

**FINANCIAL CONTRACT'S STRUCTURAL SHIFT EVIDENCED BY AN EMPIRICAL  
EXPLORATION OF TEXTUAL CREDIT AGREEMENTS**

A Thesis

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of Cornell University

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by

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## ABSTRACT

This research is an empirical exploration of financial contract structure based on data collected from textual credit agreements. Credit agreement, as one of the most common forms of financial contracts, is the contractual agreement usually signed between a lender (in this case a bank) and a borrower (a corporate entity). The study deals with data exploration concerning the structure of credit agreements signed during 1996 – 2005 between banks and large, non-financial companies. Tables of contents in the agreements are converted into a structured dataset for descriptive discussions focusing on time-series patterns or changes. The analysis leads to an intriguing insight indicating the presence of a structural shift regarding the emphasis on specific subjects within a credit agreement, which lays a foundation for future studies regarding changes in contractual relationship overall and economic implication behind.

## BIOGRAPHICAL SKETCH

Kunkai (Kyle) Ye is a master student in applied economics in the Charles H. Dyson School of Applied Economics and Management at Cornell University. After graduating from Fudan University in Shanghai, China with a B.A. degree in English Language and Literature, Kyle was admitted to the MPS in Applied Behavioral Economics and Individual Choices in 2018 and lately chose to continue the pursuit of advanced academic degree in the MS AEM program, motivated and encouraged by faculty members in Dyson. His master thesis advisor is Professor Justin Murfin.

## ACKNOWLEDGMENTS

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Last but not the least, thank you Cornell for everything. I've received way more than I could have expected more when I received the admission letter 3 years ago. Thank you for the encouraging environment, fantastic professors and the talented peers. I feel so lucky for being able to see the most beautiful campus in the world for once in my life.

## 1. Introduction

A contract is a legally binding document between at least two parties that defines and governs the rights and duties of the parties to an agreement.<sup>1</sup> It is legally enforceable and typically involves the exchanges of goods and services. Interactions among corporates or individuals, whether business-related or not, have contractual relationships involved. The consideration of the network of contracts being the cornerstone of corporate entity lays the foundation for further study of the role of incentive in the contract (Jensen & Meckling 1976). For decades, rich and growing amount of research has been devoted to the ultimate goal – to develop the one theory or mathematical model for the contract mechanism to function under every circumstance. Theoretical development has thus been pushed forward by generations of economists to being as complete as what can be witnessed today. However, as evidenced by the annual review published by Robert and Sufi (2009), the rate of update among contract theories has always been ahead of empirical research. Statistical evidence was rarely applied in the process of elaboration regarding contractual research topics. The world of business is ever-changing by its nature, and it is doubtful that financial contract, as the anchor for almost every business activity, could remain as static as it was when the theories first came into place. In other words, the assumption that all possible divergences in business choices are predictable and can all be covered by a contract when it is initiated might be way too ambitious in the first place.

What might be a direction to explore is to apply empirical evidence to testify and to some extent modify existing models in order to be reflective and predictive of the actual business world. A blunt yet straightforward solution to the source of data for such effort is the text of contracts signed in circumstances that are as various as possible. Admittedly, technological limitations

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<sup>1</sup> Ryan, Fergus (2006). Round Hall nutshells Contract Law. Thomson Round Hall. p. 1.

have in the past held responsible for slowing the process of empirical research down in terms of data collection, analysis or modeling, widening the gap between theory and practice. Usual and normal steps today in an empirical research, such as applying script with repetitive actions to scrap the data from the web, processing data into machine-readable format and storing them, were major undertakings that could have potentially terminated an idea at its early stage.

Fortunately for our generation, things have changed. Both hardware and software can store and process exponentially more data than before, enabling applications of sophisticated algorithms on megabit amount of data. With filings and contracts digitalized, records have been kept for every deal made at any time, facilitating the conversion from unstructured data to machine-readable ones. And here comes the hope of contributing statistical evidence to contractual theories.

This paper is an unprecedented trial to explore a reproducible way to describe credit agreement by using a few key quantitative and qualitative summary statistics, and to further examine time-series patterns across the sampling period. Credit agreement, as one of the most common forms of financial contracts, is the contractual agreement usually signed between a lender (in this case a bank) and a borrower (a corporate entity). Normally, credit agreement covers informative items including parties, loan size and covenant along with executive items such as like effective date, repayment, events of default and so on. The study is based on textual credit agreement attached in electronic filings of US publicly traded companies. In the establishment of the dataset, tables of contents in textual agreements are extracted and further processed into variables indicating the number of pages, the number of words, the weight each section accounts for in a contract and so forth. With units of observation labeled with respective settlement dates, the time-series dataset enables data visualization during the sampling period to examine the

existence of potential patterns and changes, as an effort to produce insights for future studies. Though the research is descriptive and exploratory, there is an underlying hypothesis that financial contract, as a form of legal document, is not likely to experience large changes in structure, content or format. The exploration has yet yielded an intriguing result in return. The length of credit agreements, quantified in pages, remains relatively stable across the sampling period. Meanwhile, the internal structure of credit agreement has demonstrated a significant shift of focus in subject evidenced by the changes in the weight of consistent sections accounting for in a contract.

## **2. Data Source & Description:**

The data analysis is based on a currently available set of textual financial contracts. The raw data – 3,720 copies of textual credit agreements – were originally collected by Professor Amir Sufi and used in the prior research (Nini, Smith and Sufi 2007), though with a purpose differs from this research. In their data collection process, Reuters LPC’s *DealScan* and S&P’s *Compustat* are used as databases to locate loan deals happening during the years 1996 through 2005 (1996 was the year when SEC starts to make the electronic filing a requirement), among public non-financial companies. The search process generates 9,580 deals as a result, within which 40% could be matched on *EDGAR* with textual filings, leading to a sample of 3,720 credit agreements initiated by 1,931 companies as the borrower. The textual files could be directly downloaded from Professor Sufi’s personal webpage<sup>2</sup>. Since the purpose of this study is about the structure of the contract, the table of content is used to maximize the amount of information collected in the limited time. Another source of data involved as references in this research is a dataset established by Professor Sufi as well, for the research regarding control rights and capital structure (Robert and Sufi 2009). The data contains several variables of interest, including details of the deal such as date, company

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<sup>2</sup> Professor Sufi’s personal website: <https://amirsufi.net/index.html>; the link to directly download textual contracts: <https://amirsufi.net/data-and-appendices/publiccontracts.zip>



names and company's violation history regarding credit agreement. The deal-related variables were generated from the above two databases, while the violation record is collected via keyword searching. The Sufi's dataset is leveraged in our dataset construction process for cross-validation and variable complementation.

The tool used to construct the dataset for this research is *Python (version 3.7.4)*, with pre-installed packages such as *pandas*, *numpy*, *matplotlib*, *re*. The process can be summarized as the following 3 steps:

- 1) browsing through textual files with a focus on the table of contents, in search for potential variables of interest that can be used to categorize the contract;
- 2) observe and record patterns to locate and extract the information needed;
- 3) construct a .csv file by converting these variables into spreadsheet format;
- 4) cross-validate and merge with Sufi's data

During the 1) step, possible indicators for contract are observed and categorized into quantitative and qualitative groups. For quantitative indicators, tables of contents (for most of the files) is able to provide information regarding page length, the number of sections (level 1 header), the number of titles (level 2 header, more detailed). Though it's not included in the table of content part, the vocabulary volume (the number of words, including numbers) of the entire agreement is collected as a quantitative measurement. For qualitative indicators, headers of section and title are recorded as direct indicators for information distribution within the contract. Figure 1 provides a subset of a typical textual credit agreement.

**Figure 1 Example of Sample Credit Agreement**

CREDIT AGREEMENT 3/22/00		Exhibit 10.28
[5-Year Agreement]		EXECUTION COPY
=====		
CREDIT AGREEMENT		
Dated as of March 22, 2000		
among		
ALBERTSON'S, INC.,		
BANK OF AMERICA, N.A.		
as Administrative Agent,		
WACHOVIA BANK, N.A.		
as Syndication Agent,		
BANK ONE, NA,		
as Documentation Agent,		
FIRST UNION NATIONAL BANK,		
UNION BANK OF CALIFORNIA, N.A.,		
U.S. BANK NATIONAL ASSOCIATION, and		
WELLS FARGO BANK, N.A.,		
as Senior Managing Agents,		
FIRST SECURITY BANK, N.A. and		
THE NORTHERN TRUST COMPANY,		
as Managing Agent		
and		
THE OTHER FINANCIAL INSTITUTIONS PARTY HERETO		
Arranged by		
Banc of America Securities LLC,		
Sole Lead Arranger		
and Sole Book Manager		
=====		
TABLE OF CONTENTS		
Section		Page
ARTICLE I DEFINITIONS 1		
1.01	Certain Defined Terms.....	1
1.02	Other Interpretive Provisions.....	14
1.03	Accounting Principles.....	15
ARTICLE II THE CREDITS.....		16
2.01	Amounts and Terms of Commitments.....	16
2.02	Loan Accounts.....	16
2.03	Procedure for Committed Borrowing.....	16
2.04	Conversion and Continuation Elections for Committed Borrowings.....	17
2.05	Bid Borrowings.....	19
2.06	Procedure for Bid Borrowings.....	19
2.07	Swingline Loans.....	22
2.08	Voluntary Termination or Reduction of Commitments.....	24
2.09	Optional Prepayments.....	25
2.10	Repayment.....	25
2.11	Interest.....	26
2.12	Fees.....	27
2.13	Computation of Fees and Interest.....	27
2.14	Payments by the Company.....	28
2.15	Payments by the Banks to the Agent.....	28
2.16	Sharing of Payments, Etc.....	29
2.17	Revolving Termination Date Extensions.....	30
2.18	Optional Increase in Commitments.....	30

In step 2) and 3), through overview of the textual contracts, most of the table of contents (roughly 80%) follows the format of “section – index – header – starting page number” with a series of distinct punctuation ‘...’ in the sentence, and the patterns is thus utilized in the *Python RE* command to locate the start and the end of the table of content in a contract, and the position of each information is used to extract respective information. This process has output a data frame with *file ID*, *time*, *word count of full text*, *section index*, *section header*, *title index*, *title header*, *part page length* (calculated by end page minus start page) and *full page length* (calculated by

aggregating *part page length* in each contract) as the variable of interest in a long format. And then in step 4), the data frame is compared with Sufi's data for cross-validation regarding the *time* variable. Three variables of interest in Sufi's data regarding company name, identifier on *Compustat* ("gvkey") and a dummy variable indicating whether a covenant violation took place the year before, have been merged to the data frame as control variables.

During this process, around 15% of the textual files are skipped due to extreme level of unstructuredness which generating missing values or outliers in the process. Potential biases could be induced by dropping these files. The cleaning process is on-going during the drafting of this research paper, and the dataset along with summary statistics is updated once it's finished. Meanwhile, the process has found that other features in Sufi's data could potentially be ideal candidates for control variables. These variables could be included in the future for other research focuses.

The completed dataset is in the long format containing all the variables of interest. A subset including key variables of interest is attached in Table 1. The full dataset expands each textual file to the extent of title (sub-section of the minimal group of text in this case), resulting in 391,995 units of observation in total, with each file expanding into around 100 rows of data.

### **3. General Summary Statistics**

Table 2 presents variables of interests and respective summary statistics. The summary statistics output from the above cleaning process are categorized as general statistics and structural statistics. The general statistics contain information regarding the entire contract, while the structural group zooms in to a more specific level to analyze the distribution and the content of information in a contract.

**Table 2 General Summary Statistics, by year**

<b>year</b>	<b>Number of Agreements</b>	<b>Word Count<sup>3</sup></b>		<b>Page Length<sup>4</sup></b>		<b>Number of Sections</b>		<b>Number of Titles</b>	
		Mean	S.E. <sup>5</sup>	Mean	S.E.	Mean	S.E.	Mean	S.E.
<b>1996</b>	94	42889.17	2543.39	155.27	7.94	10.57	0.18	42.54	3.46
<b>1997</b>	361	39794.06	1077.09	146.17	2.3	11.48	0.23	38.95	1.73
<b>1998</b>	339	44950.53	2714.14	148.61	3.73	11.47	0.36	39.44	1.62
<b>1999</b>	333	43082.12	1171.12	138.2	2.25	10.98	0.18	35.51	1.78
<b>2000</b>	298	46360.53	1786.73	141.43	2.69	11.46	0.3	37.25	1.9
<b>2001</b>	305	47979.44	1602.52	146.34	3.15	11.05	0.18	35.57	1.61
<b>2002</b>	347	50093.75	1995.51	147.81	2.91	11.6	0.32	37.12	2
<b>2003</b>	334	52924.14	1901.05	149	3.1	11.23	0.15	37.22	1.72
<b>2004</b>	344	54408.35	2106.33	141.02	3.36	10.81	0.18	34.1	1.97
<b>2005</b>	239	97881.18	2500.34	136.75	5.14	10.35	0.14	33.64	4.68

<sup>3</sup> The count of words, including numbers

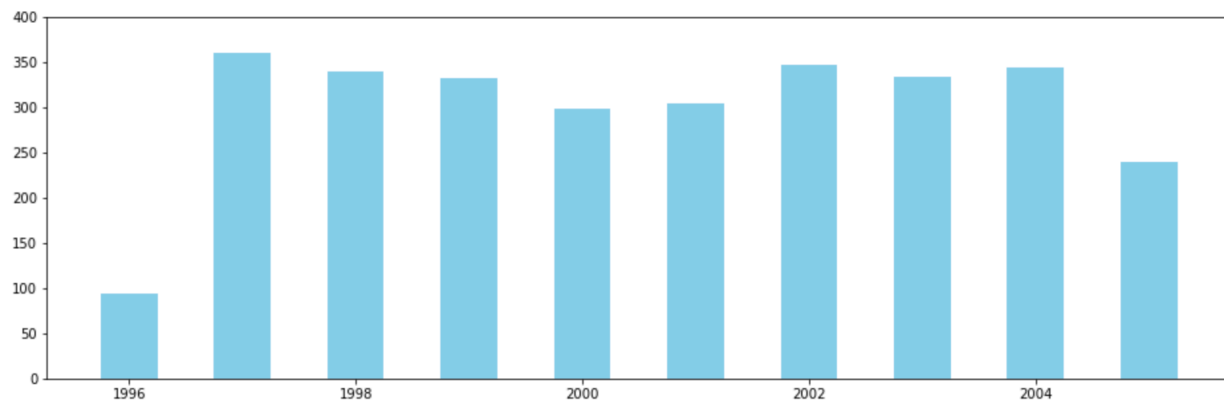
<sup>4</sup> The length of the entire contract in page

<sup>5</sup> Standard error

- **Sample Size**

Sorted by year, the sample size is a rough uniform distribution during 1997 to 2004, as presented in Figure 2. In 1996, only loan data in the last 3 months of the year is successfully collected. Aside from it, the time-series data is balanced with 12 months each year among all variables of interest between 1997 to 2005. The number of valid samples for analysis each year is around 250-350, if data in 1996 is ignored.

**Figure 2 Annual Aggregated Deals Amount**



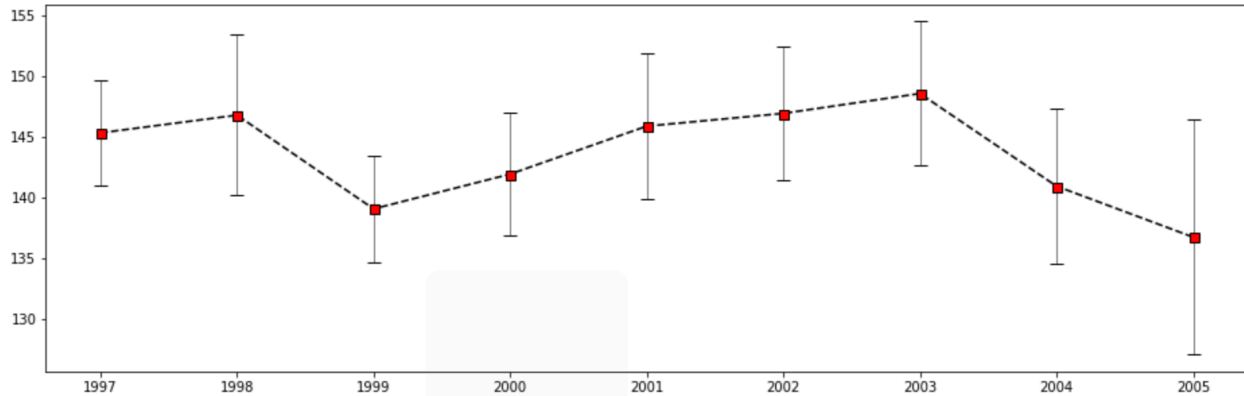
- **Page Length**

Figure 3 presents the trend for contract's page length. The average length of contracts, viewed annually, has witnessed a slight decline, with a range between 130 and 155 pages. When applied the 95% confidence interval, the decrease observed from eyeballing becomes insignificant. Based on the exploration, the conclusion is that the contract length is neither decreasing nor increasing significantly.<sup>6</sup>

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<sup>6</sup> Word count is also taken into consideration as an indicator for contract length. One would find the average number of words in a contract has been steadily increasing during the sampling period. The reason may be attributed to the appendix part. However, I have not been able to prove it due to the missing of page label in contract's appendices.

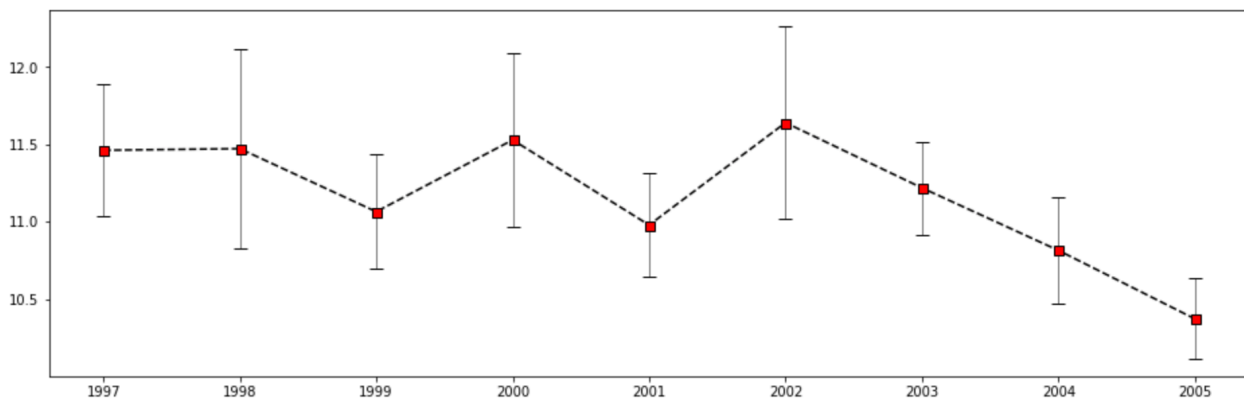
**Figure 3 Annual Average Page Length w. 95% Confidence Interval**



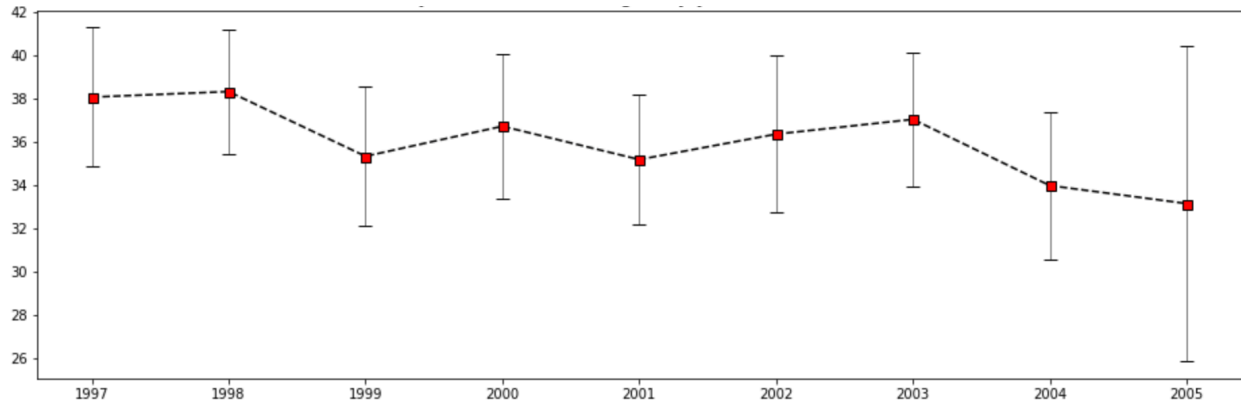
- **Sections & Titles**

Figure 4 and Figure 5 demonstrates the number of sections and titles averaged by year. A slight trend towards consolidation could be observed from the decrease in the number of sections. The annual mean has been between 10 to 12 during the sampling period and has exposed a slight decrease. Starting from 2003, the variances become smaller, which results in a significant decrease in the average number of sections in 2005 around 10%. For the number the titles, no significant difference has been observed.

**Figure 4 Annual Average No. of Sections w. 95% Confidence Interval**



**Figure 5 Annual Average No. of Titles w. 95% Confidence Interval**



Rules and regulations exist for the content necessary for a credit agreement to cover, and the regulations are relatively consistent across time. Therefore, the change in sections and titles could indicate the level of standardization of a contract. Here the observation indicates that contracts may be streamlined and standardized at the section level, while the more specific content still varies year by year.

Taken into consideration the above insight that the average contract length doesn't expose a significant trend downwards, the relatively significant decrease in the number of sections indicates that the weight, as measured by sectional page length divided by full contract length, should increase to make the content more concentrated into fewer sections across the sampling period. The hypothesized process of section length concentration potentially indicates that the structure of credit agreement is getting more standardized compared to it is before. If true, further effort is spent in figuring out specifically which sections or subject matters within the contract is getting lengthy across these years along with the economic reason behind them.

- **Within-Year Seasonality**

The data exploration also tests the within-year seasonality during the process, by averaging all the indicators mentioned above by month and visualizing the time-series trend with 95%

confidence interval. As much as ebbs and flows could be observed through eyeballing, the 95% intervals demonstrate barely statistical significance, which leads to the acceptance of the null hypothesis from now. The process of visualization could be found in the Appendix I.

#### **4. Within-Contract Structural Analysis**

- **Summary Statistic**

As an effort to further verify the within-contract shift of weight across sections, a new indicator is constructed referencing the idea of industry concentration ratio. In the research of industrial market, indicators such as CR4, HHI are used to quantify the level of concentration in the market and to some extent indicate the competitiveness within the market. The idea is referenced with contextual modifications in this study to observe the number of sections required to account for 80% of a contract length. The indicator is realized by calculating the weight of each section by dividing the sectional length by the length of contract, ranking the weight with descending order and taking the cumulative summation. By placing the limit of 80%, the process outputs the number of sections accounting 80% of the contract length. Table 3 presents the summary statistics of the indicator.



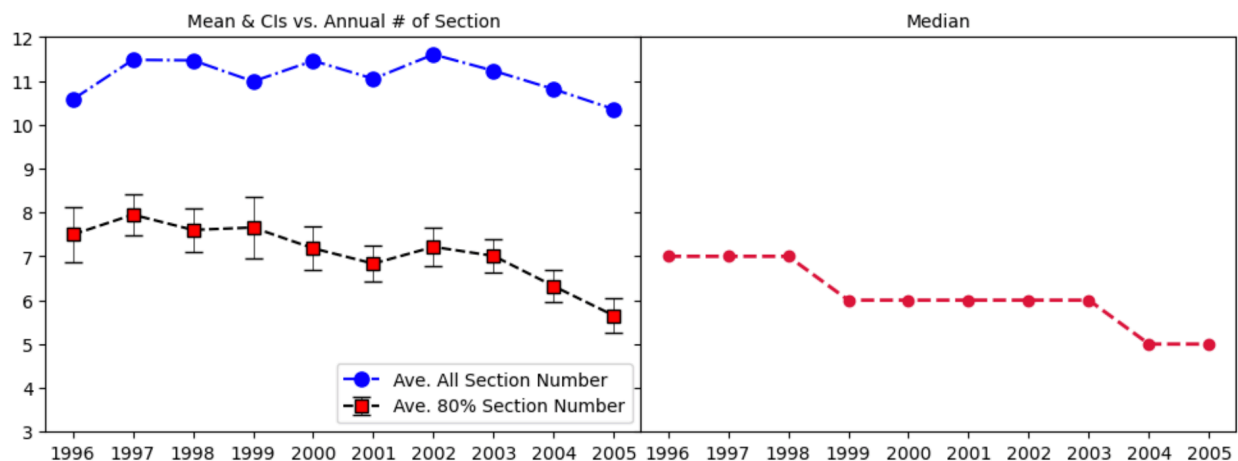
**Table 3 Summary Statistics of Weighty Sections**

<b>Year</b>	<b>The Number of Top-Rank Lengthy Sections Needed to Account for 80% Page Weight in a Contract<sup>7</sup></b>			
	<b>N</b>	<b>Mean</b>	<b>S.E.</b>	<b>Median</b>
<b>1996</b>	87	7.494252874	0.314436383	7
<b>1997</b>	346	7.947976879	0.237885036	7
<b>1998</b>	321	7.601246106	0.250057616	7
<b>1999</b>	320	7.65625	0.356425945	6
<b>2000</b>	287	7.181184669	0.250011047	6
<b>2001</b>	299	6.83277592	0.212186224	6
<b>2002</b>	331	7.214501511	0.219229598	6
<b>2003</b>	323	7.009287926	0.19652609	6
<b>2004</b>	326	6.319018405	0.189950991	5
<b>2005</b>	222	5.648648649	0.195887074	5

<sup>7</sup> Sections in this part is the top weighted ones accounting for 80% of contract weight. The process is done through: 1) calculate each section's weight by dividing sectional page length by full contract page length; 2) rank sectional weights with descending order; 3) take the cumulative summation; 4) remove the rest sections once the cumulative sum reach 0.8

By plotting the time-series chart in Figure 6, it's significant that the average number of sections required to account for 80% contract length decreases across the years, along with the median trending downwards from 7 to 5. Referenced by the time-series total number of sections, it's self-explanatory that fewer sections are needed to account for more weight. One can recall that in the analysis of general summary statistics, the section number decreases while the full length stays relatively unchanged, the decrease of this indicator further suggests that level of content concentration rises, which might be a sign that the contract is getting more standardized through structural consolidation.

**Figure 6 Visualization - Fewer Sections Needed to Account for 80% Contract Length**



- **Analysis of the Shift of Weight**

As a form of legal document, financial contract normally does not experience changes of structure or content to a large extent. However, alternation or shift of structural weight could potentially be the reflection or even the prediction for financial events or market expectations. More insights than the process of standardization could be inferred if the shift of length could be chased to specific sections or subject. A trial analysis is presented as followed.

A dataset is generated through aggregation of all the section headers that appear and their weights in the corresponding contract during the sampling period. This study selects 1997, 2004 as the 2 points of time for comparative observation. All section headers appear in these 2 years are collected along with respective values of weight.<sup>8</sup>

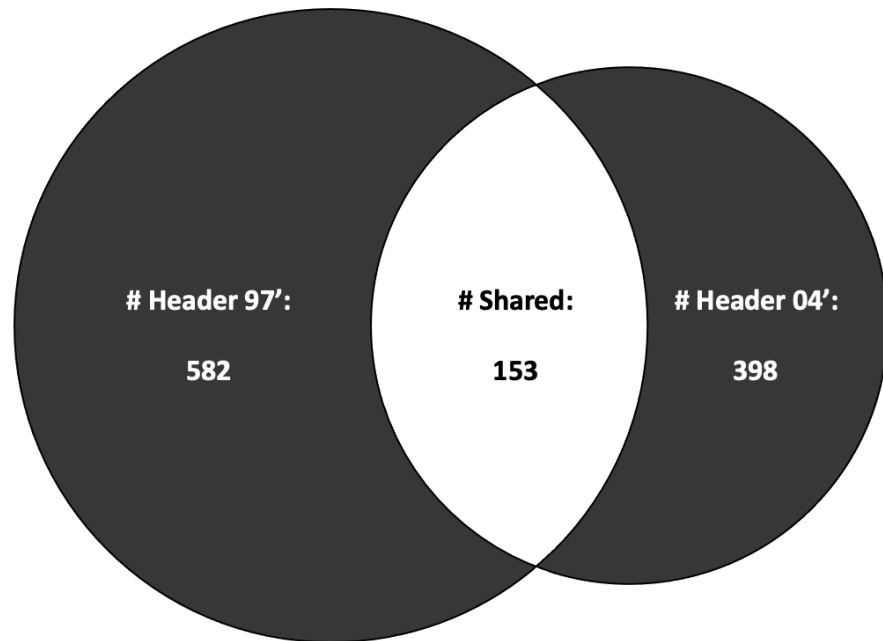
Through the process, an immediate observation is that even if the nature of legal document might inhibit large-scale changes, the codification for section name does generate randomness. This might not account for as a rebuttal for contract standardization but does generate difficulties for structural comparison. In order to make the contracts across 2 years comparable, an effort is spent on categorizing these sections using judgement call for now until a more authoritative reference could be found and utilized in the future.

Figure 7 indicates that there are 582 unique sections in 1997's contracts and 398 in 2004's, among which 153 of them appear in both year's contracts. Figure 8 presents sectional headers grouped into subjects. 26 subjects are unique to 1997 and 28 are unique to 2004, with 18 overlapping subjects. The analysis focuses in 2 aspects: 1) the study of weight shift among shared subjects, and 2) the removal/addition of unique section in each year. Due to the randomness in header codification mentioned above, the following part uses the categorized subject assigned to each section header to investigate the change in content.

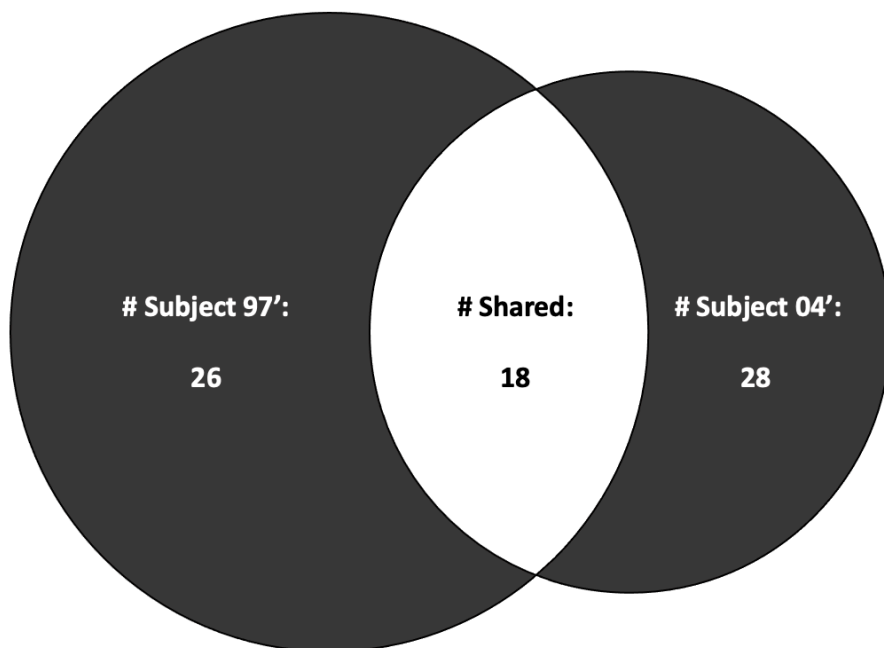
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<sup>8</sup> The 1996 data is ruled out due to incompleteness (only the deals in last 3 months are captured in the collection process) and the selection of 2004's data is based on roughly equalized contract sample size.

**Figure 7 Relationship b/t 97' Headers and 04' Headers**



**Figure 8 Relationship b/t 97' Subjects and 04' Subjects**



An insight worth noticing is that the level standardization does increase from 1997 to 2004. The sample size is around 350 for both years, while unique number of sections decreases around 20% (from 582 to 398), meaning that within a year, sectional headers are getting more similar and even identical across time.

Table 4 presents an example subset of how unstructured sectional headers are assigned with subject names that are commonly recognized as a part of content in credit agreement, and how each subject and each sectional header have changed in weight. Within a same subject, differences in weight (in percentage point) are averaged across different sectional headers in order to reduce the dimension of sectional header and to enable the following analysis to focus on subject.

**Table 4 Example of Structural Weight Shift From 1997 to 2004 (Subset)**

<b>Subject</b>	<b>Sectional Header</b>	<b>Sectional Weight in 1997, %</b>	<b>Sectional Weight in 2004, %</b>	<b>Difference in Pct. Point<sup>9</sup></b>
Condition	Conditions Precedent To The Closing Date	27.00	8.00	-19.00
	Conditions To Effectiveness And Lending	18.00	3.80	-14.20
	Conditions To Loans	12.00	2.00	-10.00
	General Terms And Conditions	15.00	11.00	-4.00
	Conditions To Loans And Letters Of Credit	5.50	2.00	-3.50
Credit General	The Facility	25.00	17.17	-7.83
	The Revolving Credit Facility	10.67	3.00	-7.67
	Loans And Notes	13.00	9.00	-4.00
	The Credit Facilities	13.80	10.00	-3.80
Covenant Borrower	Representations And Warranties Of The Borrowers	14.00	5.00	-9.00
Covenant	Covenants Of The Company	17.57	3.67	-13.90

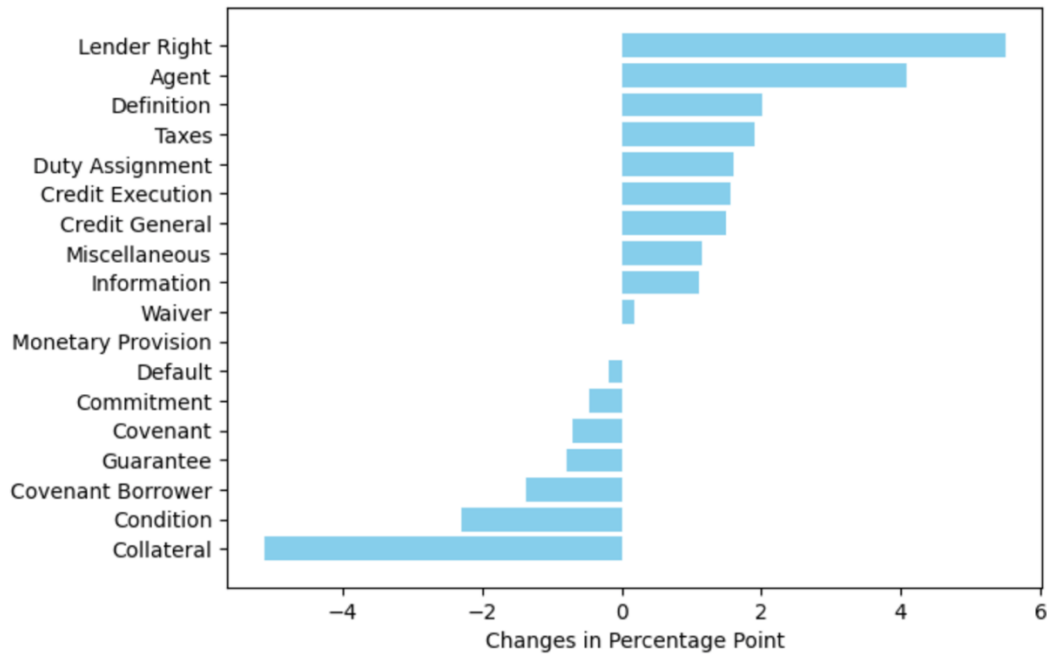
<sup>9</sup> The differences will be averaged out across different sectional headers of a same subject, to become the difference in weight for the subject. The table is only a subset, not a representation of all structural shift.

	Positive Covenants	14.00	8.50	-5.50
	Representations And Warranties Covenants	13.00	8.00	-5.00
Collateral	Collateral Reporting And Covenants	10.33	6.00	-4.33
Definition	Definitions And Construction	11.50	8.00	-3.50
Default	Events Of Default	4.89	1.58	-3.31

### 1) The Shift of Weight Among Shared Subjects

There are 153 shared section headers among these two years' contracts, which are grouped into 18 subjects. Among them, only those sections that exist in both years are preserved in order to achieve mutual exclusiveness. From the visualization in Figure 9, subjects such as "lender right", "agent", "duty assignment" increase about 12% in total, accounting for a large percentage of weight shift. By browsing through some of the sections specifying these subjects, they contain certain restrictions with regard to control right to the borrower company. If we consider that these subjects are usually associated with headers like "Commitment", "Covenant", it's tempted to infer that the contract is getting more specific and detailed to highlight debt holder's control right over the borrower company. The comparison also reveals that content's regarding "Collateral" decreases the most for about 5% in weight. The "Collateral" part in credit agreement usually specifies the monetary amount of collateral assets contains in a loan deal and lenders' right to confiscate under events of credit violations. Based on the visualization, a straightforward insight is that contract in 2004 seems to lay more emphasis on the power of lenders by eliminating contents originally belong to stating the borrowers' rights, but it is also obvious that more control variables need to be brought in before confirming it to be a fact.

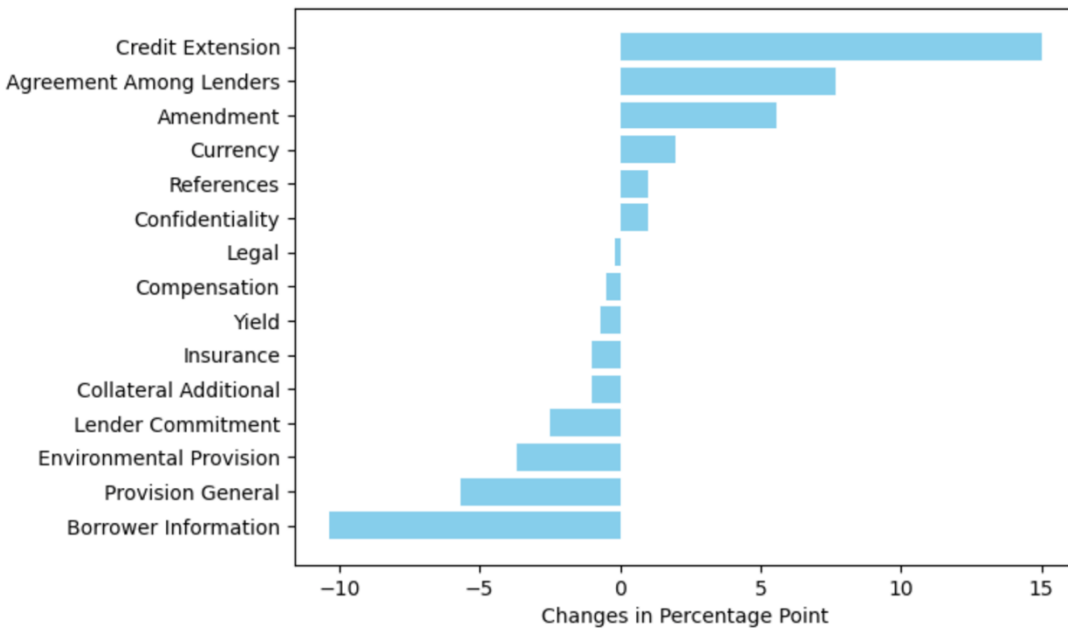
**Figure 9 Shared Subjects Weight Shift, from 1997 to 2004, in Pct. Point**



## 2) The Removal/Addition of Subjects in 2 Point of Observations

The dataset for unique subjects in each year is constructed by removing the shared subjects to observe the differences in weight. They are the ones only appear in either 1997 or 2004 and the comparison is done to demonstrate the process of unique content removal or addition. Figure 10 reveals that “Credit Extension”, “Agreement Among Lenders” and “Amendment” are the weighty ones added in 2004, and the “Environmental Provision”, “Provision General” and “Borrower Information” are the one dropped from 1997’s subjects’ group. The addition of terms regarding renegotiation of credit is intriguing, since it may indicate that credit agreement in 2004 needs to endure more rounds of conversation to prior to settlement.

**Figure 10 Removal/Addition Subjects, from 1997 to 2004, in Pct. Point**



## **5. Limitations and Discussions**

This research is an attempt to describe and explore, based on the contract data, the possibilities for further empirical research. The dataset is established based on text files of the contracts. Certain difficulties are unfortunately not able to overcome due to the nature of data source, even the process of cross-validation has been conducted. Potential errors in the collection and cleaning could cause biases in the analysis, but the progress of NLP datasets and algorithms make it hopeful that a solution can be found one day.

The collection of text files is conducted by Professor Robert and Professor Sufi in their research. Files that have been collected and utilized in this research are to some extent the most representative samples during the sampling time period, 1996 to 2005. However, there are still 60% of loan deals that cannot find a match on with the SEC dataset for unknown reasons. Also, the method to locate credit agreements among public company filings may seem judgmental by applying keyword searching. Moreover, only publicly traded, non-financial companies are



included in the samples, along with the fact that the filing of credit agreement settlement is not mandatory, leading to potential room for selection bias. Although this is the best ready-to-use sample until now and two Professors have been devoting great effort into data cleaning and restructuring, there hasn't been a perfect solution to the bias during the collection process. During the data cleaning and analysis process, several difficulties haven't been able to fully overcome either, such as the un-structuredness brought by textual files with typos and unstandardized codification of headers, which eventually forces the application of judgmental categorization in the analysis to study the changes of content and structure.

On the other hand, the analysis does produce some intriguing findings with empirical evidence, which has not been covered by published research regarding financial contract. This study puts forward quantitative and qualitative indicators that have not yet been collected via existing financial datasets, along with methodologies for their establishments. Furthermore, the time-series patterns, along with possibilities for within-year seasonality, are investigated through summary statistics and data visualization.

The implied null hypothesis throughout the paper is that the credit agreement, as a financial legal document, does not change across time. The investigation regarding the most common indicator, page length, suggests the variation is not statistically significant enough to reject the null, as contracts have not become longer. But the analysis regarding internal structural shift has yielded a surprising result by demonstrating that the weight of each part in a contract does vary significantly across the sampling period. By applying the "80/20" principle and the idea of industrial concentration ratio, the data suggests that fewer sections are required to account for 80% of the contract, measured by page length, meaning that the information is becoming more concentrated towards fewer sections. By further categorizing sections into subjects, the

visualization has demonstrated specifically which part of the content increases, decreases or even is removed across time.

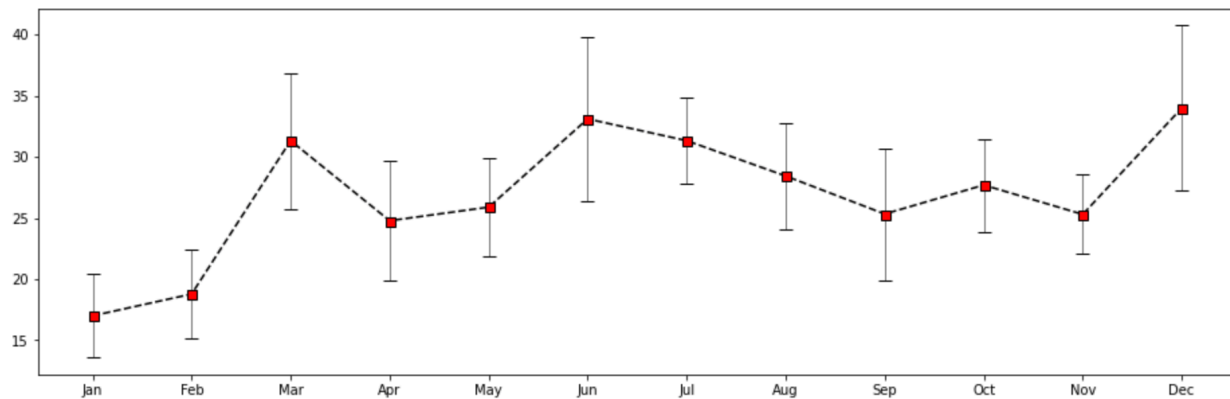
If the assumption that more pages means more content or emphasis is valid, the variation in page lengths can be a strong indicator of the shift of emphasis in contract across time. The reason why there is a shift of emphasis and the economic lessons behind further investigation on this topic then requires ongoing effort to exhaust all the causes. Based on my experience of dealing with the data, a suggestion I can offer to future studies is that descriptive changes captured in this paper may or may not be due to the changes of contract in nature. For example, different type of contract – long-term or short-term – and companies in different industries, with different revenue size or credit history, are all variables to control in future studies. Once the within-firm variations and the within-type variations are studied, hypotheses such as whether more control power is entitled to the lender party in contract can be tested for its significance. Prior to that, however, more fundamental work in data needs to be dealt with first, and hopefully more advanced algorithms can be used to speed up the process.

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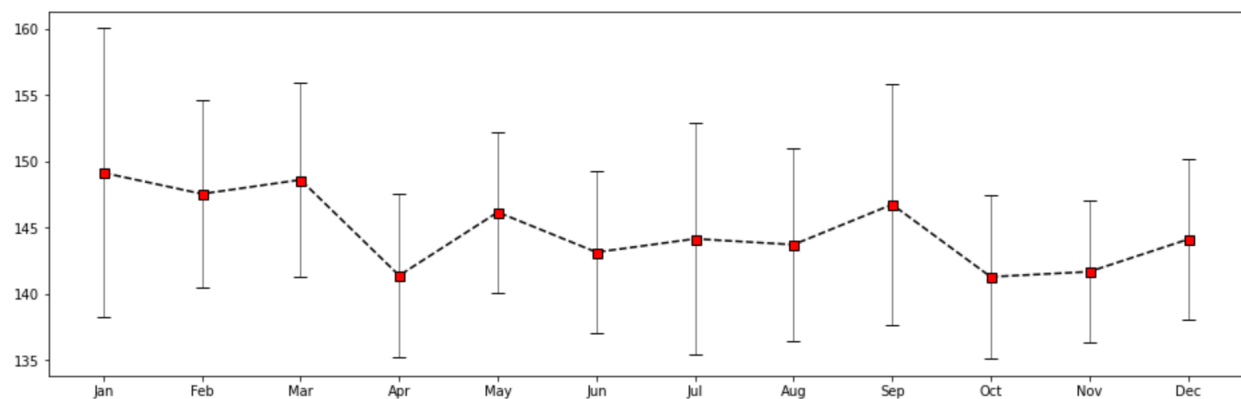
## Appendix I Investigation of Within-Year Seasonality

**Figure 11 Average Number of Deals w. 95% Confidence Interval**



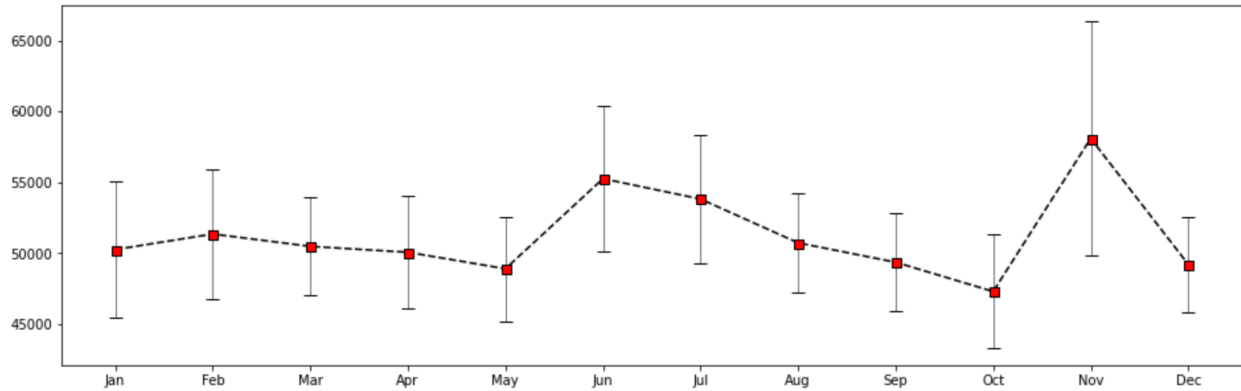
The average number of deals signed each month is calculated by averaging out the total number of deals in each of the calendar month. Though the changes might seem small-scaled in absolute values, the amount of deals increases relatively significant in March, June and December as compared to prior months. The fact that the timing being at the end of the respective season might indicate that the changes of credit demand within the year.

**Figure 12 Average Page Length w. 95% Confidence Interval**



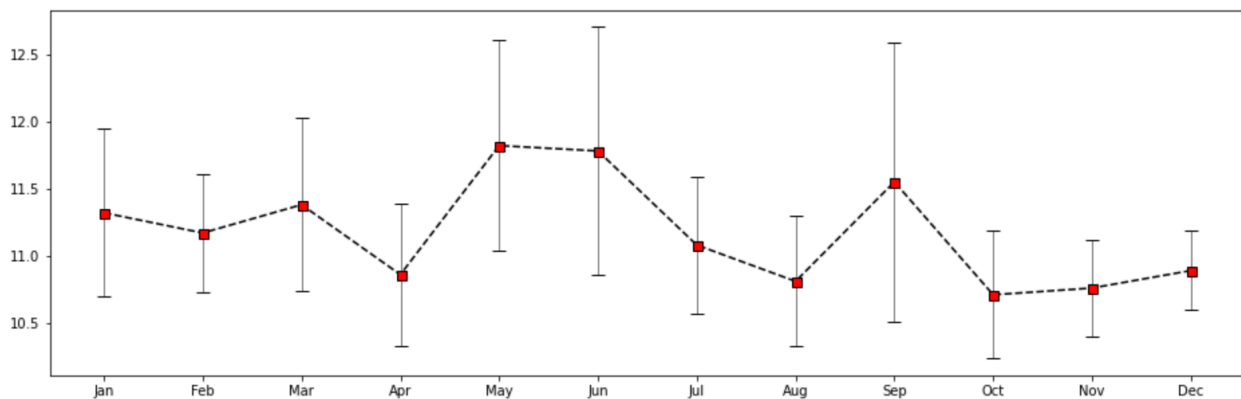
The full-page length doesn't experience with much variation.

**Figure 13 Average Word Count w. 95% Confidence Interval**

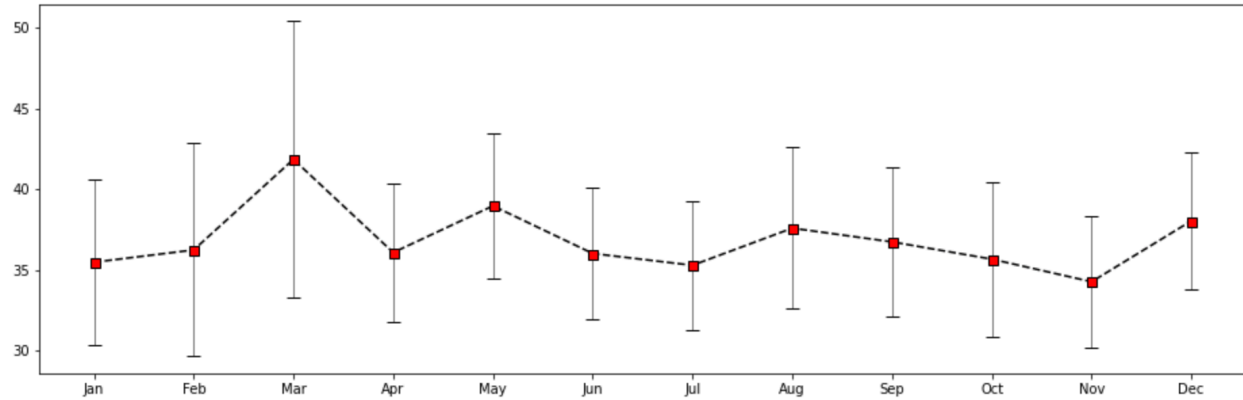


The average word count seems to have a spike at the end of 1<sup>st</sup> and 2<sup>nd</sup> half of the year, with the rest of the time remaining still or slight declining. The word count indicator, other than reflect the information in the page length, could be used to indicate the amount of information stuffed in the appendix (outside the main text). Taken into consideration that the page length each month doesn't appear to be varying a lot viewed either annually or monthly, if an assumption is made that the word per page doesn't change much as well – which seems to be valid, the information in the appendix is then certainly increasing annually and is seasonal with peaks in June and November.

**Figure 14 Average Number of Sections w. 95% Confidence Interval**



**Figure 15 Average Number of Titles w. 95% Confidence Interval**



These two structure-wise indicators are constructed with an attempt to reflect the level of content standardization, in which the mean value and variation are observed. The mean value, sorted by month, for these two variables don't appear to be varying with significant seasonal patterns. However, a decrease in the monthly variation of section numbers, measured by standard errors, could be spotted at the end of each year, which could be further explored in the topic of content standardization.

## Appendix II

**Table 5 Matching Table for Contract Headers and Corresponding Subject**

<b>subject</b>	<b>header</b>
<b>Agent</b>	Administrative Agent
	Administrative Agent Substitution Amendments Etc
	Agency Provisions
	Agent
	Agent Assignments Amendments
	Agent The Lender Group
	Agents
	Agreement Among Banks And Agents
	Concerning The Agent And The Banks
	Operations Agent
	The Administrative Agent
	The Administrative Agent Agents
	The Administrative Agent And The Collateral Agent
	The Administrative Agent Documentation Agent
	The Administrative Agent Etc
	The Administrative Agent Interbank Agreement
	The Administrative Agent Ix
	The Administrative Agent Others
	The Administrative Agent The Collateral Agent And
	The Administrative Agents
	The Agent
	The Agent And Canadian Agent
	The Agent And Collateral Agent
	The Agent And Relations Among Lenders
	The Agent And The Arranger
	The Agent And The Banks
	The Agent And The Euro Agent
	The Agent And The Issuing Bank
	The Agent And The Lenders
	The Agent Co And Banks
	The Agent Relations Among Banks
	The Agent The Managing Agents And The Co Agents
	The Agents
	The Agents And The Banks
	The Agents Etc
	The Agents The Managing Agents The Banks And The Issuing Bank
	The Bank Agents

	The Co Administrative Agents
	The Managing Agents And The Facility Agents
	Xthe Administrative Agent
<b>Agreement Among Lenders</b>	Agreement Among Lenders
	Co Borrower Provisions
	Multibank Revolving Loans Administrative Matters
	Multiple Counterparts
<b>Amendment</b>	Amendments And Waivers
	Amendments Etc
	Amendments Waivers
	Consents Amendments Waivers Etc
	Effectiveness Of Amendment And Restatement
<b>Borrower Information</b>	Company S Representations And Warranties
<b>Collateral</b>	Collateral
	Collateral Account Application Of Collateral Proceeds
	Collateral Administration
	Collateral And Guarantees
	Collateral For Term Loan General Terms
	Collateral For Term Loans General Terms
	Collateral Pool Properties
	Collateral Reporting And Covenants
	Collateral Security
	Possession Use Valuation And Release Of Collateral Application Of
	Release Of Collateral
	The Collateral
<b>Collateral Additional</b>	Additional Collateral Security
<b>Commitment</b>	Amount And Terms Of Commitment
	Amount And Terms Of Commitments
	Amount And Terms Of Revolving Credit Commitments
	Amount And Terms Of The Commitments
	Amounts And Terms Of Commitments And Loans
	Commitment
	Commitment Fee And Other Fees
	Commitments
	Commitments And Loans
	Commitments And Terms Of Credit
	Commitments Borrowing And Issuance Procedures Notes And Letters Of Credit
	Commitments Borrowing And Issuanceprocedures Notes Letters Of Credit



	Commitments Borrowing Base Determinations Competitive
	Commitments Borrowing Procedures And Notes
	Commitments Competitive Bid Facility
	Commitments Loans Ba S And Letters Of Credit
	Commitments Loans Collateral
	Commitments Loans Fees Prepayments And Outstandings
	Commitments Loans Letters Of Credit Collateral
	Commitments Of The Lenders
	Counterparts
	Creation Of Security Interest
	Fees
	Fees And Payments
	General
	General Provisions
	Icommitments
	Material Reportable Events
	Nature Of Reimbursement Obligations
	The Canadian Commitments
	The Commitments And Borrowings
	The Commitments And Credit Extensions
	The Lender S Commitment Borrowing Procedures And Lender Note
	The U S Commitments
	The Us Commitments
<b>Compensation</b>	Indemnification
	Indemnity
	Indemnity For Changes In Circumstances
	Intentionally Omitted
<b>Condition</b>	A Conditions Precedent To Initial Credit Events
	Change In Circumstances
	Change In Circumstances Affecting Loans
	Change In Circumstances Compensation
	Change In Circumstances Taxes
	Change Of Circumstances
	Changes In Circumstances
	Changes In Law Or Circumstances Increased Costs
	Choice Of Forum Consent To Service Of Process And Jurisdiction
	Choice Of Law And Venue Jury Trial Waiver
	Closing Conditions
	Closing Conditions Of Borrowing
	Closing Conditions Of Closing And Borrowing
	Closing Conditions Of Closing And Borrowings

Conditions
Conditions For Disbursements And Other Agreements
Conditions Of Borrowing
Conditions Of Borrowing First Borrowing
Conditions Of Credit
Conditions Of Effectiveness And Lending
Conditions Of Effectiveness And Of Lending
Conditions Of First Loans
Conditions Of Lending
Conditions Of Lending And Issuance Of Letters Of Credit
Conditions Of Loans
Conditions Of Loans And Letters Of Credit
Conditions Precedent
Conditions Precedent To Advances
Conditions Precedent To All Credit Events
Conditions Precedent To Credit Events
Conditions Precedent To Credit Extensions
Conditions Precedent To Initial Borrowing Date
Conditions Precedent To Initial Credit Events
Conditions Precedent To Lending
Conditions Precedent To Loans
Conditions Precedent To Loans And Letters Of Credit
Conditions Precedent To Loans On The Initial Borrowing Date
Conditions Precedent To The Bank S Obligations
Conditions Precedent To The Closing And The Making Of Loans
Conditions Precedent To The Closing Date
Conditions Precedent To The Restatement Effective Date
Conditions Term Of Agreement
Conditions To All Borrowings
Conditions To All Loans
Conditions To Availability Of Credit
Conditions To Borrowing
Conditions To Borrowings
Conditions To Borrowings And Letters Of Credit
Conditions To Credit Extensions
Conditions To Effectiveness
Conditions To Effectiveness And Article Ii
Conditions To Effectiveness And Future Credit Extensions
Conditions To Effectiveness And Lending
Conditions To Effectiveness Of Agreement
Conditions To Extending Credit

	Conditions To Loans
	Conditions To Loans And Letters Of Credit
	Conditions To Obligations Of Bbi And Buyer
	Conditions To Subsequent Loans
	Conditions To The First Lending
	Conditions To The Loan Facilities
	Conditions To The Loans
	Conditions To The Loans And Letters Of Credit
	General Terms And Conditions
	Iiiconditions Precedent
	Loans Conditions To Lending
	Preconditions To Loans And Letters Of Credit
	Significant Events And Their Effect
	Terms And Conditions
	Unconditional Guaranty
	Vconditions
	Vconditions To Credit Extensions
<b>Confidentiality</b>	Confidentiality
	Treatment Of Certain Information Confidentiality
<b>Conflict</b>	Conflict
<b>Covenant</b>	A Covenants Of Ppl
	Affirmative And Financial Covenants
	Affirmative And Negative Covenants
	Affirmative Convenants
	Affirmative Covenant
	Affirmative Covenants
	Affirmative Covenants Of Obligors
	Affirmative Covenants Of The Borrower
	Affirmative Covenants Of The Company
	Certain Negative Covenants
	Collateral Covenants
	Company S Affirmative Covenants
	Company S Negative Covenants
	Covenants
	Covenants And Agreements
	Covenants And Continuing Agreements
	Covenants Of Obligors
	Covenants Of Pm Companies
	Covenants Of The Borrower
	Covenants Of The Company
	Covenants Of The Loan Parties

	Covenants Of The Obligors
	Covenants Page
	Covets
	Financial Covenants
	General Covenants
	Ixnegative Covenants
	Negative
	Negative And Financial Covenants
	Negative Covenants
	Negative Covenants Of Obligors
	Negative Covenants Of The Company
	Negative Pledges Restrictive Agreements Etc
	Positive Covenants
	Reporting Covenants
	Representations And Warranties Covenants
	Survival
	Survival Of Covenants Etc
	Vaffirmative Covenants
	Viaffirmative Covenants
	Vicovenants
	Viiiaffirmative Covenants
	Viicovenants Affirmative Covenants
	Viiinegative Covenants
	Viinegative Covenants
	Vinegative Covenants
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	Affirmative Covenants Of Borrower
	Affirmative Covenants Of Borrower And Parent
	Affirmative Covenants Of The Borrowers
	Affirmative Covenants Of Theborrowers
	Borrower Covenants
	Borrower S Affirmative Covenants
	Borrower S Negative Covenants
	Borrower S Representations And Warranties
	Borrowers Affirmative Covenants
	Borrowers Covenants
	Borrowers Negative Covenants
	Capital Adequacy
	Certain Negative Covenants Of The Borrower
	Certain Negative Covenants Of The Borrowers
	Covenants Of Borrower

	Covenants Of Borrower And Servicers
	Covenants Of Borrower Parties
	Covenants Of The Borrowers
	Financial Covenants Of The Borrowers
	General Covenants Of Borrower And Mcri
	General Covenants Of Borrowers And Guarantor
	Negative Covenants Of Borrower
	Negative Covenants Of The Borrowers
	Representations And Warranties Of Borrower
	Representations And Warranties Of The Borrower
	Representations And Warranties Of The Borrowers
	Representations Warranties And Covenants Of The Borrower
	The Borrowers Representations And Warranties
	Viiicovenants Of The Borrower
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	Amounts And Terms Of Contributions And Purchases
	Authorization And Action
	Borrowing Procedures Base Letter Of Credit Sublimit And Possible Increase In Total Aggregate
	Borrowings Conversions And Prepayments Payments Of
	Borrowings Payments Prepayments And Interest Options
	Borrowings Prepayments And Interest Options
	Borrowings Prepayments And Selection Of Interest Rates
	Collection Allocation Mechanism
	Collection And Administration
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	Commitments Loans Notes And Prepayments
	Communications Payment Of Notes
	Compensation Repayment And Reduction Of Commitments
	Concerning The Administrative
	Conversion Interest Payments Fees Etc
	Disbursements Payments And Costs
	Enforcing This Agreement Miscellaneous
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	Expenses
	Expenses And Indemnification
	Extensions Of Credit Payments And Interest Calculations
	Fees Payments
	Fees Payments And Computations Joint And Several Liability
	General Credit Provisions Fees And Payments
	Increased Costs And Taxes

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	A The Revolving Credit Advances

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Amount And Terms Of Letter Of Credit Sub Facility
Amount And Terms Of Letters Of Credit And Participations Therein
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Amount And Terms Of The Facilities
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Amount And Terms Of The Loans
Amount And Terms Of The Loans Letters Credit
Amount And Terms Of The Revolving Loans
Amount Terms And Security Of The Bank Facilities
Amounts And Terms Of Advances
Amounts And Terms Of Facilities
Amounts And Terms Of The
Amounts And Terms Of The Advances
Amounts And Terms Of The Advances Letters Credit
Amounts And Terms Of The Credit Facilities
Amounts And Terms Of The Extensions Of Credit
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Revolving Credit Facility
Revolving Credit Loan And Swing Loan
Revolving Loan Facilities
Special Provisions For Advances
Special Provisions Relating To Eurodollar Loans
Special Provisions Relating To Loans
Term
Term Loan Facility Line Of Credit Amount And Terms
Terms Of Credit
Terms Of The Loan
The Advances
The Canadian Term Loan
The Commitments The Swing Line Facility And The Advances
The Construction Loan
The Credit
The Credit Facilities
The Credit Facility
The Credits
The Credits Amounts And Terms
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The Indebtedness Revolving Credit And Bid Loans
The Indebtedness Swing Loan
The Letter Of Credit Facility
The Loan
The Loan Facilities
The Loans
The Loans Amount And Terms
The Loans And Letters Of Credit
The Loans And The Letters Of Credit
The Offshore Facility
The Revolving Credit

	The Revolving Credit Advances
	The Revolving Credit Facilities
	The Revolving Credit Facility
	The Revolving Credit Loan
	The Revolving Credit Loans
	The Servicer S
	The Swing Line
	The Term Loan Facility
	The Term Loans
	The Terms Of The Credit Facility
	The Us Facility
	Tri Party Loan
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	Us Facility
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	The Lender S Rights And Remedies

	Viievents Of Default
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	Certain Defined Terms
	Certain Definitions
	Certain Definitions And Interpretation
	Certain General Provisions
	Definition
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	Definitions Accounting Principles And Other Interpretive Matters
	Definitions Accounting Terms
	Definitions And Accounting
	Definitions And Accounting Matters
	Definitions And Accounting Terms
	Definitions And Accouting Terms
	Definitions And Accounting Terms
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	Definitions And Related Matters
	Definitions And Rules Of Interpretation
	Definitions And Terms
	Definitions Certain Rules Of Construction
	Definitions Construction
	Definitions Etc
	Definitions Interpretation
	Definitions Interpretation And Accounting Terms
	Definitions Interpretations
	Definitions Rules Of
	Definitions Rules Of Interpretation Etc
	Idefinitions
	Idefinitions And Accounting Terms
	Interpretation
	Interpretation Etc
	Interpretation Page
	Invalid Provisions
	Ivrepresentations And Warranties
	Ixdefinitions
	Ixgeneral Provisions

	Terms Defined
<b>Duty Assignment</b>	Assignment And
	Assignment And Participation
	Assignment And Participations Appointment Of Agent
	Assignments Agency Provisions
	Assignments And Participations
	Assignments And Participations Successors
	Benefit Of Agreement Assignments Participations
	Parties Bound
	Successors And Assigns
	Successors And Assigns Lender Assignments And Participations
<b>Environmental Provision</b>	Environmental Matters
	Environmental Matters Page
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<b>Guarantee</b>	A Guaranty
	Certain Libo Rate And Other Provisions Borrower Guaranties
	Company Guaranty
	Cross Guaranty
	Guarantee
	Guarantee By Subsidiary Guarantors
	Guaranties
	Guaranty
	Guaranty And Collateral Security
	Guaranty And Other Rights And Undertakings
	Subsidiaries
	Subsidiary Guaranties
	Subsidiary Guaranty
	The Guaranty
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	Financial Statements And Information
	Financial Terms
	General Warranties And Representations
	iiirepresentations And Warranties
	Representation And Warranties
	Representations
	Representations And
	Representations And Warranties
	Representations And Warranties Covenants
	Representations And Warranties Of Bbi And Buyer
	Representations And Warranties Of Seller
	Representations And Warranties Of The Borrowers

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	Representations Warranties And Agreements
	Virepresentations And Warranties
	Vrepresentations And Warranties
	Warranties
	Warranties Etc
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<b>Leagal</b>	Choice Of Law And Venue Jury Trial Waiver
<b>Legal</b>	Governing Law
	Usa Patriot Act
	Usa Patriot Act Notification
<b>Lender Commitment</b>	Commitments Of The Bank
<b>Lender Right</b>	Bank S Rights
	Bank S Rights And Remedies
	Bankers Acceptances
	Compliance Certificate
	Non Liability Of Lenders
	Reimbursement Of Banks
	The Lender Group S Rights And Remedies
<b>Miscellaneous</b>	Enforcing This Agreement Miscellaneous
	Ixmiscellaneous
	Miscellaneous
	Miscellaneous Page
	Miscellaneous Provisions
	Term Of Agreement Miscellaneous
	Viiimiscellaneous
	Ximiscellaneous
	Xmiscellaneous
<b>Monetary Provision</b>	Certain Eurodollar And Other Provisions
	Certain Eurodollar Rate And Other Provisions
	Certain Libo Rate And Other Provisions
	Certain Provisions Applicable
	Foreign Currency Subfacilities
	Interest Provisions
	Interest Rate Provisions
<b>Provision General</b>	Other Provisions
<b>References</b>	Exhibits And References
<b>Taxes</b>	Taxes And Expenses

	Taxes Yield Protection And Illegality
<b>Waiver</b>	Acceleration Waivers Amendments And Remedies
	Acceleration Waivers Amendments Remedies And Setoff
	Amendments Or Waivers
	Choice Of Law Consent To Jurisdiction Waiver Of Jury Trial
	Consents Amendments Waivers Remedies
	Jury Trial Waiver Other Waivers And Consents Governing Law
	Waiver Of Jury Trial
	Waiver Of Jury Trial Etc
	Waivers Indemnification
<b>Yield</b>	Itaxes Yield Protection And Illegality
	Yield Protection
	Yield Protection And Illegality
	Yield Protection Illegality Taxes Etc
	Yield Protection Limitations On Advances Capital Adequacy