests of the actual book leverage ratios on actual independent variables. The tests are based on a sample of 3295 firms (deals) of the five years before the announcement year. The independent variables include *Market-to-book Ratio*, the *Asset Tangibility(net PPE/ total assets)*, the *Profitability(EBITD/total assets)*, the *R&D Expense(R&D/net sales)*, the *R&D Dummy(set to 1 if the firms do not report R&D)*, the *Selling Expense(selling expense/net sales)*, and the *Firm Size(logarithm of net sales)*. In Panel *A*, the independent variables are divided into 3 independent groups according to the percentile of values in ascending order, and the One-way ANOVA (Levene's *F*-test) examines the equality of means (the means of actual book leverage ratios) among the three samples. The null hypothesis is that the three sample means are equal. In Panel *B*, the dummy variable is divided into 2 groups according to its value, and the Independent-Samples *t*-test (two-tailed) examines the equality of means between the two samples. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

Panel A

	Group	Percentile	No.	Lev Mean	Std. Dev.	Std. Error	*F*-statistic
Market to Book	1	0~30	988	0.244	0.165	0.005	76.319***
	2	30~70	1319	0.195	0.154	0.004	
	3	70~100	988	0.157	0.158	0.005	
Asset Tangibility	1	0~30	988	0.159	0.157	0.005	128.599***
	2	30~70	1319	0.179	0.141	0.004	
	3	70~100	988	0.264	0.173	0.006	
Profitability	1	0~30	988	0.241	0.185	0.006	128.889***
	2	30~70	1319	0.215	0.158	0.004	
	3	70~100	988	0.134	0.118	0.004	
R&D Expense	1	0~30	988	0.232	0.174	0.006	93.301***
	2	30~70	1319	0.216	0.166	0.005	
	3	70~100	988	0.142	0.127	0.004	
Selling Expense	1	0~30	988	0.102	0.111	0.004	524.189***
	2	30~70	1319	0.190	0.117	0.003	
	3	70~100	988	0.307	0.190	0.006	
Firm Size	1	0~30	988	0.198	0.190	0.006	0.021
	2	30~70	1319	0.199	0.167	0.005	
	3	70~100	988	0.198	0.119	0.004	

Panel B

	Group	Dummy	No.	Lev Mean	Std. Dev.	Std. Error	*t*-statistic
R&D Dummy	1	0	1601	0.163	0.132	0.003	-12.552***
	2	1	1694	0.232	0.180	0.004	

Table 5-10 reports the estimated coefficients of firms' actual book leverage ratios on the independent variables by the tobit model. All the coefficients are statistically significant at the 1% level. The coefficient for market-to-book value is -0.006 and statistically significant. Market-to-book ratio stands for the growth/investment opportunities or a measurement of firms' value of assets in place, which is explained by the static trade-off theory and the pecking order hypothesis. It also stands for time measure which is explained by the market timing theory. The static trade-off theory, the complex version of pecking order hypothesis and market timing predict a negative relationship between the book leverage ratio and the market-to-book ratio, and these predictions have been proved by quite a few empirical studies. Though the coefficient of market-to-book ratio in this research is not economically significant, its negative relationship and statistical significance are consistent with those empirical results of Rajan and Zingales (1995), Houston and James (1996), Hovakimian et al. (2001), Baker and Wurgler (2002), Hovakimian (2006), Flannery and Rangan (2006), Alti (2006), and Kayhan and Titman (2007).

The asset tangibility coefficient is 0.142 and statistically significant. The control hypothesis and the static trade-off theory predicts a positive relationship between the leverage ratio and the asset tangibility because they suppose tangible assets are considered as collateral and debt lenders are willing to supply loans to the firms with large proportion of "safe" assets. The result of this research fits the control hypothesis and the static trade-off theory, and is consistent with the empirical results of Hovakimian et al. (2001), Baker and Wurgler (2002), Hovakimian et al. (2004), Leary and Roberts (2005), Hovakimian (2006), Flannery and Rangan (2006), Alti (2006), Kayhan and Titman (2007), and Morellec and Zhdanov (2008).

The profitability coefficient is economically significant with a negative value of -0.320 and statistically significant. This result proves the pecking order theory which anticipates a strong negative relation between the leverage ratio and profitability that profitable firms are likely to use the profits to repay debt and profitable firms usually experience share price increases, therefore the leverage ratio decreases. This result also supports the dynamic trade-off theory that firms that were highly profitable (or suffer a loss) in the past are likely to be under-levered (or over-levered), which is explained by the effects of profitability on the deviation of actual leverage ratio from the optimal leverage ratio. This result is consistent with those of Rajan and Zingales (1995), Berger et al. (1997), Hovakimian et al. (2001), Fama and French (2002), Baker and Wurgler (2002), Hovakimian et al. (2004), Leary and Roberts (2005), Flannery and Rangan (2006), Alti (2006), Hovakimian (2006), Kayhan and Titman (2007), and Morellec and Zhdanov (2008). It does not support the static trade-off theory which predicts a positive relationship.

The R&D expense coefficient is economically significant with a negative value of -0.101 and statistically significant. This result supports the static trade-off theory which considers R&D as an indicator of firms' uniqueness and non-debt tax shields, and predicts a negative relationship between the leverage ratio and R&D expense. This result fits the empirical results of Titman and Wessels (1988), Hovakimian et al. (2001), Fama and French (2002), Hovakimian et al. (2004), Flannery and Rangan (2006), Alti (2006), and Kayhan and Titman (2007).

The R&D dummy coefficient is 0.032 and statistically significant. The dummy is used to distinguish firms that do not report R&D spending from the firms which report very low spending. The dummy is set to 1 if firms do not report their R&D spending. There is no theory to predict the sign of this dummy. This result is consistent with those of Fama and French (2002), Flannery and Rangan (2006), Alti (2006) and Kayhan and Titman (2007).

The selling expense coefficient is 0.089 and statistically significant. The static trade-off theory considers selling expense as indicator of uniqueness, and predicts a negative relationship between the leverage ratio and selling expense. This research result does not support previous research. However, this result is consistent with the univariate test in Table 5-9.

The firm size parameter is 0.016 and statistically significant. This result upholds both the static trade-off theory and the pecking order theory. The static trade-off theory explains the positive relation between leverage ratio and firm size by explaining that larger firms have greater access to capital markets with low costs, thus they can afford to be highly levered. The pecking order theory argues that small firms are likely to keep low leverage ratio in order to avoid costs of financial distress because the firm size is adversely related with cash volatility. This result is consistent with the result of Rajan and Zingales (1995), Titman and Wessels (1988), Baker and Wurgler (2002), Hovakimian et al. (2004), Leary and Roberts (2005), Hovakimian (2006), Alti (2006), Kayhan and Titman (2007) and Morellec and Zhdanov (2008).

Table 5-10 Estimated Coefficients by Tobit Regression

This table reports the estimated parameters of firms' optimal book leverage ratios by the tobit model. This research standardises all the sample firms into an 11 year window (from 5 years before the announcement to 5 years after the announcement) and runs the tobit regression based on a sample of 3295 firms (deals) of the five years before the announcement year. The dependent variable is the *book leverage ratio*, and the independent variables include *Market-to-book Ratio*, the *Asset Tangibility(net PPE/ total assets)*, the *Profitability(EBITD/total assets)*, the *R&D Expense(R&D/net sales)*, the *R&D Dummy(set to 1 if the firms do not report R&D)*, the *Selling Expense(selling expense/net sales)*, and the *Firm Size(logarithm of net sales)*.

$$ActualLeverageRatio_t = \alpha + \beta_1 (M/B)_{t-1} + \beta_2 \, AssetTagibility_{t-1} + \beta_3 \, Profitability_{t-1} + \beta_4 \, R\&DExpense_{t-1} + \beta_5 \, R\&DDummy_{t-1} + \beta_6 \, SellingExpense_{t-1} + \beta_7 \, FirmSize_{t-1} + \varepsilon_t$$

For each independent variable, the estimated parameter is reported, and the *Z*-statistic, the *F*-statistic and the *Log Likelihood Ratio* are reported. ***, **, * denotes the significance level at 1%, 5%, and 10%.

	Coefficient	Std. Error	*Z*-statistic	
Constant	0.102	0.012	8.368***	
Market-to-book	-0.006	0.002	-3.425***	
Asset Tangibility	0.142	0.014	9.979***	
Profitability	-0.320	0.037	-8.736***	
R&D Expense	-0.101	0.017	-5.979***	
R&D Dummy	0.032	0.006	5.780***	
Selling Expense	0.089	0.005	17.817***	
Firm Size	0.016	0.004	4.216***	
Adjusted *R*-Squared				0.241
***F*-statistic**				150.730 ***
***Log Likelihood* Ratio** χ^2 (7)				940.536 ***

A robust test is undertaken to check if any potential outliers of the independent variables in Table 5-7 bias the estimation. If outliers indeed exist, the exclusion of them should return a series of estimated coefficients which fit the theoretical model better than the estimated coefficients of the sample of 3295 firm-year. In the robustness check, all the independent variables (except the R&D dummy) are winsorized at the -/+ 3 standard deviation point, and the sample size is reduced to 3134 firm-years. The estimated coefficients by tobit regression are shown in the table below. Comparing this table with Table 5-10, there is no improvement in the estimation coefficients. Hence there is no potential outlier problem and the sample size should be kept as 3295 firm-years as in Table 5-7.

Robust Check: Estimated Coefficients by Tobit Regression

This table reports the estimated coefficients by tobit regression of the truncated sample. All the independent variables (except R&D dummy) are truncated at -/+3 standard deviation level to exclude potential outliers. The sample is made up of 3134 firm-year.

	Coefficient	Std. Error	***Z*-statistic**
Constant	0.119	0.014	8.526***
Market-to-book	-0.008	0.003	-2.875***
Asset Tangibility	0.081	0.019	4.394***
Profitability	-0.271	0.047	-5.704***
R&D	-0.666	0.081	-8.205***
R&D Dummy	0.008	0.006	1.358
Selling Expense	0.186	0.013	14.010***
Firm Size	0.010	0.004	2.426**
Adjusted *R*-Squared			0.237
***F*-statistic**			181.004 ***
***Log Likelihood* Ratio** χ^2 (7)			1104.413 ***

Table 5-11 reports the estimated coefficients by a multiple OLS regression. The multiple OLS regression shows qualitatively the same results as the tobit model. Except the constant and R&D dummy, all the other coefficients of the multiple OLS regression are slightly smaller than those of the tobit model, which is explained by Greene (2000) that empirically the ML estimates can often be approximated by dividing the OLS estimates by the fraction of non-limit observations in the sample.

Table 5-11 Estimated Coefficients by Multiple OLS Regression

This table reports the estimated parameters of firms' optimal book leverage ratios by the OLS model. This research standardises all the sample firms into an 11 year window (from 5 years before the announcement to 5 years after the announcement) and runs the multiple OLS regression based on a sample of 3295 firms (deals) of the five years before the announcement year. The dependent variable is the *book leverage ratio*, and the independent variables include *Market-to-book Ratio*, the *Asset Tangibility(net PPE/ total assets)*, the *Profitability(EBITD/total assets)*, the *R&D Expense(R&D/net sales)*, the *R&D Dummy(set to 1 if the firms do not report R&D)*, the *Selling Expense(selling expense/net sales)*, and the *Firm Size(logarithm of net sales)*.

$$ActualLeverageRatio_t = \alpha + \beta_1 (M/B)_{t-1} + \beta_2 AssetTagibility_{t-1} + \beta_3 Profitability_{t-1} + \beta_4 R\&DExpense_{t-1} + \beta_5 R\&DDummy_{t-1} + \beta_6 SellingExpense_{t-1} + \beta_7 FirmSize_{t-1} + \varepsilon_t$$

For each independent variable, the estimated parameter is reported, and the *Z*-statistic, the *F*-statistic and the *Log Likelihood Ratio* are reported. ***, **, * denotes the significance level at 1%, 5%, and 10%.

	Coefficient	Std. Error	*Z*-statistic	
Constant	0.119	0.011	10.604***	
Market-to-book	-0.006	0.002	-3.413***	
Asset Tangibility	0.128	0.013	9.705***	
Profitability	-0.278	0.034	-8.253***	
R&D Expense	-0.064	0.008	-7.557***	
R&D Dummy	0.034	0.005	6.512***	
Selling Expense	0.088	0.005	18.804***	
Firm Size	0.010	0.003	2.995***	
Adjusted *R*-Squared				0.249
***F*-statistic**				157.278***

Stage 2：Prediction

At this stage, the estimated coefficients of the tobit model are used to predict the value of the optimal book leverage ratio for given values of independent variables. For the i^{th} firm in year t whereas $i \in [1, 659]$ and $t \in [-5,5]$, the optimal book leverage ratio is given by

$$PredictedLeverageRatio_{i,t} = \hat{\alpha} + \hat{\beta}_1 \ (M/B)_{i,t-1} + \hat{\beta}_2 \ AssetTagibility_{i,t-1} + \hat{\beta}_3 \ Profitability_{i,t-1} + \hat{\beta}_4 \ R\&DExpense_{i,t-1} + \hat{\beta}_5 \ R\&DDummy_{i,t-1} + \hat{\beta}_6 \ SellingExpense_{i,t-1} + \hat{\beta}_7 \ FirmSize_{i,t-1}$$

Table 5-12 reports the descriptive statistics of predicted book leverage ratios by the tobit model over the 11 year window [-5, +5]. Since the predicted book leverage ratio in year t is determined by the actual independent variables in year $t-1$, the significant change of actual independent variables between year -1 and year 0 should lead to significant change of predicted book leverage ratios between year 0 and year 1. This table divides the 659 sample firms into two groups according to whether the predicted book leverage ratios increase or decrease between year 0 and year 1. The Increase Group consists of 458 firms. In the 11-year period, the minimum predicted book leverage ratios are in the range of [0.002, 0.072], and the maximum ratio are in the range of [0.725, 8.791]. The median of predicted book leverage ratios fluctuates between year -5 and 0, experiences a jump from 0.183 in year 0 to 0.204 in year 1 (11.5% increase), and keeps at a high level afterwards. The mean of predicted book leverage shows the same tendency and there is a jump from 0.192 in year 0 to 0.232 in year 1 (20.8% increase). The Decrease Group consists of 201 firms. The minimum predicted book leverage ratios are in the range of [0.000, 0.072], and the maximum ratio are in the range of [0.540, 0.986]. The median fluctuates between 0.196 and 0.202 in years [-5, 0], drops between year 0 and 1 from 0.202 to 0.188 (6.9% reduce), surge between year 1 and 2 from 0.188 to 0.202 (7.4% increase), and keeps at a high level afterwards. The mean shows the same tendency. For both groups, the median and mean approve the assumption that M&A changes firms’ actual book leverage ratios dramatically in the announcement year thus changes firms’ predicted book leverage ratios in year 1.

Table 5-12 Descriptive Statistics of Firm's Predicted Book Leverage Ratios

This table describes the statistics of sample firms' predicted book leverage ratios in the 11 year window [-5, +5]. The announcement year is set to 0, the previous year of the announcement year is set to -1, and the next year of the announcement year is set to 1. The sample is made up of 659 acquiring firms (deals). According to whether the predicted book leverage ratios increase or decrease between year 0 and year 1, the sample is divided into two groups, the Increase Group and Decrease Group. For the i^{th} firm in year t whereas $i \in [1, 659]$ and $t \in [-5,5]$, the prediction equation is given as:

$$PredictedLeverageRatio_{i,t} = \hat{\alpha} + \hat{\beta}_1 (M/B)_{i,t-1} + \hat{\beta}_2\ AssetTagibility_{i,t-1} + \hat{\beta}_3\ Profitability_{i,t-1} + \hat{\beta}_4\ R\&DExpense_{i,t-1} + \hat{\beta}_5\ R\&DDummy_{i,t-1} + \hat{\beta}_6\ SellingExpense_{i,t-1} + \hat{\beta}_7\ FirmSize_{i,t-1}$$

	-5	**-4**	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**4**	**5**
Panel A (Increase Group) N=458											
Min	0.067	0.002	0.060	0.058	0.034	0.005	0.062	0.072	0.053	0.049	0.008
Max	0.873	0.988	0.725	0.731	0.736	1.168	2.440	2.887	8.791	3.949	8.222
Med	0.186	0.188	0.185	0.183	0.182	0.183	0.204	0.203	0.208	0.207	0.207
Mean	0.199	0.199	0.196	0.195	0.192	0.192	0.232	0.225	0.240	0.229	0.245
Std. Dev.	0.080	0.083	0.072	0.075	0.073	0.086	0.157	0.150	0.409	0.193	0.411
Panel B (Decrease Group) N=201											
Min	0.072	0.000	0.001	0.000	0.029	0.008	0.000	0.071	0.025	0.045	0.001
Max	0.692	0.554	0.636	0.615	0.750	0.928	0.540	0.986	0.972	0.846	0.779
Med	0.196	0.200	0.198	0.197	0.202	0.202	0.188	0.202	0.209	0.204	0.204
Mean	0.215	0.214	0.215	0.214	0.223	0.225	0.204	0.223	0.226	0.223	0.219
Std. Dev.	0.085	0.082	0.080	0.079	0.088	0.094	0.071	0.096	0.100	0.089	0.083

Data Source: WRDS Compustat North America.

Table 5-13 probes how acquisitions suddenly change the optimal book leverage ratios in year +1. The average value of each firm's actual independent variables over years [-5, -1] is compared with its value in year 0 to examine this change. The sample of predicted book leverage ratios is divided into two groups according to whether these ratios increase or decrease between year 0 and year +1.

All Pearson correlation tests are significant at 1% level, which means all variables satisfy the paired-samples assumption that observations for each pair are made under the same conditions and the mean differences are normally distributed. The Increase Group is made up of 458 firms. Between year [-5, -1] and year 0, for means, market-to-book ratio increases, asset tangibility decreases, profitability increases, R&D expense does not change, R&D dummy increases, selling expense increases, and firm size increases. Among them, the changes of R&D dummy, selling expense and firm size are consistent with the relationship between leverage ratio and estimations of coefficients by the tobit regression, and attribute to pull up the predicted book leverage ratios in year +1. The paired-samples *t*-statistic procedure examines the significance of difference between the two sample means. It showed that the changes of means of market-to-book ratio, asset tangibility, profitability and firm size are statistically significant. Since firm size is the only independent variable whose change is consistent with the estimation of tobit model and is statistically significant in the *t*-test, it concludes that the increase of predicted leverage ratios in year +1 mainly attributes to the increase of firm size. The Decrease Group consists of 201 firms. Between year [-5, -1] and year 0, for means, market-to-book ratio increases, asset tangibility decreases, profitability decreases, R&D expense decreases, R&D dummy increases, selling expense increases, and firm size increases. Among them, the changes of market-to-book ratio and asset tangibility are consistent with the relationship between leverage ratio and estimations of coefficients by the tobit regression, and attribute to push down the predicted book leverage ratios in year +1. The paired-samples *t*-statistics are significant for market-to-book ratio, asset tangibility, selling expense and firm size. Since market-to-book ratio and asset tangibility are the independent variables whose changes are consistent with the estimation of tobit model and are statistically significant in the *t*-test, it concludes that the decrease of predicted leverage ratios in year +1 mainly attributes to the increase of market-to-book ratio and the decrease of asset tangibility.

Table 5-13 Comparison of the Actual Independent Variables before and at the M&A

This table compares the actual independent variables before and at the M&A announcement. The average values of independent variables of each firm over [-5, -1] are compared with the independent variables of the firm in year 0. The Pearson correlation examines if the two samples of year [-5, -1] and year 0 satisfy the paired-samples assumption; the paired-samples *t*-statistic examines the significance of difference between the two sample means. The sample is divided into two groups according to whether the predicted book leverage ratios increase or decrease between year 0 and year 1. ***, ** and * denotes the significance level at 1%, 5% and 10%.

	Median		**Mean**		**Pearson**	**Paired Samples**
	[-5, -1]	**0**	**[-5, -1]**	**0**	**Correlation**	***t*-statistic**
Increase Group (N=458)						
Market to Book	1.735	1.763	2.112	2.588	0.591***	-3.512***
Asset Tangibility	0.324	0.323	0.367	0.359	0.926***	2.112**
Profitability	0.162	0.175	0.166	0.182	0.673***	-5.522***
R&D Expense	0.000	0.000	0.030	0.030	0.990***	0.294
R&D Dummy	1.000	1.000	0.526	0.533	0.974***	-1.246
Selling Expense	0.360	0.334	0.472	0.483	0.505***	-0.322
Firm Size	2.542	2.712	2.592	2.749	0.969***	-19.473***
Decrease Group (N=201)						
Market to Book	1.405	1.677	1.849	2.233	0.676***	-3.482***
Asset Tangibility	0.357	0.339	0.380	0.369	0.937***	2.331**
Profitability	0.146	0.139	0.143	0.137	0.687***	1.459
R&D Expense	0.003	0.001	0.062	0.047	0.997***	1.354
R&D Dummy	0.200	0.000	0.487	0.493	0.946***	-0.517
Selling Expense	0.417	0.457	0.622	0.714	0.677***	-2.119**
Firm Size	2.702	2.808	2.692	2.800	0.966***	-7.464***

Stage 3: Deviation

At this stage, firms' optimal book leverage ratios are subtracted from the actual book leverage ratios to obtain the deviations of book leverage ratios.

Table 5-14 reports the deviations of book leverage ratios over the 11 year window. The deviation for the i^{th} firm in year t is calculated as:

$$\Delta LeverageRatio_{i,t} = ActualLeverageRatio_{i,t} - PredictedLeverageRatio_{i,t}$$

whereas $i \in [1, 659]$ and $t \in [-5,5]$. It divides the 659 sample firms into two groups according to whether the book leverage ratio deviations increase or decrease between year -1 and year 0. The Increase Group consists of 416 firms. In the 11-year period, the minimum deviations are in the range of [-3.127, -0.211], and the maximum deviations are in the range of [0.531, 1.560]. The median of deviations keeps decreasing between year -5 and -1, experiences a significant jump from -0.045 in year -1 to 0.078 in year 0, and decreases afterwards. The mean of deviations shows the same tendency and there is a jump from -0.030 in year -1 to 0.092 in year 0. The Decrease Group consists of 243 firms. The minimum deviations are in the range of [-8.447, -0.275], and the maximum deviations are in the range of [0.419, 2.013]. The median fluctuates between -0.014 and -0.001 in years [-5, -1], drops significantly between year -1 and 0 from -0.001 to -0.042, surges between year 0 and 1 from -0.042 to -0.014, and keeps at a high level afterwards. The mean shows the same tendency. The Overall Sample's medians and means fall between those of the Increase Group and the Decrease Group, which is consistent with the rationale of splitting the sample to avoid the offsetting effect of these two groups. For both groups, the median and mean approve the assumption that M&A changes firms' book leverage ratio deviations dramatically at the announcement year, which is consistent with the predictions of the *co-insurance and increasing debt capacity* hypothesis, the *unused debt capacity* hypothesis, the *financial slack* hypothesis, the *commitment device* hypothesis, and the *wealth transfer* hypothesis. The trend that firms gradually revert back to their optimal leverage ratios in the years after M&A support the dynamic trade-off theory.

Table 5-14 Descriptive Statistics of Firm's Book Leverage Ratio Deviations

This table describes the statistics of sample firms' book leverage ratio deviations in the 11 year window [-5, +5]. The announcement year is set to 0, the previous year of the announcement year is set to -1, and the next year of the announcement year is set to 1. The sample is made up of 659 acquiring firms (deals). According to whether the book leverage ratio deviations increase or decrease between year -1 and year 0, the sample is divided into two groups, the Increase Group and Decrease Group. For the i^{th} firm in year t whereas $i \in [1, 659]$ and $t \in [-5,5]$, the deviation is given as:

$$\Delta LeverageRatio_{i,t} = ActualLeverageRatio_{i,t} - PredictedLeverageRatio_{i,t}$$

	-5	-4	-3	-2	-1	0	1	2	3	4	5
Panel A (Increase Group) N=416											
Min	-0.638	-0.587	-0.486	-0.578	-0.576	-0.211	-1.734	-0.498	-0.799	-0.471	-3.127
Max	0.601	0.585	0.531	0.619	0.587	0.633	0.698	1.255	1.285	1.557	1.560
Med	-0.019	-0.025	-0.032	-0.034	-0.045	0.078	0.047	0.037	0.018	0.010	0.005
Mean	-0.004	-0.008	-0.014	-0.016	-0.030	0.092	0.057	0.056	0.040	0.037	0.029
Std. Dev.	0.147	0.144	0.137	0.139	0.132	0.151	0.188	0.177	0.178	0.180	0.248
Panel B (Decrease Group) N=243											
Min	-0.275	-0.294	-0.279	-0.328	-0.387	-0.894	-1.178	-2.584	-8.447	-3.545	-7.707
Max	0.463	0.419	0.517	1.129	0.903	0.888	0.857	2.013	1.750	1.685	1.627
Med	-0.007	-0.014	-0.010	-0.002	-0.001	-0.042	-0.014	-0.014	-0.006	-0.017	-0.021
Mean	0.004	0.011	0.009	0.019	0.027	-0.025	0.009	0.007	-0.021	-0.008	-0.027
Std. Dev.	0.127	0.130	0.132	0.158	0.155	0.148	0.169	0.261	0.576	0.293	0.533
Panel C (Overall Sample) N=659											
Min	-0.638	-0.587	-0.486	-0.578	-0.576	-0.894	-1.734	-2.584	-8.447	-3.545	-7.707
Max	0.601	0.585	0.531	1.129	0.903	0.888	0.857	2.013	1.750	1.685	1.627
Med	-0.014	-0.022	-0.022	-0.024	-0.028	0.034	0.030	0.024	0.008	0.003	-0.008
Mean	-0.001	-0.001	-0.006	-0.003	-0.009	0.049	0.039	0.038	0.018	0.021	0.009
Std. Dev.	0.140	0.139	0.136	0.147	0.143	0.160	0.183	0.213	0.378	0.229	0.380

Chart 5-1 reports the result of Table 5-14 in an intuitive way. Chart 5-2 reports the deviations of the top 10% and the bottom 10% firms, ranking them by the difference of deviations between year -1 and year 0. Chart 5-2 supports the result of Table 5-14 and Chart 5-1 further. Bruner (1988) gives evidence of negative leverage ratio change in the second year before the takeover, suggesting that acquirers are building up debt capacity before merger. Ghosh and Jain (2000) find out that the acquiring firms are under-levered in the 2-year period before the M&A compared with benchmark firms with matched industry and size, and leverage ratios increase and stay at a high level in the 5-year period after the M&A. Their results of the deviations before and at the announcement are consistent with the Increase Group trend in Chart 5-1.

Chart 5-3 and Chart 5-4 report the leverage deviation results of Morellec and Zhdanov (2008) and Harford et al. (2007) for comparison. Both of these charts show that acquiring firms are under-levered before announcement, and lever up dramatically between year -1 and year 0, which is consistent with this research's Increase Group. However, their results reveal that the increase of leverage at the announcement is unable to push firms well above their optimal leverage ratios, i.e., acquiring firms are nearly under-levered throughout their life, which is contradictory with the reality that takeovers make many acquiring firms over-levered. Moreover, in reality, a number of firms are not under-levered in the years before M&A announcement (eg, firms in Decrease Group of Chart 5-1). Last, in the long run after M&A, their trend of deviation does not show clear evidence of dynamic trade-off that firms' leverage ratios converge to their optimisms.

The different results between Morellec and Zhdanov (2008) and Harford et al. (2007) and this research attributes to three factors. First, when a firm involves successive takeovers in the object window, they do not distinguish one deal's influence from another, but this research excludes those firms with successive deals. Second, they mix the estimation window and the event window thus the impact of event is diluted; however, this research draws a clear line between the estimation window and the event window. Third, they do not split the sample according to whether the deviation increases or decreases at announcement year, so the leverage deviations of firms that lever up and firms that lever down cancel out with each other; in contrast, this research distinguishes the Increase Group and Decrease Group firms. Consequently, this research discovers more significant changes of deviations both at the announcement period and in the post-merger period, not only illustrates the considerable influence of M&A on acquiring firms' leverage ratios, but also is a better support of the dynamic trade-off theory that firms revert to their optimal leverage ratios in the years after M&A.

Chart 5-1 Book Leverage Ratio Deviations (Median)

This chart describes the sample firms' book leverage ratio deviations (median value) in the 11 year window by dividing the firms into two groups: for the Increase Group, the deviation value increases between year -1 and year 0; for the Decrease Group, the deviation value decreases between year -1 and year 0. The Increase Group is made up of 416 firms and the Decrease Group is made up of 243 firms. The deviations are calculated by subtracting the predicted book leverage ratios from the actual book leverage ratios.

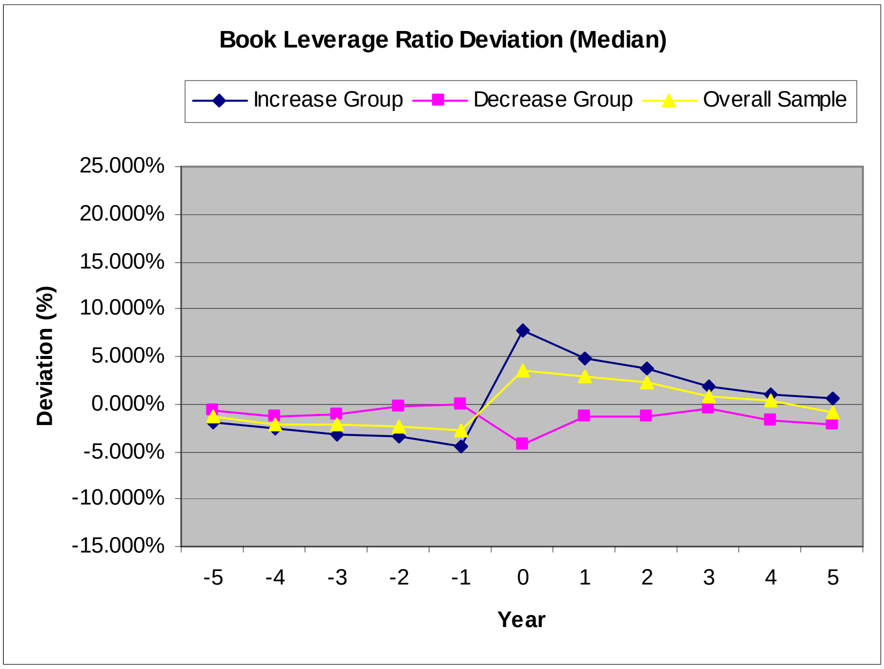


Chart 5-2 Top & Bottom Book Leverage Ratio Deviations (Median)

This chart describes the top 10% and bottom 10% book leverage ratio deviations (median value) in the 11 year window [-5, +5]. The deviations are calculated by subtracting the predicted book leverage ratios from the actual book leverage ratios. The top 10% deviation group and the bottom 10% deviation group, ranked by the difference between year -1 and year 0 of the 659 firms, each have 65 firms.

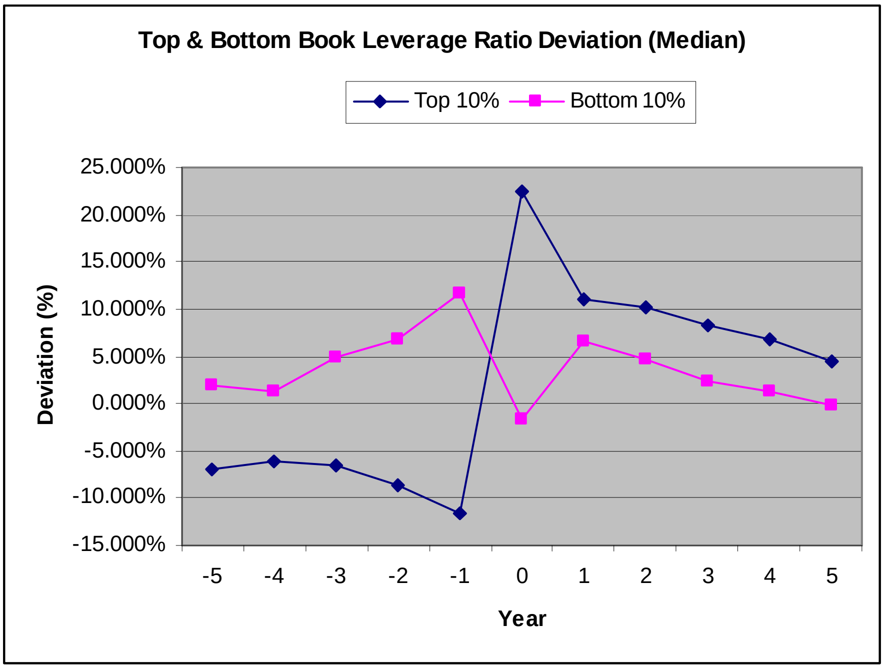


Chart 5-3 Market Leverage Ratio Deviations

This chart reports the 6-year market leverage ratio deviations by Morellec and Zhdanov (2008) (see their Fig 7, page 573). The sample consists of 1926 acquiring firms that announce M&A between 1 Jan 1980 and 31 Dec 2005.

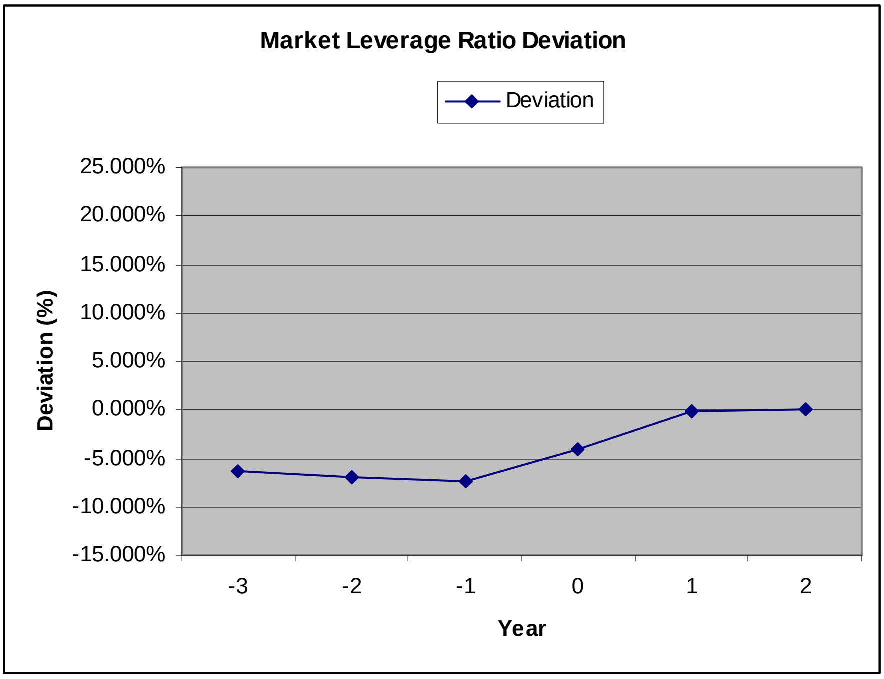
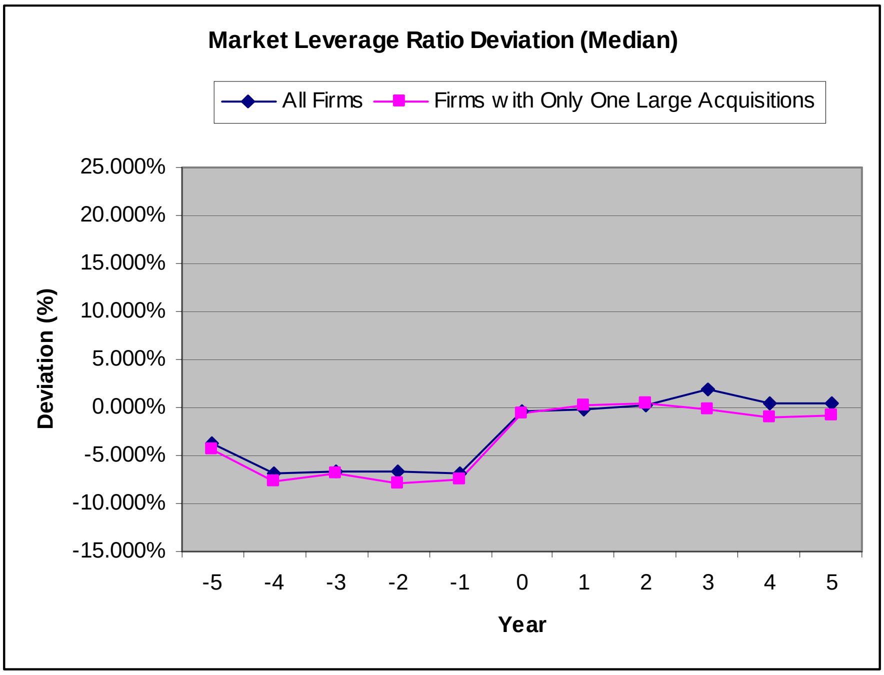
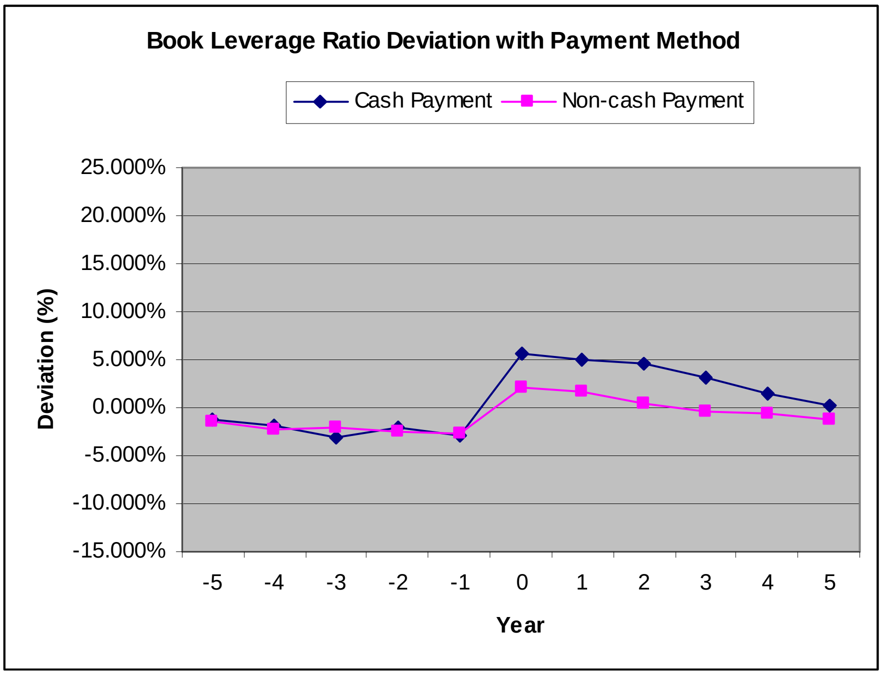


Chart 5-4 Market Leverage Ratio Deviations (Median)

This chart reports the market leverage ratio deviations by Harford et al. (2007) (see their Table 6, page 35). The sample for "All Firms" consists of 1188 acquiring firms that announce M&A between the beginning of 1981 and the end of 2000. The "Firms with Only Large Acquisitions" consists of about 618 acquiring firms (52% of the 1188 firms) that take just one acquisition within a 11-year period.



It is possible that the method of payment could be a main discriminator of leverage change, therefore the split of sample according to the method of payment should demonstrate a more significant difference between these two groups. The deviations are split into two groups according to the method of payment, and the result is displayed in the chart below. The trends of the cash payment group and the non-cash payment group are similar, and the difference between these two groups is less explicit than the difference between the groups in Chart 5-1. Thus, the possibility that method of payment is a main discriminator on deviations is refused.



To sum up, deviation's movement over the time in Chart 5-1 has four implications: (1) firms do have optimal book leverage ratios; (2) firms under-levered (over-levered) before the M&A are observed to increase (decrease) leverage at M&A announcement; (3) M&A has crucial impact on firms' book leverage ratios—it either increases or decreases the deviations (in this research, the increase impact is stronger than the decrease impact); (4) after M&A, firms gradually revert the deviations. The empirical discovery that firms do not adjust their leverage ratios immediately after the M&A but revert back to the optimal level gradually in a long run, supports the dynamic trade-off theory. According to that theory, there are costs and delays for firms to adjust to their optimal leverage ratio. Therefore, when M&A bumps firm away from their optimal leverage ratios, they cannot offset this deviation, instead, they choose to revert the leverage ratio in a long period. This evidence of dynamic trade-off theory is consistent with those from Hovakimian et al. (2001), Hovakimian et al. (2004), Alti (2006), and Kayhan and Titman (2007).

5.3 Partial Adjustment

Graham and Harvey (2001) report in their survey that 81% of the firms consider an optimal leverage ratio or range when they make financial decisions. Dynamic trade-off theory maintains that firms take positive steps to offset deviations from their optimal leverage ratios, and the speed with which firms reverse depends on the cost of adjustment (Flannery and Rangan, 2006). If firm values are highly sensitive to the deviations and the leverage ratio adjustment cost is relatively low, historical variables should have only a temporary effect on the actual leverage ratios; in the extreme, if the adjustment cost is zero, firms should never deviate from their optimal leverage ratios. If firm values are less sensitive to the deviations and the adjustment cost is high, historical variables should have a persistent effect on the actual leverage ratios; in the extreme, if the adjustment cost is infinite, firms should never move back to optimal leverage ratios. Alternative theories such as pecking order hypothesis, market timing theory and the managerial inertia reject the optimal leverage ratios and firms' convergence towards the optimisms.

This section uses the standard partial adjustment model to test the speed of adjustment a firm moves towards the optimal leverage ratios in the post-merger period on the dynamic trade-off theory. It then uses several modified partial adjustment models to test the influences of competing theories on the adjustment speed. These competing theories include pecking order hypothesis (the financial deficit variable), market timing theory (the external finance weighted average variable, the yearly timing variable, the long-term timing variable, and the share price surprise variable) and managerial inertia theory (the stock return variable).

5.3.1 Dynamic Trade-off Theory and Partial Adjustment Model

The Model

"The partial adjustment model has been used in many areas of applied economics as a description of optimal behaviour in the face of adjustment costs." (Kennan, 1979: 1441) It says that firms adjust their variables only partially towards their optimal levels. A standard partial adjustment model consists of two parts, the dynamic partial adjustment process (5.3-1) and the static expectation which describes how the optimism is determined (5.3-2). The dynamic partial adjustment process is given by

$$ActualLeverage_t - ActualLeverage_{t-1} = \lambda\,(PredictedLeverage_t - ActualLeverage_{t-1}) + \varepsilon_t$$

(5.3-1)

whereas λ is the adjustment speed (0< λ <1): a typical firm closes a proportion λ of the gap between its actual leverage ratio and predicted leverage ratio each year. The predicted leverage ratio takes the form of:

$$PredictedLeverage_t = \beta X_{t-1}$$

(5.3-2)

whereas X_{t-1} is a vector of firm characteristics related to the costs and benefits of operating with various leverage ratios defined in section 5.2: the *Market-to-Book Ratio*, the *Asset Tangibility*, the *Profitability*, the *R&D Expense*, the *R&D Dummy*, the *Selling Expense* and the *Firm Size*. Substitute (5.3-2) into (5.3-1) and rearrange, the estimable model is given by:

$$ActualLeverage_t = (\lambda\beta)\, X_{t-1} + (1-\lambda) ActualLeverage_{t-1} + \varepsilon_t$$

(5.3-3)

The reason why firms make only a partial adjustment to the optimal level is explained by the adjustment cost. Adjustment costs could be transaction costs (to issue or retire securities), adverse selection costs (equity sells for less than it is really worth), scarce managerial time, and so on. The adjustment cost and the cost of being in disequilibrium mutually decide the adjustment speed. In equation (5.3-3), the null hypothesis is $(1-\lambda)$ =0 or λ =1. In this case $ActualLeverage_t$ is the same as $PredictedLeverage_t$ (see equation (5.3-1)), or $ActualLeverage_t = (\lambda\beta) X_{t-1}$ (see equation (5.3-3)), which is a complete adjustment (instantaneous adjustment) and the actual leverage ratio is always at its optimal level. If λ =0, the adjustment is infinitely slow or the adjustment does not exist, and $ActualLeverage_t$ follows a random walk. Hence if 0< λ <1 and the *t*-test for $(1-\lambda)$ is significant, the partial adjustment holds true.

Model Analysis

Acquiring firms are tested by the standard partial adjustment model (5.3-3) upon the dynamic trade-off theory in the post-takeover period. Table 5-15 reports the results of OLS estimates. The first five columns *Year +1* to *Year +5* present the estimates of the annually cross-sectional regressions; the last column *Year [+1, +5]* reports the estimates of the 5-year pooled cross-sectional regression. 659 acquiring firms are split into two samples according to whether the median deviation of leverage increases or decreases between year -1 and year 0. All the *F*-tests are statistically significant at 1% level. The adjusted *R*-squares are between 0.608 and 0.823 for the Increase Group and between 0.524 and 0.910 for the Decrease Group. These values are consistent with the *R*-square of 0.756 in Flannery and Rangan (2006) (Table 2, page 478) and the *R*-squares of 0.80 and 0.68 in Fama and French (2002) (Table 4, page 24).

For both the Increase Group and Decrease Group in column *Year [+1, +5]*, all those firm characteristics variables that are statistically significant hold the same signs with the estimators in Table 5-10 and Table 5-11 (except profitability in the Decrease Group): asset tangibility in the Increase Group, market-to-book ratio, R&D expense, R&D dummy and selling expense in the Decrease Group. Comparing with Table 5-10 and Table 5-11, the statistical insignificance and opposite sign of some of the firm characteristics variables in Table 5-15 may attribute to the split of sample into Increase Group and Decrease Group, and the out-of-sample estimation. The out-of-sample factor could be the explanation for the potential differences (if there are any) between the results of previous research and this research. For previous research such as Fama and French (2002), Flannery and Rangan (2007) and Kayhan and

Titman (2007), there are no events, thereafter the partial adjustment models are based on the in-sample estimations. This research considers M&A as an event, and the event window is separated from the estimation window; thus the estimation is an out-of-sample estimation. The in-sample estimation incorporates all the observations so the coefficients of estimators should to be uniform, but provide less objective evidence of the influence of event than the out-of-sample estimation. Although Flannery and Rangan (2006) use the in-sample prediction, it is unexplained why some of their estimators hold the opposite signs of hypothesis and are statistically insignificant (in their Table 2, page 478).

Results on (1-λ)

The coefficients for the lagged actual leverage ratios, (1-λ), are all statistically significant at 1% level. For the Increase Group, the adjustment speed λ is 19% for *Year +1*, 3.5% for *Year +2*, 10% for *Year +3*, 15.8% for *Year +4* and 2.8% for *Year +5*, and 10.3% for *Year [+1, +5]*. For the Decrease Group, the adjustment speed λ is 14.9% for *Year +1*, 10.3% for *Year +2*, 10.7% for *Year +3*, 11.0% for *Year +4* and 12.3% for *Year +5*, and 11.7% for *Year [+1, +5]*. These results are similar with Fama and French (2002) and Flannery and Rangan (2006). Fama and French (2002) discover 7%~10% adjustment speed for dividend payers and 15%~18% adjustment speed for dividend nonpayers (in their Table 4, page 24) based on the Fama and MacBeth regression model. Flannery and Rangan (2006) report 13.3% adjustment speed by the Fama and MacBeth regression model (in their column (1) of Table 2, page 478) and 13.6% by the OLS regression model (in their column (2) of Table 3, page 483). The low adjustment speed might reflect the adjustment costs that prevent firms to converge to their optimal leverage ratios immediately, explained by the dynamic trade-off theory. The speed results here are also consistent with the trends in Chart 5-1 and Chart 5-2. Flannery and Rangan (2006) also use Fama and MacBeth panel regression, Fama and MacBeth demeaned regression and Fama and MacBeth demeaned regression with year dummy, and they find evidence of higher speeds of adjustment which are over 30% per year (see their Table 2, column (2),(3) and (4), page 478). They attribute the more rapid adjustment speed to influence of the firm-specific unobserved effects which are captured by these models.

The low adjustment speed could arise from either the high adjustment costs or the alternative capital structure considerations. Previous papers have suggested that variables for the pecking order hypothesis, market timing theory and managerial inertia could compete with variables associated with the dynamic trade-off theory, and "the variables associated with the true theory are more important than their competitors" (Flannery and Rangan, 2006). In order to test if the alternative considerations outweigh the cost of deviating from predicted leverage ratios, variables for these competing theories are added to the main specification in (5.3-3) for further tests.

5.3.2 Pecking Order Hypothesis and Financial Deficit

The Model

Financial deficit is defined as the net amount of equity and debt that a firm issues or repurchases in a given year (Frank and Goyal, 2003; Kayhan and Titman, 2007). A positive financial deficit means the firm invests more than its internal cash flows; a negative financial deficit means the firm has more internal cash flows than its investments. Myers and Majluf (1984) analyse financial deficit by an adverse selection model that firms with higher financial deficits are inclined to increase their leverage. Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) explain financial deficit by the pecking order theory that firms with high financial deficits are likely to increase their debt ratios because debt is likely to be the marginal source of financing. Flannery and Rangan (2006) argue that financial deficit explains a firm's contemporaneous changes in its book leverage ratio. They test the pecking order hypothesis against the dynamic trade-off theory by adding a financial deficit variable to the partial adjustment model:

$$ActualLeverage_t - ActualLeverage_{t-1} = (\lambda\beta)\, X_{t-1} - \lambda\, ActualLeverage_{t-1}$$
$$+ \gamma\, FinancialDeficit_t + \varepsilon_t \qquad (5.3\text{-}4)$$

whereas λ is the adjustment speed stands for the dynamic theory, and γ is the coefficient of financial deficit stands for the pecking order hypothesis. The question is whether financial deficit affects the estimated coefficients on X_{t-1} or the lagged actual leverage ratio. If partial adjustment (dynamic trade-off theory) holds, λ will be between 0 and 1, and the *t*-test for -λ will be significant. If pecking order hypothesis fully holds, γ should be 1 and statistically significant, and substantially alter the other variables' signs and significance levels. Otherwise, pecking order effect is just part of a generalised version of the trade-off theory (Flannery and Rangan, 2006).

This research first examines pecking order by Frank and Goyal (2003) definition (see Table 5-4) of financial deficit, which is

$$FD = \frac{DividendPayments + Investments + ChangeinWorkingCapital - InternalCashFlow}{TotalAssets}$$

This calculation is based on cash flow statements. However, since US firms were not required to submit cash flow statements until 1988, Compustat does not cover cash flow data comprehensively. In this research, only 10% of the sample firms are with valid cash flow statement data. Due to the low power of model cause by data invalidity, regression results are not reported here.

Kayhan and Titman (2007: 10) acknowledge this cash flow statement data problem, and they calculate financial deficit by balance sheet data. They argue that although "balance sheet calculation reflects changes in account balances that do not necessarily have underlying cash components and hence leads to noise", the two results are qualitatively similar. This research then examines pecking order following definition of Kayhan and Titman (2007) (see Table 5-4).

Model Analysis

Table 5-16 reports the results of OLS estimates on equation (5.3-4) with balance sheet data. The first five columns *Year +1* to *Year +5* present the estimates of the annually cross-sectional regressions; the last column *Year [+1, +5]* reports the estimates of the 5-year pooled cross-sectional regression. 659 acquiring firms are also split into two samples. Compared with Table 5-15, the adjusted *R*-squares in Table 5-16 reduce from 0.524~0.910 to 0.002~0.270, and the *F*-tests are statistically insignificant for Increase Group in *Year +2* and for Decrease Group in *Year +2* and *Year +3*, and the values of all *F*-tests drop considerably. These results show that the financial deficit variable has some influence on this model. For the coefficients of firm characteristics variables in *Year +1 to Year +5*, there are tiny changes in the signs and significance levels compared with Table 5-15, but they are inconclusive; these coefficients in *Year [+1, +5]* are qualitatively the same for Table 5-15 and Table 5-16. The adjusted *R*-squares are between 0.002 and 0.114 for the Increase Group and between 0.005 and 0.270 for the Decrease Group. These values are consistent with the *R*-square of 0.198 in Flannery and Rangan (2006) (column (3), Table 5, page 489). These low *R*-squares indicate that the financial deficit variable for pecking order decreases the goodness of fit of the model.

Results on -λ and γ

The coefficients for the lagged actual leverage ratios, -λ, are statistically significant for Increase Group in *Year +1* and *Year +3*, and for Decrease Group from *Year +1* to *Year +4*; the coefficients are statistically significant at 1% level for both the 5-year pooled cross-sectional models as ever before. The adjustment speed, λ, is qualitatively the same as in Table 5-15: for the Increase Group, the adjustment speed is 17.4% for *Year +1*, 3.1% for *Year +2*, 9.7% for *Year +3*, 18.6% for *Year +4* and 4.7% for *Year +5*, and 10.7% for *Year [+1, +5]*; for the Decrease Group, the adjustment speed is 13.7% for *Year +1*, 11.2% for *Year +2*, 10.5% for *Year +3*, 10.2% for *Year +4* and 10.3% for *Year +5*, and 10.7% for *Year [+1, +5]*. The coefficients of financial deficit, γ, take values between -0.164 and 0.222, and their absolute values are close to zero. These coefficients are statistically significant for Increase Group in *Year +4* and *Year +5*, for Decrease Group in *Year +1*, *Year +2*, *Year +4* and *Year [+1, +5]*. The pecking order hypothesis predicts positive relation between the financial deficit and the leverage ratio; however, three of these statistically significant coefficients signify negative relation, which may attribute to the split of sample and the out-of-sample prediction power.

Even if the financial deficit variable has some impact on the model, in general, the stability of adjustment speed λ and the low value of γ for these regressions can reject the pecking order hypothesis against the dynamic trade-off theory. Flannery and Rangan (2006) reports that the financial deficit coefficient is significantly positive, but does not substantially change the other variables' signs and significance levels (in their column (3), Panel A, Table 5), thereafter the pecking order forces is just part of a generalized version of the dynamic trade-off theory, rather than a unique determinant of leverage ratios. They also find out that a one-standard deviation change in predicted book leverage ratio changes the $ActualBookLeverage_t - ActualBookLeverage_{t-1}$ as 15.13 times (0.0711 divide 0.0047) as a one-standard deviation change in financial deficit changes the $ActualBookLeverage_t - ActualBookLeverage_{t-1}$ (in their Panel B, Table 5), so they conclude changes in optimal leverage ratios is much more important than financial deficit in explaining book leverage ratios.

5.3.3 Market Timing Theory and External Finance Weighted Average

The Model

Baker and Wurgler (2002) and Kayhan and Titman (2007) argue that firms adjust their leverage ratios by timing the stock market, i.e., firms tend to raise funds with equity when their stock price is high and with debt when their stock price is low. As a result, firms reduce their leverage ratios by raising funds in equity when the stock market is perceived to be favourable (with a high market-to-book ratio). Flannery and Rangan (2006) test the market timing theory by including the lagged external finance weighted average market-to-book ratio (defined by Baker and Wurgler, 2002) into the partial adjustment model:

$$ActualLeverage_t = (\lambda\beta)\, X_{t-1} + (1-\lambda)\, ActualLeverage_{t-1} + \delta\left(\frac{M}{B}\right)_{efwa,t-1} + \varepsilon_t$$

(5.3-5)

whereas $\left(\frac{M}{B}\right)_{efwa,t-1}$ is the firm's external finance weighted average market-to-book ratio which summarises the relevant historical variation in market values. The market timing theory predicts a negative relation between leverage ratio and $(\frac{M}{B})_{efwa,t-1}$. If partial adjustment (dynamic trade-off theory) holds, (1-λ) will be between 0 and 1, and the *t*-test will be significant. If market timing theory holds, δ should be negative and statistically significant, and substantially alter the other variables' signs and significance levels. Baker and Wurgler (2002: 12) argue that the weighting scheme "gives more weight to valuations that prevailed when significant external financing decisions were being made", therefore, "the weighted average is better than a set of lagged market-to-book ratios because it picks out, for each firm, precisely which lags are likely to be the most relevant". They define this variable as:

$$(\frac{M}{B})_{efwa,t-1} = \sum_{j=0}^{4}[\frac{\Delta equity_j + \Delta debt_j}{\sum_{j=0}^{4}(\Delta equity_j + \Delta debt_j)} \times (\frac{M}{B})_j]$$

(5.3-6)

whereas *j* is the sequence of year which takes value [0, +4]. $\Delta equity$ and $\Delta debt$ denote net equity issues and net debt issues, respectively, as defined in Table 5-4 by Kayhan and Titman (2007). For example, *j*=3 stands for the 3rd year after M&A announcement, and the weight is the sum of net equity issue and net debt issue in year 3, divided by the cumulative sum of net equity issues and net debt issues for year [0, +3]. As suggested by Baker and Wurgler (2002) [19], negative weight $\frac{\Delta equity_j + \Delta debt_j}{\sum_{j=0}^{4}(\Delta equity_j + \Delta debt_j)}$ is reset to zero, all the $(\frac{M}{B})_{efwa,t-1}$ are winsorized at the 1st and 99th percentiles to avoid the influence of outliers, and observations that $(\frac{M}{B})_{efwa,t-1}$ exceed 10 are dropped.

[19] Baker and Wurgler (2002: 12): The purpose of not allowing negative weights is to ensure the forming of weighted average. Otherwise, the weights may not be increasing in the total amount of external finance raised in each period, which would eliminate the intuition that the weights correspond to times when capital structure was most likely to be changed. A zero weight means the variable contains no information about the market-to-book ratio in that year.

Model Analysis

Table 5-17 reports the results of OLS estimates on equation (5.3-5). The columns *Year +1* to *Year +5* present the estimates of the annually cross-sectional regressions. Each $(\frac{M}{B})_{efwa,t-1}$ takes a weighted average value summarising on years [0, *t-1*]. 659 acquiring firms are split into two samples. Compared with Table 5-15, the adjusted *R*-squares and *F*-tests in Table 5-17 are qualitatively the same. The coefficients of firm characteristics variables remain basically unchanged when compared with Table 5-15, except that the simple market-to-book coefficients those were significant lose significance (the coefficients of market-to-book in Table 5-15 that were significant are no longer significant in Table 5-17, and for the others the absolute *t*-values now reduce). This may ascribe to the split of market-to-book effect between the lagged market-to-book variable and the weighted average market-to-book variable $(\frac{M}{B})_{efwa,t-1}$. The adjusted *R*-squares are between 0.616 and 0.818 for the Increase Group and between 0.431 and 0.903 for the Decrease Group. Compared with Table 5-15, these *R*-squares indicate that the inclusion of the $(\frac{M}{B})_{efwa,t-1}$ variable for market timing does not change the goodness of fit of the model.

Results on (1-λ) and δ

The coefficients for the lagged actual leverage ratios, (1-λ), are all statistically significant at 1% level. The adjustment speed, λ, is qualitatively the same as compared with the results in Table 5-15 (except that the mean of these speeds increase slightly). For Increase Group, the adjustment speed is18.3% for *Year +1*, 4.1% for *Year +2*, 9.1% for *Year +3*, 18.1% for *Year +4* and 2.7% for *Year +5*; for Decrease Group, the adjustment speed is18.1% for *Year +1*, 12.1% for *Year +2*, 10.4% for *Year +3*, 10.6% for *Year +4* and 16.8% for *Year +5*. The coefficient of market timing, δ, takes values between -0.011 and 0.005, which are close to zero. Only two of the coefficients are statistically significant at 10% level, for Decrease Group in *Year +2* and *Year +5*, and both coefficients are negative. This result is similar to Flannery and Rangan (2006) who report the market timing coefficient is at best marginally significant with *p*-value 0.093. The negative relationship between book leverage ratio and $(\frac{M}{B})_{efwa,t-1}$ fits the market timing theory, which is consistent with Baker and Wurgler (2002) (see their Table III and Table IV) and Flannery and Rangan (2006) (see their column (2) and (4), Panel A, Table 5, page 489).

The stability of adjustment speed λ, and the low value and statistical insignificance for most of the market timing coefficients δ could reject the market timing effect against the dynamic trade-off. Flannery and Rangan's (2006) result also refuse the market timing effect: a one-standard deviation's effect of the optimal book leverage ratio on the actual book leverage ratio is 44.07 times (0.0617 divide -0.0014) the effect of market timing on the actual book leverage ratio (in their Panel B, Table 5).

The Model

Kayhan and Titman (2007) decompose the Baker and Wurgler (2002) $(\frac{M}{B})_{efwa,t-1}$ as the sum of $\frac{Cov(FD,\frac{M}{B})}{\overline{FD}}$ and $\overline{(\frac{M}{B})}$. They argue that the first term in the decomposition is scaled by the average financial deficit, making it irrelevant to the amount of fund raised; the second term might not capture the market timing intuition because market-to-book ratio is likely to proxy for the investment opportunities. They present two timing measures *YT* and *LT* that are closely related to the $(\frac{M}{B})_{efwa,t-1}$ timing measure which they believe to be more preferable.

Yearly timing $YT = Cov(FD,\frac{M}{B})$ is the covariance between the financial deficit and the market-to-book ratio. It captures the idea that firms are more likely to decrease their leverage ratios if they raise funds in the stock market when the stock price is relatively high. It assumes that managers time the stock market and take advantage of short-term stock over-valuation, i.e., they compare the firms' contemporary market-to-book ratios with those in the surrounding years. According to Kayhan and Titman (2007: 7), this variable "accounts for the fact that marketing timing is likely to affect a firm's capital structure to a greater degree if the firm raises more external capital". They predict a negative relationship between *YT* and leverage ratio. *YT* variable is defined as

$$\frac{\sum_{j=0}^{4}(FinancialDeficit \times MarkettoBookRatio)}{\sum j} - \overline{FinancialDeficit} \times \overline{MarkettoBookRatio}$$

Long-term timing measure $LT = \overline{FD} \times \overline{(\frac{M}{B})}$ is the product of average external financing and average market-to-book ratio. Kayhan and Titman (2007) prefer this measure to the Baker and Wurgler (2002) measure (second term in the decomposition) for three assumptions. First, managers judge whether their stock is over or undervalued by comparing their market-to-book ratios to all firms in general. Second, managers act as though their cost of equity financing is negatively related with their market-to-book ratio. The third assumption is made upon the pecking order hypothesis which has nothing to do with market timing. Three reasons explain why the market-to-book ratio could be related to the pecking order hypothesis. 1) Asymmetric Information—firms with relatively high market-to-book ratio are facing fewer asymmetric information problems than other firms, hence they bear lower costs to raise fund in the equity market. 2) Signalling—firms with relatively high market-to-book ratio are willing to be exposed under public scrutiny. 3) Growth Opportunity—firms with relatively high market-to-book ratio are likely to be firms with high growth rate, and they avoid debt issue to keep financial flexibility. Kayhan and Titman (2007) argue that in case the leverage ratio changes more slowly than investment opportunities, or if the market-to-book ratio is a very noisy proxy for investment opportunities, the average market-to-book ratio might be a better proxy for the investment opportunities than the one-year lagged market-to-book ratio recommended by Baker and Wurgler (2002). Kayhan and Titman (2007) also predict a negative relationship between this variable and the leverage ratio. The long-term timing (*LT*) variable is defined as

$$\frac{\sum_{j=0}^{4} FinancialDeficit}{\sum j} \times \frac{\sum_{j=0}^{4} MarkettoBookRatio}{\sum j} \text{ or}$$

$$\overline{FinancialDeficit} \times \overline{MarkettoBookRatio}.$$

A new equation is set up to test market timing by substituting Kayhan and Titman's (2007) *YT* and *LT* variables for Baker and Wurgler's (2002) $(\frac{M}{B})_{efwa,t-1}$ into equation (5.3-6):

$$ActualLeverage_t = (\lambda\beta) X_{t-1} + (1-\lambda) ActualLeverage_{t-1} + \eta YearlyTiming_{t-1} + \psi LongTermTiming_{t-1} + \varepsilon_t$$

(5.3-7)

If the market timing theory holds, η and ψ should be negative and statistically significant, and substantially change the other variables' signs and significance levels.

Model Analysis

Table 5-18 reports the results of OLS estimates on equation (5.3-7). Columns *Year +2* to *Year +5* present the estimates of the annually cross-sectional regression. The definition of *YT* requires at least two years' data, so *Year +1* is not subject to analysis (because *Year +1* has only one year data on financial deficit and market-to-book ratio, all *YT*s equal to zero). 659 firms are split into two samples. Compared with Table 5-15 and Table 5-17, the adjusted *R*-squares, *F*-tests and firm characteristics variables are qualitatively the same. The *t*-tests of simple market-to-book ratio in Table 5-18 are slightly less significant than those in Table 5-15 but a bit more significant than those in Table 5-17. The adjusted *R*-squares are between 0.698 and 0.820 for the Increase Group and between 0.525 and 0.909 for the Decrease Group. Compared with Table 5-15, these *R*-squares indicate that the inclusion of the yearly timing variable and the long-term timing variable does not change the goodness of fit of the model.

Results on (1-λ), η and ψ

The coefficients for the lagged actual leverage ratios, (1-λ), are all statistically significant at 1% level. The adjustment speed, λ, is qualitatively the same as results in Table 5-15 and Table 5-17 (by considering the four years *Year +2* to *Year +5*, the mean adjustment speed in Table 5-18 is higher than that in Table 5-15 but lower than that in Table 5-17). For Increase Group, the adjustment speed is 3.6% for *Year +2*, 10.3% for *Year +3*, 16.4% for *Year +4* and 2.8% for *Year +5*; for Decrease Group, the adjustment speed is 10.2% for *Year +2*, 10.8% for *Year +3*, 11% for *Year +4* and 12.4% for *Year +5*. The coefficient of *YL*, η, takes values between -0.001 and 0.001, which are close to zero. The coefficient of *LT*, ψ, takes value 0. Only the coefficients of *YT* and *LT* for *Year +2* in Decrease Group are statistically significant. The sign of this *YT* is negative and consistent with the prediction of market timing. The sign of this *LT* is positive (in the table it is reported 0.000, and its actual value is 0.000301) and opposite to the prediction. The noise might come from M&A's influence on stock prices and the split of sample: acquiring firms usually experience negative abnormal stock returns in the post-merger period, meanwhile firms might reduce their leverage ratios between year +1 and year +2 (see Chart 5-2), thus *LT* could be positively related with actual leverage ratio in year +2.

The stability of adjustment speed λ, and the low value and statistical insignificance of η and ψ reject the market timing (and pecking order) effect against the dynamic trade-off. This conclusion supports the results of Table 5-17.

5.3.4 Managerial Inertia, Market Timing and Stock Returns

The Model

Welch (2004) asserts that firms do little to counteract the influence of stock price changes on their capital structures; as a result, stock price changes are negatively related to leverage ratios. Flannery and Rangan (2006) call this effect of stock return as the managerial inertia theory. Managerial inertia theory has the same prediction as market timing theory. Graham and Harvey (2001), Hovakimian et al. (2001) and Kayhan and Titman (2007) suggest that managers time the equity market: they tend to issue (repurchase) equity following stock price increases (decreases) because they can raise fund under more favourable terms. The market timing theory implies that leverage ratios are strongly negatively related to past stock returns. The difference between the stock return measure (managerial inertia) and the yearly timing (*YT*) measure (market timing) is that the former one focuses on stock price changes whereas the later one focuses on stock values. In order to test the stock price mechanics, Flannery and Rangan (2006) define the partial adjustment model as:

$$ActualLeverage_t = (\lambda\beta) X_{t-1} + (1-\lambda) ActualLeverage_{t-1} + (1-\upsilon) SPE_{t-1} + \varepsilon_t \quad (5.3\text{-}8)$$

whereas λ is the adjustment speed for the anticipated deviation, and υ is the adjustment speed for share price surprises. *SPE*, the share price effect, is defined as

$$SPE_{t-1} = \frac{TotalDebt_{t-1}}{TotalDebt_{t-1} + TotalEquity_{t-1}(1 + Stock\,Return_{t-1,t})} - ActualLeverage_{t-1}$$

$Stock\,Return_{t-1,t}$ is the realized appreciation in share price during the period between year *t-1* and year *t*: $\frac{P_t - P_{t-1}}{P_{t-1}}$. *P* is the monthly stock price (without dividends) from CRSP[20]. If the managerial inertia theory holds, υ should equal to 0 (the shock of stock return on leverage ratios follows a random walk), and the other variables' signs and significance levels are substantially changed. Give an example on how the stock price change affects SPE_{t-1}. Suppose in year *t-1* the value of total debt is 2 and the value of total equity is 8, therefore the actual leverage ratio is $\frac{2}{2+8}$=0.2. Without stock price change, SPE_{t-1}=0. If the stock price change between year *t-1*and year *t* causes a return of 100%, then $\frac{TotalDebt_{t-1}}{TotalDebt_{t-1} + TotalEquity_{t-1}(1 + Stock\,Return_{t-1,t})} = \frac{2}{2+8(1+100\%)} = 0.11$ thus SPE_{t-1} equals -0.09 (=0.11-0.2). The 100% stock return decreases the leverage ratio by 9% percent.

[20] Price (Prc) is the closing price or the negative bid/ask average for a trading day. If the closing price is not available on any given trading day, the number in the price field has a negative sign to indicate that it is a bid/ask average and not an actual closing price. Please note that in this field the negative sign is a symbol and that the value of the bid/ask average is not negative.

Model Analysis

Table 5-19 reports the results of OLS estimates on equation (5.3-8). The first five columns *Year +1* to *Year +5* present the estimates of the annually cross-sectional regressions; the last column *Year [+1, +5]* reports the estimates of the 5-year pooled cross-sectional regression. 659 acquiring firms are split into two samples. Compared with Table 5-15, the adjusted *R*-squares and *F*-tests in Table 5-19 are qualitatively the same. There are slight changes on the coefficients of firm characteristics variables but inconclusive. The adjusted *R*-squares are between 0.653 and 0.805 for the Increase Group and between 0.535 and 0.923 for the Decrease Group. These *R*-squares are similar to the high *R*-square of 0.860 in Flannery and Rangan (2006) (column (3), Table 7). Compared with Table 5-15, these *R*-squares indicate that the inclusion of the SPE_{t-1} variable for managerial inertia does not improve the goodness of fit of the model.

Results for (1-λ) and (1-υ)

The coefficients for the lagged actual leverage ratios, (1-λ), are all statistically significant at 1% level. The adjustment speed, λ, is higher than Increase Group results and lower than Decrease Group results in Table 5-15. For Increase Group, the adjustment speed is 20.2% for *Year +1*, 5.0% for *Year +2*, 10.8% for *Year +3*, 21.9% for *Year +4* and 2.8% for *Year +5*, and 12.1% for *Year [+1, +5]*; for Decrease Group, the adjustment speed is 9.5% for *Year +1*, 8.5% for *Year +2*, 7.5% for *Year +3*, 9.1% for *Year +4* and 15.2% for *Year +5*, and 10.0% for *Year [+1, +5]*. The coefficients for the managerial inertia variable *SPE*, (1-υ), are statistically significant for *Year +1*, *Year +4* and Year [+1, +5] in Increase Group and *Year +2* in Decrease Group. For these significant coefficients, the adjustment speeds are 88.2% (υ=1-0.118), 90.7% (υ=1-.093), 93.8% (υ=1-.062) and 91.4% (υ=1-.086), respectively. These high adjustment speeds indicate that firms actively absorb the effect of share price, and reject Welch (2004) managerial inertia hypothesis. The results for both λ and υ support the dynamic trade-off theory. Flannery and Rangan (2006) report 9.1% adjustment speed for the trade-off variable and -2.9% adjustment speed for the managerial inertia variable by an OLS model (see their column (3), Table 7, page 495), and argue that firms do not respond initially to share price surprises. Nevertheless, when they include the firm fixed effects, they discover 34.2% adjustment speed for the trade-off variable and 2.9% for the managerial inertia variable (see their column (4), Table 7, page 495). They suggest that although the low adjustment speed on managerial inertia variable indicates that firms ignore stock price changes in the year they occur, the high adjustment speed on trade-off variable means the stock price changes pass into the lagged actual leverage in subsequent year; so their results do not support the Welch (2004) hypothesis.

The Model

This research then replaces the Welch (2004) managerial inertia variable with the Kayhan and Titman (2007) market timing variable to examine the stock price effects:

$$ActualLeverage_t = (\lambda\beta)\, X_{t-1} + (1-\lambda)\, ActualLeverage_{t-1} + \kappa\, Stock\, Return_{t-1} + \varepsilon_t \quad (5.3\text{-}9)$$

whereas the stock return variable is calculated as the cumulative log of 12 monthly stock return between year *t-1* and year *t*, defining as $\sum log_{10}(1+\frac{P_t - P_{t-1}}{P_{t-1}})$. According to market timing theory, the coefficient of stock return, κ ,is expected to be significantly negative, and substantially alter the other variables' signs and significance levels.

Model Analysis

Table 5-20 reports the results of OLS estimates on equation (5.3-9). The first five columns *Year +1* to *Year +5* present the estimates of the annually cross-sectional regressions; the last column *Year [+1, +5]* reports the estimates of the 5-year pooled cross-sectional regression. 659 acquiring firms are split into two samples. Compared with Table 5-15 and Table 5-19, the adjusted *R*-squares, *F*-tests and firm characteristics variables are qualitatively the same. The adjusted *R*-squares are between 0.592 and 0.810 for the Increase Group and between 0.538 and 0.923 for the Decrease Group. Compared with Table 5-15, these *R*-squares indicate that the inclusion of the stock return variable for market timing does not improve the goodness of fit of the model.

Results for (1-λ) and κ

The coefficients for the lagged actual leverage ratios, (1-λ), are all statistically significant at 1% level. The adjustment speed, λ, is higher than Increase Group results in Table 5-19. For Increase Group, the adjustment speed is 21.0% for *Year +1*, 6.4% for *Year +2*, 11.0% for *Year +3*, 22.1% for *Year +4* and 5.0% for *Year +5*, and 13.5% for *Year [+1, +5]*; for Decrease Group, the adjustment speed is 9.2% for *Year +1*, 9.3% for *Year +2*, 9.0% for *Year +3*, 10.1% for *Year +4* and 12.4% for *Year +5*, and 10.4% for *Year [+1, +5]*. The coefficient for stock return, κ, takes values between -0.068 and 0.059, which are all close to zero. Only four of the coefficients are statistically significant, *Year +1*, *Year +5* and *Year [+1, +5]* for Increase Group, and *Year +2* for Decrease Group. All of these coefficients are negative, which is consistent with the market timing prediction. The negative relation between the actual leverage ratios and the stock returns are consistent with the result of Kayhan and Titman (2007) (see their Table 2, page 14). The stability of adjustment speed, λ, and the low value of stock return coefficient, κ, is in favour of the dynamic trade-off effect.

In summary, Section 5.3 utilizes partial adjustment models to test whether there exists an optimal leverage ratio, and the speed of adjustment a firm moves towards its optimism. It uses a standard partial adjustment model to test the adjustment speed on dynamic trade-off theory. The adjustment speeds (generally between 10% and 19%) are similar to those reported by Fama and French (2002) and Flannery and Rangan (2006), therefore supports the dynamic trade-off theory. However, this low adjustment speed could be caused by either the high adjustment cost, or by the dominance of competing capital structure theories. In order to distinguish those two factors, it then includes extra variables into the partial adjustment model to test the effects of pecking order hypothesis, market timing theory and managerial inertia hypothesis against the dynamic trade-off theory. All the results reject the alternative theories and are in favour of the dynamic trade-off effects, hence give indirect evidence that the low adjustment speed is caused by high adjustment cost.

Table 5-15 Dynamic Trade-off Theory

$$ActualLeverage_t = (\lambda\beta)X_{t-1} + (1-\lambda)ActualLeverage_{t-1} + \varepsilon_t \quad (5.3\text{-}3)$$

The lagged actual leverage is the dynamic trade-off variable with coefficient (1- λ), and λ is adjustment speed.

	Year +1		Year +2		Year +3		Year +4		Year +5		Year [+1,+5]	
	Coefficient	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***
Panel A: Increase Group												
	N=416		**N=416**		**N=416**		**N=416**		**N=416**		**N=2080**	
Constant	0.104	2.765***	-0.043	-1.576	0.019	0.833	0.035	0.871	0.020	0.696	0.024	1.725*
Market to Book	0.005	2.007**	-0.000	-0.874	-0.001	-0.659	0.003	1.757*	-0.001	-0.582	0.000	0.722
Asset Tangibility	0.061	1.578	-0.005	-0.204	-0.003	-0.136	0.021	0.892	0.036	1.492	0.018	1.642*
Profitability	-0.249	-2.287**	0.007	0.075	-0.060	-0.765	-0.042	-0.442	0.035	0.324	-0.040	-1.022
R&D Expense	-0.058	-2.424**	0.005	1.727*	-0.016	-0.806	0.001	0.011	0.020	0.519	-0.001	-0.159
R&D Dummy	-0.018	-1.572	0.010	0.983	-0.000	-0.036	0.023	1.729*	0.003	0.317	0.004	0.709
Selling Expense	-0.021	-0.803	-0.003	-1.521	-0.012	-1.375	0.002	0.253	-0.002	-0.182	-0.004	-1.312
Firm Size	-0.007	-0.787	0.016	2.287**	0.005	0.733	-0.007	-0.870	-0.010	-1.413	-0.001	-0.223
Actual Leverage	0.810	18.318***	0.965	22.732***	0.900	20.136***	0.842	7.042***	0.972	25.018***	0.897	28.664***
Adjusted *R*-square		0.608		0.747		0.823		0.704		0.785		0.735
***F*-Statistic**		81.419***		153.880***		242.257***		124.268***		189.965***		721.203***
Panel B: Increase Group												
	N=243		**N=243**		**N=243**		**N=243**		**N=243**		**N=1215**	
Constant	0.073	2.495**	-0.004	-0.159	0.004	0.126	0.015	0.667	0.009	0.311	0.024	1.944**
Market to Book	-0.005	-2.153**	-0.005	-1.591	0.002	0.919	-0.005	-1.882*	-0.003	-1.460	-0.003	-2.483***
Asset Tangibility	-0.039	-0.811	-0.062	-1.791*	0.015	0.380	0.040	1.633	-0.052	-1.160	-0.015	-0.843
Profitability	0.062	0.653	0.243	1.322	0.010	0.134	0.028	0.435	0.216	2.165**	0.111	2.555***
R&D Expense	0.005	0.113	-0.054	-1.399	-0.079	-1.355	-0.013	-0.309	-0.044	-0.649	-0.024	-1.878*
R&D Dummy	0.033	2.086**	0.012	0.608	-0.001	-0.063	0.000	0.027	0.012	0.759	0.012	1.719*
Selling Expense	-0.002	-0.188	0.025	1.574	0.022	1.473	0.005	0.345	0.018	0.755	0.009	2.071**
Firm Size	-0.004	-0.503	0.004	0.360	0.001	0.063	-0.002	-0.392	-0.001	-0.192	-0.003	-0.700
Actual Leverage	0.851	14.929***	0.897	20.863***	0.893	18.844***	0.890	27.738***	0.877	11.553***	0.883	38.616***
Adjusted *R*-Square		0.680		0.524		0.809		0.910		0.765		0.740
***F*-Statistic**		65.428***		34.313***		128.949***		306.946***		99.594***		432.588***

Table 5-16 Pecking Order Hypothesis vs. Dynamic Trade-off Theory

$$ActualLeverage_t - ActualLeverage_{t-1} = (\lambda\beta)\, X_{t-1} - \lambda\, ActualLeverage_{t-1} + \gamma\, FinancialDeficit_t + \varepsilon_t$$ whereas λ is adjustment speed. (5.3-4)

The lagged actual leverage is the dynamic trade-off variable with coefficient $-\lambda$, and λ is adjustment speed. Financial deficit is the pecking order variable with coefficient γ.

	Year +1		Year +2		Year +3		Year +4		Year +5		Year [+1,+5]	
	Coefficient	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***
Panel A: Increase Group												
	N=413		**N=412**		**N=412**		**N=414**		**N=414**		**N=2065**	
Constant	0.088	2.305**	-0.044	-1.644*	0.021	0.908	0.036	0.928	-0.003	-0.112	0.026	1.819*
Market to Book	0.005	1.881*	-0.000	-0.964	-0.001	-0.695	0.003	2.055**	-0.001	-0.407	0.001	0.762
Asset Tangibility	0.063	1.600	-0.008	-0.289	-0.004	-0.202	0.027	1.137	0.044	1.960*	0.020	1.703*
Profitability	-0.271	-2.263**	0.009	0.091	-0.071	-0.894	-0.003	-0.033	0.159	1.605	-0.032	-0.833
R&D Expense	-0.054	-2.061**	0.005	1.824*	-0.023	-1.053	0.001	0.019	-0.008	-0.139	-0.000	-0.154
R&D Dummy	-0.019	-1.794*	0.010	0.988	-0.001	-0.167	0.025	1.839*	0.009	0.917	0.004	0.840
Selling Expense	-0.023	-0.854	-0.003	-1.537	-0.012	-1.393	0.006	0.703	-0.002	-0.185	-0.004	-1.268
Firm Size	-0.003	-0.389	0.016	2.272**	0.005	0.706	-0.008	-0.983	-0.008	-1.332	-0.001	-0.388
Actual Leverage	-0.174	-4.208***	-0.031	-0.756	-0.097	-2.193**	-0.186	-1.504	-0.047	-1.255	-0.107	-3.405***
Financial Deficit	0.086	1.509	0.022	0.399	0.023	0.639	-0.138	-2.198**	-0.164	-3.506***	-0.027	-0.996
Adjusted *R*-square		0.114		0.002		0.055		0.104		0.090		0.035
***F*-Statistic**		6.905***		1.110		3.654***		6.312***		5.544***		9.431***
Panel B: Increase Group												
	N=242		**N=242**		**N=241**		**N=241**		**N=242**		**N=1208**	
Constant	0.035	1.357	-0.017	-0.647	0.004	0.132	0.012	0.528	0.010	0.348	0.023	1.841*
Market to Book	-0.006	-1.884*	-0.005	-1.492	0.002	0.930	-0.003	-1.212	-0.003	-1.416	-0.002	-1.923**
Asset Tangibility	-0.053	-1.347	-0.046	-1.320	0.012	0.340	0.041	1.661*	-0.059	-1.405	-0.020	-1.199
Profitability	0.011	0.134	0.307	1.597	-0.004	-0.048	-0.011	-0.172	0.186	1.985**	0.078	1.708*
R&D Expense	-0.008	-0.165	-0.051	-1.494	-0.075	-1.325	-0.012	-0.270	-0.032	-0.479	-0.022	-1.708*
R&D Dummy	0.022	1.751*	0.010	0.500	0.000	0.008	0.003	0.347	0.016	0.958	0.014	1.931**
Selling Expense	0.005	0.633	0.024	1.687*	0.021	1.446	0.005	0.304	0.014	0.589	0.008	1.911*
Firm Size	0.006	0.729	0.005	0.413	0.001	0.148	-0.002	-0.328	-0.001	-0.169	-0.002	-0.386
Actual Leverage	-0.137	-2.765***	-0.112	-2.667***	-0.105	-2.148**	-0.102	-3.209***	-0.103	-1.507	-0.107	-4.904***
Financial Deficit	0.222	4.924***	-0.104	-2.532**	0.016	0.245	0.044	1.996**	0.061	0.622	0.053	1.951**
Adjusted *R*-square		0.270		0.005		0.020		0.123		0.050		0.053
***F*-Statistic**		10.886***		1.147		1.553		4.746***		2.423***		8.450***

Table 5-17 Market Timing Theory vs. Dynamic Trade-off Theory (Baker and Wurgler Variable Definition)

$$ActualLeverage_t = (\lambda\beta)\,X_{t-1} + (1-\lambda)\,ActualLeverage_{t-1} + \delta(\frac{M}{B})_{efwa,t-1} + \varepsilon_t \quad (5.3\text{-}5)$$

The lagged actual leverage is the dynamic trade-off variable with coefficient (1-λ), and λ is adjustment speed. $(M/B)_{efwa,t-1}$ is the market timing variable with coefficient δ.

	Year +1		Year +2		Year +3		Year +4		Year +5	
	Coefficient	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***
					Panel A: Increase Group					
	N=403		**N=398**		**N=392**		**N=388**		**N=386**	
Constant	0.113	3.079***	-0.048	-1.356	0.018	0.649	0.040	1.009	0.028	0.946
Market to Book	0.002	0.742	-0.001	-0.127	-0.004	-0.757	0.002	0.491	-0.002	-0.369
Asset Tangibility	0.083	2.089**	-0.007	-0.264	-0.009	-0.444	0.020	0.863	0.043	1.487
Profitability	-0.325	-3.342***	-0.012	-0.073	-0.043	-0.455	-0.039	-0.363	0.004	0.034
R&D Expense	-0.060	-0.362	0.003	0.038	-0.028	-0.201	0.025	0.252	-0.183	-1.180
R&D Dummy	-0.025	-1.917*	0.009	0.882	-0.003	-0.300	0.022	1.542	-0.008	-0.707
Selling Expense	-0.035	-1.294	-0.004	-2.061**	-0.008	-0.928	0.013	1.335	-0.002	-0.093
Firm Size	-0.006	-0.633	0.019	2.557**	0.006	0.845	-0.011	-1.334	-0.011	-1.390
Actual Leverage	0.817	20.048***	0.959	19.392***	0.909	19.327***	0.819	6.507***	0.973	23.584***
M/B efwa	0.003	0.691	0.001	0.370	0.000	0.129	0.003	0.876	0.003	0.552
Adjusted *R*-square		0.616		0.727		0.818		0.705		0.786
***F*-Statistic**		72.766***		118.655***		196.180***		103.973***		158.502***
					Panel B: Increase Group					
	N=239		**N=235**		**N=232**		**N=231**		**N=230**	
Constant	0.077	2.587**	-0.001	-0.031	-0.009	-0.298	0.012	0.452	0.048	1.425
Market to Book	0.000	0.054	0.005	1.275	0.001	0.093	-0.004	-1.429	-0.001	-0.342
Asset Tangibility	-0.020	-0.423	-0.058	-1.629*	0.020	0.492	0.045	1.789*	-0.054	-1.123
Profitability	-0.014	-0.143	0.206	1.029	-0.000	-0.001	0.007	0.103	0.188	1.560
R&D Expense	0.003	0.068	-0.048	-1.200	-0.080	-1.251	0.002	0.045	-0.101	-1.229
R&D Dummy	0.033	2.018**	0.015	0.766	-0.001	-0.074	0.005	0.527	0.009	0.520
Selling Expense	-0.005	-0.484	0.022	1.348	0.022	1.347	-0.000	-0.015	0.015	0.762
Firm Size	-0.005	-0.519	0.005	0.439	0.002	0.268	-0.002	-0.258	-0.002	-0.183
Actual Leverage	0.819	11.099***	0.879	18.211***	0.896	17.086***	0.894	24.639***	0.832	10.481***
M/B efwa	-0.002	-0.194	-0.009	-1.916*	0.005	0.821	0.001	0.232	-0.011	-1.801*
Adjusted *R*-square		0.591		0.431		0.781		0.903		0.748
***F*-Statistic**		39.255***		20.730***		92.440***		239.388***		76.509***

Table 5-18 Market Timing Theory vs. Dynamic Trade-off Theory (Kayhan and Titman Variable Definition)

$$ActualLeverage_t = (\lambda\beta)\, X_{t-1} + (1-\lambda)\, ActualLeverage_{t-1} + \eta\, YearlyTiming_{t-1} + \psi\, LongTermTiming_{t-1} + \varepsilon_t \quad (5.3\text{-}7)$$

The lagged actual leverage is the dynamic trade-off variable with coefficient (1-λ), and λ is adjustment speed. $YearlyTiming_{t-1}$ is the market timing variable with coefficient η. $LongTermTiming_{t-1}$ is the pecking order variable with coefficient ψ.

	Year +2		Year +3		Year +4		Year +5	
	Coefficient	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***
Panel A: Increase Group								
	N=411		**N=409**		**N=409**		**N=409**	
Constant	-0.044	-1.596	0.018	0.734	0.038	0.926	0.022	0.758
Market to Book	0.000	0.158	-0.001	-0.580	0.002	1.538	-0.001	-0.517
Asset Tangibility	-0.006	-0.221	-0.002	-0.081	0.021	0.888	0.040	1.660*
Profitability	0.008	0.084	-0.055	-0.665	-0.038	-0.402	0.033	0.302
R&D Expense	0.016	0.644	0.015	0.243	-0.014	-0.199	0.007	0.144
R&D Dummy	0.011	1.001	0.000	0.061	0.023	1.643*	0.003	0.306
Selling Expense	-0.003	-1.437	-0.011	-1.332	0.003	0.357	-0.003	-0.208
Firm Size	0.016	2.156**	0.005	0.680	-0.007	-0.889	-0.011	-1.512
Actual Leverage	0.964	22.109***	0.897	19.454***	0.836	6.823***	0.972	24.268***
YT	0.000	0.381	0.000	0.619	0.000	0.091	0.000	1.011
LT	0.000	0.021	0.000	0.878	-0.000	-0.420	-0.000	-0.824
Adjusted *R*-square		0.742		0.820		0.698		0.782
***F*-Statistic**		118.775***		187.125***		95.115***		147.468***
Panel B: Increase Group								
	N=242		**N=242**		**N=241**		**N=241**	
Constant	0.016	0.521	0.007	0.229	0.010	0.384	0.011	0.352
Market to Book	-0.005	-1.551	0.002	0.928	-0.005	-1.832*	-0.003	-1.441
Asset Tangibility	-0.052	-1.486	0.015	0.385	0.034	1.293	-0.051	-1.082
Profitability	0.219	1.232	0.003	0.046	0.044	0.666	0.215	2.138**
R&D Expense	-0.044	-1.258	-0.075	-1.215	-0.018	-0.422	-0.043	-0.620
R&D Dummy	0.013	0.688	-0.000	-0.015	0.000	0.029	0.013	0.786
Selling Expense	0.020	1.430	0.021	1.320	0.007	0.461	0.017	0.721
Firm Size	-0.001	-0.103	-0.000	-0.000	-0.001	-0.147	-0.002	-0.229
Actual Leverage	0.898	21.065***	0.892	18.175***	0.890	27.786***	0.876	11.413***
YT	-0.001	-2.956***	0.001	0.679	-0.001	-0.828	-0.000	-0.173
LT	0.000	2.859***	0.000	0.072	-0.000	-0.046	0.000	0.409
Adjusted *R*-square		0.525		0.807		0.909		0.762
***F*-Statistic**		27.589***		101.749***		241.714***		78.022***

Table 5-19 Managerial Inertial vs. Dynamic Trade-off (Welch Variable Definition)

$$ActualLeverage_t = (\lambda\beta) X_{t-1} + (1-\lambda) ActualLeverage_{t-1} + (1-\upsilon) SPE_{t-1} + \varepsilon_t \quad (5.3\text{-}8)$$

The lagged actual leverage is the dynamic trade-off variable with coefficient (1-λ), and λ is adjustment speed. SPE_{t-1} is the managerial inertia variable with coefficient $1-\upsilon$ and υ is the adjustment speed for share price surprises.

	Year +1		Year +2		Year +3		Year +4		Year +5		Year [+1,+5]	
	Coefficient	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***
Panel A: Increase Group												
	N=398		**N=398**		**N=397**		**N=396**		**N=397**		**N=1986**	
Constant	0.054	1.693*	-0.049	-1.784*	-0.003	-0.131	0.017	0.531	0.003	0.110	0.010	0.732
Market to Book	0.004	1.658*	-0.000	-0.936	-0.001	-0.561	0.004	2.986***	-0.001	-0.473	0.001	0.880
Asset Tangibility	0.009	0.346	0.012	0.545	-0.007	-0.349	0.015	0.691	0.039	1.573	0.017	1.743*
Profitability	-0.069	-0.780	0.058	0.545	-0.044	-0.519	0.002	0.025	0.097	0.808	0.011	0.270
R&D Expense	-0.037	-2.258**	0.006	1.882*	-0.008	-0.370	-0.012	-0.222	0.034	0.857	-0.001	-0.349
R&D Dummy	-0.016	-1.465	0.005	0.494	0.001	0.144	0.018	1.435	0.006	0.566	0.002	0.405
Selling Expense	0.032	1.954**	-0.002	-1.294	-0.009	-0.792	0.016	1.294	-0.001	-0.064	0.001	0.287
Firm Size	-0.001	-0.112	0.015	2.569***	0.012	1.571	-0.001	-0.139	-0.010	-1.371	0.002	0.527
Actual Leverage	0.798	19.742***	0.950	32.258***	0.892	17.654***	0.781	6.387***	0.972	17.659***	0.879	26.220***
SPE	0.118	2.858***	-0.002	-0.064	0.060	1.586	0.093	1.672*	0.038	0.699	0.062	2.862***
Adjusted *R*-square		0.653		0.749		0.805		0.660		0.745		0.719
***F*-Statistic**		84.120***		132.690***		182.463***		86.345***		129.641***		564.567***
Panel B: Increase Group												
	N=232		**N=233**		**N=232**		**N=233**		**N=233**		**N=1163**	
Constant	0.090	3.217***	-0.033	-1.235	-0.013	-0.544	0.002	0.102	0.020	0.644	0.022	1.783*
Market to Book	-0.005	-2.236**	-0.000	-0.018	0.003	1.370	-0.004	-1.599	-0.008	-1.382	-0.003	-1.785*
Asset Tangibility	-0.012	-0.295	-0.065	-1.890*	0.008	0.218	0.045	1.947**	-0.051	-1.106	-0.012	-0.747
Profitability	0.028	0.349	0.322	1.896*	0.024	0.350	0.035	0.542	0.129	1.337	0.099	2.448***
R&D Expense	0.033	0.831	-0.060	-1.736*	-0.015	-0.445	-0.008	-0.210	-0.026	-0.412	-0.015	-1.353
R&D Dummy	0.023	1.529	0.018	0.900	0.000	0.012	-0.007	-0.817	0.016	1.038	0.010	1.469
Selling Expense	-0.007	-1.010	0.028	1.969**	0.005	0.629	0.003	0.254	0.011	0.513	0.006	1.581
Firm Size	-0.012	-1.628	0.002	0.165	0.004	0.572	-0.001	-0.110	0.005	0.565	-0.002	-0.655
Actual Leverage	0.905	20.223***	0.915	23.579***	0.925	21.550***	0.909	26.462***	0.848	9.337***	0.900	38.369***
SPE	0.011	0.282	0.086	1.633*	0.012	0.249	0.030	0.893	-0.078	-1.054	0.005	0.217
Adjusted *R*-square		0.724		0.535		0.830		0.923		0.773		0.755
***F*-Statistic**		68.169***		30.705***		126.738***		309.785***		88.772***		399.868***

Table 5-20 Market Timing vs. Dynamic Trade-off Theory (Kayhan and Titman Variable Definition)

$$ActualLeverage_t = (\lambda\beta)\, X_{t-1} + (1-\lambda)\, ActualLeverage_{t-1} + \kappa\, Stock\, Return_{t-1} + \varepsilon_t \quad (5.3\text{-}9)$$

The lagged actual leverage is the dynamic trade-off variable with coefficient (1- λ), and λ is adjustment speed. $Stock\, Return_{t-1}$ is the market timing variable with coefficient κ .

	Year +1		Year +2		Year +3		Year +4		Year +5		Year [+1,+5]	
	Coefficient	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***
Panel A: Increase Group												
	N=405		**N=405**		**N=405**		**N=405**		**N=405**		**N=2025**	
Constant	0.105	2.827***	-0.049	-1.922*	0.008	0.374	0.038	0.958	0.015	0.571	0.021	1.540
Market to Book	0.004	1.433	-0.000	-1.042	-0.001	-0.823	0.004	3.166***	-0.001	-0.786	0.000	0.577
Asset Tangibility	0.075	1.845*	0.006	0.240	-0.002	-0.103	0.028	1.303	0.042	1.759*	0.026	2.398**
Profitability	-0.212	-2.019**	0.052	0.540	-0.079	-1.117	-0.065	-0.607	0.065	0.599	-0.030	-0.768
R&D Expense	-0.054	-2.438**	0.005	1.711*	-0.015	-0.618	-0.032	-0.525	0.009	0.205	-0.001	-0.278
R&D Dummy	-0.019	-1.747*	0.007	0.715	0.002	0.330	0.021	1.597	0.005	0.505	0.003	0.648
Selling Expense	-0.031	-0.965	-0.002	-0.954	-0.013	-1.453	0.007	0.820	-0.000	-0.029	-0.003	-0.905
Firm Size	-0.008	-0.909	0.017	2.653***	0.011	1.549	-0.004	-0.500	-0.010	-1.374	0.001	0.343
Actual Leverage	0.790	17.542***	0.936	32.094***	0.890	21.218***	0.779	6.333***	0.950	19.711***	0.865	26.410***
Stock Return	-0.059	-1.854*	-0.027	-1.196	-0.003	-0.090	-0.020	-0.584	-0.058	-1.719*	-0.039	-2.588***
Adjusted *R*-square		0.592		0.745		0.810		0.656		0.752		0.709
***F*-Statistic**		66.141***		132.161***		192.095***		86.604***		137.294***		550.105***
Panel B: Increase Group												
	N=233		**N=234**		**N=234**		**N=234**		**N=234**		**N=1169**	
Constant	0.094	3.478***	-0.022	-0.894	-0.015	-0.577	0.004	0.200	0.008	0.280	0.021	1.755*
Market to Book	-0.005	-2.440**	-0.003	-1.244	0.001	0.627	-0.004	-1.964**	-0.005	-1.222	-0.003	-2.274**
Asset Tangibility	-0.010	-0.254	-0.063	-1.848*	0.022	0.555	0.047	2.024**	-0.053	-1.128	-0.008	-0.451
Profitability	0.026	0.334	0.284	1.546	0.027	0.364	0.013	0.208	0.182	1.677*	0.097	2.314**
R&D Expense	0.028	0.671	-0.055	-1.614	-0.029	-0.848	-0.005	-0.124	-0.027	-0.416	-0.015	-1.366
R&D Dummy	0.022	1.491	0.018	0.878	-0.005	-0.265	-0.006	-0.626	0.016	0.976	0.010	1.346
Selling Expense	-0.008	-1.044	0.024	1.745*	0.010	1.057	0.002	0.164	0.012	0.526	0.006	1.582
Firm Size	-0.014	-1.801*	0.003	0.289	0.006	0.971	0.001	0.128	0.002	0.276	-0.002	-0.538
Actual Leverage	0.908	21.514***	0.907	24.799***	0.910	22.129***	0.899	29.198***	0.876	10.914***	0.896	40.611***
Stock Return	-0.028	-0.919	-0.068	-2.591***	0.004	0.129	-0.019	-0.887	0.059	1.156	-0.010	-0.703
Adjusted *R*-square		0.728		0.538		0.821		0.923		0.773		0.755
***F*-Statistic**		70.038***		31.141***		119.434***		311.739***		89.167***		399.955***

5.4 Method of Payment and Source of Fund

Ghosh and Jain (2000) suggest that the post-takeover increase in leverage ratio could take place because of an increase in debt, decrease in the market value of the firm, or both. They find that both the market value of firms and book value of debt increase. Therefore they conclude that an increase in leverage ratio is likely to attributes to the additional debt taken by the firms, and mostly because of long-term debt.

This section examines whether the leverage ratio increase at M&A announcement is caused by the method of payment and source of fund. When acquiring firms select the method of payment and source of fund, they have to consider quite a few factors such as EPS dilution, currency, ownership structure, asymmetric information, debt covenants, availability and costs of different funds, tax consideration, accounting treatment[21], compensation effects[22], regulation effects[23] and financial strategy. This research focuses on the financial strategy and tests its link with the method of payment and source of fund based on the dynamic trade-off theory. Dynamic trade-off theory assumes that firms actively adjust their leverage ratios to trade off between the benefits and costs of debt; the speed of adjustment is influenced by the costs and delays, hence financial adjustments are realised gradually. According to this theory, the leverage ratio deviations before the M&A announcement, at the announcement and after the announcement could be linked with the method of payment and source of fund.

Method of payment in acquisitions includes cash, stock exchange, cash underwritten share offer, loan stock, convertible loan or preferred shares, deferred payment and a mixture of any of them (Sudarsanam, 2003). Pure cash, pure stock and a mixture are the three most commonly used payment methods. Firms usually raise debt to make the cash payment thus cash should be connected with increase of leverage ratios. Hereby the leverage ratio deviations are tested by whether they

[21] Pooling method vs. purchase method.

[22] Amortization reduces reported earnings, therefore managements avoid the amortization of good will if their compensation is linked with accounting performance.

[23] Tender offers in the form of stock exchange needs the approval of Securities and Exchange Commission, thus the process of a stock offer acquisition could take longer time than the cash offer acquisition.

involve cash payment. Among the 659 deals, 279 involve the cash payment (including 150 deals with pure cash payment).

Table 5-21 reports the univariate tests of leverage ratio deviations on the method of payment. The first test is on if cash payment is negatively associated with the pre-merger cumulative leverage ratio deviations in year [-3, -1]: it examines if the firms with unused debt capacity before the merger is more likely to pay by cash. The second test is on if cash payment is positively associated with the increase of leverage ratio deviations in year [-1, 0]: it examines if the deviation change at announcement is caused by the cash payment. The third test is on if cash payment is positively associated with the post-merger cumulative leverage ratio deviations in year [0, +5]. The sample firms are divided by three different criteria. I.) Cash>0% measures if the payment includes cash—Code 0 group is made up of 380 firms without cash payment, and Code 1 group is made up of 279 firms with cash payment. II.) Cash>50% measures if the cash accounts for over 50% of the payment—Code 0 group is made up of 440 firms with cash less than 50%, and Code 1 group is made up of 219 firms with cash over than 50%. III.) Cash=100% measures if the payment is pure cash—Code 0 group is made up of 509 non-pure cash payment firms, and Code 1 group is made up of 150 pure cash payment firms.

The results show that pre-merger cumulative leverage ratio deviations are not influenced by the cash payment, so there is no evidence that firms consider the unused debt capacity when they make decisions on the method of payment. The announcement deviation changes are statistically significant at 1% level for all the three *t*-statistics, and for each split the Code 1 group has higher mean than the Code 0 group. It provides evidence that the increase of leverage ratio at announcement is caused by the cash payment. The post-merger cumulative leverage ratio deviations are statistically significant at 10% level for the *t*-statistic of Cash>0% and Cash>50%, and for both splits the Code 1 group is with higher means. It gives evidence that the post-merger leverage ratios is more likely to remain at a high level if the payment is made by cash.

Table 5-21 Univariate Tests on Method of Payment

This table tests the relationship of cash payment with the pre-merger cumulative leverage ratio deviations, the announcement deviation changes, and the post-merger cumulative leverage ratio deviations. The pre-merger cumulative leverage ratio deviation is the sum of deviations in years [-3, -1]; the announcement deviation change is the difference between deviations in year -1 and year 0; the post-merger cumulative leverage ratio deviation is the sum of deviations in years [0, +5]. Cash>0% splits the firms into two groups: non-cash payment group with Code 0 and with-cash payment group with Code 1; Cash>50% splits the firms into two groups: cash payment less than 50% firms with Code 0 and cash payment more than 50% firms with Code 1; Cash=100% splits firms into two groups: non-pure cash payment firms with Code 0 and pure cash payment firms with Code 1. The independent samples *t*-test (two-tailed) examines the equality of means between the two samples. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

			Year [-3, -1]		**Year [-1, 0]**		**Year [0, +5]**	
	Code	**No.**	**Mean**	***t*-statistic**	**Mean**	***t*-statistic**	**Mean**	***t*-statistic**
Cash>0%	0	380	-0.021	-0.253	0.044	-2.841***	0.092	-1.839*
	1	279	-0.013		0.076		0.284	
Cash>50%	0	440	-0.019	-0.151	0.042	-3.901***	0.105	-1.875*
	1	219	-0.014		0.089		0.310	
Cash=100%	0	509	-0.015	0.313	0.049	-2.886***	0.142	-1.129
	1	150	-0.026		0.088		0.281	

When payment method is cash, the source of fund could include cash on hand, new issue of debt and new issue of stock; when payment method is equity, the source of fund could include shares in treasury and new issue of shares. The pecking order hypothesis suggests that the value maximising acquirer will prefer to use internal resources before seeking external financing. However, the financing source could also be determined by CEOs' personal preference and their opportunistic response to the capital market. Thomson One banker classifies source of fund into borrowing, bridge loan, common stock offering, internal corporate funds, debt issue, junk bond issue, line of credit, preferred stock issue, mezzanine loan, and so on. The 659 sample firms involve 84 borrowing, 8 bridge loan, 7 common stock offering, 61 internal corporate funds, 24 debt issue, 74 line of credit and 4 preferred stock issue (some firms may involve more than one source of fund). Among them, the borrowing, bridge loan, debt issue, line of credit and preferred issue engage the raise of debt. Thus, if the source of fund involves at least one of these five sources, the deal is labelled as dummy 1 and otherwise 0.

Table 5-22 reports the result of univariate tests on source of fund. The pre-merger cumulative leverage ratio deviations are not influenced by the source of fund, so there is no evidence that firms consider the unused debt capacity when they make decisions on the source of fund. The announcement deviation changes are statistically significant at 1% level for the *t*-statistic, and the Code 1 group has higher mean than the Code 0 group. It provides evidence that the increase of leverage ratio at announcement is caused by the raise of debt. The post-merger cumulative leverage ratio deviations are statistically significant at 1% level for the *t*-statistic, and the Code 1 group is with higher means. It gives evidence that the post-merger leverage ratios is more likely to remain at a high level if the firms raise debt. The results of source of fund are consistent with the results of method of payment.

Table 5-22 Univariate Tests on Source of Fund

This table tests the relationship of source of fund with the pre-merger cumulative leverage ratio deviations, the announcement deviation changes, and the post-merger cumulative leverage ratio deviations. The dummy variable is coded as 1 if the source of fund involves borrowing, bridge loan, debt issue, line of credit and preferred issue engage the raise of debt and 0 if the source of fund involves common stock offering and internal corporate funds. The independent samples *t*-test (two-tailed) examines the equality of means between the two samples. The null hypothesis is that the two sample means are equal. ***, ** and * denotes the significance level at 1%, 5% and 10%.

			Year [-3, -1]		Year [-1, 0]		Year [0, +5]	
	Code	**No.**	**Mean**	***t*-statistic**	**Mean**	***t*-statistic**	**Mean**	***t*-statistic**
	0	510	-0.008	1.192	0.041	-5.265***	0.089	-3.052***
Raise Debt	1	149	-0.051		0.113		0.463	

To sum up, the method of payment and source of fund have significant impact on the announcement period deviation changes and on the post-merger leverage ratio deviations. When the deal payment involves cash payment and raise debt, the leverage ratio is more likely to increase significantly and revert slowly.

5.5 Conclusion

This research explores the influence of takeovers on 659 US acquiring firms' capital structures in an 11-year period [-5, +5]. It focuses on two research questions, the leverage ratio deviation and the partial adjustment.

The leverage ratio deviation is calculated in three stages. At the first stage, the actual leverage ratios are regressed on a number of lagged independent variables by a tobit model to estimate coefficients. These independent variables include the market-to-book ratio, the asset tangibility, the profitability, the R&D expense, the R&D dummy, the selling expense, and the firm size. The estimation results support the capital structure hypotheses and are coherent with previous research: the negative relation between market-to-book and leverage ratio supports the static trade-off theory, complex pecking order theory and market timing theory; the positive relation between asset tangibility and leverage ratio supports the static trade-off theory; the negative relation between profitability and leverage ratio supports the dynamic trade-off theory and the pecking order hypothesis; the negative relation between R&D expense and leverage ratio supports the static trade-off theory; the positive relation between firm size and leverage ratio supports the static trade-off theory and pecking order hypothesis. The positive relation between selling expense and leverage is opposite to the prediction of static trade-off theory, however, the robust check (univariate test) supports this result. An OLS regression gives qualitatively the same results of these independent variables as the tobit model.

At the second stage, the estimated regression equation is used for predicting the value of optimal leverage ratios for given values of independent variables by substituting the estimated coefficients into each year of the 11 years. The 659 sample firms are divided into two groups according to whether the predicted leverage ratios increase or decrease between year 0 and 1. The Increase Group shows that the median of predicted leverage ratios reduces between year -5 and 0, jumps from year 0 to year 1, and keeps at a high level afterwards. The Decrease Group shows that the median of predicted leverage ratios drops between year 0 and 1, and surges between year 1 and 2. These results approve the assumption that M&A changes firms' predicted leverage ratios dramatically in year 1.

At the third stage, these predicted leverage ratios are subtracted from firms' actual leverage ratios to obtain the deviations of leverage ratios. The result of deviations is the most important discovery and contribution of this research. The trend of the deviations in the 11-year window demonstrates that M&A changes firms' leverage ratios considerably at the announcement year, which is consistent with the results of Morellec and Zhdanov (2008) and Harford et al. (2007). However, this trend presents two differences from previous research. First, the magnitude of the deviation change at announcement year is much larger than previous research. For the Increase Group, the deviation (median) increases from -4.5% in year -1 to 7.8% in year 0, this is far beyond the optimal level. Morellec and Zhdanov (2008) report the deviation increases from -7.3% in year -1 to -4.0% in year 0, and increases further to 0% in year 2; Harford et al. (2007) find the deviation (median of all firms) increases from -6.86% in year -1 to -0.41% in year 0, and increases further to 1.89% in year 3. From their results, the deviations are still below the optimal level at the announcement year, and it is unexplained what keeps pushing up the leverage ratio even 2 or 3 years after the M&A. Second, this research provides explicit evidence that firms gradually converge their leverage ratios towards the optimisms in the five years after merger, which is consistent with the prediction of dynamic trade-off theory. The previous research did not find this. The new findings of this research are due to three improvements on the methodology: the sample selection excludes the firms with successive deals in the 11-year period; it predicts the optimal leverage ratios by an out-of-sample model, where previous research all uses the in-sample model which mix the estimation window and the event window, thus dilutes the impact of the event; this research splits sample firms according to whether the deviation increases or decreases between year -1 and year 0, where the previous research do not distinguish those two groups, thus the leverage deviations of firms that lever up and firms that lever down cancel out with each other.

The partial adjustment is tested by a standard partial adjustment model and several modified partial adjustment models. The standard partial adjustment model is used to test the speed of adjustment a firm moves towards the optimal leverage ratios in the post-merger period on the dynamic trade-off theory. The OLS regression results show statistically significant adjustment speed 2.8%~19% for the Increase Group, and speed 10.3%~14.9% for the Decrease Group, which are consistent with the results of Fama and French (2002) and Flannery and Rangan (2006).

In order to distinguish whether the partial adjustment effect (against complete adjustment) is caused by the adjustment cost or by the influence of alternative capital structure theories, this research utilizes several modified partial adjustment models to test the influences of competing theories on the adjustment speed. The financial deficit variable from Kayhan and Titman (2007) is added into the standard partial adjustment model to test the pecking order hypothesis. The adjustment speed variable shows similar result as in the standard partial adjustment model, and the other variables are unaffected by the financial deficit variable, so the pecking order hypothesis is rejected. The external finance weighted average variable $(\frac{M}{B})_{efwa,t-1}$ of Baker and Wurgler (2002) is added to the model to test the market timing hypothesis. The stability of adjustment speed and the insignificance of the external finance weighted average variable reject the market timing theory. The yearly timing variable and long-term timing variable of Kayhan and Titman (2007) are added to the model to further test the market timing hypothesis, and it is again rejected. Then the share price effect variable from Welch (2004) is added to the model to test the managerial inertia theory. The high adjustment speed of the share price effect variable indicates that firms actively absorb the effect of share price and thus rejects the managerial inertia hypothesis. The stability of partial adjustment variable supports the dynamic trade-off theory. At last, a stock return variable from Kayhan and Titman (2007) is added to the model to test the market timing hypothesis, and the results reject it. All of these modified models reject the effect of alternative hypotheses variables and support the dynamic trade-off hypothesis. Thus it gives indirect evidence that the partial adjustment effect could be caused by the adjustment cost.

This research also tests the influences of method of payment and source of fund on leverage ratios. It finds that the method of payment and source of fund have significant impact on the announcement period deviation changes between year -1 and 0, and on the post-merger leverage ratio deviation sums between year 0 and +5. When the deal payment involves cash payment and raise debt, the leverage ratio is more likely to increase significantly at the announcement period and to revert slowly afterwards.

Chapter 6 Conclusion

This dissertation is made up of two topics in corporate finance.

The first study, "*The Impact of Acquisitions on the Short-Run Returns to Shareholders and Bondholders*", investigates the short-run returns of shareholder and bondholder with respect to 310 acquisitions in the UK market between 1994 and 2006. Based upon the theories of M&A motivations and shareholder-bondholder conflicts, this study designs five testable hypotheses to investigate M&A's impact on the 41-day and 3-day market-adjusted returns (MAR) and abnormal returns (AR). The significant positive target stock return, negative acquirer stock return, positive target bond return and negative acquirer bond return are consistent with the wealth transfer hypothesis and the hubris hypothesis. The combined security returns show that stockholders lose, bondholders gain, target firms gain, acquirer firms lose, and shareholders/bondholders of target and acquiring firms as a whole lose. These results support the co-insurance hypothesis, wealth transfer hypothesis, and hubris hypothesis, and reject the synergy hypothesis. The univariate and multivariate analyses on the deal characteristics find that target and acquirer stock returns are higher with cash payment, acquirer stock returns are higher in friendly and industry unrelated takeovers, the acquirer bond returns are higher in industry related takeovers, target firm share returns are higher when target size is smaller than the acquirer, target and acquirer stock returns are higher in bull market period, and acquirer bond returns are higher in the bear market period.

This study has five contributions. First, it is the first empirical research to test UK bondholders' wealth in acquisitions. Second, this study does a thorough review on existing theories which explain the shareholder and bondholder wealth in M&A, and designs out five testable hypotheses to explain the potential results. Third, the main contribution of this study to knowledge is that it detects significant abnormal returns for both target firm bonds and acquirer firm bonds. As the first empirical study in the UK market on bondholders' wealth with respect to M&A, these results are different when compared with previous studies for the US market. Rathinasamy et al. (1991) argue that bondholder wealth could be neutralised by the incentive effects the managers increase the leverage ratios after merger; Asquith and Kim (1982) and Dennis and McConnell (1986) ascribe the mild bondholder returns to bond covenants which effectively protect bondholder wealth. Renneboog and Szilagyi (2007) study the bondholder wealth effects of M&A on European countries, and they do not find significant bondholder returns for target firms. As MacKinlay (1997) and Maxwell and Rao (2003) argue, monthly data could bias the studies against finding any significant effects. This study utilizes daily bond data from Datastream, which is more powerful to reject the null hypothesis of normal return than the previous studies which use monthly bond data. Fourth, this research finds a significantly negative *Total* security return, indicating acquisitions are value destroying, which has never been found by previous research. Fifth, this is the first research to test the effect of stock market trend on bondholder returns, and it finds significant results.

Although this research benefits from Datastream on its high frequency of bond data, there are limitations on the sample size and validity of bond-specific diagnostic and descriptive information. In this research, there are only 5 deals that both the target and acquirer have valid bond data (Renneboog and Szilagyi 2007 examine all European firms between 1995 and 2004, and also find very small sample); in contrast, Billett et al. (2004) examine the US market between 1979 and 1997, and report 141 deals that both the target and acquirer have valid bond data. This difference attributes to two factors. First, it is much more popular for US firms to be financed by corporate bond than UK/EU firms, so the number of UK firms as the objective of corporate bond is smaller. Second, the academic institutions in the UK do not have access to Lehman Brothers Fixed Income Database (LBFID) as academic institutions in the US do. As Hong and Warga (2000), Maxwell and Rao (2003) and Billett (2004) argue, LBFID is by far the best bond database which provides complete information not only on bond prices, but also on bond-specific diagnostic and descriptive information. The database available to this study is Datastream, on which the corporate bond price information is incomplete, which diminishes the sample size further. The small sample makes the tests less powerful when compared with US studies of large samples. Moreover, the invalidity of bond-specific diagnostic and descriptive information on Datastream makes it impossible to test the risk effect, maturity effect and leverage effect.

As discussed in the last paragraph, it is much more popular for US firms to be financed by corporate bond than UK firms to be. The potential explanations could be the pecking order hypothesis or that bondholders in the US are protected better than bondholders in the UK. Hence, further studies could be undertaken to compare the capital structures between the US and UK, or to compare the corporate governance systems between the two countries on the protection of debtholders with respect to takeovers.

The second study, "*A Test of the Partial Adjustment Theory of Leverage Using Leverage Changes Arising from Takeovers*", investigates firms' capital structures with 659 US acquisitions between 1962 and 2001. Based upon the theories of capital structure and hypotheses which link capital structure research with takeovers, this study utilizes takeover as an event to investigate its potential influences on acquiring firms' book leverage ratios. The trend of the book leverage ratio deviations in the 11-year window demonstrates that takeover changes firms' leverage ratios dramatically in the announcement year, which fits the hypotheses that links takeovers and firms' capital structures. The trend also illustrates that firms gradually converge their leverage ratios towards the optimal in the years after merger, which is consistent with the prediction of dynamic trade-off theory. The standard partial adjustment model with OLS regression discovers a low but persistent adjustment speed for leverage ratios after the takeovers. In order to examine whether this low adjustment speed is caused by adjustment costs or by alternative theories competing with the dynamic trade-off theory, variables proxy for pecking order theory, market timing theory and managerial inertial are added into the partial adjustment model for further tests. These tests reject all the alternative theories and find consistent evidence of dynamic trade-off effects, thus providing indirect evidence that the low adjustment speed is caused by the adjustment costs. Last, this research tests the influences of method of payment and source of fund on leverage ratios. It reports that cash payment and raise of debt are inclined to increase leverage ratios at announcement, and to maintain leverage ratios at a high level in the post-merger period.

This study contributes to knowledge in four major ways. First, the sample selection process is improved from previous papers. The study of takeover's impact on a firm's capital structure requires isolating one deal's influence from another in case the firm takes more than one deal in the object window. Previous studies do not restrict series acquirers. This research excludes firms that take more than one takeovers in the 11-year period, and avoids the overlapping problem. Second, the regression process is different. To examine the influence of M&A on capital structures, M&A is considered as an event, thus the features of capital structures after M&A should be quite different from those before M&A. Thereafter, the event period itself should not be included in the estimation period to prevent the event from influencing the normal performance model parameter estimates. Previous research estimate of capital structure coefficients by in-sample models, which could cause a problem by mixing the "estimation window" and the "event window". This research uses out-of-sample regression for the coefficients estimations and the results are more objective. Third, the deviation tests split the sample into two groups on whether firms' deviations increase between year -1 and year 0. It is evident that M&A increases some firms' leverage ratios but decreases other firms' leverage ratios, and the trend of deviations of those two groups should be quite different. Previous research do not distinguish those two groups, therefore the leverage deviations of firms that lever up and firms that lever down cancel out with each other, and the aggregate deviation trend of the sample is noisy. Due to the above three reasons, this research shows more significant influence of takeovers at the announcement year than previous research, and gives evidence of dynamic trade-off theory that firms reverse back to their optimal leverage ratios gradually in the years after takeovers which has not been reported by other papers. Fourth, despite that quite a few papers examine the method of payment on capital structures, this research is the first one to test on the source of funds on capital structures.

This research relies purely on quantitative financial data. Although it has successfully discovered significant impact of takeovers on acquiring firms' capital structure and the evidence of dynamic trade-off, it does not tell the stories beyond these data. Quantitative research is unable to reveal the rationale and process of managers' considerations on capital structures in the event of takeovers. Thus, a qualitative research design may compensate for this weakness and investigate takeover's impact on firms' capital structure in a different way.

This study opens up the door for a number of topics for further work. This study focuses on acquiring firms' capital structures with respect to takeovers; future research could examine target firms' capital structures, and compare them with acquiring firms. Takeover is just one type of restructuring operation, and future research could look into the impact of asset sale, spin-off, equity carve-out or LBOs impact on firms' capital structure. Moreover, if restructuring operation is a key reason for firms' growth strategy, future studies may explore how to use firms' capital structure to predict the potential objects of restructuring operations.

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