The Effect of Private Equity on the Stability of Corporate Capital Structure

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ผลกระทบของกองทุนร่วมลงทุนที่มีต่อความเสถียรภาพของโครงสร้างเงินทุน

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อภิชาติ เกิดดอนแฝก : ผลกระทบของกองทุนร่วมลงทุนที่มีต่อความเสถียรภาพของโครงสร้างเงินทุน (The Effect of Private Equity on the Stability of Corporate Capital Structure) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: อ. ดร. คณิสร์ แสงโชติ, 65 หน้า.

วิทยานิพนธ์ฉบับนี้จัดทำขึ้นเพื่อศึกษาว่า กิจกรรมที่ดำเนินโดย กองทุนร่วมลงทุนนั้น ส่งผลถึง ความไม่เสถียรภาพของโครงสร้างเงินทุนหรือไม่ โดยทำการทดสอบ โครงสร้างเงินทุนของ บริษัทในสหรัฐอเมริกา ทั้งบริษัทที่เป็น เป้าหมายของกองทุนร่วมลงทุน และ บริษัทจดทะเบียนทั่วไป ผลลัพธ์ของการศึกษานี้พบว่า กิจกรรม ของ กองทุนร่วมลงทุน อาทิ เช่น leveraged Buyout และ leveraged recapitalization นั้นมีความสัมพันธ์ถึง ความไม่เสถียรภาพของ โครงสร้างเงินทุน ของบริษัท กิจกรรมเหล่านี้ ส่งผลกระทบต่อ โครงสร้าง เงินทุนของ บริษัท เป้าหมายเช่นเดียวกับ บริษัท อื่นที่คล้ายคลึงกัน ในอุตสาหกรรมเดียวกัน นอกจากนี้ ผลของการศึกษายัง แสดงให้เห็นถึง ความสัมพันธ์ เชิงบวกระหว่างความไม่เสถียรภาพของ โครงสร้างเงินทุนของบริษัท และ โอกาสที่บริษัท จะ กลายเป็นเป้าหมาย ของกองทุนร่วมลงทุน ท้ายที่สุด ผลของการวิเคราะห์ การถดถอยแสดงให้เห็นว่า แนวโน้มในการที่บริษัทจะทำ leveraged recapitalization เพิ่มขึ้น ไปในทิศทางเดียวกับ โอกาสที่บริษัท จะกลายเป็นเป้าหมาย ของกองทุนร่วมลงทุน

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The purpose of this study is to investigate whether private equity activities drive the instability of capital structure. By testing the capital structure stability of U.S. firms for both private equity target firms and general listed firms. The result shows that the private equity activities (e.g. leveraged Buyout and leveraged recapitalization) are correlated with the instability of corporate capital structure. These activities affect target firm's capital structure as well as other similar firms in the same industry. The result also indicates that there is a positive correlation between the instability and the likelihood that firm will become private equity target. Moreover, the result from regression shows that the probability of firm will do leveraged recapitalization increase along with the likelihood that firm will become private equity target.

Department:	Banking and Finance	Student's Signature	....
Field of Study:	Finance	Advisor's Signature	....
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CHAPTER 1

INTRODUCTION

1.1 backgrounds and Problem review

How do firms choose their capital structure? The capital structure puzzle remains unsolved since 1996. Although no one can solve this puzzle until now, many researchers believe that firm's optimal capital structure or target leverage exists. There are many empirical studies that try to observe how firm pursue the target leverage, e.g. Fama and French (2002) found that there is a slow speed of leverage adjustment toward target leverage each year. However, in practice do firms pursue an optimal capital structure? If they do, when they achieve it, the capital structure should tend to be stable for a long period of time.

Lemmon, Roberts, and Zender (2009) found relatively high firm fixed effects in panel leverage regressions, and suggested that there is a time invariant effect which drive the variation in leverage ratio. Moreover, they found that high levered firm's leverage tends to remain at the same level for 20 years. However, the most recent paper from Deangelo and Roll (2015) published the opposite result. They found that leverage cross-sections are not stable over time with differences growing each year.

The contrasting result leads to an interesting question. What drives the time variation in capital structure among these firms? One factor that has also played an important role in corporate finance and might be the source of instability is private equity.

Private equity is a source of investment capital from institutions and high net worth individuals. The purpose of private equity firm is to invest and acquire equity ownership in companies. Generally, to acquire other companies private equity firms have to do financing, which most of the financing is highly leveraged transactions (HLT). These highly leveraged transactions often refer as Leveraged Buyout (LBO) which is the acquisition of a company in which the buyer borrow a lot of money to finance its operation. The purpose of LBO is to allow companies to make large acquisitions without having to commit a lot of capital. After a private equity acquire the company. The target company's existing debt is usually refinanced and replaced with new debt to finance the transaction. Sometimes private equity uses leveraged recapitalization as a strategy with the purpose of either repurchasing shares or paying a large dividend. Leveraged recapitalization is also employed as a takeover defense strategy. Generally, firms that become private equity target firms have one thing in common which is its high debt capacity. Hence, to prevent their firms from takeover attempt, Private equity target firms usually do leveraged recapitalization to reduce its debt capacity. All of these transactions, LBO and Leveraged Recapitalization, directly affect the capital structure of target firms and indirectly affect the firms that have a high chance to become target firms. Thus, Private equity activities might be the determinant of the instability of capital structure.

1.2 Objective of the Study

Hence, this study objective is to examine the capital structure stability of U.S. firms for both private equity target firms and general listed firms and answer the research question which is Do private equity activities drive the instability of capital structure?

1.3 Contributions

To my knowledge, there is no research recently has been studied about the Private equity activities and The Corporate Capital structure stability. One motivation behind this work is aiming to find the source of capital structure instability which might relate to other important issues in corporate finance. There are seven chapters in this thesis Chapter1 present the Introduction and motivation behind this thesis while Chapter2 provide the literature reviews of past related researches in both capital structure and private equity. Chapter 3present how I developed the hypothesis Chapter4 shows the Data and Descriptive statistic of each sample Chapter5 show the methodology to answer the research question which will provide 1. The evidence of the instability of corporate capital structure 2. Analysis of the source of instability. 3. The relationship between, Leveraged Buyout and Leveraged recapitalization. Chapter6 provide the robustness test and Chapter7 show the conclusions of this thesis.

CHAPTER 2

LITERATURE REVIEW

2.1 Capital structure literatures

2.1.1 Mainstream Capital structure Theories

The very first paper which discussed on capital structure is written by Modigliani and Miller (1958). They came up with two propositions Proposition I: "the market value of any firm is independent of its capital structure" and proposition II the expected rate of return is a linear function of the debt to equity ratio. These results make a better understanding of the capital structure decision. In 1963 they took tax benefit of debt into account and claimed that the firm value will increase as long as it increases its debt.

Contrast with MM theory, trade-off theory by Kraus and Litzenberger (1973) stated that by increasing debt financing the company can take a tax benefit, but at the same time it also increases the financial distress which is the chance of being bankrupt or "Bankruptcy cost". Warner (1977) also analyzed in more detail and found that Bankruptcy costs can be considered as two different portions which are direct and indirect costs. Jensen and Meckling (1976) introduced "Agency theory". The main importance of this theory is when a company wants to create an optimal capital structure not only tax benefit or bankruptcy cost that have to consider but the agency problem should take into account also. In 1984 Myers and Majluf

answered to the question "How do firms choose their capital structure?" by saying "We don't know". The pecking theory by Myers stated that there are asymmetries information between the insider and outsider, so when a firm want to raise funds. The firm will prefer inside fund more than outside fund and when internal fund are not sufficient. The firm will issue debt before equity because of 2 reasons 1. Tax benefit 2. Equity issuing might signal that the firm overvalue.

Baker and Wurgler (2002) proposed "Market timing theory" which pointed that Firm capital structure decisions can signal the sign to shareholders. Firm will issue equity when it's overvalued and repurchase equity back when it's under-value. So when a manager wants to adjust the firm capital structure they should aware of Market circumstances. Finally, Although there is no clear answer which theory can better explain the capital structure, many papers confirm that firm's target leverage exists.

2.1.2 The stability of corporate capital structure

Lemmon, Roberts, and Zender (2008) started their research by gathering data from CRSP-compustat dataset and create two sample groups which are 1. Nonfinancial US firms for the period between 1965 and 2003 2. Subsample of sample1 but selected only firms that have at least 20 years of non-missing Book leverage to eliminate Survivorship bias. They found highly significant firm fixed effects in panel leverage regressions, and claimed that there is a time invariant effect which drives the variation in leverage ratio. Moreover, they found that High (low) levered firms tend to remain as such for over two decades.

2.1.3 The evidence of instability (DeAngelo & Roll, 2015)

The objective of this paper is to examine the corporate capital structure's stability over a long horizon. This paper found that leverage cross-sections are not stable over time with differences growing each year. To test the stability of capital structure, the authors used the sample of 15,096 industrial firms over 1950 to 2008 and separated into two subsets 1. Firms with 20 or more years 2. Firms listed from 1950 to at least 2000 this subset is called "constant composition".

First, the authors introduced the instability of capital structure by plotting the book leverage with market leverage across time to see leverage in each year. They found that the individual firm's leverage is not stable over time. A numbers of firms that their leverage deviate more than 0.1 from their initial book leverages for at least 10

and 20 years are 50.3% and 9.9% respectively. These numbers can be interpreted that 1. No firms have permanent, stable capital structure, however in some cases; it can be stable within the sub period especially for a low leverage firm. 2. Although the evidence of stable capital structure can be seen in high leveraged firm but it's almost always temporary.

Second, the authors trying to show the importance of firm-specific, time-series variation in leverage by comparing the adjusted-R square between several models which differ in component in Time and firm dummy. The result shown model which included firm-decade interaction effects have a greater Adjusted R square.This result implied that the corporate capital structure is not stable over time.

Finally, to test stability in cross-section. The author measured by study relation of leverage among different times. Stability of the leverage cross-section means that a firm's current high or low leverage (relative to other firms) reliably predicts a comparable relative position in future cross-sections. The result showed that leverage cross-sections are not stable over time with differences growing each year.

2.2 Private equity literatures

2.2.1. The role of Leverage in private equity

The core of the private equity business model is "leverage". The word leverage means   an investment strategy of using borrowed money to generate outsized investment returns. But in the private equity world, it means "borrow cheap buy high". In 2007 Guy Hands, founding partner of the private equity firm Terra Firma, said that "We buy stuff with cheap debt and arbitrage on the difference with equity markets."

Many researchers have tried to understand more about the role of leverage in private equity firms. Appelbaum and Batt (2014) published the book called "Private Equity at Work: When Wall Street Manages Main Street" which show that leverage is at the core of the private equity business model. Private equity partners put up $1 to $2 for every $100 that pension funds and other investors in their PE funds contribute. They typically finance the buyout of a Main Street company with 30 percent of the money coming from the PE fund and 70 percent borrowed from creditors.

Moreover, there are researchers who try to study the capital structure of private equity firms. Axelson et al. (2009) presents a model of the financial structure of a private equity firm. In the model, a firm can finance its investments either ex ante, by pooling capital across future deals, or ex post, by financing deals when the GP finds out about them. The result shows that financial structure matters because managers have better information about deal quality than potential investors. In 2013 they also

published another paper which suggests that the capital structure of buyouts requires a different explanation from that of public firms. Market conditions are important determinants of the level of leverage in buyouts, the structure of that leverage, the pricing of deals, and even the returns of the private equity funds making the investments.

2.2.2. Private equity activities as Takeover defense strategy

The use of leveraged transactions, e.g. Leveraged buyout or leveraged recapitalization is not only dispersed among private equity firms. There are many incidents that show the use of leveraged transaction among general listed firms, especially in the case of merger and acquisition. To prevent the unfriendly takeovers, the management of the firm usually employs Leveraged buyout or leveraged recapitalization. Bae and Simet (1998) found the significant positive abnormal return during the transaction announcement period. While Carow and Roden (1997) found that During the transaction date firms with either high free cash flow or low Tobin's q have higher abnormal returns. Handa and Radhakrishnan (1991) who studied 42 leveraged recapitalizations by takeover targets. They suggested that Restructuring might not be the main primary managerial motive. In fact, leveraged recapitalization is strategic game-playing by management to survive an acquisition attempt. They found that there is an initial increase in leverage at the completion of recap. All firms prefer to subsequently unload debt irrespective of their performance.

CHAPTER 3
HYPOTHESIS DEVELOPMENT

The primary objective of this study is to find out whether private equity activities drive the instability of capital structure. Generally, After Private equity transaction, e.g. leveraged buyout (LBO). The target company's existing debt is usually refinanced (although it can be rolled over) and replaced with new debt to finance the transaction. Sometimes private equity use Leveraged Recapitalization as a strategy with the intention of either paying a large dividend or repurchasing shares. All of these transactions, LBO and Leveraged Recapitalization, directly affect the capital structure of target firms and indirectly affect the firms that have a high chance to become target firms.

Hence, in the long horizon, both target firms and general listed firms which have a high likelihood to become a private equity target should have a less stable capital structure than other listed firms. This study predicts that when compared with general listed firms. Firms with, related to private equity activities will have a less stable capital structure.

HYPOTHESIS: Firms with, related to private equity activities will have a less stable capital structure compared to the general listed firms.

CHAPTER 4

DATA AND DESCRIPTIVE STATISTIC

The detail of leveraged buyout transactions can be found on Thomson One Banker database. This database contains information on the details of the transaction, such as the target and acquires information (name, industry, SIC, business description, transaction, etc.) There are 9,485 deals which classified as leveraged buyout that were announced between 1990 and 2013 in the United States. The number of LBO transactions during 1990 to 2013 is shown in figure1 while the full details of transactions are provided in the appendix section.
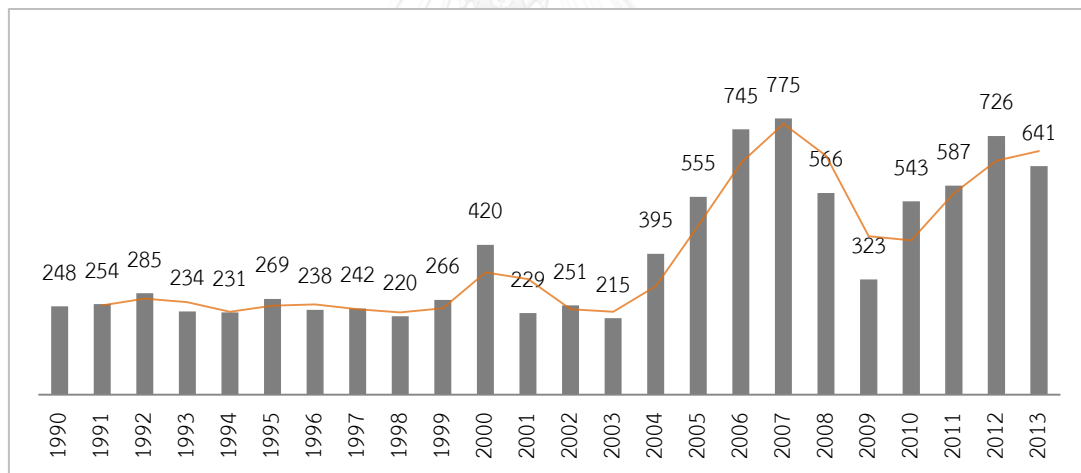
Figure1 shows the number of LBO Transactions between 1990 and 2013

From the list of LBO target firms, I only selected a list of all US firms that appear as targets by private equity in at least one transaction. The result from using this criterion is the Private equity LBO target firm list which contains 3,904 deals. For each of these private equity target firms I extract financial information e.g. total assets, revenue, book debt etc. from the compustat database. Eventually, I get the LBO sample that contains 282 firms and 3,116 firm-year observations. As a common practice in capital structure research, I exclude firms in banking (SIC 6000-6999) and utilities (SIC 4900 to 4949) sectors.

To compare the capital structure, stability between general listed firms and LBO target firm, it's necessary to create another sample that represents the general listed firm. Moreover, to prevent the selection bias problem, I have to do matching as follows. First, each LBO firm is paired with similar non-LBO firms. By using following criteria 1) non-LBO firms need to have the same activity as the LBO firm at the SIC-4 or SIC-2 digit 2) the revenue of non-LBO firms cannot deviate more than 20% from those of the LBO firm at the end of the fiscal year preceding the deal. 3) Each firm has to have data on compustat more than 10 years. After applying these criteria I get the samples that contain 5,626 and 23,680 Firm-year observations for Matched SIC 4-digit sample and SIC 2-digit respectively.

Finally, in order to represent the entire firm (both LBO and non-LBO target firms) I construct the sample from compustat database by using only one criterion that is

each Firm in the sample has to have data on compustat more than 20 years. The result is compustat sample that contains 1,623 firms and 37,971 firm-year observations.

Table I reports summary statistics of each sample. There are 12 key financial items in the table: (1) Total Assets (2) Cash (3) Invested Capital (4) Intangible Assets (5) Income tax (6) EBITDA (7) Book Leverage (8) Cash ratio (9) ROIC (10) Log(sale) (11) Tax ratio (12) Tangible Assets. All of these financial items are the input variables that often classified as Determinants of Firm's Financial Leverage. Some variables such as Cash, Total assets or EBITDA can be tracked directly from compustat database, however there are some variable that I have to calculate further. The definition of each variable is presented in Table II.

Table I reports summary statistic of each sample. Each financial item was retrieved from compustat database. As a common practice in capital structure research, This study excludes firms in banking and utilities sectors (SIC codes outside the ranges 4900 to 4949 (utilities) and 6000 to 6999 (financials)).Panel A report the summary statistic of compustat sample which is created by selecting only US firm that has data on compustat more than 20 years during the sample time period 1990-2013. While LBO sample is created by selecting firms that classified as an LBO target by Private Equity firms. It contains 45,029 and 3,116 firm-year observations respectively. The rightest column shows the t-statistic and p-value of differences in mean between LBO sample and compustat sample. The null hypothesis is whether the means of LBO sample is equal to compustat sample.Panel B reports that statistic for both Matched SIC 2-digit and 4-digit samples which are comparison samples of LBO firm. Each LBO Firm is paired with similar non-LBO firms. By using following criteria 1) non-LBO firms need to have the same activity as the LBO firm at the SIC 4-digit for Matched SIC 4-digit sample and SIC 2-digit for Matched SIC 2-digit sample and 2) the revenue of non-LBO firms cannot deviate more than 20% from those of the LBO firm at the end of the fiscal year preceding the deal. 3) Each firm has to have data on compustat more than 10 years. After applying these criteria I get the samples that contain 5,626 and 23,680 Firm-year observations for Matched SIC 4-digit sample and SIC 2-digit respectively. The rightest column of each sample shows the t-statistic and p-value of differences in mean between each sample and LBO sample. The null hypothesis is whether the means of LBO sample equal to Matched SIC 2-digit, Matched SIC 4-digit sample.

Panel A	Compustat Sample			LBO Sample			
Variable	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	p-value
Total Assets	5361.89	350.45	24409.8	705.27	211.56	2073.17	0.0000
Cash	350.12	17.23	1878.41	46.26	11.99	129.7	0.0000
Invested capital	3094.67	39.59	13636.5	479.89	50.63	1335.65	0.0000
Income tax	130.93	0.03	836.97	13.95	3.03	64.39	0.0000
EBITDA	685.67	42.36	2936.32	92.17	77.15	291.9	0.0000
Log(sale)	2.52	2.58	1.11	2.35	2.82	0.7	0.0000
Tangible Assets	4514.65	301.6	21526.7	537.96	452.95	1493.52	0.0000
Free cash flow	184.89	5.25	1520.66	19.75	1.81	245.97	0.0000
Book Leverage	0.28	0.2	1.28	0.28	0.42	0.32	0.1283
Cash ratio	0.11	0.06	0.14	0.11	0.16	0.14	0.0957
ROIC	0.08	0.12	5.16	0.29	0.21	12.46	0.3174
Effective tax rate	-0.02	0.02	8.98	0.02	0.04	0.05	0.6980
FCFR	-1.25451	0.03	55.79	-0.43	0.01	17.55	0.0144
N	37,971			3,116			
Number of firms	1,623			282			

Panel B		Matched 2 digit				Matched 4 digit		
Variable	Mean	Median	Std. Dev.	p-value	Mean	Median	Std. Dev.	p-value
Total Assets	850.36	182.66	2854.91	0.6611	682.67	174.62	2281.41	0.9653
Cash	84.16	15.1	266.94	0.1154	63.82	16.09	170.61	0.3703
Invested capital	547.71	34.15	1691.99	0.9346	424.44	39.01	1229.59	0.1263
Income tax	15.77	0	81.47	0.1304	10.93	0	77.1	0.1314
EBITDA	100.96	16.18	334.27	0.1159	76.31	15.17	283.2	0.0232
Log(sale)	2.21	2.23	0.79	0.8543	2.15	2.13	0.73	0.001
Tangible Assets	652.3	152.72	2276.04	0.1691	534	146.95	1778.77	0.8214
Free cash flow	20.43	2.4	263.65	0.9157	6.13	1.17	228.58	0.8134
Book Leverage	0.22	0.13	0.37	0.0000	0.21	0.1	0.28	0.0000
Cash ratio	0.15	0.09	0.16	0.1387	0.16	0.1	0.17	0.207
ROIC	0.07	0.1	3.57	0.327	0.11	0.08	3.73	0.4329
Effective tax rate	0.03	0.01	2.41	0.3182	0.08	0.01	4.93	0.3242
FCFR	-0.81	0.02	2.8	0.453	-0.47	0.01	32.71	0.9746
N			23,680				5,626	
Number of firms			1,305				319	

Table II Variables Definition

Table II showed the definition of each variable that was used in this study. There are

6 main variables as follow

Variable	Definition
Book leverage	It is expressed as total book debt/total assets
ROIC	Return On Invested Capital equal to (operating income before taxes *plus* interest expenses) *divided* by "Invested Capital"
Effective tax rate	The ratio of Income tax divided by total revenue
Cash ratio	The ratio of net cash divided by total assets
Tangibility	The ratio of Tangible assets divided by total assets
Free cash Flow	Income Before Extraordinary Items *plus* Depreciation and Amortization *less* Cash Dividends *less* Non-Equity and Minority Interest Dividends Paid *less* Equity Dividends Paid *less* Capital Expenditures or Additions to Fixed Assets.
Free cash flow to revenue (FCFR)	The ratio of free cash flow divided by total revenue

* All items that were used as an input of each ratio was retrieved from compustat directly

It can be seen from the Table I that the LBO sample, Matched 2 digits and Matched 4 digits sample have very similar characteristics in many variables E.g. Free cash flow, ,Total assets, ROIC, Invested Capital except Book leverage.However, these numbers look very contrast with compustat sample. The difference between compustat sample and other samples can be seen in most ratio variables the reason for such a difference are

(1) Effective tax rate

The interest expenses are tax deductible. Given the fact than LBO transactions are always referred as a highly leveraged transaction or high debt financing. Thus, it's not surprising that the tax benefits are a large source of wealth in LBOs (Kaplan, 1989). Marais, Schipper and Smith (1989) present evidence that tax savings are correlated with the LBO premium. Hence, followed the Tax- savings hypothesis, the Effective tax rate of firms in LBO sample is greater than compustat sample.

(2) Tangibility and Cash ratio

When compared between firm with substantial tangible assets and another one that have fewer assets. Firm with substantial tangible assets are favored because In the case of Bankruptcy, The more tangible assets, the more guarantees that the creditor will not lose all assets. Hence, Assets that can easily transferable when there is a

financial difficulty also increases a firm's attraction to become an LBO target. Hence, LBO sample should have greater tangibility and cash ratio than compustat sample

(3) Leverage

A high borrowing capacity will be a key factor in the success of the LBO transactions. A company with no debt and high free cash flow is a great candidate for an LBO target firm given the fact that Private equity can buy the company with senior debt and use the free cash flows of the company to pay the principal and interest due. This characteristic is also shown in LBO sample, matched 4digit and matched 2digit samples which have quite lower leverage when compared with compustat sample.

(4) ROIC and Log (sale)

Desbrières et Schatt (2002) showed that LBO target firms tend to have more profitability when compared to its peers. They find that acquired firms are more profitable than industry average prior to the LBO transaction. This result is also consistent with the LBO sample in my study that have higher ROIC which tended toward significance (p=0. 16) when compared with Compustat sample.

(5) Free cash flow

IN 1976 jensen and meckling introduced the Free Cash Flow Hypothesis, which shows that When there is a large Free cash flow manager will have an incentive to waste organizational resources on negative NPV projects, rather than pay out the excess cash to shareholders. There are many evidences show that firm with high likelihood to become LBO target will have free cash flow more than general firm. For instance, Tim Opler and Sheridan Titman (1993), find that firms that initiate LBOs can be characterized as having a combination of unfavorable investment opportunities (lowTobin'sq) and relatively high cash flow. This characteristic is also shown in my sample. FCFR from LBO sample, matched 4digit and matched 2digit samples have higher FCFR with significance level than compustat sample.
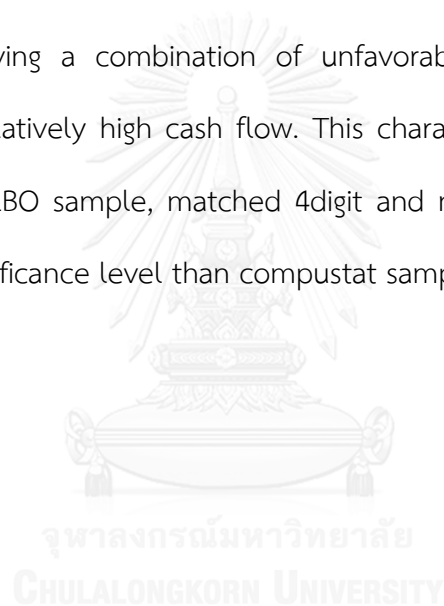
CHAPTER 5

METHODOLOGY

5.1 THE EVIDENCE OF INSTABILITY

According to Deangelo and Roll (2015), they construct two different models that can measure time-series variation in leverage as these following models

$$Debt/TA_{it} = \beta_0 + Firm\ dummies + Year\ dummies + \varepsilon_{it} \qquad (1)$$

$$Debt/TA_{it} = \beta_0 + Firm\ x\ Quinquennial\ dummies + Year\ dummies + \varepsilon_{it} \qquad (2)$$

The dependent variable is the ratio of total book debt to total assets (Debt/TA) it or Book leverage where firms are indexed by i and years are indexed by t. The difference between model (1) and model (2) is that the model (2) includes interaction effects for a given firm which are assumed to be constant within each quinquennial (5 years). In other word, it means that the model (2) allows firm fixed effects to vary across 5 years. Hence, if the firm capital structure is stable, Model (1) should be the more suitable model to explain the time-series variation in leverage However, if the firm capital structure is not stable over time, Model (2) should be the more suitable model. To measure the goodness of fit of each model, I run Model (1) and Model (2) to obtain Adjusted-R2 of each model. The results of regression are shown in table III.

The results indicated that firm-quinquennial interaction effects are greatly significant. In panel A report results from compustat sample. There is a statistically significant increase in Adjusted-R^2 more than 0.5 from 0.2034 to 0.7066 when include firm-quinquennial interaction effects. This result also consistent with other samples, e.g. In Panel B shows that for both matched 4 digits and matched 2 digits, The Adjusted-R^2 increase from 0.5709 to 0.7372 and 0.3549 to 0.5634 respectively when include firm-decade interaction effects. These results still hold even I add other control variables that often classified as Determinants of Firm's Financial Leverage as in Rajan and Zingales (1995) into the model, e.g. Log (sales), EBITDA (profitability), and Asset tangibility.

All of these results implied that explanatory power from Model (2) which allows firm fixed effects to vary across 5 years is better than model (1) which mean that the Corporate capital structure is not stable as many researchers believe.

This result is consistent with Deangelo and Roll (2015) who stated that leverage cross-sections are not stable over time with differences growing each year. They also suggested that firm-specific, time-series variation in leverage is systematically important, as previous studies have reported for cross-firm variation. Hence, the question that remains open is what drives the instability of capital structure. The next step of my study is to identify the source of instability and answer the research question which is Do private equity activities drive the instability of capital structure?

Table III

Explanatory Power of Firm Main Effects and Firm-Time Interaction Effects

According to Deangelo and Roll (2015), Dependent variable is the ratio of debt to total assets (Debt/TA)$_{it}$ where firms are indexed by i and years are indexed by t. I run the regression and compared the results from two different models which are Model (1) which each firm has a dummy variable that remains constant over time and the Model (2) that allow firm fixed effect to vary across quinquennial (5 years). Panel A reports results for Compustat sample. Panel B reports results for Matched LBO firm samples both 2digits and 4 digits. Panel C repeated regression in both Panel A and Panel B again but include other control variables that often classified as Determinants of Firm's Financial Leverage e.g. *Log (sales), EBITDA (profitability), and Asset tangibility.* The rightest column reports the t-statistic to compare Adjusted-R^2 between model (1) and (2)

	Adjusted-R^2 for Model with		
	Firm Dummies	Firm-quinquennial dummies	t-statistic to compare Model (1) and (2)
Panel A: Compustat universe			
Compustat sample	0.2034	0.7066	7.57***
Panel B: Matched LBO			
Matched 2 digits	0.3549	0.5634	4.62***
Matched 4 digits	0.5709	0.7372	8.95***

Figure2 shows the number of LBO deals in the Business Service industry and The average leverage over time.

	Adjusted-R^2 for Model with		
	Firm Dummies	Firm-quinquennial dummies	t-statistic to compare Model (1) and (2)
Panel C:			
Regression with other control variables			
Compustat sample	0.2060	0.7049	7.76***
Matched 2 digits	0.3569	0.5653	4.21***
Matched 4 digits	0.5720	0.7416	9.24***

5.2 IDENTIFY THE SOURCE OF INSTABILITY

To find out that the private equity activities drive the instability of capital structure,

it's necessary to find the correlation between private activities and the instability of

capital structure. After running the regression of Model (1), Not only the Adjusted-R2

that will receive but also the residual (ε) which represent the "Excess leverage". The

higher excess leverage suggests that corporate The capital structure decision is likely

related to private equity activities. I can use this residual (ε) as a representative of

instability. The only thing that's left is the representation of private equity activities

so I have to construct another model that can represent the private equity activities

which is following the model

$$\Pr(LBO_{it} = 1|X_{it}) = \Phi(\beta X_{it} + E_{it}) \qquad (3)$$

Model (3) is a probit model that identifies the likelihood of a firm being the target of

private equity in a particular year. Where the dependent variable is LBO_{it} Which is a

dummy variable that takes the value of 1 if private equity transaction (e.g. LBO) is

made in year t otherwise its value will equal to zero. The matrix Xi,t contains firm-

specific variables that the literature has identified as determinants of the likelihood

that a firm is an private equity target, namely firm size (measured by revenue), the

leverage, the level of income taxes, the firm's profitability (measured by ROIC),

liquidity (proxied by cash divided by total assets). The definition of each variable is

shown in Table II in the previous section.

The predicted value from regression model (3) is called the propensity score. Its interpretation is that it measures the probability, as predicted by the model, that a firm becomes a private equity LBO target in a given year. In other words, firms with similar propensity scores share similar characteristics, that lead to being a private equity target.

The last step is to find the correlation between private activity transaction and the instability of capital structure. Let ρ (ε, propensity score) denote the correlation between the residual (ε) and propensity score from Model (3). The higher correlation suggests that The corporate capital structure decision is likely related to private equity activities.

However, by calculating the correlation between the residual (ε) and propensity directly, It can be viewed as an unconditional methodology. The unconditional term refers to the fact that this method still doesn't take the effect of industry, year and firm into account. The different industry might affect this correlation in the different way as well as the time and firm. Hence , To prevent and correct this problem, This study also develops other models that can capture the correlation between private activity transaction and the instability of capital structure as follows Model (4) is the regression with robust standard errors which I regress excess leverage on propensity score with both industries (2-digit SIC) and year fixed effects.

While the model (5) is the same as the model (4) the only difference is that in this model excess leverage is regressed on both firm and year fixed effects. These two models can be viewed as a conditional method which refers to the fact that this method already take the effect of industry, year and firm into account

$$Excess\ Leverage_{it} = \beta_0 + \beta_1 Propensity\ score_{it} + Year\ dummies \qquad (4)$$
$$+Industry\ dummies + \epsilon_{it}$$

$$Excess\ Leverage_{it} = \beta_0 + \beta_1 Propensity\ score_{it} + Year\ dummies \qquad (5)$$
$$+firm\ dummies + \epsilon_{it}$$

Table IV shows the result from probit regression of all samples which include compustat Sample, Matched SIC-4 digit sample and Matched SIC-2 digit sample.

The result of the correlation between the residual ($\mathcal{E}$) and propensity score from Model (3) and The result of regressions from model (4) and model (5) is shown in Table V

Table IV

Analysis the source of instability

Table IV reports the Log likelihood statistic from three multivariate probit regressions. The dependent variable is a dummy variable that takes the value of 1 if Leveraged Buyout is made in year t. The independent variables are firm-specific variables that the literature has identified as determinants of the likelihood that a firm is a Leveraged buyout target, namely firm size (measured by Revenue), Leverage, the level of income taxes, the firm's profitability (measured by ROIC), liquidity (proxies by cash divided by assets).

Variables	Compustat sample	Matched SIC-2 digit	Matched SIC-4 digit
Leverage	-0.00117	0.134***	0.158*
	(-0.10)	(3.71)	(2.54)
Cash ratio	-0.135	-0.480***	-0.293*
	(-1.12)	(-3.79)	(-1.99)
ROIC	0.000247	-0.00179	-0.00345
	(0.09)	(-0.41)	(-0.58)
Log(sale)	-0.0885***	0.0561*	0.0823**
	(-5.80)	(2.54)	(3.21)
Effective tax rate	-0.000746	-0.0253**	-0.0211*
	(-0.72)	(-2.71)	(-2.19)
Tangibility	-0.696***	-0.182*	-0.315**
	(-8.50)	(-2.20)	(-3.29)
FCFR	0.00107	0.00524*	0.00409
	(1.59)	(2.39)	(1.68)
N	45151	30761	12727
Number of firms	2239	1305	319

*T statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001*

Table V

The correlation between the excess leverage and propensity score

Table V reports the correlation between the residual ($\mathcal{E}$) with is a represent of an excess leverage and propensity score by using three different method First, This study calculate correlation directly while the other two methods use the regression method which are model (4) and Model (5) where the model (4) is the regression with robust standard errors which I regress excess leverage on propensity score with both industries (2-digit SIC) and year fixed effects While the model (5) is the same as the model (4) the only difference is that in this model excess leverage is regressed on both firm and year fixed effects. Panel A reports the result from the first method while Panel B reports the result from model (4) and Panel C reports the result from model(5)

Panel A

| | Correlation between the residual | |
	($\mathcal{E}$) and propensity score	P>|t|
Compustat sample	0.0727	0.0000
Matched SIC 2 digit	0.4830	0.0000
Matched SIC 4 digit	0.3050	0.0000

Panel B

| | | | Robust | | | [95% | |
		Coef.	Std. Err.	t	P>|t|	Conf.	Interval]
Compustat sample	Propensity score	1.82034	2.18712	0.83	0.405	-2.468656	6.109337
Matched SIC 2 digit	Propensity score	61.11658	9.383791	6.51	0.000	42.7076	79.52556
Matched SIC 4 digit	Propensity score	20.70795	6.747061	3.07	0.002	7.433436	33.98247

Panel C

		Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Compustat sample	Propensity score	.9510466	1.032769	0.92	0.357	-1.074239	2.976333
Matched SIC 2 digit	Propensity score	24.28266	9.404838	2.58	0.010	5.832392	42.73293
Matched SIC 4 digit	Propensity score	6.883523	2.433291	2.83	0.005	2.09614	11.67091

According to the results of Compustat sample, the only significant variable predicting the likelihood of LBO is Log (sale) and Tangibility which has both negative coefficient significantly. This result shows that LBO targets are more likely to have a less revenue and tangible asset in their balance sheet more than general firm. This result seem contrast to the normal characteristics of the firm that have a likelihood to become LBO target firm. One explanation behind this result is that there might be some selection bias in the compustat sample. The Compustat sample is created by selecting only firm that has year on Compustat more than 20 years Hence, It means that every firm in this sample seems to be the successful firm that survive in the long run. So it's not surprising that on average the Compustat sample will have higher revenue, tangible assets more than LBO target firms and make the result of the probit regression to be negative.

The second and third column reports the result for Matched SIC-4 digit sample and Matched SIC-2 digit sample respectively. It seems that the profitability (Log (sale)) is still the main motive to make the firm have a higher likelihood to become an LBO target.

Table V shows the correlation between the residual (ε) and propensity score from three different methods. The higher correlation suggests that The corporate capital structure decision is likely related to private equity activities. The result shows that all samples show the statistically significant positive correlation, especially, for both Matched SIC 2 digit and Matched SIC 4 digit sample that show the high correlation which are 0.4830 and 0.3050 respectively with a p value less than 0.0001.

Moreover, These results also consistent with the result of the regression model (4) and Model (5) which show the same positive coefficient sign, especially for both Matched SIC 2 digit and Matched SIC 4 digit which have the high positive value with a p value less than 0.01. Apart from the high coefficient value , When I look at the industry that have the highest amount of LBO deal during 1990 to 2013 which are Business Service (1,362 deals) Industrial, Commercial Machinery and Computer Equipment (506 deals), Engineering, Accounting, Research (452 deals), Management and Related Services (397 deals). The amount of LBO deals of these industries increases from time to time and interestingly, I found that the average leverage by industry-year is moving in the same ways as the number of LBO deals

Figure2 shows the number of LBO deals in the Business Service industry and

The average leverage over time.

Industry : Industrial And Commercial Machinery And Computer Equipment

Industry : Electronic And Other Electrical Equipment And Components, Except Computer Equipment

Industry : Business Services

Industry : Engineering, Accounting, Research, Management, And Related Services
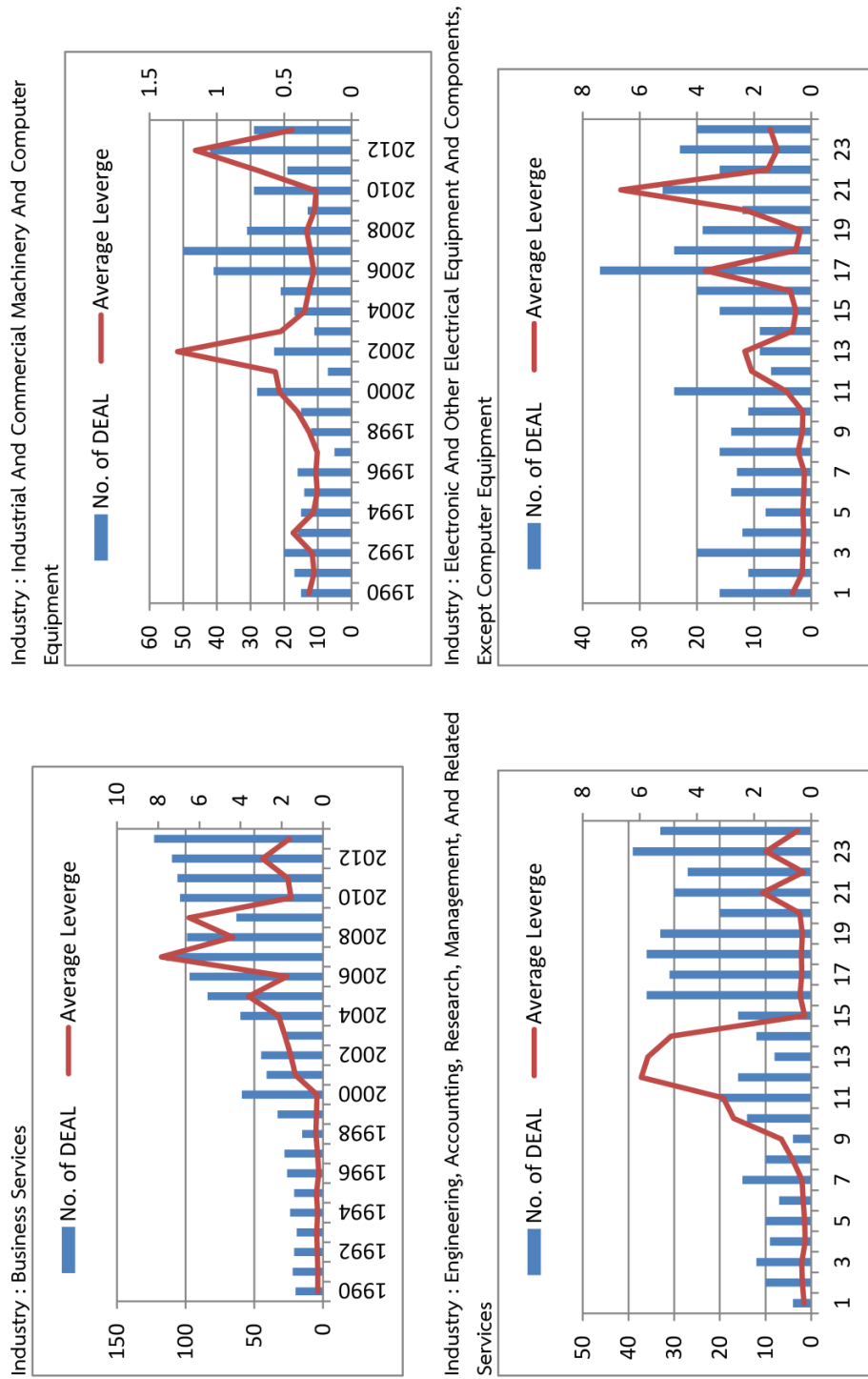
To confirm the result that the private equity activities are actually related to the instability of capital structure, this study also adjusts the Model (1) and Model (2) to explain about this correlation by adding the propensity scores as an independent variable.

$$\frac{Debt}{TA}_{it} = \beta_0 + Firm\ dummies + Year\ dummies \tag{6}$$

$$+Propensity\ scores + \varepsilon_{it}$$

$$\frac{Debt}{TA}_{it} = \beta_0 + Firm\ x\ Quinquennial\ dummies + Year\ dummies \tag{7}$$

$$+Propensity\ scores + \varepsilon_{it}$$

The expected result from Model(6) and Model(7) That this thesis focus is still the same as before which is the Adjusted R square that represent the explanatory power of the model. The results of the regression are reported in the Table VI

In panel A The result shows that The Adjusted R square from model (6) and (7) which included propensity scores as an independent variable increase greatly when compared with the Adjusted R square from Model (1) and Model (2). However the increase in Compustat sample is not significant which is opposite from Matched 2 and 4 samples with shows the statistically significant at every level. This result indicated that when adding the propensity scores into the model the power of explanatory power increase dramatically, which implied that the likelihood of the firm becoming a private equity target is associated with the instability of the capital structure. And the reason why the Adjusted R square from compustat sample is not significant might be that this compustat sample contains firm that have a lower likelihood to become an LBO target when compared to Matched 2 and 4 samples

(Matched 2 and Matched 4 samples only contain firm that have a similar characteristic to LBO sample which shown in Table I). This result still holds even I add another control variable, e.g. Log (sale), EBITDA, Tangibility etc. into regression the result reported in Panel B shows that the Adjusted R square significantly increase at every level.

Finally, The interesting point in this result is that When I regress the Book leverage in the model (2) which allow firm fixed effect to vary across 5 years (quinquennial) the Adjusted R square increase greatly which mean that There is time series variation in leverage. However, when adding propensity scores which can be varied across time (not limited to quinquennial) the Adjusted R square even increase greatly (move up to more than 0.8) which can interpret that private equity might be the Time-series factor that drive the time-series variation in leverage.

All of these results implied that corporate capital structure decision is likely related to private equity activities. One possible explanation for this result is that generally, when firms face with a high probability that their firms will become target firms. The management might decide to do a takeover defense strategy. The common strategy that firm normally used is "Leveraged Recapitalization"

Table VI

Table VI reports The Adjusted R square from Model (6) and Model (7) compared to Model (1) and Model (2) respectively. All models have the book leverage as the dependent variable. The difference between Model (6), Model (7) and Model (1),Model (2) is that it contains the Propensity scores as an independent variable. In Panel A reports the results from all regressions while Panel B reports the same result as Panel A but include other control variables that often classified as Determinants of Firm's Financial Leverage as in Rajan and Zingales (1995) into the model, e.g. Log (sales), EBITDA (profitability), and Asset tangibility.

Adjusted-R square for Model with

	Firm dummies			Firm-quinquennial dummies		
	Not include Propensity scores	Include Propensity scores	t-statistic to compare between Model(6) and Model(1)	Not include Propensity scores	Include Propensity scores	t-statistic to compare between Model(7) and Model(2)
Panel A						
Compustat sample	0.2034	0.2281	0.366	0.7066	0.7318	0.291
Matched 2 digit Sample	0.3549	0.5467	3.66***	0.5634	0.7755	3.828***
Matched 4 digit Sample	0.5709	0.6107	1.79***	0.7372	0.7728	1.573*
Panel B						
Compustat sample	0.2060	0.2318	0.276	0.7049	0.7325	0.343
Matched 2 digit Sample	0.3569	0.6954	6.7482***	0.5653	0.8197	4.159***
Matched 4 digit Sample	0.5720	0.7092	6.0982***	0.7416	0.8328	4.282***

As I mentioned in previous part, firms that become private equity target firms usually have one thing in common which is its high debt capacity. Hence, to prevent their firms from Takeover. Private equity target firms usually do leveraged recapitalization to reduce its debt capacity. With this assumption it means that not only actions from private equity will make the corporate capital structure less stable, but activities like Leverage Recap from general listed firms might be the source of capital structure instability.

Finally, Table VII divided all firms in the Compustat database into quartile by using Propensity score. The result shows that firms that have the high propensity score have the same characteristic in common which are high revenue have a lot of tangible assets, high income tax

Table VII

The Characteristics of firms that become Private Equity LBO Target

Table VII reports the characteristics of each sample. By using propensity score (likelihood that the firms become a private equity LBO target), I can equally divide each sample into 4 quartiles. The characteristic of each quartile is shown below

Variable	Quartile1			Quartile2			Quartile3			Quartile4		
	Mean	Mdn	S.D.	Mean	Mdn	S.D.	Mean	Mdn	S.D.	Mean	Mdn	S.D.
Total asset	345	9.08	10203.9	585.9	56.62	12969.4	1726.5	335.55	12682.5	8050.7	1649.89	23070.5
Cash	30.97	1.81	577.89	62.36	3.8	1171.53	159.31	13.72	1125.12	469.4	53.1	1765.97
Invested	198.12	5.7	-5664.1	361.99	36.61	7464.79	1105.85	215.2	7665.01	4724.49	1039.28	13359.1
Tangible	323.37	8.93	9420.19	532.66	54.97	11520	1587.72	313.83	11261.5	6491.21	1140.77	19924.7
Income tax	15.48	0	540.35	16.9	0.23	357.95	49.93	3.83	464.92	163.97	21.06	-686.89
EBITDA	50.77	-0.8	-1609.4	72.87	4.09	1362.16	257.18	37.32	-1837.5	982.56	191.59	-2672.2
Log(sale)	0.57	0.73	0.9	1.73	1.76	0.55	2.51	2.57	0.69	3.16	3.23	0.86
Leverage	1.56	0.07	36.63	0.28	0.16	1.48	0.31	0.24	1.41	0.34	0.29	1.05
Cash ratio	0.29	0.24	0.25	0.12	0.08	0.12	0.08	0.05	0.09	0.06	0.04	0.06
ROIC	0.24	-0.09	-49.57	0.27	0.08	28.35	0.06	0.11	5.31	-0.06	0.12	-32.3
Effective tax rate	-0.01	0	4.67	0.01	0	0.67	0.02	0.01	0.35	-0.11	0.02	-17.73
Tangibility	0.98	1	0.06	0.96	1	0.09	0.9	0.96	0.13	0.7	0.73	0.22
FCFR	-27.18	-0.37	-365.02	-1.12	0.01	-45.79	-0.46	0.02	-13.55	-0.34	0.03	-39.55
Propensity	0	0	0	0	0	0	0	0	0	0.01	0.01	0
N	36961			36961			36961			36961		

5.3 LEVERAGED RECAPITALIZATION AND LEVERAGED BUYOUT

As I mentioned in previous part Leveraged Recapitalization is also used as a takeover defense strategy. Hence, the goal of this section is to find whether Firms tend to do Leveraged Recapitalization if they face with the threat that their firm might become LBO targets.

So to analyze this issue I have to create another sample called "Leveraged Recapitalization sample". Thomson Reuters LPC is used to retrieve the information of companies that involved with leveraged loans which have a purpose of Recapitalization, Dividend recapitalization and Stock repurchase between 1990 and 2012. compustat database is also used to retrieve financial information. There are 1,781 loans, 773 firms and 11,405 firm-year observations in the Leveraged Recapitalization sample

Next, I have to construct another model that can explain the relationship between Leveraged Recapitalization and Leveraged Buyout. The model was shown below

$$PR(RECAP_{i,t}|H_{i,t}) = \Phi(\beta_0 H_{i,t} + \beta_1 ActualLBO \qquad (8)$$
$$or\ LBOlikelihood + U_{i,t})$$

Model (8) is a probit model. The dependent variable is a dummy variable that takes the value of 1 if Leveraged Recapitalization is made in year t. for the independent variables, The matrix Hi,t contains the firm-specific variables that are identified as

determinants of likelihood that firm will do Leveraged recapitalization which is very similar to the variables in the model (2) e.g. Leverage, Tangibility, Profitability.

Another Independent variable ActualLBO is dummy that will take a value of 1 for the firms that pass all following criteria 1. Firms are in the same Industry (Both SIC-2digit and SIC4-digit) as Leveraged recap firms 2. There is an LBO happen in this industry one year before the leveraged recap event.

The last independent variable is LBOlikelihood which the result from model (3) is. Its interpretation is that if the likelihood of doing Leveraged Recap increases when the firm is facing with a high chance of being LBO targets, the coefficient should have a statistically significant positive sign. The results of probit regression are shown in Table VIII

Table VIII

Likelihood of Firms doing Leveraged Recapitalization

Table VIII reports the marginal effect from six multivariate probit regressions. The dependent variable is a dummy variable that takes the value of 1 if Leveraged Recapitalization is made in year t. The independent variables are firm-specific variables are identified as determinants of likelihood that firm will do Leveraged recapitalization. The difference between Column (1) and Column (2) is that Column (2) contains the LBO condition dummy that will take a value of 1 for the firms that pass all criteria 1. Firms are in the same Industry as Leveraged recap firms 2. There is an LBO happen in this Industry one year before the leveraged recap happens. Column (3) contains Propensity score as an independent variable. Column (4)-(6) is the same as (1)-(3) but the SIC-condition is changed from 2 to 4 digits.

	SIC-2 digit condition			SIC-4 digit condition		
	column(1)	column(2)	column(3)	column(4)	column(5)	column(6)
Leverage	-0.00000181	-0.00000109	-0.00000118	-0.00000181	-0.00000180	-0.00000118
	(-0.08)	(-0.06)	(-0.06)	(-0.08)	(-0.08)	(-0.06)
Cash ratio	-0.00295*	-0.00368**	-0.000389	-0.00295*	-0.00321*	-0.000389
	(-2.27)	(-2.79)	(-0.29)	(-2.27)	(-2.45)	(-0.29)
ROIC	-0.000000252	-0.000000272	0.000000129	-0.000000252	-0.000000252	0.000000129
	(-0.04)	(-0.04)	(0.02)	(-0.04)	(-0.04)	(0.02)
Log(sale)	0.000877***	0.000970***	-0.0000650	0.000877***	0.000897***	-0.0000650
	(5.01)	(5.47)	(-0.26)	(5.01)	(5.11)	(-0.26)
Effective tax rate	0.00000342	0.00000355	0.00000805	0.00000342	0.00000377	0.00000805
	(0.07)	(0.08)	(0.22)	(0.07)	(0.08)	(0.22)
tangibility	-0.00193	-0.00180	-0.00116	-0.00193	-0.00190	-0.00116
	(-1.90)	(-1.77)	(-1.13)	(-1.90)	(-1.87)	(-1.13)
FCFR	-0.000000378	-0.000000441	-0.000000293	-0.000000378	-0.000000390	-0.000000293
	(-0.41)	(-0.50)	(-0.31)	(-0.41)	(-0.43)	(-0.31)
ActualLBO		0.00204***			0.00201*	
		(5.03)			(2.43)	
LBOlikelihood			0.877***			0.877***
			(6.38)			(6.38)
N	147841	147841	147841	147841	147841	147841

The result from Table VIII shows the statistically significant positive coefficient sign of propensity scores in every regression. These results implied that when firm face with high probability to become LBO targets, there is a higher chance that firm will do leveraged recapitalization. This result also consistent when look at the coefficient on LBO condition which also have the positive sign.

Overall, the results from all previous Tables implied that the corporate capital structure is not stable over time and the related private equity activities both Leveraged Buyout and Leveraged recapitalization are one source of the instability. The instability that happened from these activities is not affected, only Target firms, but also other listed firm because by facing with a high chance of becoming Target firms, to prevent their firms from Takeover. Management of firms usually decides to do leveraged recapitalization as a takeover defense strategy to reduce its debt capacity. All of these transactions, LBO and Leveraged Recapitalization, directly affect the capital structure.

CHAPTER 6

ROBUSTNESS CHECK

To confirm that the private equity activity is one of the factors that drive the instability of capital structure, the event study methodology was applied by constructing the event window to test the leverage stability of firms that have a high chance to become private equity target firms before and after the transaction date.

Event Window: The event window is Average leverage movement observation period of how stable of corporate capital structure. Which I determine from the average of leverage of firms which have similar characteristics, e.g. Industry, Profitability these Average industry leverage are also the same as average leverage from Matched SIC-2 digit samples I defined event window as ±2 years from a private equity transaction (t=0)

**Leveraged Buyout
Transaction Date**

T-2   **T=0**   **T+2**
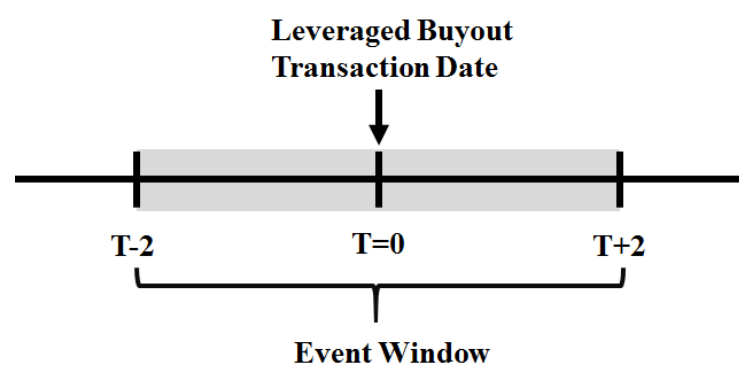
Event Window

Figure I: Illustration of how to construct an Event window

To calculate the Average leverage movement observation, I collected the Leverage at each time observation from Matched SIC-2 digit and Matched SIC-2 digit samples and run the following regression.

$$\frac{\text{Debt}}{\text{TA}_{it}} = \beta_0 + \text{SICdummies} + \text{Year dummies}$$

$$+\text{Timeobservation dummies} + u_{it}$$

(9)

The focus of this study is the coefficients of time dummies that interpret as an "Excess leverage" the positive coefficient mean that on average at a time t firm that have a high chance to become private equity target firms has leverage more than usual. The results of the regression are shown in table IX
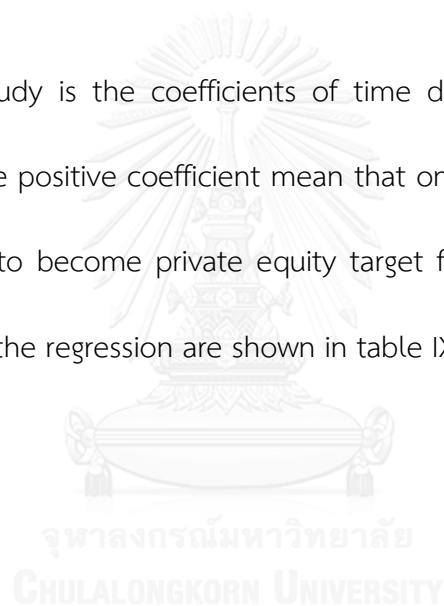
Table IX

Table IX reports the outcome from the regression where. The dependent variable is the ratio of debt to total assets (Debt/TA) it where firms are indexed by i and years are indexed by t. The independent variables are SIC dummies, Year dummies and time dummies. The focus of this study is the coefficients of time dummies that interpret as an "Excess leverage". Finally, to prevent the perfect collinearity problem I drop one dummy variable which is time-2 variable.

Event window	Matched SIC-2 digit leverage	Robust standard error	Matched SIC-4 digit leverage	Robust standard error
Time-1	-0.000347	0.0069036	0.0157	0.0097095
	-0.96		-0.106	
Time0	0.0128	0.0087552	0.0424**	0.0180401
	-0.143		-0.019	
Time+1	0.0195*	0.0108604	0.0650**	0.0257121
	-0.072		-0.012	
Time+2	0.0187	0.0115918	0.0657***	0.0237511
	-0.107		-0.006	
N(Cluster firms)	1575		406	
N(Time-year observations)	10735		2365	

*p<0.1, ** p<0.05, *** p<0.01*

The result shows that there is a statistically significant positive coefficient on leverage at time 1 and time 2 for both samples and at time 0 for matching SIC-4 digit sample. This result can interpret in this following way.

At time zero when there is a Leveraged Buyout happening in a particular industry. Firms which have the same characteristics as the target firms face the threat that their firm might be the next target. Hence, to prevent themselves from takeover attempt, They might decide to do leveraged recapitalization, which is to increase the leverage and reduce the debt capacity to make their firms look less attractive. This is why there is a positive coefficient on leverage at time 1and 2 for Matched SIC-2 digit sample and 0,1 and 2 for Matched SIC-4 digit sample.

This result is also consistent with the results from Handa and Radhakrishnan (1991) who studied 42 leveraged recapitalizations by takeover targets. They suggested that Restructuring might not be the main primary managerial motive. In fact, leveraged recapitalization is strategic game-playing by management to survive an acquisition attempt. They found that there is an initial increase in leverage at the completion of recap. All firms prefer to subsequently unload debt irrespective of their performance.

Another possible explanation for an increase in leverage after the leveraged buyout event might be that leveraged buyout changes the Management perception of debt. Although LBO is a somewhat risky type of investment, but its result is often in big payoffs. Hence, it's possible that this payoff is the motivation that encourages the management of general firm to try to follow the private equity firms. Finally, although I cannot identify that private equity activities, e.g. LBO or leveraged recapitalization are the direct determinant of corporate capital structure, stability but The result definitely confirmed that there is an association between private equity activities and instability of corporate capital structure.
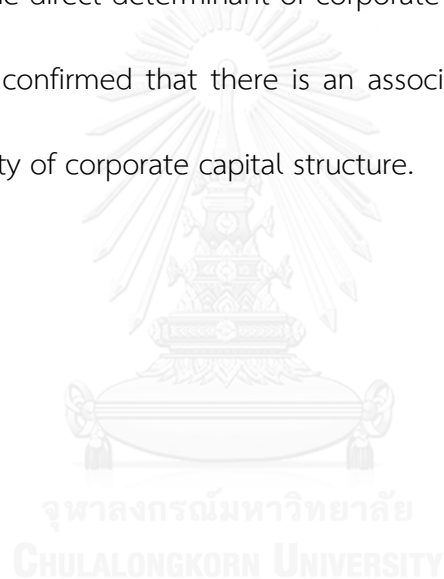
CHAPTER 7

CONCLUSION

The purpose of this study is to investigate whether private equity activities drive the instability of capital structure. By testing the Capital structure stability of U.S. private equity target firm. From available information of Leveraged Buyout deal, Leveraged Recapitalization and financial information on Thomson one, LPC and compustat. I find that there is a time-series variation in leverage. Moreover, I find that the explanatory power from Model which allows firm fixed effects to vary across 5 years is much better than the model that assume fixed effect are constant over time. I also find positive correlation between the capital structure instability and the likelihood that the firm will become an LBO target which can be suggests that corporate The capital structure decision is likely related to private equity activities

Interestingly, private equity activities seem to relate to the instability of corporate capital structure. Not only to the target firms, but also the general listed firm. One possible explanation for this result is that generally, when firms face with a high probability that their firms will become target firms. The management might decide to do a takeover defense strategy. The common strategy that firm normally used is "Leveraged Recapitalization". This explanation is also consistent with my study with the positive coefficient between the likelihood that a firm will do the leveraged recapitalization and the LBO condition, propensity score.

Finally, for the robustness test, there is a positive coefficient on leverage at time 1and 2 for Matched SIC-2 digit sample and 0,1 and 2 for Matched SIC-4 digit sample. Which can also imply that Firm might decide to do leveraged recapitalization, which is to increase the leverage and reduce the debt capacity to make their firms look less attractive. Although I cannot identify that private equity activities are the direct determinant of corporate capital structure, stability but the result definitely confirmed that there is an association between private equity activities and instability of corporate capital structure.

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APPENDIX

APPENDIX A: SIC Division Structure

Table A.1: SIC MAJOR GROUP DEFINITIONS

SIC Major Group	Description
1	Agricultural Production Crops
2	Agriculture production livestock and animal specialties
7	Agricultural Services
8	Forestry
9	Fishing, hunting, and trapping
10	Metal Mining
12	Coal Mining
13	Oil And Gas Extraction
14	Mining And Quarrying Of Nonmetallic Minerals, Except Fuels
15	Building Construction General Contractors And Operative Builders
16	Heavy Construction Other Than Building Construction Contractors
17	Construction Special Trade Contractors
20	Food And Kindred Products
21	Tobacco Products
22	Textile Mill Products
23	Apparel And Other Finished Products Made From Fabrics And Similar Materials
24	Lumber And Wood Products, Except Furniture
25	Furniture And Fixtures
26	Paper And Allied Products
27	Printing, Publishing, And Allied Industries
28	Chemicals And Allied Products
29	Petroleum Refining And Related Industries
30	Rubber And Miscellaneous Plastics Products
31	Leather And Leather Products
32	Stone, Clay, Glass, And Concrete Products
33	Primary Metal Industries
34	Fabricated Metal Products, Except Machinery And Transportation Equipment
35	Industrial And Commercial Machinery And Computer Equipment
36	Electronic And Other Electrical Equipment And Components, Except

	Computer Equipment	
37	Transportation Equipment	
38	Measuring, Analyzing, And Controlling Instruments; Photographic, Medical And Optical Goods; Watches And Clocks	
39	Miscellaneous Manufacturing Industries	
40	Railroad Transportation	
41	Local And Suburban Transit And Interurban Highway Passenger Transportation	
42	Motor Freight Transportation And Warehousing	
43	United States Postal Service	
44	Water Transportation	
45	Transportation By Air	
46	Pipelines, Except Natural Gas	
47	Transportation Services	
48	Communications	
49	Electric, Gas, And Sanitary Services	
50	Wholesale Trade-durable Goods	
51	Wholesale Trade-non-durable Goods	
52	Building Materials, Hardware, Garden Supply, And Mobile Home Dealers	
53	General Merchandise Stores	
54	Food Stores	
55	Automotive Dealers And Gasoline Service Stations	
56	Apparel And Accessory Stores	
57	Home Furniture, Furnishings, And Equipment Stores	
58	Eating And Drinking Places	
59	Miscellaneous Retail	
60	Depository Institutions	
61	Non-depository Credit Institutions	
62	Security And Commodity Brokers, Dealers, Exchanges, And Services	
63	Insurance Carriers	
64	Insurance Agents, Brokers, And Service	
65	Real Estate	
67	Holding And Other Investment Offices	
70	Hotels, Rooming Houses, Camps, And Other Lodging Places	
72	Personal Services	
73	Business Services	

75	Automotive Repair, Services, And Parking
76	Miscellaneous Repair Services
78	Motion Pictures
79	Amusement And Recreation Services
80	Health Services
81	Legal Services
82	Educational Services
83	Social Services
84	Museums, Art Galleries, And Botanical And Zoological Gardens
86	Membership Organizations
87	Engineering, Accounting, Research, Management, And Related Services
88	Private Households
89	Miscellaneous Services
91	Executive, Legislative, And General Government, Except Finance
92	Justice, Public Order, And Safety
93	Public Finance, Taxation, And Monetary Policy
94	Administration Of Human Resource Programs
95	Administration Of Environmental Quality And Housing Programs
96	Administration Of Economic Programs
97	National Security And International Affairs
99	Nonclassifiable Establishments

APPENDIX B: Leveraged buyout deal during 1990 to 2013

Table B.1: The number of leveraged buyout deal categorized by industry during 1990 to 2013

Year	SIC Major group																				
	1	2	7	8	9	10	12	13	14	15	16	17	20	21	22	23	24	25	26	27	28
1990	1						1	4		1		1	9		2	3		5	4	10	8
1991			1				1	2		1	2	2	10		1	4	4		7	16	12
1992			1		1			2	1	1		4	19		2	5	3	1	6	5	14
1993								4	1	1		3	10		5	7	1	2	8	10	7
1994	2							3		3		1	7		5	5	5	4	3	8	8
1995					1	1	1	1	2	3			11		4	4	4	4	2	12	13
1996							1	3		1	1		13		4	6		2	2	13	6
1997			1										10		2	4	2	1	3	13	6
1998				1	1		1	4		3	1		3		2	3	3	3	5	8	7
1999	1			1		1		1			1	3	5		2	7	3	6	1	11	8
2000	1		3					4		1		1	12		6	5	3	4	7	11	23
2001			1	1		1		3				1	7		2	3	1		7	6	6
2002	1	1						2		5		3	3	1	7	1	3	4	5	8	7
2003	1						2	3	3	3	3	1	8		2	3	2	5	1	5	6
2004							2	9		2		3	12		4	5	4	2	6	14	21
2005	1		1	1		2		10		4	2	2	15		1	5	7	5	9	11	19
2006	2		1			4		9		2	2	5	17		7	4	10	9	11	21	27
2007	3		2	2		1	3	6	1	7		5	27		10	11	6	12	12	10	25
2008	3							5		5	6	6	19		4	9	3	4	6	13	28
2009		1	1			2		4		5	2	5	9		3	5	2		4	12	22
2010	1		1					9	4	4	1	3	23		2	3	3	3	6	9	21
2011	2	2	1			2	1	14	1	2	2	6	19		2	6	4	1	7	6	24
2012	2		1			1		20	1	4		4	19		6	4	4	4	6	8	36
2013	2		4				1	10		2	1	7	25		4	9	3	6	11	7	27
N	23	5	19	6	3	15	15	132	14	59	24	66	312	2	89	121	80	87	139	247	381

Year	SIC Major group																						
	29	30	31	32	33	34	35	36	37	38	39	40	41	42	44	45	46	47	48	49	50	51
1990		1	2	4	8	13	15	16	7	8	5		1	3		7		2	4	3	9	2
1991		5		2	9	6	17	11	11	10	5			2	1	2	1	1	2	1	5	16
1992		8		4	8	6	20	20	4	10	6	2		3		2			6	3	5	8
1993		6	2	1	2	5	16	12	8	9	2			1	1	1		1	8	1	10	7
1994		3			5	7	15	8	5	9	3			3	2			1	6		13	12
1995	1	5	1	2	10	10	14	14	7	10	7			2		1			6	1	10	9
1996		4	1	1	1	3	16	13	6	10	7			1	2	1		2	7	3	10	3
1997		6	1	1	7	8	5	16	8	10	8	2		3				1	10		10	6
1998	1	9	2	3	2	5	12	14	9	7	4		1	7	1	3		3	5	2	11	8
1999		7	1	2	5	7	15	11	8	7	8			2		2		2	6	3	9	3
2000		17		2	4	11	28	24	14	15	10		2	7		2		1	15	4	18	7
2001		5			4	9	7	7	5	5	2		1	3		3			8	1	9	2
2002		2		2	2	6	23	9	8	4	9			2	1			3	7	6	6	3
2003		6		2	2	5	11	9	7	4	5		1	4		3		1	7	4	3	6
2004	1	7	1	4	6	13	17	16	15	17	6		1	3	1	1		1	6	9	11	6
2005	1	17	2	6	9	19	21	20	19	17	7		1	5	1	4		2	12	15	17	10
2006	1	14	1	8	14	39	41	37	21	19	9	1	1	11	3	2		3	20	11	27	8
2007		26	3	8	12	18	50	24	23	30	13	1	1	13	1	10		3	16	12	26	9
2008	3	11	2	1	9	10	31	19	12	13	10			15	1	5	1	4	7	8	18	14
2009		7	2	1	3	4	13	12	9	9	2			7		1		1	5	4	9	7
2010	1	13	1	2	7	16	29	26	14	18	5			5	1	3			7	13	23	10
2011		9	1	9	9	25	19	16	13	26	7		4	9	3	4		6	10	7	21	5
2012	3	19	3	5	12	32	42	23	24	23	14		1	18	2	4		5	11	9	25	8
2013	2	12	3	5	5	25	29	20	13	24	12		1	5		3		5	6	18	17	5
N	14	219	29	69	155	302	506	397	270	314	166	6	15	134	21	64	2	48	197	138	322	174

Year	52	53	54	55	56	57	58	59	60	61	62	63	64	65	67	70	72	73	75	76	78	79
1990	2	4	3	1	3	1	2	2	8	3	5	6	2	5	5	3		20	3			3
1991		1	4		1	2	1	4	1	5	4	3	2	4	4	2	2	22				1
1992		2	5	2	4	4	5	7	8	7	7	1	4	3	4	1		21			2	2
1993		1	4	1		1	4	4	4	4	5	5	2	2	4	1	1	19	1		1	2
1994	1		2	2	1	2	9	3	2	3	4	3		1	4	1	1	24	3	1		2
1995	3	1	3	2	2	1	9	8	5	5	4	2	2	1	4		2	21			2	7
1996		2		1	2	3	8	5	4	3	5	1		4	4		1	26	3		1	2
1997	2	1	2		4	3	8	4			2	4	1	6	7	1		28	1		1	1
1998	2	1		1	4	1	9	4	4	1	2	1		1	3	1	2	15	1		1	
1999		1	2		1	3	8	4	1	4	2	4	3	3	7		3	33	1		1	1
2000		1	1	2	1	1	9	12	2	5	2	7	2	7	7	3	1	59	1		1	4
2001	1		2	2	1	1	6	4	1	2	5	4	2	4	5	4		41				2
2002	1				1	1	5	12	2	3	7		2	3	5		1	45	2		2	3
2003	1		1	1	1		6	5	3	3	4	2	2	3	6	1		28	1		1	1
2004	2	3	3	1	1	2	11	4	2	3	11	1	6	4	11	5	3	60	1		2	2
2005	2	3	1	4	7	3	15	11	3	2	9	6	8	8	9	7		84	3	1	5	5
2006	3	1	5	2	7	3	22	11	6	6	11	11	2	6	22	16	4	97	4	4	3	6
2007	1	3	4	2	7	9	18	10	5	11	14	12	4	2	14	6	4	114	3	2	4	5
2008		1	6	1	4	3	10	10	3	6	11	1	7	4	13	1	5	99	4		5	6
2009			2	1	1		3	7	2	1	7	1	1	6	7	2	1	63	1		1	4
2010			2	1	6	2	12	7	4	7	7	2	3	2	8	9	3	104	4		2	4
2011		5	4	2	4	2	12	7	4	6	11	4	1	13	14	6	4	106	6	1	2	3
2012	1	1	3	5	5		15	10	2	11	18	6	8	6	7	7	1	110	4	3	3	4
2013		2	5	2	4	2	10	4		8	11	4	16	18	11	6	5	123	4	1	2	5
N	22	34	64	36	72	50	217	159	76	109	168	91	80	116	185	83	44	1362	51	13	44	75

SIC Major group

Year	SIC Major group											Total Transaction
	80	81	82	83	84	86	87	89	94	95	96	
1990	3	1	1				4					254
1991	7						10	1		1		285
1992	5		1				12			1		234
1993	5						9					231
1994	4						10					269
1995	6						7					238
1996	3				1		15					242
1997	10		2				10					220
1998	7		1	1			4	1				266
1999	13		6				14					420
2000	7	1	1	1			20					229
2001	12		1			1	16					251
2002	3		2				8					215
2003	2		2				12					395
2004	10	1	2				16		1			555
2005	17	1	8	1			36	1				745
2006	26		11	3			31			1		775
2007	27		7	3			36	1		3		566
2008	16		10	4		1	33	1			1	323
2009	9		6	1			20	1			1	543
2010	27		4	2	1		30	1	1	1		587
2011	26	2	8	2			27					726
2012	41		8	3		2	39					641
2013	27		4	1		1	33	2		1		
N	313	6	85	23	2	5	452	8	2	8	2	9458

Table B.2: The average leverage [total asset-weighted] categorized by industry during 1990to 2013

year	SIC Major group													
	1	2	7	8	9	10	12	13	14	15	16	17	20	21
1990	0.269	0.547	0.612	0.065	0.240	0.239	0.306	0.298	0.319	0.508	0.210	0.413	0.348	0.242
1991	0.345	0.795	0.289	0.072	0.357	0.242	0.332	0.313	0.336	0.528	0.243	0.271	0.321	0.211
1992	0.386	0.862	0.263	0.078	0.315	0.220	0.372	0.293	0.361	0.491	0.272	0.414	0.325	0.234
1993	0.399	0.533	0.233	0.096	0.350	0.200	0.296	0.288	0.374	0.453	0.240	0.442	0.305	0.213
1994	0.407	0.491	0.308	0.105	0.355	0.186	0.461	0.276	0.331	0.453	0.268	0.301	0.306	0.200
1995	0.397	0.432	0.210	0.589	0.351	0.222	0.468	0.271	0.303	0.465	0.222	0.282	0.295	0.188
1996	0.366	0.355	0.352	0.478	0.351	0.243	0.462	0.247	0.315	0.441	0.134	0.264	0.300	0.175
1997	0.267	0.366	0.373	0.629	0.349	0.272	0.336	0.264	0.221	0.445	0.141	0.231	0.291	0.190
1998	0.374	0.392	0.367	0.593	0.256	0.262	0.354	0.333	0.246	0.436	0.140	0.306	0.331	0.329
1999	0.362	0.530	0.383	0.588	0.340	0.214	0.356	0.308	0.288	0.431	0.188	0.279	0.323	0.283
2000	0.253	0.493	0.651	0.660	0.308	0.275	0.329	0.268	0.401	0.445	0.204	0.295	0.351	0.353
2001	0.215	0.546	0.678	0.781	0.243	0.279	0.291	0.303	0.373	0.458	0.164	0.244	0.357	0.293
2002	0.220	0.489	0.619	0.885	0.235	0.264	0.288	0.310	0.367	0.441	0.219	0.210	0.345	0.322
2003	0.243	0.302	0.481	0.999	0.235	0.236	0.280	0.278	0.362	0.426	0.214	0.209	0.334	0.337
2004	0.241	0.312	0.448	1.309	0.000	0.191	0.280	0.234	0.316	0.415	0.167	0.242	0.308	0.312
2005	0.242	0.403	0.430	0.818	0.003	0.192	0.301	0.203	0.301	0.327	0.143	0.274	0.295	0.290
2006	0.246	0.352	0.351	0.106	0.000	0.179	0.295	0.230	0.310	0.369	0.138	0.225	0.286	0.243
2007	0.205	0.228	0.383	0.172		0.271	0.290	0.235	0.400	0.408	0.086	0.216	0.302	0.283
2008	0.188	0.187	0.345	0.167		0.264	0.260	0.263	0.377	0.448	0.097	0.074	0.347	0.366
2009	0.159	0.154	0.314	0.170		0.209	0.267	0.256	0.307	0.440	0.097	0.067	0.298	0.376
2010	0.166	0.135	0.290	0.214		0.164	0.272	0.247	0.305	0.435	0.122	0.049	0.295	0.364
2011	0.157	0.088	0.294	0.199		0.167	0.312	0.255	0.302	0.442	0.159	0.045	0.291	0.389
2012	0.154	0.076	0.286	0.164		0.208	0.349	0.282	0.268	0.440	0.165	0.066	0.313	0.429
2013	0.128	0.063	0.264	0.243		0.247	0.410	0.287	0.266	0.419	0.173	0.098	0.309	0.484

year	SIC Major group													
---	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1990	0.455	0.376	0.372	0.325	0.392	0.265	0.259	0.177	0.390	0.201	0.482	0.227	0.326	0.279
1991	0.446	0.341	0.359	0.296	0.378	0.256	0.243	0.193	0.344	0.166	0.450	0.238	0.307	0.281
1992	0.383	0.364	0.370	0.336	0.369	0.227	0.238	0.203	0.326	0.135	0.456	0.269	0.311	0.277
1993	0.399	0.313	0.428	0.287	0.389	0.245	0.215	0.198	0.286	0.327	0.386	0.266	0.301	0.248
1994	0.389	0.253	0.386	0.258	0.379	0.279	0.223	0.205	0.267	0.387	0.397	0.261	0.293	0.214
1995	0.415	0.250	0.398	0.262	0.362	0.307	0.234	0.187	0.284	0.270	0.379	0.238	0.321	0.246
1996	0.383	0.265	0.405	0.258	0.369	0.312	0.225	0.172	0.306	0.222	0.390	0.248	0.314	0.239
1997	0.432	0.283	0.394	0.251	0.385	0.318	0.239	0.181	0.312	0.175	0.383	0.258	0.306	0.242
1998	0.439	0.319	0.396	0.276	0.386	0.346	0.250	0.201	0.358	0.275	0.390	0.278	0.355	0.253
1999	0.463	0.408	0.366	0.293	0.380	0.341	0.259	0.208	0.405	0.162	0.377	0.279	0.395	0.245
2000	0.484	0.402	0.369	0.276	0.404	0.326	0.276	0.173	0.404	0.189	0.373	0.291	0.424	0.237
2001	0.508	0.379	0.380	0.265	0.386	0.341	0.274	0.178	0.388	0.222	0.346	0.292	0.424	0.247
2002	0.373	0.337	0.437	0.246	0.367	0.343	0.267	0.178	0.371	0.220	0.344	0.264	0.401	0.232
2003	0.347	0.291	0.408	0.263	0.357	0.348	0.247	0.162	0.355	0.231	0.322	0.268	0.379	0.215
2004	0.272	0.273	0.337	0.267	0.327	0.328	0.236	0.139	0.335	0.116	0.303	0.213	0.356	0.206
2005	0.336	0.242	0.327	0.219	0.336	0.322	0.228	0.135	0.322	0.117	0.316	0.213	0.346	0.189
2006	0.324	0.211	0.339	0.246	0.312	0.394	0.216	0.132	0.362	0.125	0.335	0.202	0.351	0.192
2007	0.382	0.209	0.359	0.229	0.336	0.422	0.229	0.135	0.326	0.025	0.351	0.234	0.328	0.195
2008	0.433	0.205	0.392	0.256	0.411	0.381	0.253	0.147	0.329	0.042	0.405	0.283	0.342	0.223
2009	0.406	0.192	0.443	0.204	0.336	0.351	0.253	0.171	0.308	0.021	0.358	0.253	0.325	0.212
2010	0.389	0.185	0.424	0.181	0.317	0.325	0.243	0.158	0.370	0.063	0.360	0.267	0.320	0.204
2011	0.367	0.189	0.357	0.195	0.312	0.280	0.249	0.153	0.345	0.072	0.366	0.282	0.318	0.210
2012	0.310	0.173	0.354	0.217	0.314	0.260	0.256	0.155	0.315	0.153	0.372	0.295	0.316	0.220
2013	0.320	0.188	0.361	0.207	0.311	0.278	0.256	0.171	0.320	0.124	0.373	0.304	0.339	0.222

year	SIC Major group													
	36	37	38	39	40	41	42	44	45	46	47	48	49	50
1990	0.279	0.423	0.276	0.284	0.244	0.352	0.211	0.381	0.353	0.509	0.433	0.363	0.478	0.512
1991	0.276	0.417	0.250	0.249	0.250	0.450	0.194	0.369	0.388	0.500	0.437	0.358	0.468	0.499
1992	0.275	0.399	0.225	0.228	0.233	0.389	0.180	0.400	0.435	0.489	0.451	0.338	0.447	0.504
1993	0.259	0.388	0.216	0.215	0.223	0.396	0.183	0.375	0.444	0.477	0.437	0.325	0.474	0.478
1994	0.241	0.386	0.178	0.218	0.200	0.395	0.189	0.406	0.455	0.448	0.398	0.326	0.453	0.474
1995	0.225	0.384	0.193	0.253	0.216	0.385	0.178	0.393	0.405	0.442	0.384	0.380	0.449	0.414
1996	0.216	0.387	0.206	0.239	0.206	0.382	0.174	0.378	0.337	0.407	0.383	0.352	0.477	0.404
1997	0.205	0.403	0.226	0.258	0.269	0.384	0.157	0.367	0.315	0.436	0.384	0.358	0.499	0.380
1998	0.210	0.384	0.238	0.344	0.273	0.398	0.153	0.359	0.319	0.371	0.389	0.339	0.558	0.403
1999	0.197	0.401	0.234	0.353	0.268	0.359	0.149	0.352	0.322	0.385	0.445	0.306	0.585	0.389
2000	0.179	0.414	0.232	0.288	0.267	0.457	0.196	0.386	0.320	0.369	0.499	0.336	0.576	0.373
2001	0.253	0.424	0.233	0.237	0.254	0.290	0.225	0.404	0.370	0.289	0.488	0.337	0.595	0.360
2002	0.219	0.422	0.216	0.210	0.247	0.283	0.208	0.416	0.336	0.321	0.425	0.350	0.594	0.372
2003	0.188	0.441	0.201	0.197	0.233	0.329	0.220	0.430	0.361	0.351	0.304	0.326	0.577	0.354
2004	0.163	0.440	0.169	0.192	0.198	0.292	0.169	0.399	0.352	0.363	0.169	0.311	0.575	0.322
2005	0.150	0.431	0.177	0.215	0.204	0.254	0.141	0.377	0.311	0.328	0.177	0.311	0.505	0.292
2006	0.145	0.371	0.181	0.175	0.187	0.262	0.172	0.382	0.343	0.335	0.145	0.325	0.478	0.282
2007	0.150	0.367	0.201	0.176	0.205	0.309	0.272	0.417	0.306	0.284	0.194	0.322	0.507	0.281
2008	0.185	0.417	0.213	0.190	0.220	0.282	0.330	0.447	0.368	0.375	0.280	0.355	0.478	0.328
2009	0.175	0.378	0.204	0.173	0.223	0.217	0.343	0.427	0.379	0.371	0.249	0.347	0.463	0.310
2010	0.159	0.343	0.206	0.181	0.172	0.196	0.368	0.430	0.348	0.335	0.349	0.327	0.455	0.299
2011	0.176	0.334	0.222	0.201	0.171	0.180	0.410	0.429	0.325	0.337	0.343	0.328	0.460	0.305
2012	0.191	0.344	0.227	0.191	0.179	0.173	0.433	0.416	0.324	0.294	0.235	0.340	0.453	0.328
2013	0.187	0.348	0.213	0.196	0.184	0.170	0.434	0.405	0.320	0.303	0.269	0.359	0.475	0.304

year	SIC Major group													
	51	52	53	54	55	56	57	58	59	70	72	73	75	76
1990	0.339	0.303	0.339	0.471	0.331	0.229	0.338	0.475	0.315	0.349	0.259	0.282	0.527	0.041
1991	0.319	0.244	0.336	0.457	0.268	0.211	0.290	0.435	0.261	0.298	0.256	0.312	0.489	0.056
1992	0.288	0.281	0.271	0.474	0.227	0.182	0.244	0.402	0.250	0.306	0.225	0.336	0.490	0.159
1993	0.255	0.283	0.261	0.448	0.185	0.171	0.227	0.395	0.258	0.338	0.202	0.316	0.518	0.211
1994	0.263	0.276	0.261	0.428	0.228	0.167	0.224	0.394	0.261	0.320	0.258	0.302	0.553	0.246
1995	0.240	0.263	0.367	0.425	0.287	0.200	0.253	0.367	0.268	0.365	0.258	0.273	0.582	0.199
1996	0.262	0.252	0.349	0.425	0.366	0.171	0.253	0.345	0.260	0.363	0.288	0.288	0.550	0.315
1997	0.291	0.241	0.325	0.415	0.434	0.200	0.233	0.394	0.253	0.366	0.307	0.287	0.551	0.346
1998	0.295	0.242	0.315	0.416	0.418	0.199	0.169	0.403	0.290	0.461	0.352	0.275	0.602	0.828
1999	0.290	0.134	0.318	0.408	0.405	0.183	0.160	0.398	0.298	0.455	0.282	0.246	0.595	0.588
2000	0.237	0.159	0.314	0.377	0.446	0.189	0.138	0.404	0.287	0.409	0.284	0.210	0.541	0.483
2001	0.267	0.151	0.317	0.371	0.435	0.190	0.121	0.348	0.254	0.393	0.284	0.235	0.546	0.584
2002	0.250	0.143	0.320	0.380	0.424	0.185	0.104	0.337	0.225	0.379	0.254	0.226	0.554	0.675
2003	0.231	0.106	0.247	0.351	0.437	0.164	0.081	0.332	0.235	0.387	0.258	0.209	0.529	0.344
2004	0.235	0.103	0.230	0.332	0.430	0.155	0.059	0.322	0.196	0.358	0.251	0.191	0.496	
2005	0.218	0.124	0.227	0.344	0.406	0.146	0.097	0.320	0.214	0.317	0.249	0.194	0.492	
2006	0.244	0.197	0.231	0.331	0.425	0.121	0.092	0.327	0.239	0.349	0.286	0.202	0.556	
2007	0.245	0.248	0.270	0.328	0.417	0.174	0.084	0.401	0.270	0.425	0.296	0.240	0.564	
2008	0.276	0.231	0.273	0.323	0.438	0.186	0.125	0.416	0.296	0.422	0.319	0.262	0.614	
2009	0.265	0.189	0.250	0.310	0.380	0.159	0.104	0.387	0.273	0.341	0.299	0.248	0.572	
2010	0.267	0.193	0.260	0.296	0.439	0.141	0.099	0.375	0.256	0.357	0.260	0.244	0.574	
2011	0.251	0.213	0.266	0.299	0.425	0.235	0.112	0.364	0.260	0.445	0.248	0.229	0.578	
2012	0.270	0.222	0.259	0.287	0.452	0.220	0.115	0.379	0.253	0.446	0.304	0.235	0.584	
2013	0.305	0.275	0.274	0.269	0.493	0.203	0.109	0.363	0.252	0.437	0.318	0.238	0.583	

year	SIC Major group									
	78	79	80	81	82	83	86	87	89	99
1990	0.361	0.510	0.477		0.218	0.521		0.408		0.552
1991	0.295	0.491	0.433		0.161	0.660		0.372		0.555
1992	0.324	0.491	0.381		0.132	0.322		0.295		0.579
1993	0.391	0.469	0.378	0.329	0.121	0.506		0.210		0.562
1994	0.484	0.454	0.393	0.165	0.119	0.479		0.230		0.329
1995	0.447	0.468	0.401	0.062	0.102	0.462		0.201		0.317
1996	0.381	0.421	0.394	0.052	0.109	0.494		0.179		0.282
1997	0.373	0.434	0.425	0.020	0.162	0.554		0.162		0.286
1998	0.358	0.486	0.435	0.019	0.159	0.598	0.000	0.194		0.281
1999	0.364	0.518	0.472	0.009	0.218	0.645	0.002	0.218		0.299
2000	0.340	0.547	0.388	0.060	0.205	0.694	0.055	0.182	0.025	0.271
2001	0.280	0.531	0.364	0.040	0.176	0.736	0.298	0.193	0.096	0.328
2002	0.265	0.534	0.360	0.033	0.125	0.703	0.465	0.198	0.000	0.329
2003	0.242	0.541	0.382	0.320	0.133	0.498		0.198		0.308
2004	0.371	0.486	0.403	0.235	0.102	0.527		0.178	0.074	0.318
2005	0.382	0.533	0.411	0.202	0.088	0.460		0.141	0.015	0.327
2006	0.376	0.537	0.555	0.198	0.099	0.330		0.192	0.002	0.360
2007	0.410	0.517	0.600	0.185	0.078	0.371		0.239		0.369
2008	0.479	0.605	0.579	0.155	0.159	0.567		0.242		0.391
2009	0.534	0.540	0.538	0.065	0.165	0.541		0.205		0.381
2010	0.426	0.536	0.557	0.006	0.134	0.546		0.191		0.357
2011	0.451	0.508	0.551	0.006	0.148	0.617		0.201		0.340
2012	0.430	0.561	0.558	0.003	0.177	0.717		0.231		0.317
2013	0.396	0.563	0.551		0.159	0.719		0.294		0.297

VITA

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