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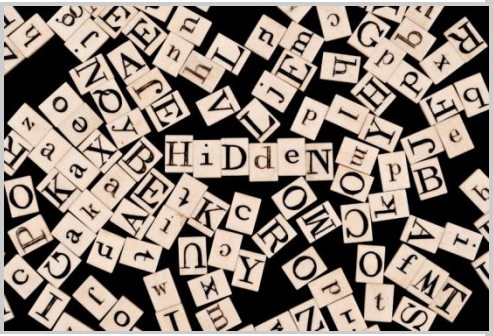

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6 February 2013

Quantamentals

Camouflaged in Complexity

Using Textual Analysis to Extract Signals from 10-K Reports

Applying textual analysis to annual reports: Traditionally quant investors have relied on a variety of models based on hard information to uncover accounting manipulations or signals related to future operating performance. We take a different approach and use textual analysis to examine the readability of the Management Discussion & Analysis (MD&A) section of annual reports.

Why could complexity predict returns? Our view is that management may attempt to hide negative developments (e.g. low profitability, earnings persistence) by making information disclosures more complex or difficult to read. High complexity, or increases in complexity, would be expected to predict lower stock returns.

Constructing measures of report readability: We develop processes that first extract the MD&A section from annual reports and then examine features such as MD&A length, sentence length and proportion of complex words.

Implications of annual report complexity: Our key findings are (1) Complexity measures based on levels do not predict returns; (2) Increases in complexity predict lower returns over longer horizons; (3) Increases in complexity are associated with declines in current and future operating performance.

Usage by investors: Our findings can be used by fundamental and quant investors. The signal is better suited to longer-term investors with shorting capabilities.

Fig 1 Quintile Performance of a Change in Complexity Factor

Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013. (Q1 = Good; Q5 = Bad). 12 Month Returns are shown with Newey-West T-statistics.

Camouflaged in Complexity

Using Textual Analysis to Extract Signals from 10-K Reports

We use textual analysis methods to examine signals in 10-K reports.

In this note we use textual analysis methods to examine the readability of the text disclosed by corporations in their annual reports. Traditionally quant investors have relied on a variety of models based on hard information from financial statements to uncover accounting manipulations or signals that indicate deterioration in future operating performance. We take a different approach and focus on linguistic features in the Management Discussion & Analysis (MD&A) section of annual reports.

Our view is management may present information in a more complex manner in order to hide negative developments.

Our view is that management may attempt to hide, or obfuscate, negative developments by making information disclosures more complex, or less readable. The motivation for this research is the belief that management obfuscates bad information. This bad information may be in the form of lower profitability. It may alternatively be that positive earnings are transient or negative earnings are persistent. Either way the firm has an incentive to not make it easy for investors to understand its true situation.

The Securities and Exchange Commission (SEC) also deems the readability of corporate filings to be an important issue. Going back to the Wheat Report of 1969, and more recently the Plain English disclosure guidelines of 1998, attempts have been made to encourage filings to be presented in a clear and simple manner. The aim of the SEC is to help investors understand corporate filings and make better informed decisions.

We examine the length of MD&A, sentence length and proportion of complex words.

Our objective is to determine whether measures of annual report readability can be used to predict stock returns. Specifically, we want to see whether an increase in complexity predicts lower stock returns. To provide a solid basis for our complexity constructs and justification for why there should be a negative relation with stock returns, we also aim to link our readability measures with changes in the fundamental performance of a firm.

For our analysis we focus on the MD&A section of corporate 10-K reports (i.e. annual reports). To measure the complexity of corporate filings we develop a range of algorithms that capture features such as MD&A length, sentence length and proportion of complex words.

Academic Insights

Academics have found relationships between annual report readability and earnings persistence / profitability.

Academia has examined several consequences of annual report readability. Li's (2008) "Management obfuscate hypothesis" proposes a firm may indulge in increasing the processing cost of adverse information in order to reduce or delay its incorporation in stock price. Bloomfield et al. (2002) acknowledges that firms may intentionally hide bad performance. He points that complexity of filings tends to increase when firm performance is poor and that this may be more evident if negative events are unique or unusual. Prior studies by Baker and Kare (1992) and Subramanian, Insley and Blackwell (1993) have argued that managers will use the complexity feature to their advantage when firm's performance deteriorates.

In a related stream of research, Goel et al. (2010) finds that verbal content (content words, frequencies of usages, word patterns, etc.) and also the presentation style of the annual reports to explore linguistic features (such as voice [active versus passive], uncertainty markers, readability index, tone, usage of proper nouns, type-token ratio, etc.) can help distinguish fraudulent annual reports from non-fraudulent reports.

Annual report readability has also been linked with fraud, along with varying behaviour from market participants.

The readability of financial disclosures also has other consequences. Miller (2010) finds that less readable 10-K reports are associated with lower trading volume around the 10-K filing date, and that the result is largely driven by the behaviour of small traders. Lehavy, Li and Merkley (2011) find that less readable reports are associated with more analyst forecast dispersion and less forecast accuracy. In addition, more analysts tend to follow firms with less readable reports, suggesting that the demand for analyst services increases with the difficulty in understanding 10-K filings. Lee (2012) finds that less readable 10-Q reports correspond to lower stock market reactions around the filing date and longer price drift following the filing.

Key Findings & Next Steps

We find that increases in complexity are associated with future stock underperformance. We link this with deteriorations in operating performance.

This note is our first foray into the textual analysis space. Our initial findings relating to annual report complexity are:

- Higher levels of annual report complexity do not predict lower stock returns.
- Declines in the readability of the MD&A section (i.e. increased MD&A length, increased sentence length, increased proportion of complex words) is related to future stock underperformance. This is more pronounced at longer horizons.
- Changes in the readability of MD&A sections are related to the fundamental performance of companies. We find firms with large increases in complexity are associated with current and future declines in operating performance.
- Combining measures of operating performance using hard information with measures of complexity produces even more powerful results.
- Measures of readability that are motivated by the SEC's Plain English guidelines are not informative.

Overall, we are encouraged by this research. We think this is an encouraging area for quantitative research. Indeed, academia is going even further nowadays. Promising research is now being done on transcripts of conference calls (see Larcker and Zaklyukina, 2012) and also audio recordings from conference calls (see Hobson, Mayew and Venkatachalam, 2011). For longer term investors in particular, and those with shorting capabilities, we believe this is a promising area of research.

Outline of the note

Our note proceeds as follows. We first provide an introduction to textual analysis to 10-K reports and how we construct complexity measures. We then dive into understanding the complexity measures. Next we start our backtesting – first by looking at complexity in levels, and then looking at complexity in changes. For robustness, we link our measures of complexity with the fundamental performance of firms. We finish the analysis by exploring a separate set of complexity measures motivated by the SEC's Plain English Guidelines.

An Introduction to Text Analysis of 10-K's

Setting the Scene

For our text analysis we focus on the MD&A section of annual reports.

As we have discussed, we use company 10-Ks (i.e. annual reports) in our analysis. We start our foray into textual analysis by focusing on 10-Ks largely out of simplicity – a full download of 10-Ks was 250Gb and took 2 ½ weeks!

Briefly, a 10-K has many sections. These include:

1. Business: Describes the business of the firm in terms what it does, which subsidiaries it owns and what markets it operates in.
2. Properties: Mentions significant properties and physical assets of the firm.
3. Legal Proceedings: Discloses any legal proceeding or law suit.
4. Safety Disclosures: Some firms may need to report mine safety violations.
5. Market: Gives the highs and lows of stock.
6. Consolidated Financial Data: Provides financial data for the firm and its subsidiaries.
7. Management's Discussion and Analysis: Discusses operations of company by comparing current versus prior period and outlook.
8. Financial Statements: Provides independent auditor's report, consolidated statements of operations, balance sheets etc.
9. Other information pertaining to accounting and financial disclosure, executive compensation, control procedures etc.

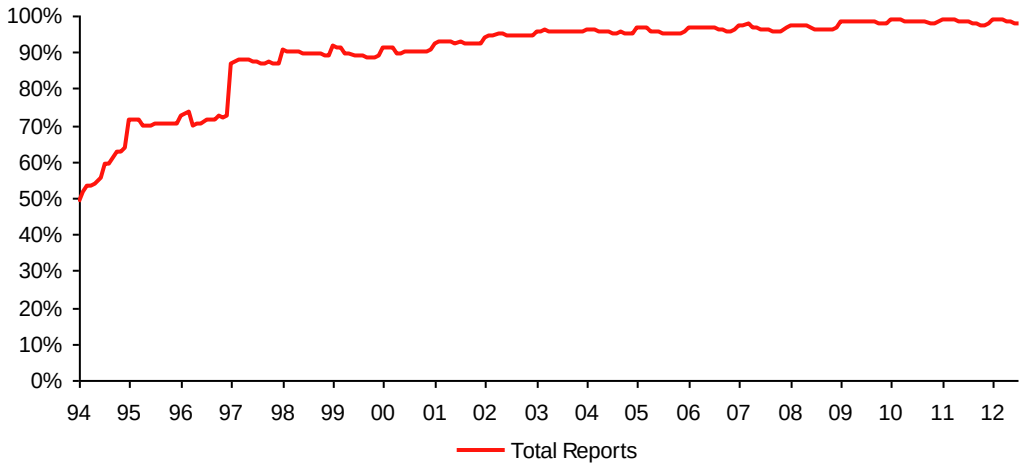
We focus our analysis on Management's Discussion and Analysis. It provides a commentary by the management on its operations and also its outlook. This section is critical in knowing the management's viewpoint. We believe this section could be the most informative section when it comes to evaluating changes in information disclosure.

Source

We download all annual reports from the SEC's online Edgar database.

SEC's online Edgar database has electronic fillings of form 10-K since 1994. Prior to 1996, firms were not required to report electronically however many reports are available. We download all of the reports available on with Edgar database. Amendments to Form 10-K i.e. 10-K/A, are not included in our research. We also note that prior to 2002, Form 10-K could also be designated as Form 10-K405. We map the downloaded reports to the R1000 universe to examine coverage. In Fig 2, we note that in the early part of our sample, coverage of the R1000 was not great. As such we start our testing from 1997 when coverage reaches a more acceptable level.

Fig 2 Coverage of R1000 by Report Type



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

We note that even in the present period, we do not have perfect coverage. To account for the missing coverage we check the recent most fillings of R1000 constituents as of end of March 2012. We find two categories of securities whose report is not a part of the analysis:

- ADR: Foreign entity
- New Firm: Is part of R1000 but is yet to complete one year since listing

Processing of Form 10-K

Annual reports are downloaded in plain text and HTML formats. It is necessary to clean the HTML filings before proceeding.

Downloaded 10-Ks are in two formats:

1. Plain Text: This was common prior to 2002.
2. HTML: This is common for most of the recent reports.

Before beginning the text analysis we need to process (or clean) the filings. This process is necessary for the HTML formatted filings. The cleaning process involves identifying HTML tags and references and following a rule based approach to convert them into plain text. A sample HTML text snippet is shown in Fig 3.

Fig 3 Sample HTML Section with HTML Tags and Special Characters

<DIV align="left" style="margin-left: 0%; margin-right: 0%; text-indent: 0%; font-size: 10pt; font family: 'Times New Roman', Times; color: #000000; background: #FFFFFF">
Our software business is comprised of two operating segments: (1) new software license revenues and (2) software license updates and product support revenues. We expect that our software business revenues will continue to increase due to continued demand for our products and due to our acquisitions, which should allow us to improve margins and profits and continue to make investments in research and development.
</DIV>

Source: Securities and Exchange Commission, Macquarie Capital (USA), February 2013.

In Fig 3 we find plain text along with HTML tags such as *DIV* and HTML references such as * *.

The first step of cleaning the HTML filings is removing HTML references.

We follow the rule-based approach below to convert HTML files to plain text files:

- **HTML References**: All HTML references for ASCII characters, ISO-8859-1 character sets and symbols are identified and transformed. In order to capture all references possible, we prepare a universe of HTML references for a one-to-one map. Some examples of HTML references and their transformations are listed in Fig 4.

Fig 4 HTML References

Class	Character	HTML Reference	Description
ASCII	!	!	exclamation mark
ASCII	"	"	quotation mark
ASCII	#	#	number sign
ASCII	$	$	dollar sign
ASCII	%	%	percent sign
Symbols	∀	∀	for all
Symbols	∂	∂	part
Symbols	∃	∃	exists
Symbols	∅	∅	empty
Symbols	∇	∇	nabla
ISO 8859-1 Symbols	¬	¬	negation
ISO 8859-1 Symbols	®	®	registered trademark
ISO 8859-1 Symbols	¯	¯	spacing macron
ISO 8859-1 Symbols	°	°	degree

Source: Macquarie Capital (USA), February 2013.

It is also necessary to remove HTML tags.

- **HTML Tags**: HTML Tags are key identifiers for different parts of a text. The parts of regular text begin with a specific tag to identify it as header, part of a table, enumeration, section or division etc. Tags have a beginning and ending identifier. The ending identifier would have '/' to differentiate it from the beginning identifier. All tags definitions are present in "<>". For instance in Fig 3 the HTML tag is "div". In Fig 5 we show a sample of HTML tags and the corresponding text sections to which they map.

Fig 5 HTML Tags

Sections	Tags	Format	Transformation
Header	H1, H2, H3, H4, H5, H6	<H1 …> *heading* </H1>	The heading is retained
Table	TABLE	<TABLE>…</TABLE>	Retain all cells in all rows
Row	TR	<TR>…</TR>	Retain cells in a row
Cells	TD	<TD>*cell value* </TD>	Retain the cell
Paragraph	P	<P>*text* </P>	Retain the text
Section	DIV	<DIV>*text* </DIV>	Retain the text
Ordered/Unordered List and Items	OL, UL,LI	<OL> <LI>*item value 1* </LI> <LI>*item value 2* </LI> </OL>	Retain items in order

Source: Macquarie Capital (USA), February 2013.

These two steps will transform the HTML code present in Fig 3 to what can be seen in Fig 6.

Fig 6 Transformed text

> Our software business is comprised of two operating segments: (1)new software license revenues and (2)software license updates and product support revenues. We expect that our software business revenues will continue to increase due to continued demand for our products and due to our acquisitions, which should allow us to improve margins and profits and continue to make investments in research and development.

Source: Macquarie Capital (USA), February 2013.

Extraction

After cleaning the filings we begin the process of extracting the MD&A section.

Processed 10-K reports are the starting point for extraction of sections and/or the whole report. For our analysis we extract the Management's Discussion and Analysis (MD&A) section and the entire report starting from the first item i.e. Business. To extract the MD&A section we perform a line by line check until we find the line starting with 'Item 7 Management's Discussion and Analysis'. We stop the extraction when we enter the new section which would be 'Item 8 Financial Statements'. To ensure we extract precisely what we intend to, we employ several checks. These checks include ensuring the beginning of the line should be 'Item 7'; the line should not be a part of referencing mentioned elsewhere; and if it is an HTML formatted file it should be part of a heading. To extract the whole report we replace the search criteria above with 'Item 1 Business'. We retain the entire subsequent report thereafter. Essentially we are ensuring the table of contents gets excluded.

Several checks are utilized to ensure accuracy of extraction.

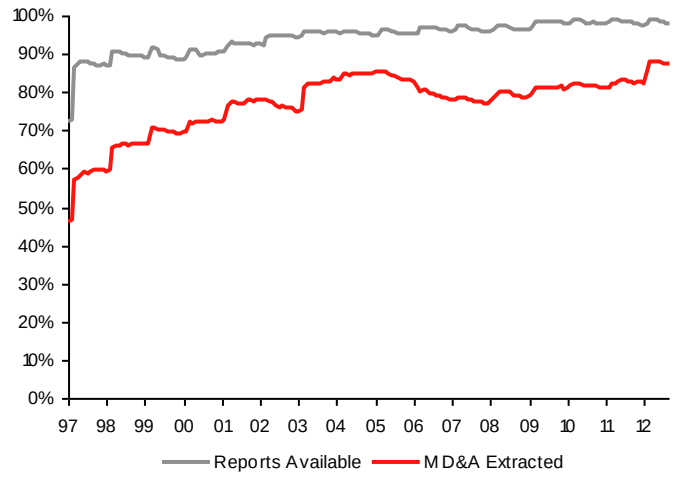
As tables do not contribute to complexity analysis, we strip out tables we may encounter during the extraction of the MD&A section and the whole report extraction.

To test the robustness of our extraction process we perform a random check for 50 reports.

Some reports provide reference to the MD&A section typically towards the end of report. We identify such cases through keywords such as "reference", "incorporated", "herein". Analyzing these occurrences shows that these sections are typically one paragraph in length with one sentence. For these reports we follow a revised procedure to extract MD&A section. An estimated 20% of sample reports tend to have "referenced" MD&A section reporting.

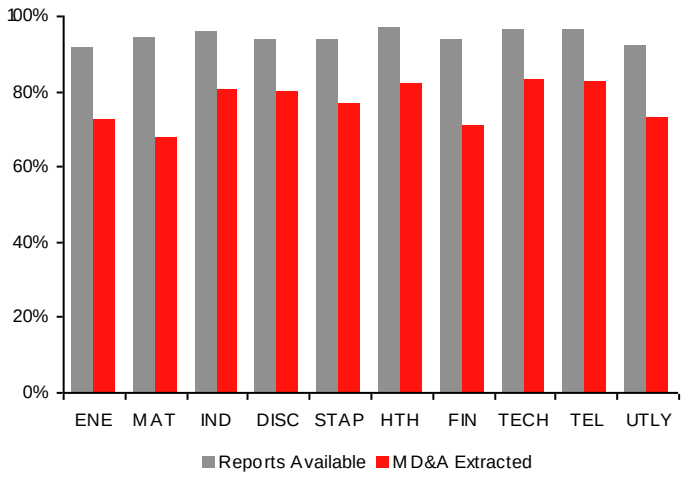
In Fig 7 we measure the efficacy of the extraction process with reference to the reports downloaded. We also examine the sector coverage and efficacy in extraction of the MD&A section by sector in Fig 8.

Fig 7 Success rate of extracting MD&A



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Fig 8 Success rate of extracting MD&A by Sector

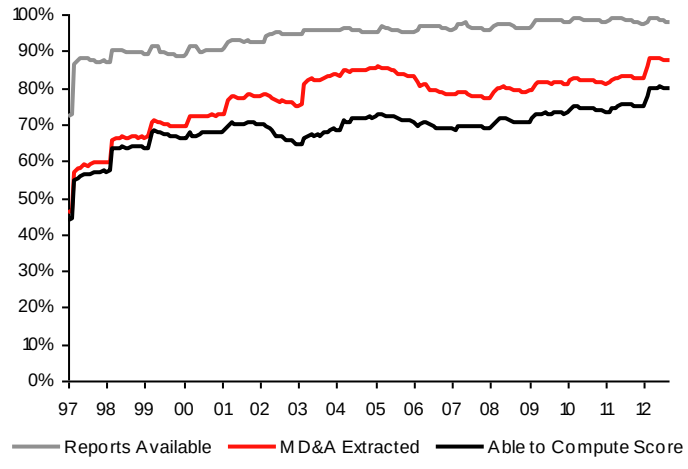


Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013. Key: ENE = Energy, MAT = Materials, IND = Industrials, DISC = Consumer Discretionary, STAP = Consumer Staples, HTH = Health Care, FIN = Financials, TECH = Information Technology, TEL = Telecommunication Services, UTLY = Utilities.

Measuring Complexity

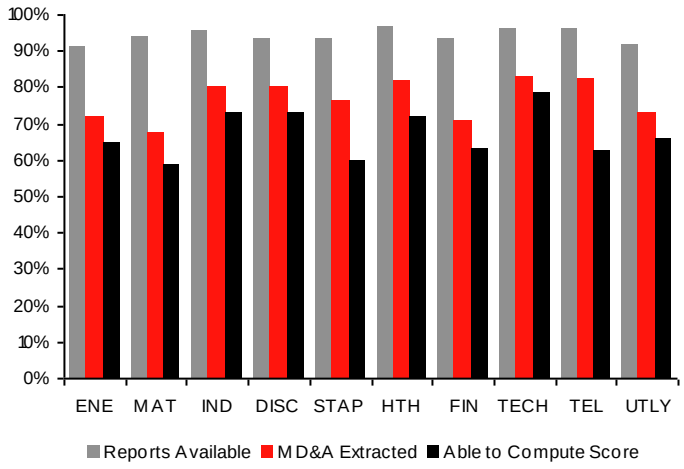
The MD&A section extracted is a collection of paragraphs. We identify the number of paragraphs, sentences, words, complex words and syllables. The following rules are used: (1) Paragraph: Must have at least 3 sentences; (2) Sentences: Must have at least three words; and (3) Complex words: Must have at least three syllables. There may be instances where we are able to 'successfully' extract at MD&A section. However, the section may not have at least 3 sentences, in which case complexity scores are not computed.

Fig 9 Success rate of computing scores



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Fig 10 Success rate of computing scores by Sector



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013. Key: ENE = Energy, MAT = Materials, IND = Industrials, DISC = Consumer Discretionary, STAP = Consumer Staples, HTH = Health Care, FIN = Financials, TECH = Information Technology, TEL = Telecommunication Services, UTLY = Utilities.

To understand the complexity measures we look at correlations with stock attributes and historical trends.

Understanding the Complexity Measures

To shed light on complexity measures we look at correlations with a range of stock characteristics; trends in the complexity measures over time; and differences across sectors.

Correlations with Stock Characteristics

We look at the average cross sectional correlations between our measures of annual report readability and a range of stock characteristics. We choose characteristics that capture size, performance and transactional aspects of a company.

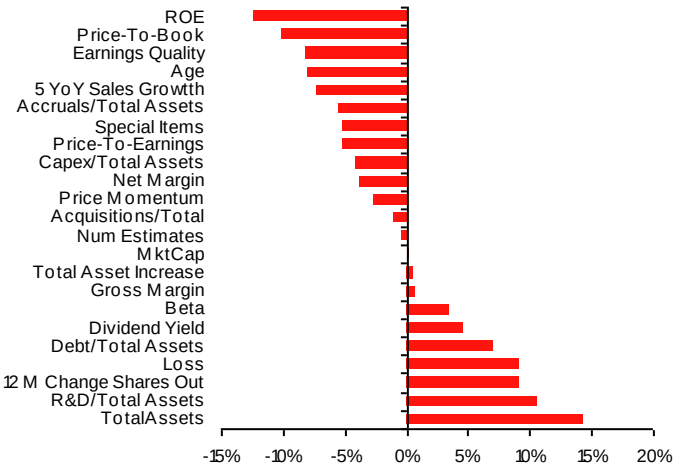
Measures of annual report complexity are positively correlated with firm size, investments and financing; and are negatively correlated with operating performance.

Focusing on our complexity measures in levels, we see across Fig 11 to Fig 14 that the complexity measures are all positively related to firm size (as measured by total assets). There are also positive correlations with leverage, share issuance and investments in R&D. We interpret these correlations as suggesting that there could be reasons for increased report complexity that arise as part of normal operations. This is carefully controlled in our analysis.

Additionally, for the number of word measures these are negatively correlated with ROE. In other words, poor performance is associated with longer MD&A sections and longer reports. This is highlighted by the positive correlation with the loss variable, which is a dummy variable that equals 1 if the firm has negative earnings. It also comes through in the negative correlation with sales growth.

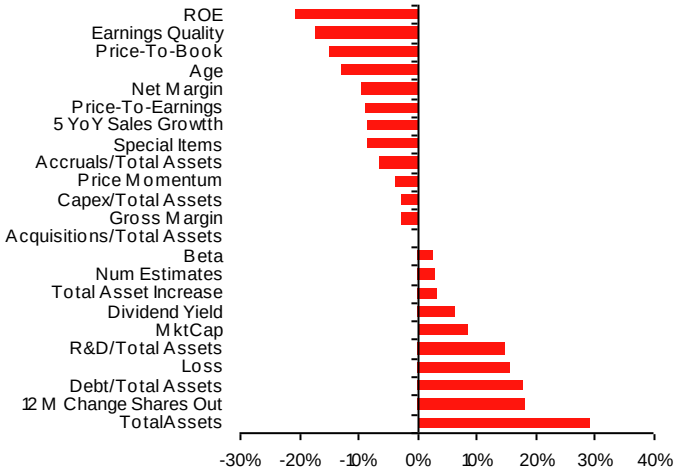
When examining the correlations using the complexity measures in changes (see Fig 15 to Fig 18), we note that the correlation with stock characteristics are all at a much lower magnitude. Notably, MD&A length, report length and sentence length are positively correlated with acquisitions and asset growth – consequences of normal business operations.

Fig 11 Number of Words for MD&A



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 12 Number of Words for Whole Report



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Fig 13 Number of Words per Sentence

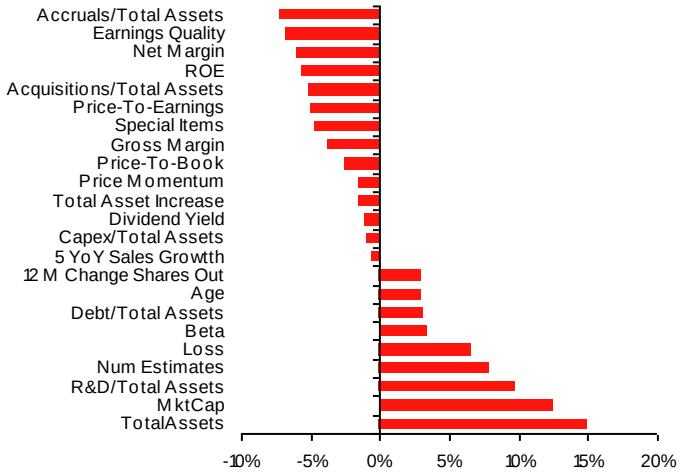


Fig 14 Proportion of Complex Words

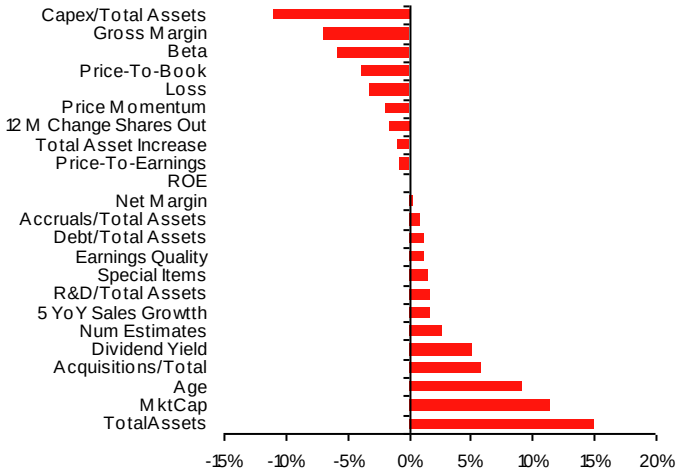


Fig 15 Change in Number of Words for MD&A

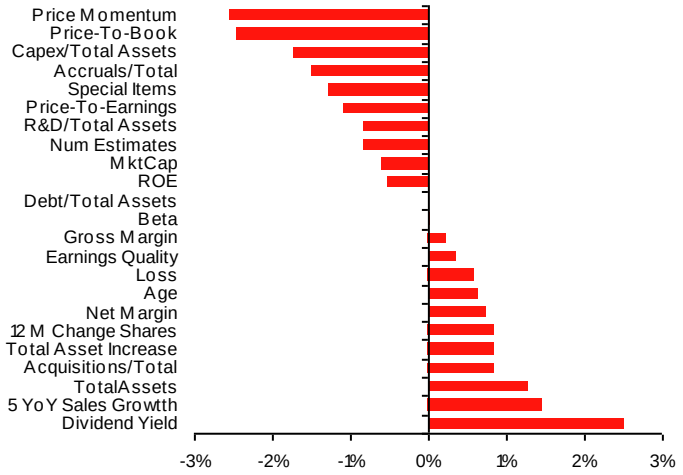


Fig 16 Change in Number of Words for Whole Report

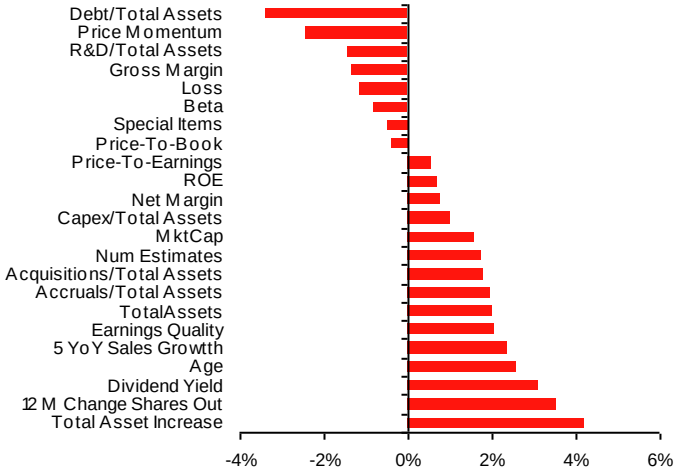


Fig 17 Change in Number of Words per Sentence

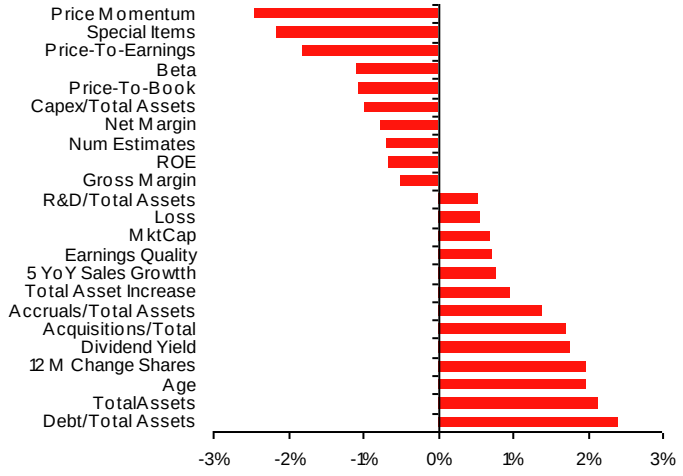
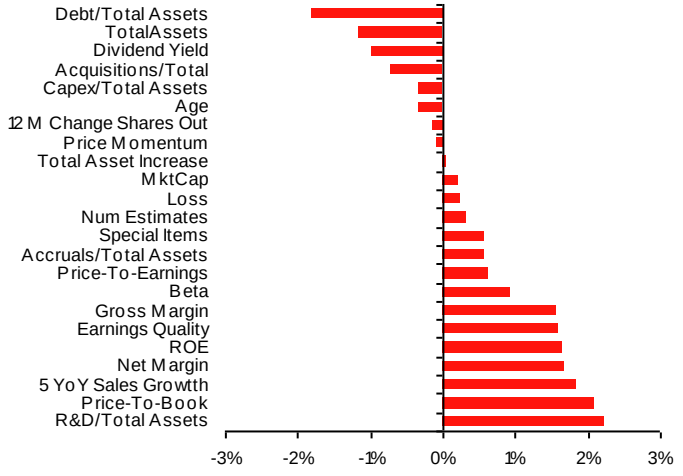


Fig 18 Change in Proportion of Complex Words



Source for Fig 13-18: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Trends in Complexity

MD&A sections appear to have become more complex over time.

In Fig 19 to Fig 22 we examine how the complexity measures have changed over time. The striking trend is the increase in MD&A length over time. Similarly, the length of the whole annual report has grown, but not to the same extent as the MD&A section. Sentence length has also steadily trended up over our sample period. The conclusion from these obeservations is that MD&A sections have become more complex. Interestingly, the proportion of complex words in the MD&A section have remained relatively flat.

Fig 19 Trends in Number of Words for MD&A

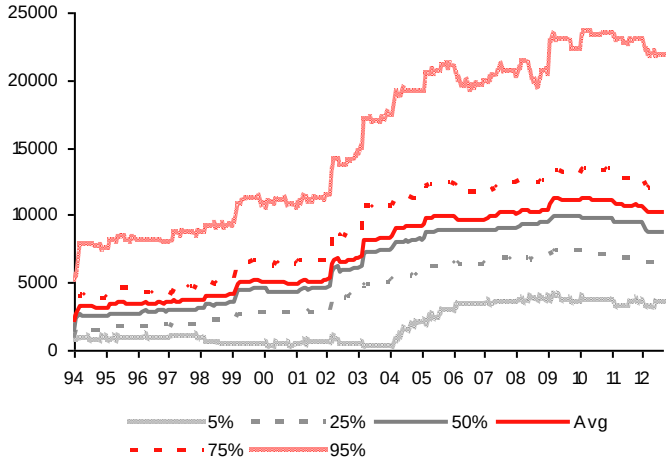


Fig 20 Trends in Number of Words for Whole Report

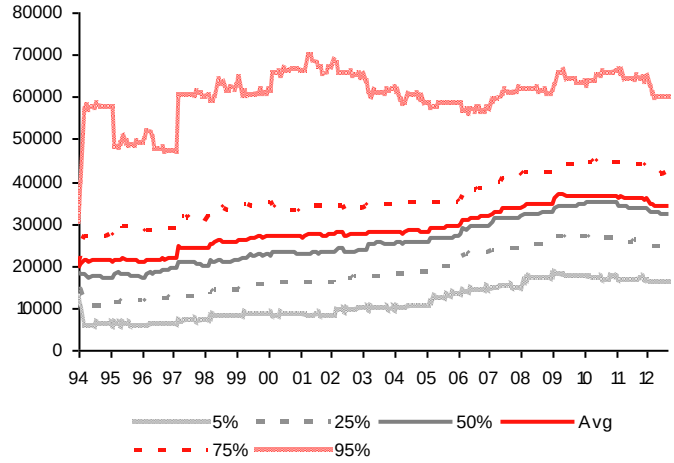


Fig 21 Trends in Number of Words per Sentence

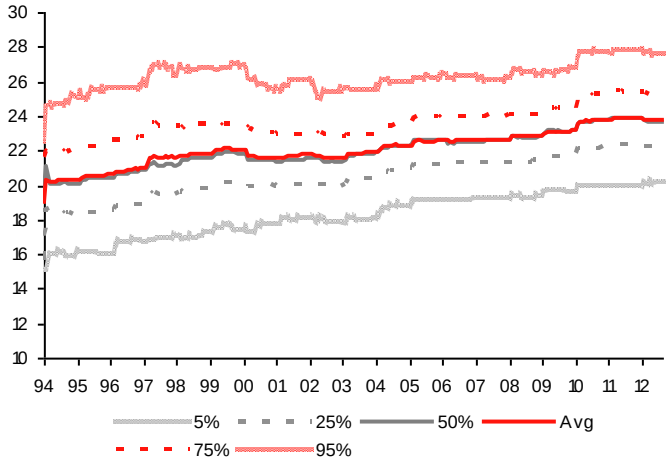
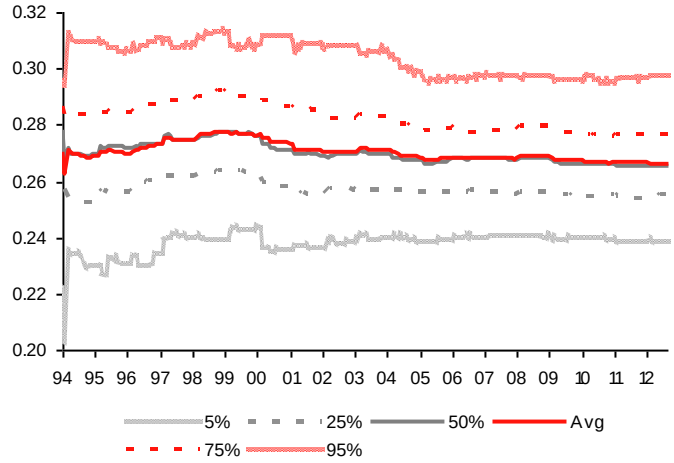


Fig 22 Trends in Proportion of Complex Words



Source for Fig 19-22: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Complexity Measures by Sector

There are variations in complexity measures across sectors.

When we look at the complexity measures by sector we see that Financials and Utilities typically have longer MD&A sections. Longer sentences are used in the Telecommunications sector. And more complex words are used in the Utility and Health Care sectors. Similar to our observations when examing correlations with stock characteristics, we will be careful to control for sector effects in our analysis.

Fig 23 Number of Words in MD&A by Sector

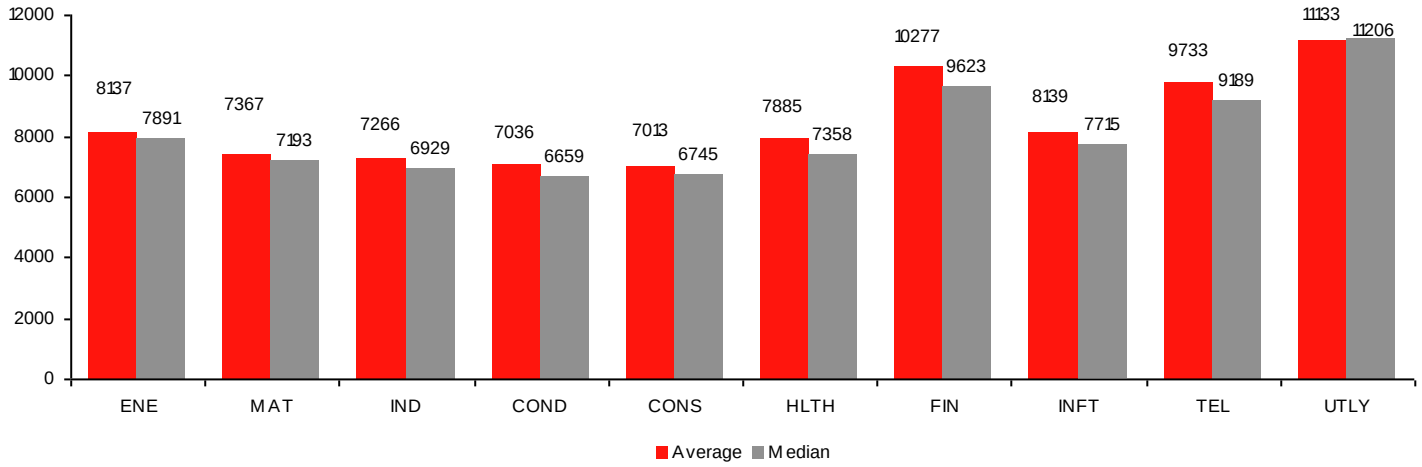


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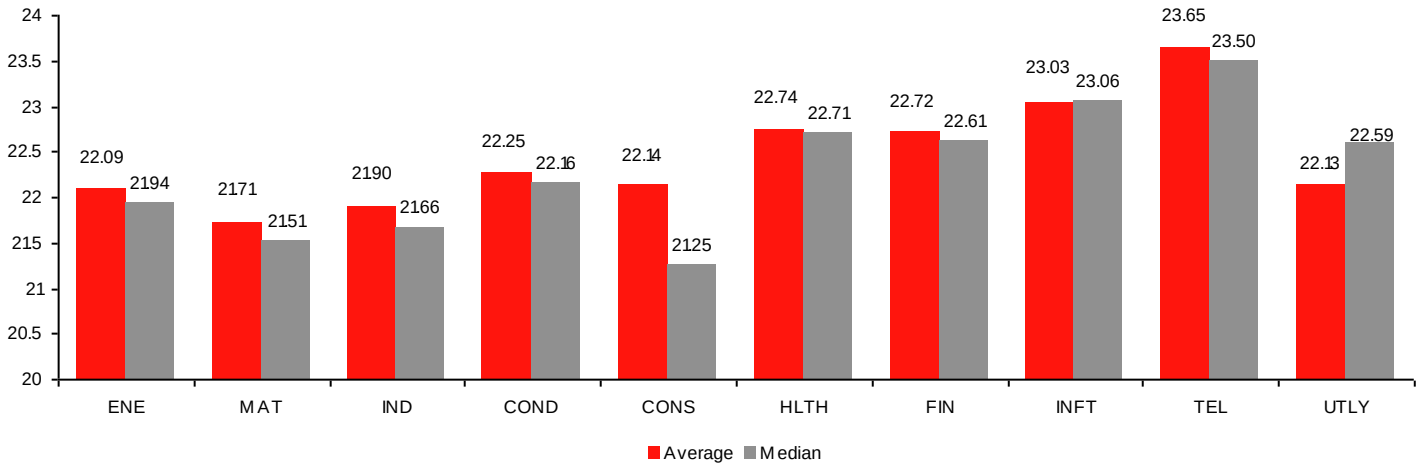
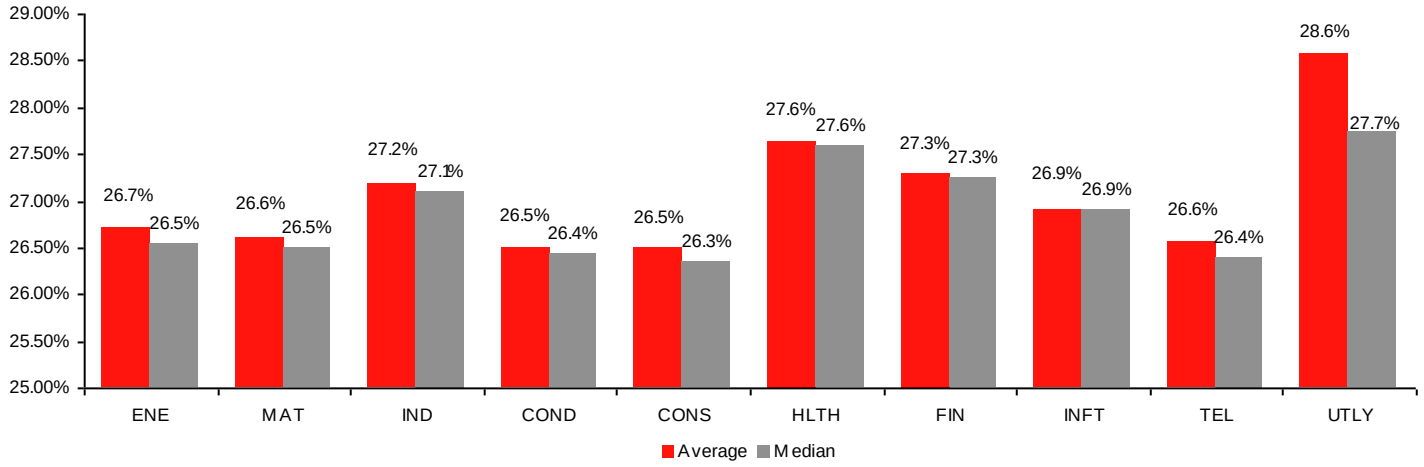
Fig 24 Sentence Length by Sector



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013. Key: ENE = Energy, MAT = Materials, IND = Industrials, DISC = Consumer Discretionary, STAP = Consumer Staples, HTH = Health Care, FIN = Financials, TECH = Information Technology, TEL = Telecommunication Services, UTLY = Utilities.

Fig 25 Proportion of Complex Words by Sector



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013. Key: ENE = Energy, MAT = Materials, IND = Industrials, DISC = Consumer Discretionary, STAP = Consumer Staples, HTH = Health Care, FIN = Financials, TECH = Information Technology, TEL = Telecommunication Services, UTLY = Utilities.

Complexity and Stock Returns

We examine whether complexity can explain future stock returns.

Having looked at determinants of complexity we now want to assess if complexity can explain future stock returns. We start off testing factors individually and then we use a simple composite score. The complexity factors we examine are:

- Number of words in the MD&A
- Words per sentence
- Complex words per word

We clean our complexity measures of size, asset growth and sector effects prior to testing.

As we observed in the previous section, complexity itself will be a function of several underlying stock characteristics. For instance, large market capitalization firms with many business segments will have larger MD&A and can be complex. A firm investing in R&D would like to present a detailed overview of its investment. Similar would be the case with acquisitions, debt issues, special items etc. In order to control for the sources of complexity that arise from normal business operations, we perform the below regression:

$$C_{i,t} = c + \beta_1 \text{Log Total Assets}_{i,t} + \beta_3 \text{Asset Growth}_{i,t} + \sum_{s=1}^{s-1} \beta_s \text{Sector}_{si,t} + \varepsilon_{i,t} \quad (1)$$

The objective is to strip out effects from the complexity measures that are due to size, asset growth and sectors. Asset growth is used to control for transactional effects (e.g. acquisitions, share issuance, debt issuance etc) (see Cooper. Gulen and Schill, 2008).

For this analysis we exclude financials. We have repeated all of our analysis including financials and also without the controls outlined above.

Throughout the analysis Q1 refers to the quintile corresponding to low complexity, and Q5 to high complexity.

As a summary of the analysis of complexity measures based on levels, we do not find any stable relationship with returns.

Number of Words for MD&A

The return profile for number of words lacks monotonicity and fluctuates through time.

We start the testing using number of words in the MD&A. In Fig 26 and Fig 27 we show 1 and 12 month average excess returns by quintile. Its very clear there is no desirable pattern to the return profile. Similarly the monthly 1 month and 12 month spread returns in Fig 28 and Fig 29 show large fluctuations. And while the return profile is not monotonic, meaning we do not want to place great emphasis on the spread returns, in Fig 30 we can see the spread returns are actually on average opposite to what we would expect.

Fig 26 Average Quintile Returns (1 Month)

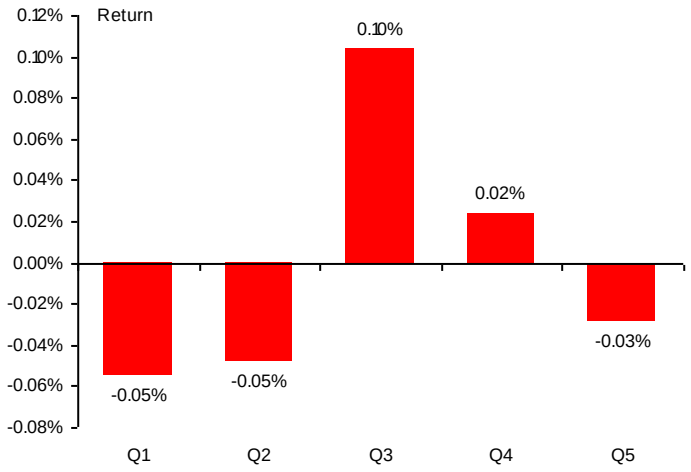


Fig 27 Average Quintile Returns (12 Month)

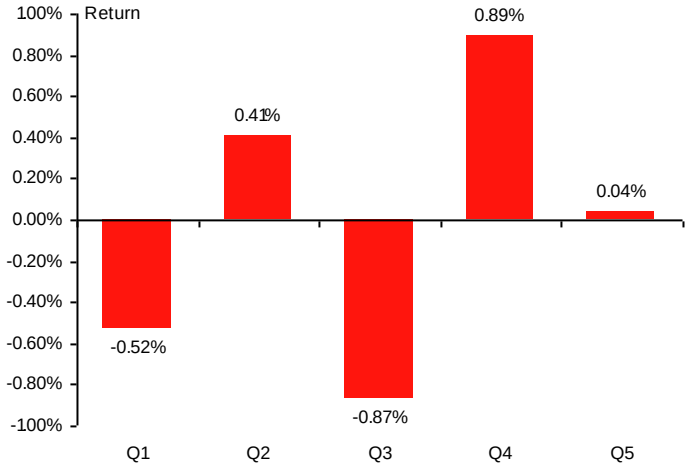


Fig 28 Monthly Spread Returns (1 Month)

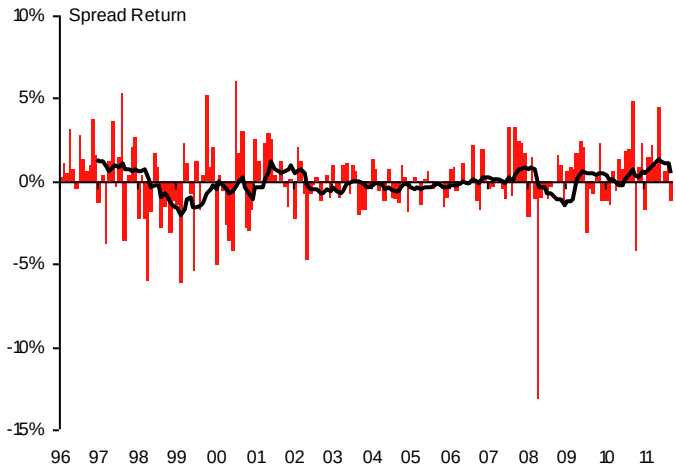


Fig 29 Monthly Spread Returns (12 Months)

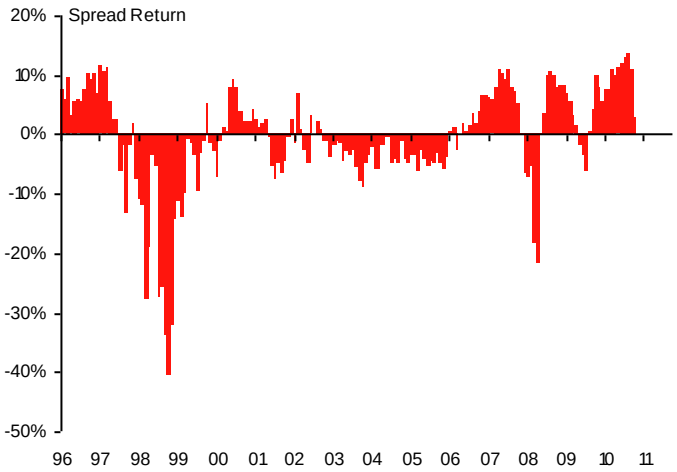


Fig 30 Average Spread Returns

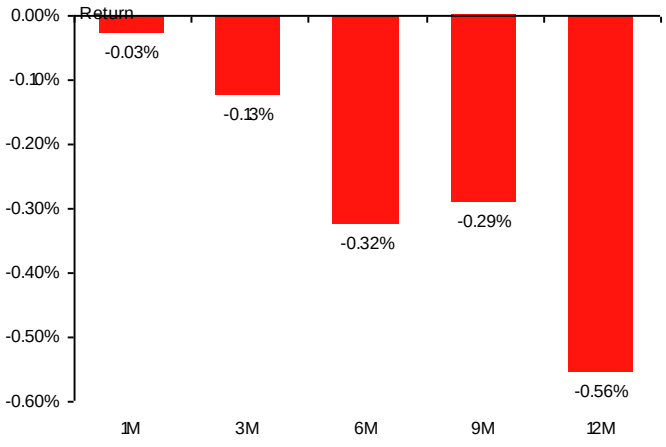
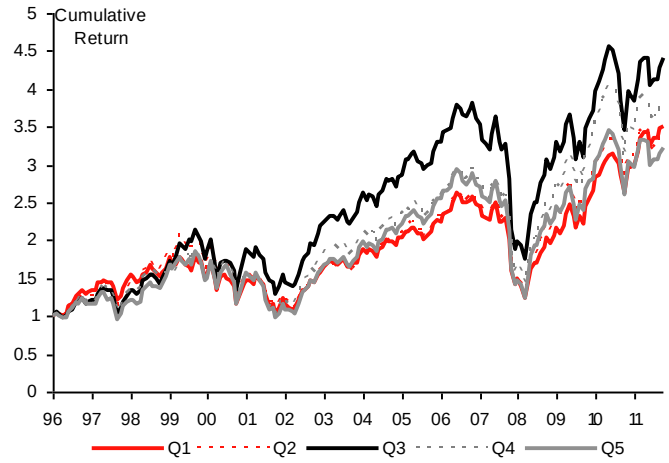


Fig 31 Cumulative Quintile Returns



Source for Fig 26-31: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Number of Words per Sentence

Sentence length does not yield any encouraging results.

The second measure of complexity that we examine is number of words to sentences. The results across Fig 32 to Fig 37 do not yield any encouraging insights.

Fig 32 Average Quintile Returns (1 Month)

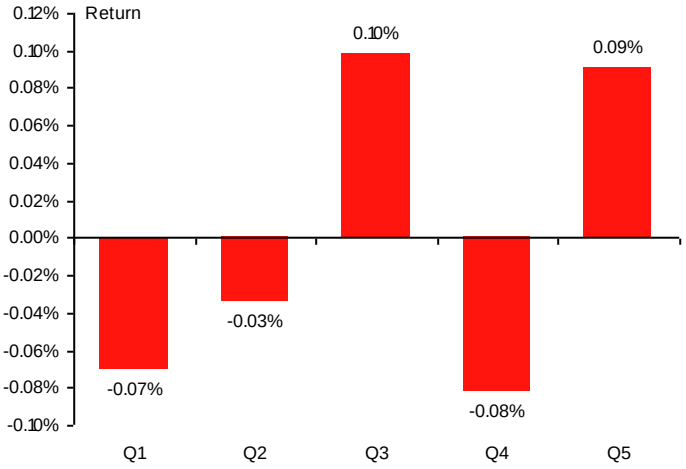


Fig 33 Average Quintile Returns (12 Month)

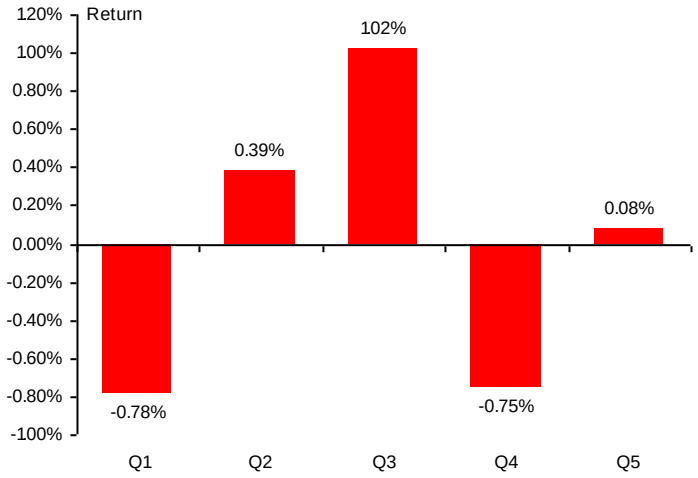


Fig 34 Monthly Spread Returns (1 Month)

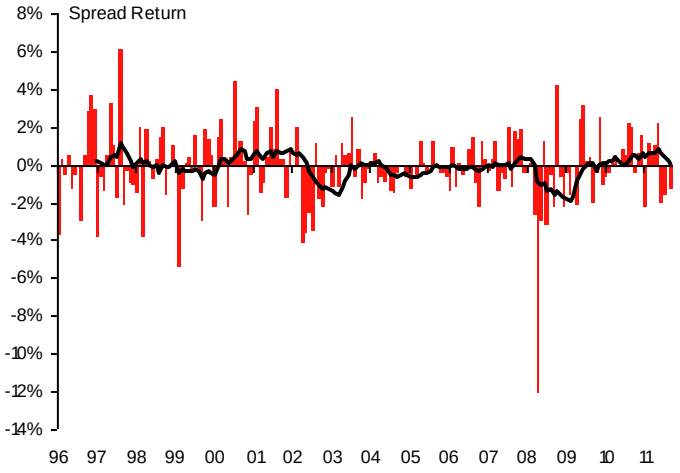
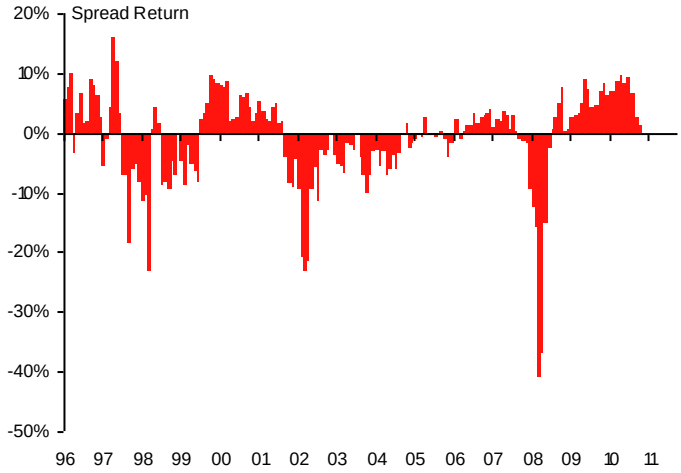
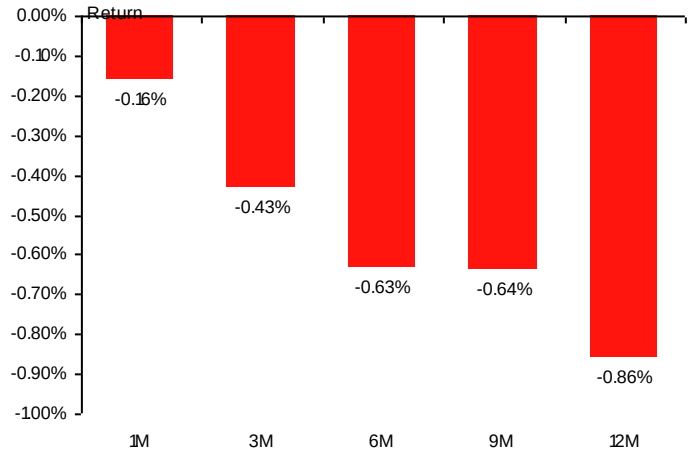


Fig 35 Monthly Spread Returns (12 Months)



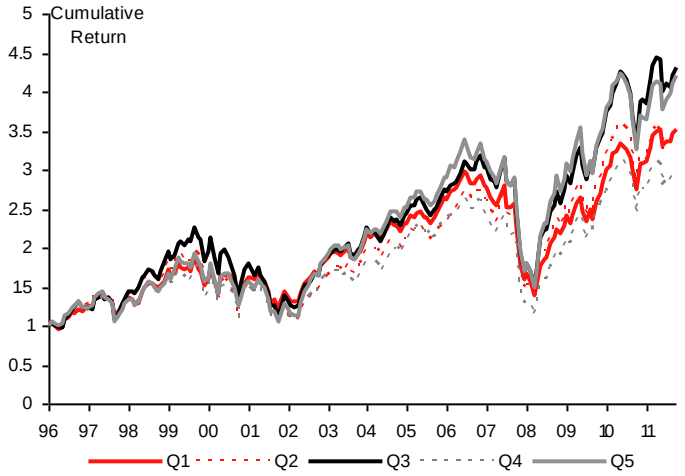
Source for Fig 32-35: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 36 Average Spread Returns



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 37 Cumulative Quintile Returns



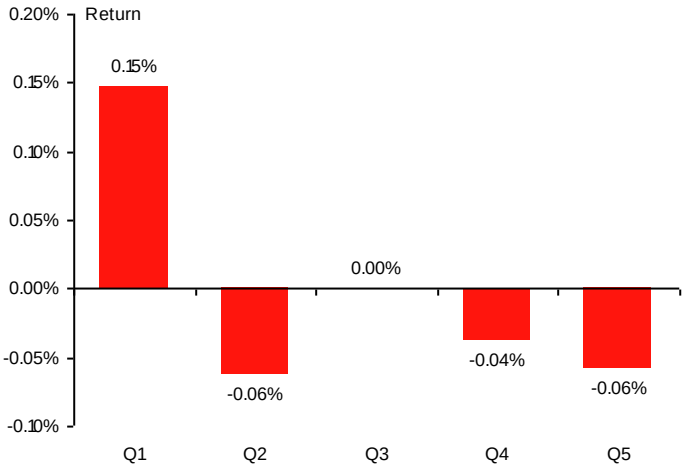
Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Proportion of Complex Words

Proportion of complex words produces the 'right' sign but the overall is not stunning.

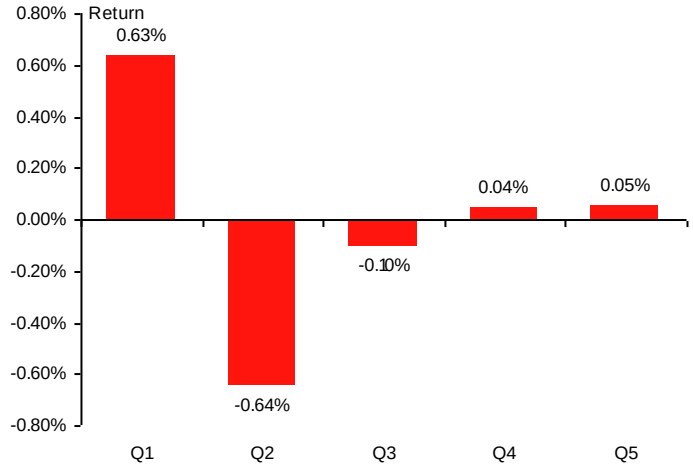
The third complexity measure we examine is the proportion of complex words in the MD&A section. Of the three factors, this factor has the predicted sign. We see that Q1 in Fig 38 and Fig 39 outperforms all other quintiles. This translates into positive spread returns in Fig 42 and strong cumulative outperformance of Q1 in Fig 43.

Fig 38 Average Quintile Returns (1 Month)



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 39 Average Quintile Returns (12 Month)



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Fig 40 Monthly Spread Returns (1 Month)

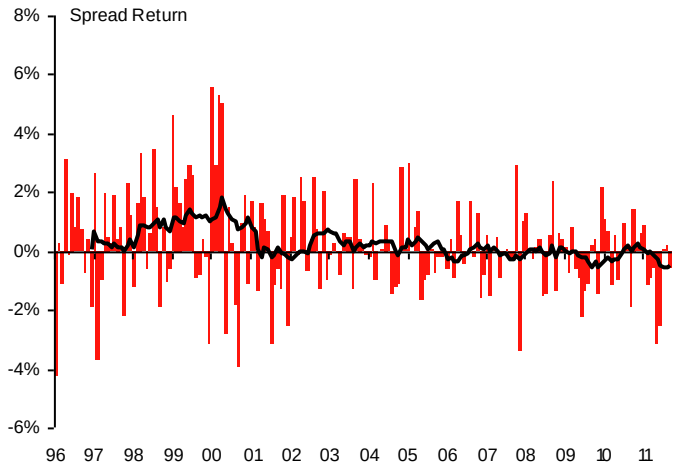


Fig 41 Monthly Spread Returns (12 Months)

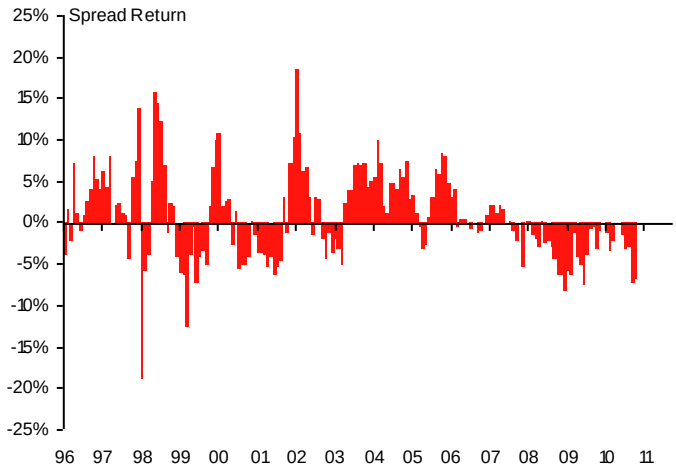


Fig 42 Average Spread Returns

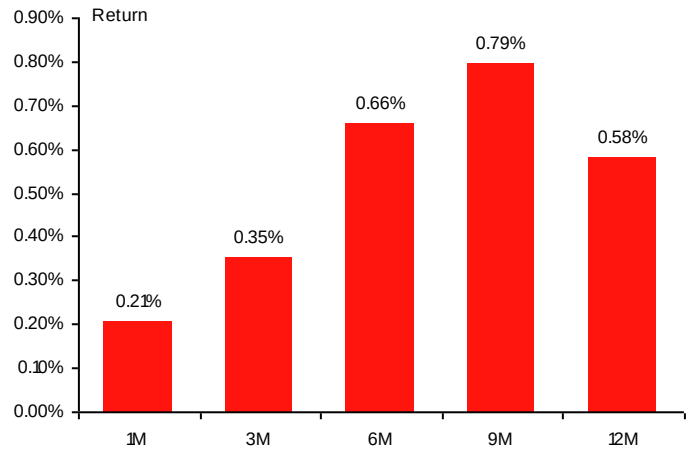
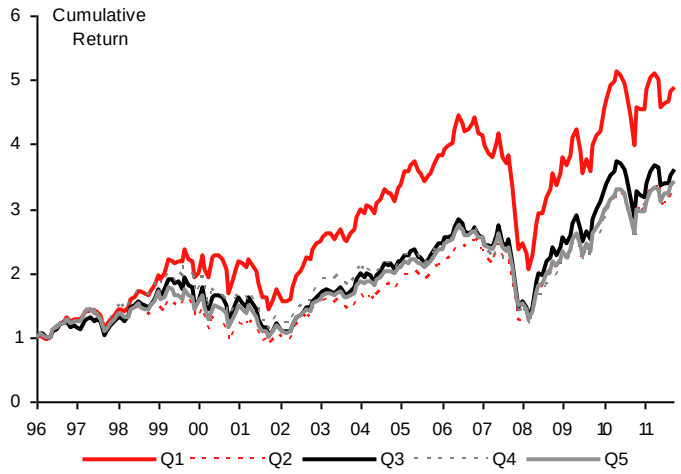


Fig 43 Cumulative Quintile Returns



Source for Fig 40-43: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Combining the 3 individual complexity scores does not produce better results.

A Simple Complexity Score

The last step of our analysis is to examine a simple composite of the three complexity measures. This complexity score produces very odd results, which is best highlighted in Fig 45. Q1 and Q5 both outperform with the greatest unperformance being in Q3!

Fig 44 Average Quintile Returns (1 Month)

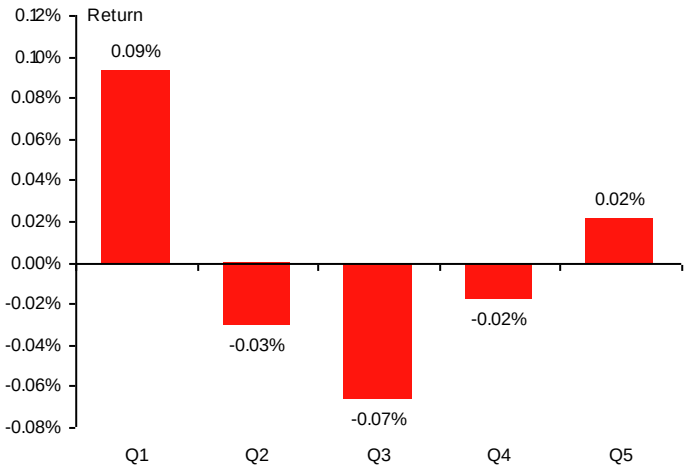


Fig 45 Average Quintile Returns (12 Month)

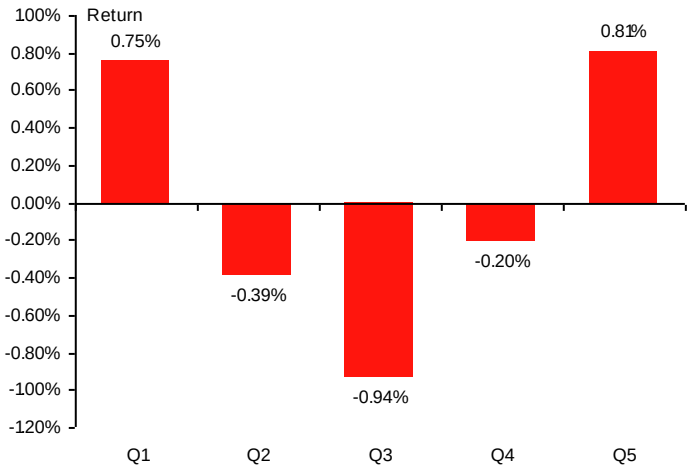


Fig 46 Monthly Spread Returns (1 Month)

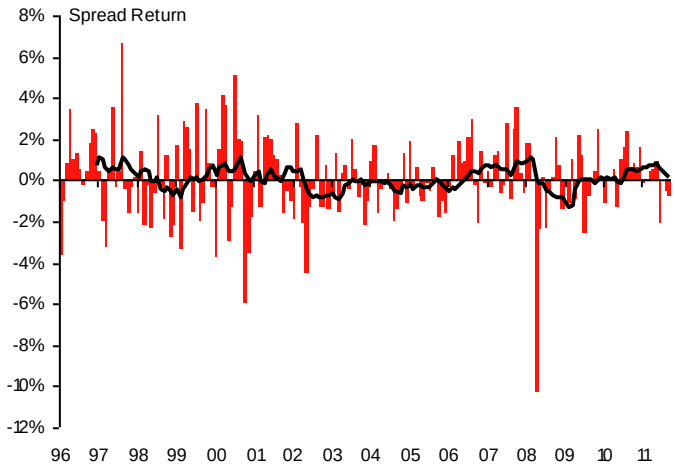


Fig 47 Monthly Spread Returns (12 Months)

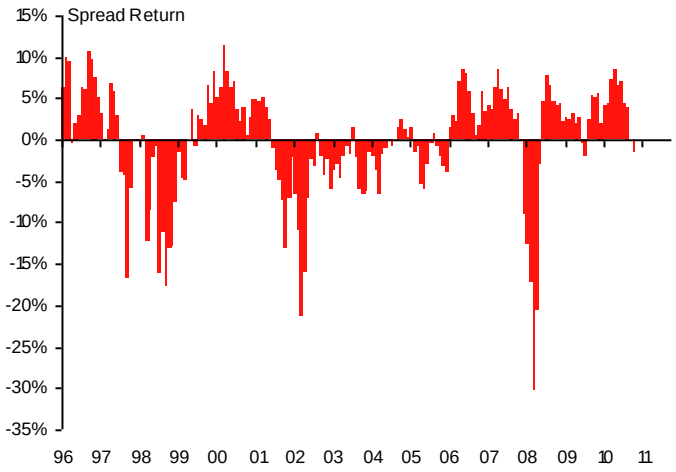


Fig 48 Average Spread Returns

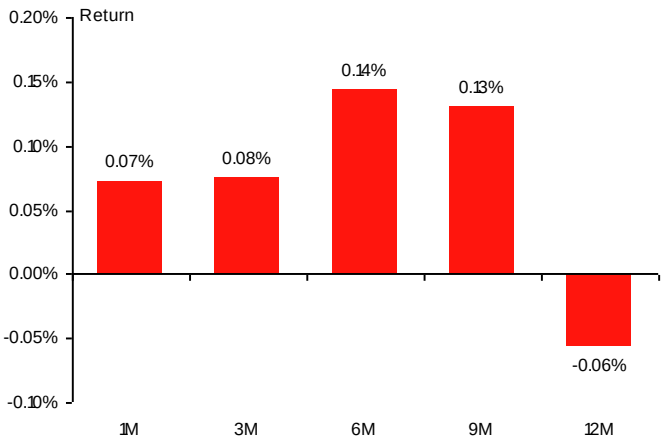


Fig 49 Cumulative Quintile Returns

Source for Fig 44-49: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

It's All about Changes!

Are changes in complexity important?

So far we have found that complexity measures in level forms do not help predict stock returns. We now examine whether changes in complexity is important. We look at year-on-year changes. Similar to the earlier analysis, we control for size, asset growth and sector effects.

To summarize this section, increases in complexity predict underperformance, particularly at longer holding durations.

Change in Number of Words for MD&A

Changes in MD&A produce meaningful spread returns at longer horizons.

Looking at the change in MD&A length prdouces some interesting results. At the 1 month horizon, there is nothing to get excited about. However, over longer horizons, we see a nice monotonic return distribution (Fig 51). The build up of this effect at longer horizons is pronounced in the average spread returns in Fig 54.

Fig 50 Average Quintile Returns (1 Month)

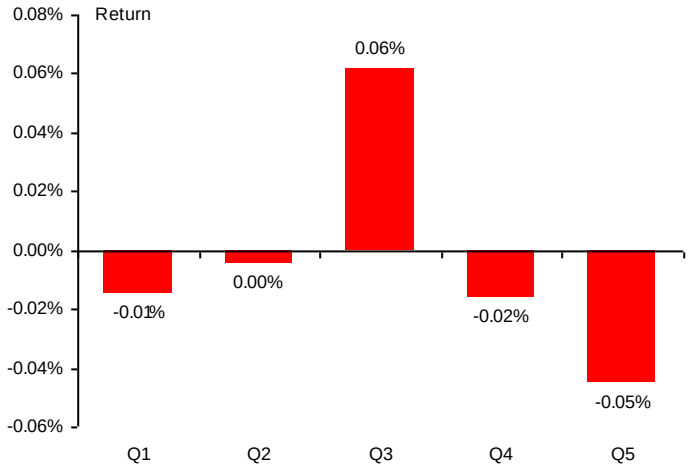


Fig 51 Average Quintile Returns (12 Month)

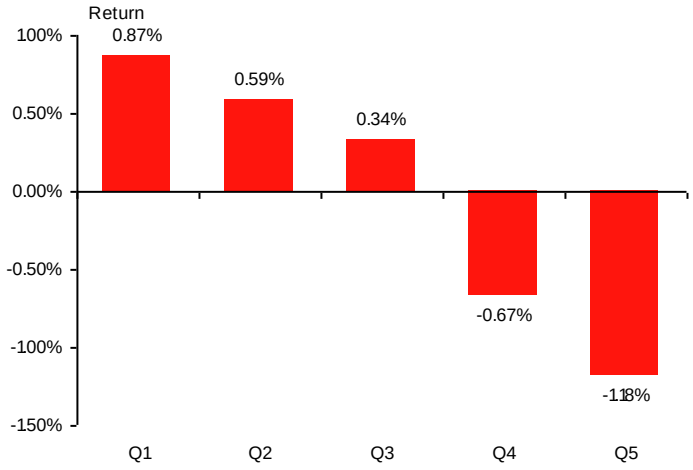


Fig 52 Monthly Spread Returns (1 Month)

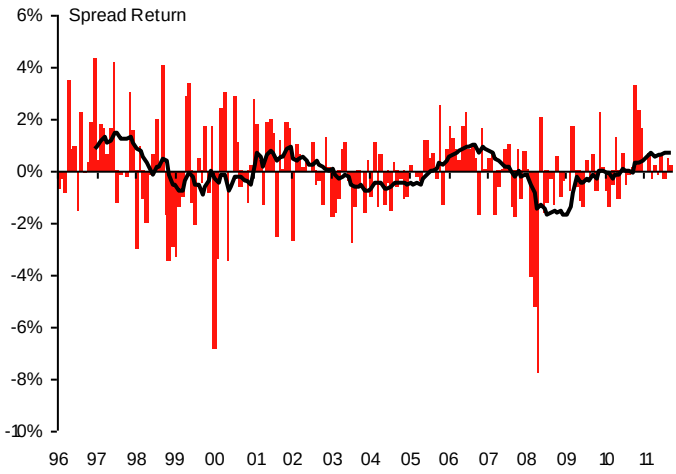
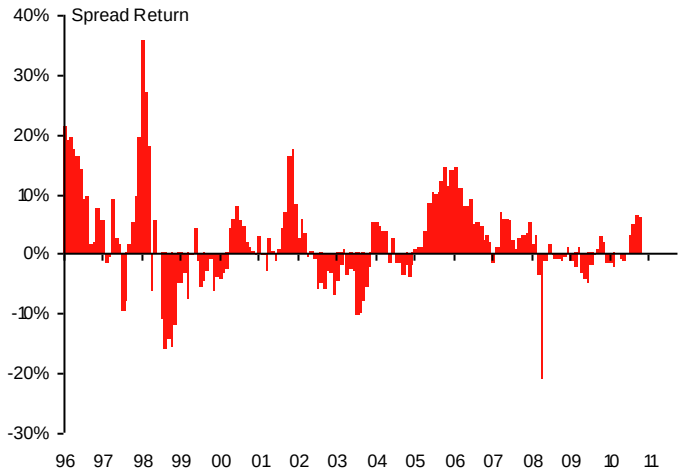
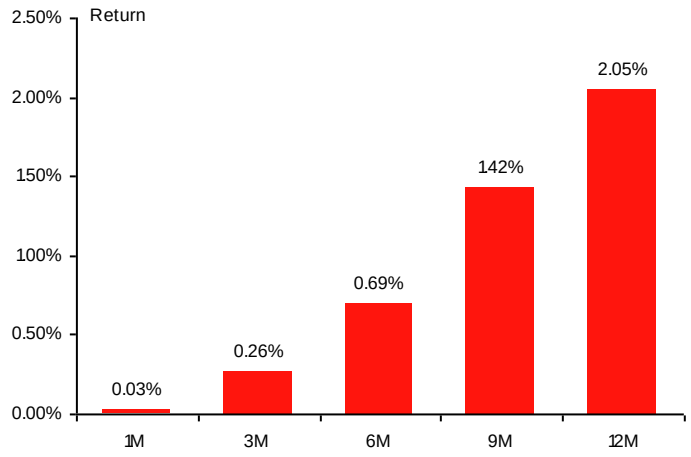


Fig 53 Monthly Spread Returns (12 Months)



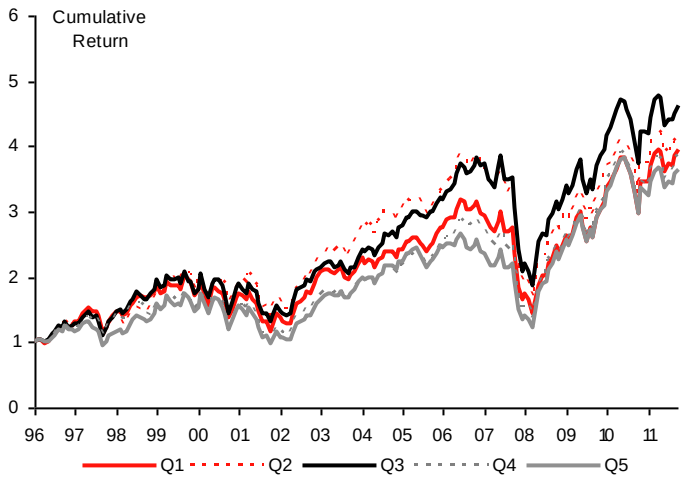
Source for Fig 50-53: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 54 Average Spread Returns



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 55 Cumulative Quintile Returns



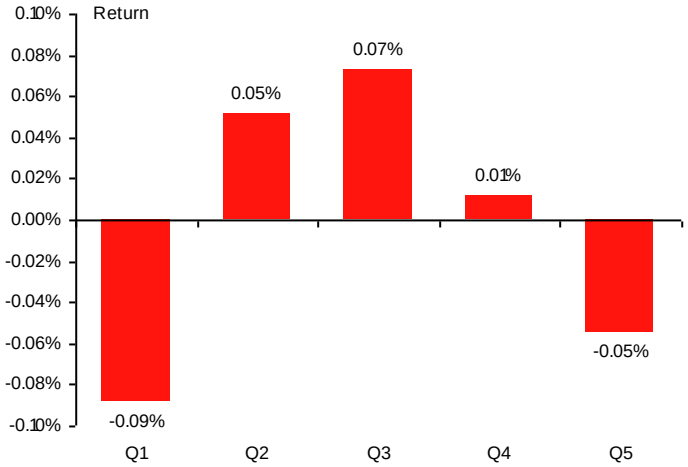
Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Change in Number of Words per Sentence

Changes in MD&A produce meaningful spread returns at longer horizons.

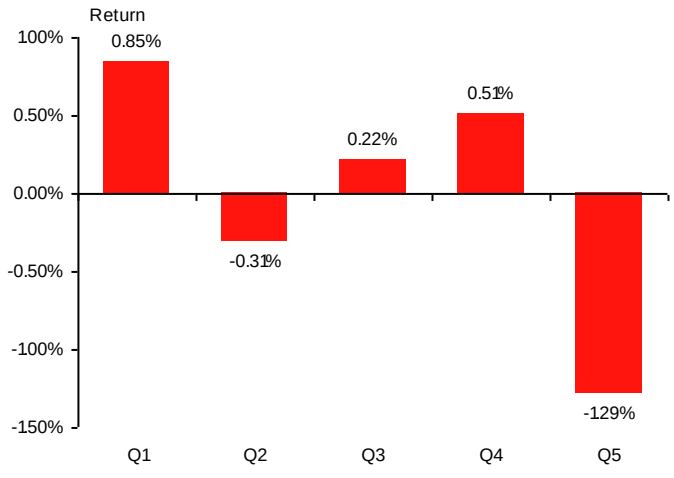
Similar to change in MD&A length, change in sentence length appears to work better at longer horizons (Fig 57).

Fig 56 Average Quintile Returns (1 Month)



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 57 Average Quintile Returns (12 Month)



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Fig 58 Monthly Spread Returns (1 Month)

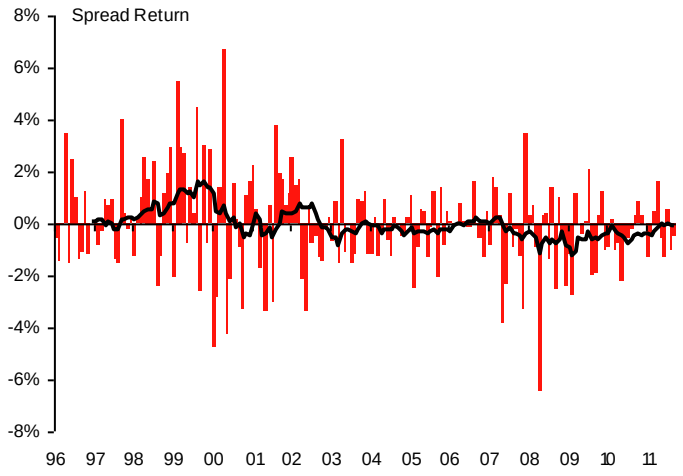


Fig 59 Monthly Spread Returns (12 Months)

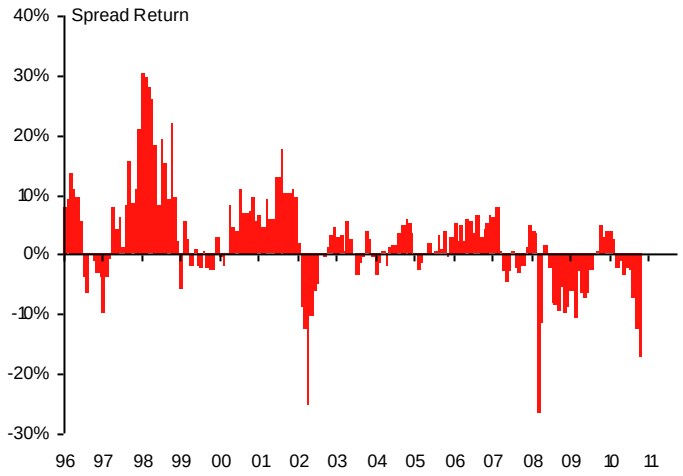


Fig 60 Average Spread Returns

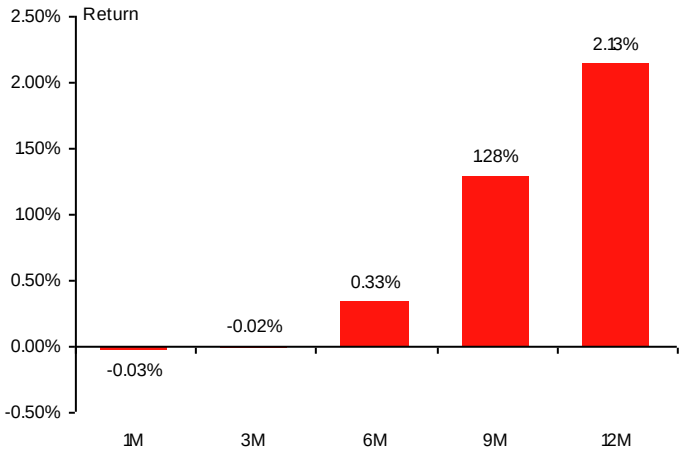
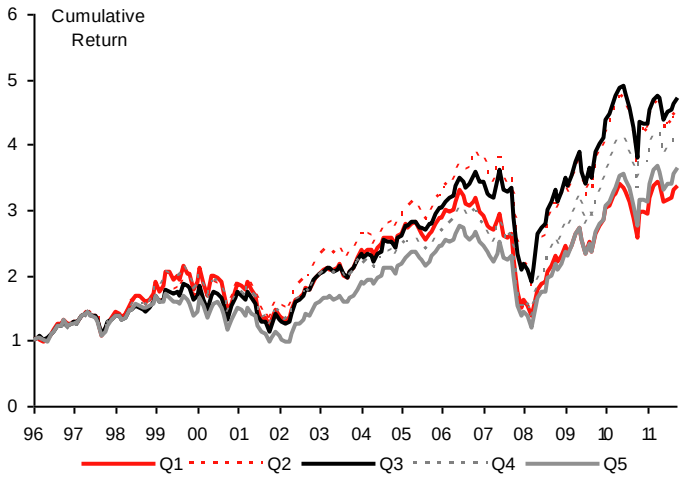


Fig 61 Cumulative Quintile Returns



Source for Fig 58-61: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Change in Proportion of Complex Words

Overall, low changes in proportion of complex words outperform high changes.

With regards to change in proportion of complex words, low changes appear to outperform larger changes. It is interesting to see the returns in Q1 and Q2 at longer holding durations (Fig 63), with Q2 significantly outperforming Q1.

Fig 62 Average Quintile Returns (1 Month)

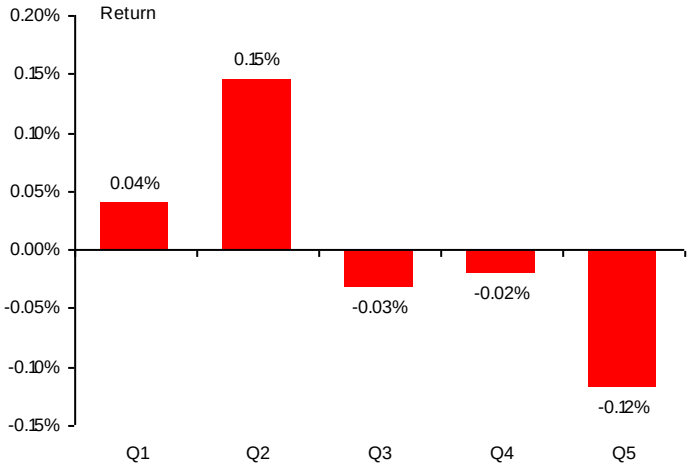


Fig 63 Average Quintile Returns (12 Month)

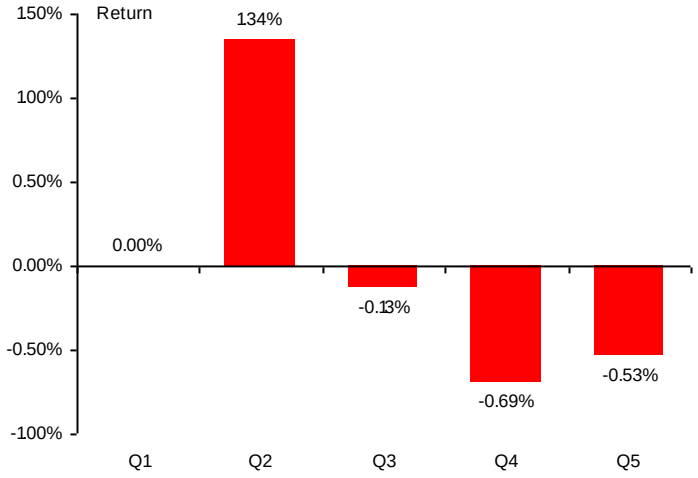


Fig 64 Monthly Spread Returns (1 Month)

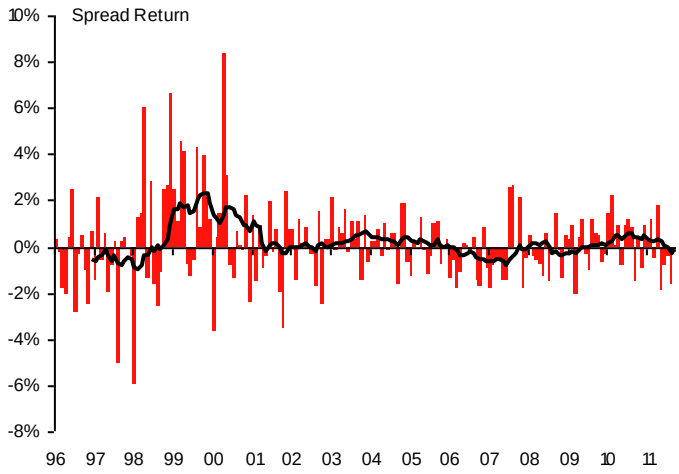


Fig 65 Monthly Spread Returns (12 Months)

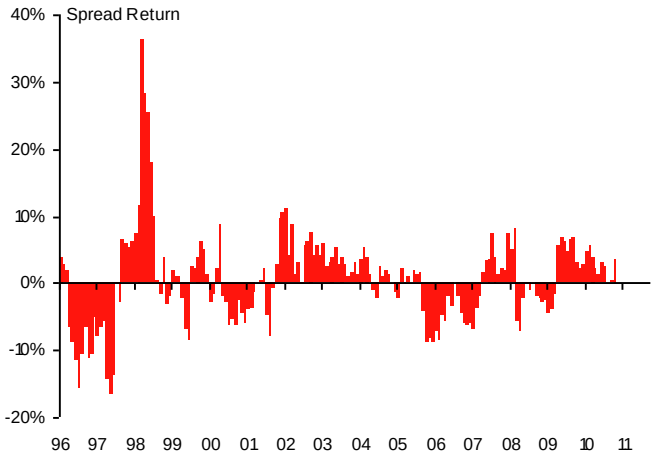


Fig 66 Average Spread Returns

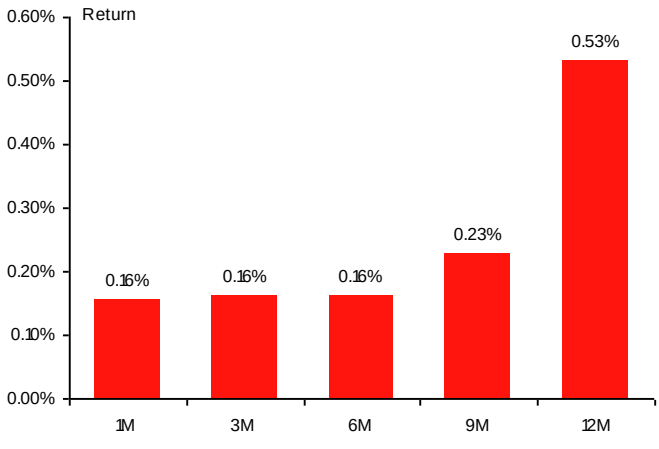
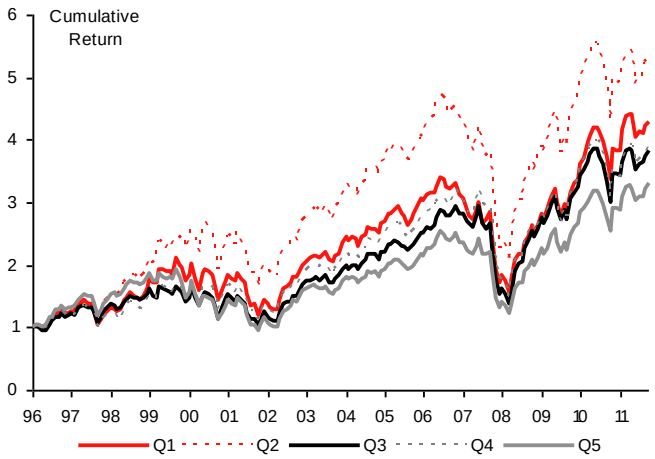


Fig 67 Cumulative Quintile Returns



Source for Fig 62-67: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

A Simple Change in Complexity Score

12 month spread returns for a composite change in complexity factor is 4%!

So far the returns associated with changes in the complexity scores appear more encouraging. We now test whether a simple composite performs better, by helping reduce noise that each individual measure is likely to be capturing.

Again at longer holding durations, it is quite clear that Q5 significantly underperforms all other quintiles. This is actually apparent in all forms of the complex score i.e. including financials; without controlling for various effects.

Fig 68 Average Quintile Returns (1 Month)

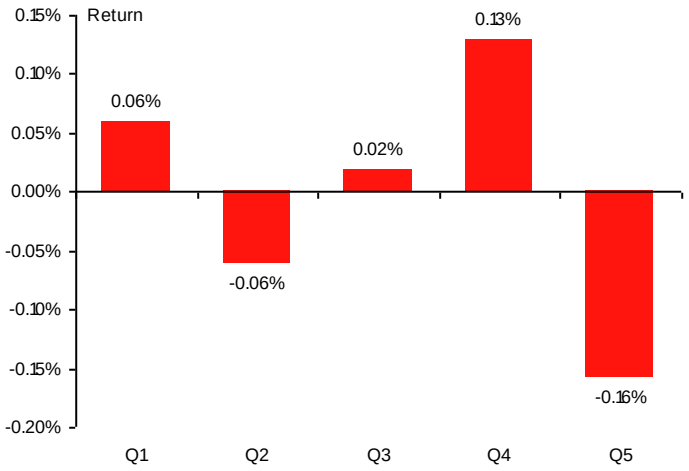


Fig 69 Average Quintile Returns (12 Month)

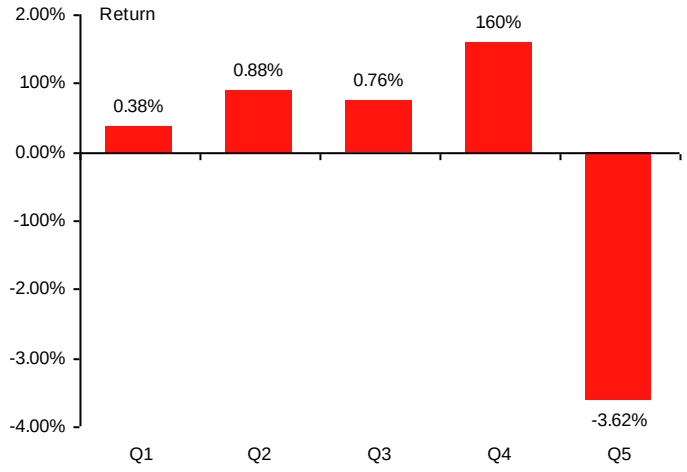


Fig 70 Monthly Spread Returns (1 Month)

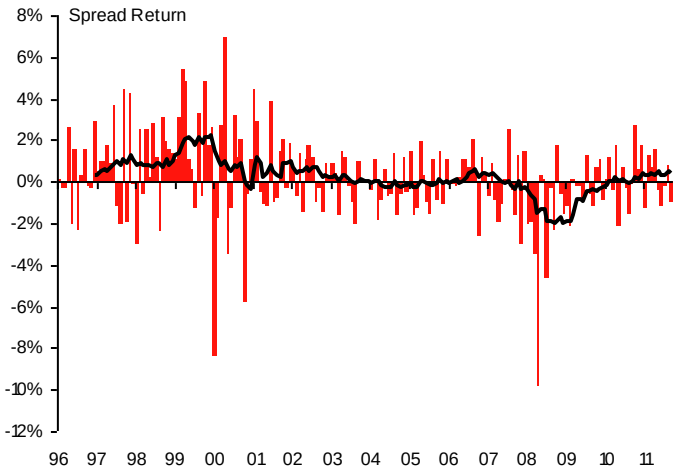
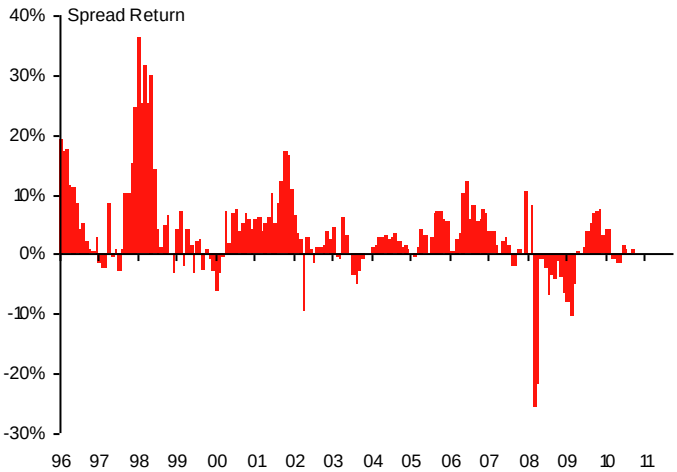
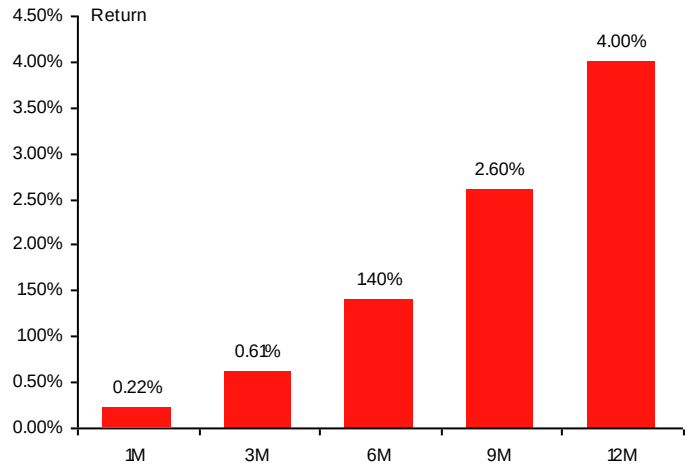


Fig 71 Monthly Spread Returns (12 Months)



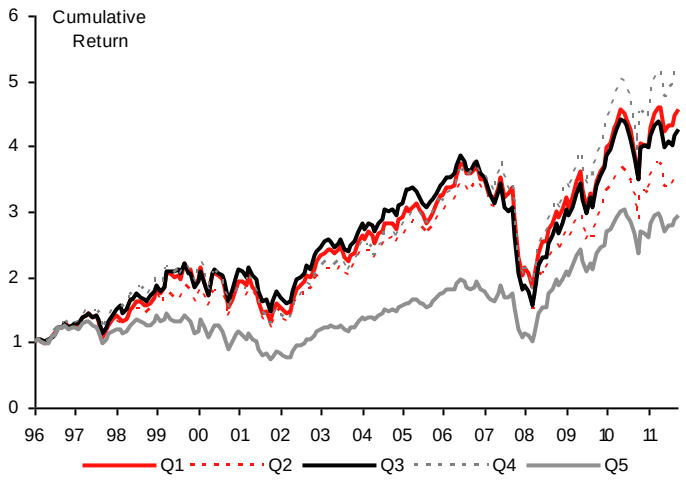
Source for Fig 68-71: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 72 Average Spread Returns



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 73 Cumulative Quintile Returns



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Why Does Complexity Predict Returns?

What is the transfer mechanism from changes in complexity to stock returns?

In the previous section we showed that large increases in complexity of MD&A sections predicts underperformance – particularly at longer durations. A big question is why? We motivate the overall research on the grounds that management is trying to hide current performance and implications around future operating performance. Indeed Li (2008) finds lower levels of readbility predict lower earnings persistence. Brown and Tucker (2011) find firms modify their MD&A from the previous year to a larger extent following significant changes in earnings than they do following small changes.

In this section we examine whether changes in complexity are associated with current operating performance, and whether it can also predict future operating performance. As robustness, we also clean out operating performance effects from our complexity measures and re-test their predictive ability of stock returns.

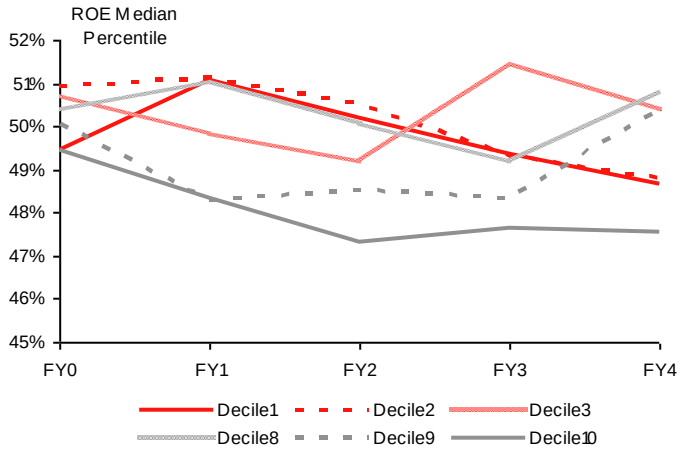
Linking Complexity with Fundamentals

We find that increases in complexity are associated with low current and future operating performance.

To link changes in complexity with fundamentals, we first form deciles based on change in complexity. Within each decile we compute the median ROE and ROA from years FY0 to FY4. When working with ROE and ROA, we work with percentile rank equivalents. We do so because accounting ratios can be very noisy, even after winsorising.

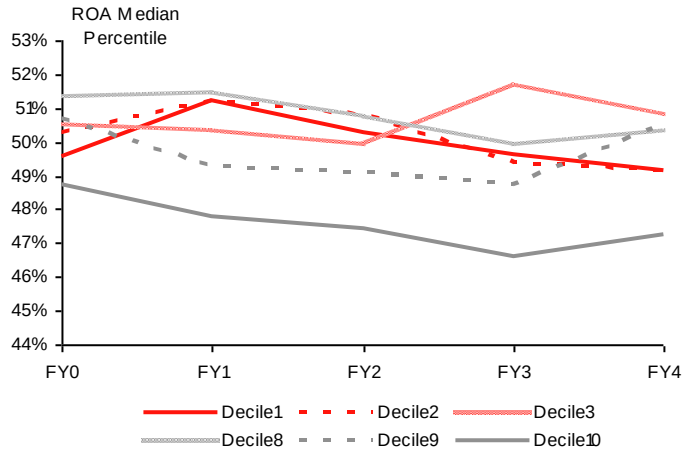
In Fig 74 and Fig 75 we chart the ROE and ROA profiles. The main point from these figures is the lower percentile rank for decile 10 across all time periods. Decile 9 has the second lowest ROE and ROA before a pick up in FY4.

Fig 74 ROE Profile partitioned on Complexity



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 75 ROA Profile partitioned on Complexity



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Large increases in complexity are associated with large declines in operating performance.

Building on the analysis of ROE and ROA, when examine the relationship of changes in complexity with changes in ROE and ROA. Fig 76 and Fig 77 tell us that those firms with the largest increase in complexity are associated with the largest declines in operating performance in FY0 and FY1.

Having linked changes in complexity with fundamentals, we next want to see whether adding a signal of operating performance based on 'hard' information can improve the performance of the 'soft' information signal. We look at returns of portfolios that have been double sorted first by complexity and then ROE (and ROA). Specifically, we first form quintiles based on our change in complexity score. Then within each quintile we split stocks based on the median level of ROE or ROA.

What we find is that combining ROE (or ROA) with complexity improves performance. This is particularly pronounced in Q5 of both Fig 78 and Fig 79.

Fig 76 Change in ROE Profile partitioned on Complexity

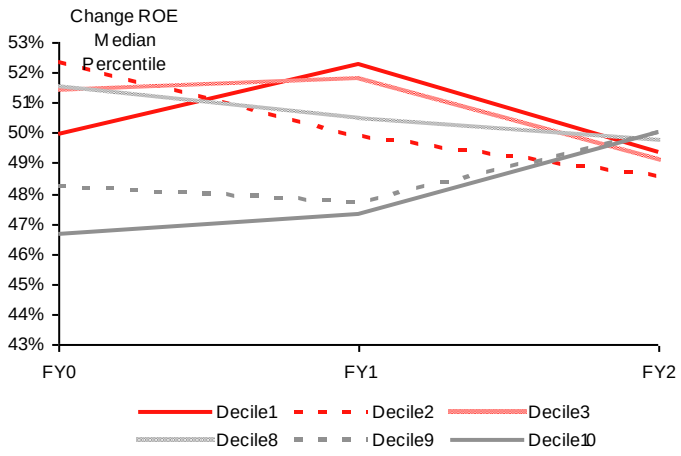


Fig 77 Change in ROA Profile partitioned on Complexity

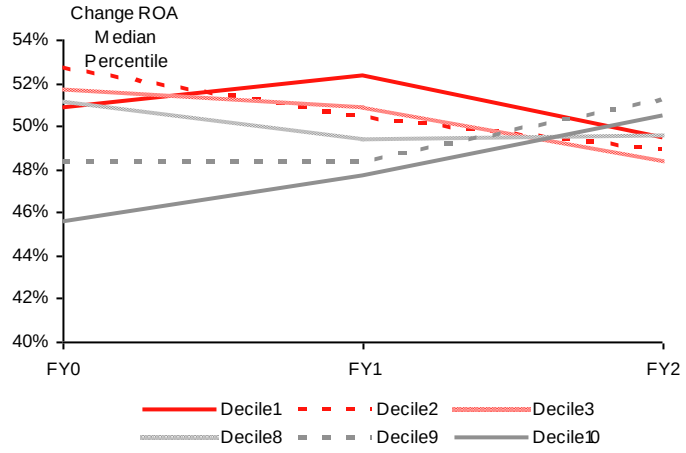


Fig 78 Double Sort Returns – Complexity and ROE

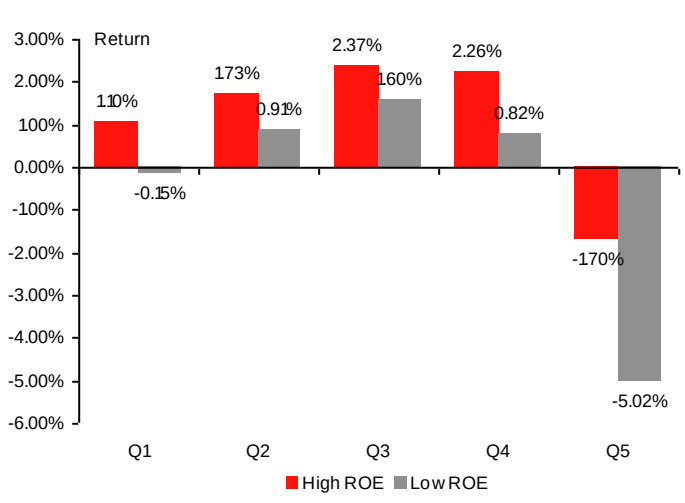
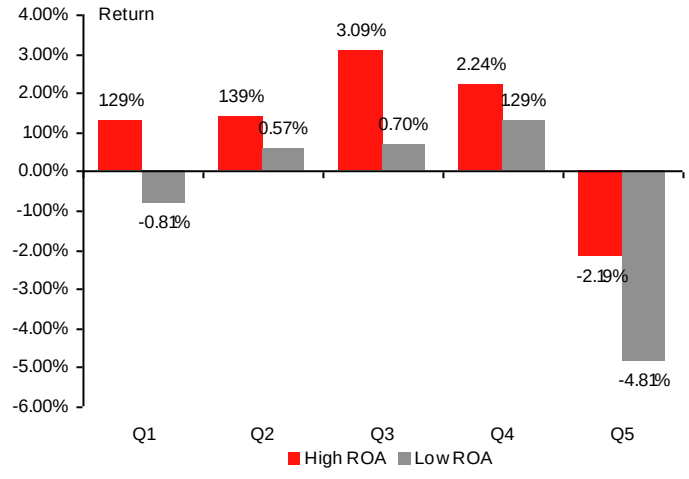


Fig 79 Double Sort Returns – Complexity and ROA



Source for Fig 76-79: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Performance of a Complexity Score after Controlling for ROE

Controlling for ROE has a negligible effect on the performance of our complexity factor.

To account for this relationship between ROE and complexity, and show that the complexity is not picking up pure ROE performance effects, we modify equation (1) and also control for ROE. We then repeat the stock return testing. We do so only for the composite change in complexity score. Overall we find that controlling for ROE does not consume the explanatory power of our complexity factor. Controlling for ROE actually has a negligible effect.

Fig 80 Average Quintile Returns (1 Month)

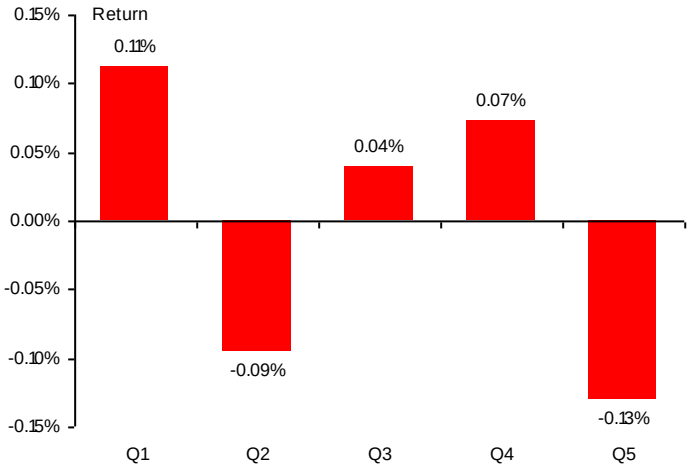


Fig 81 Average Quintile Returns (12 Month)

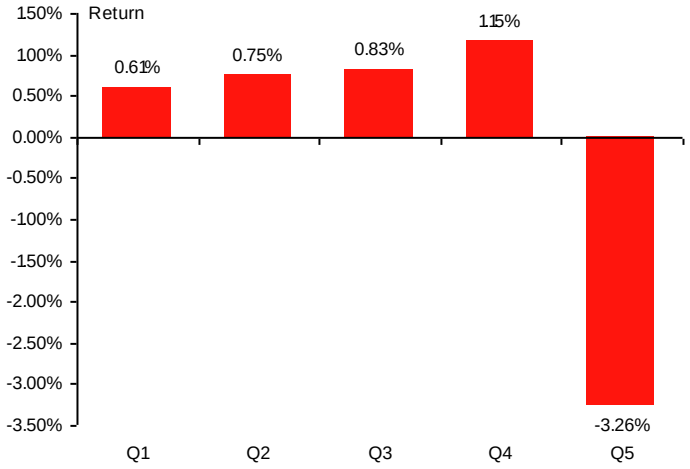


Fig 82 Monthly Spread Returns (1 Month)

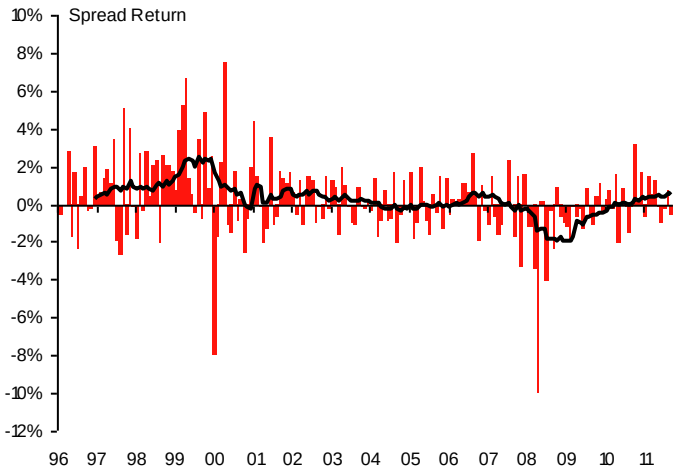
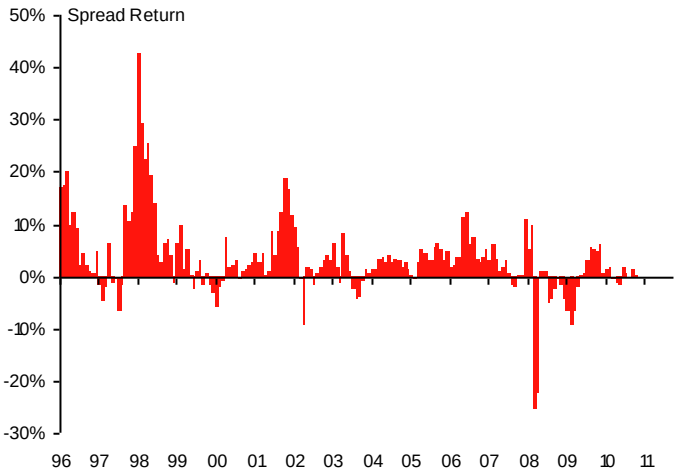
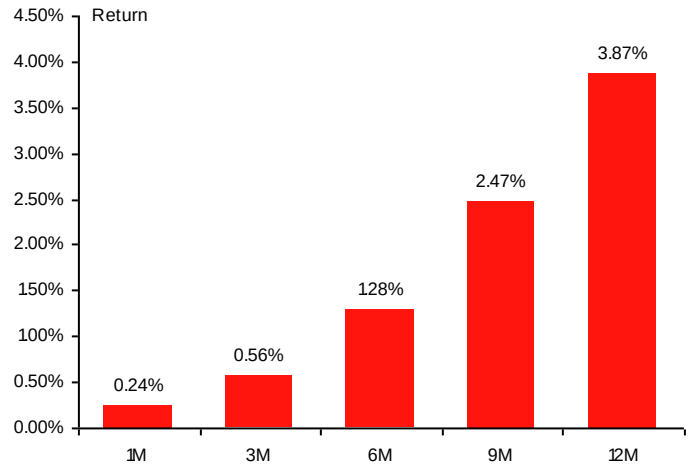


Fig 83 Monthly Spread Returns (12 Months)



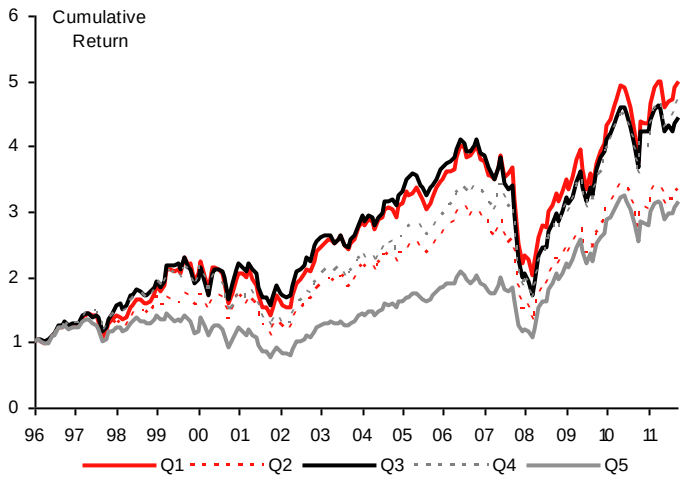
Sourced for Fig 80-83: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 84 Average Spread Returns



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 85 Cumulative Quintile Returns



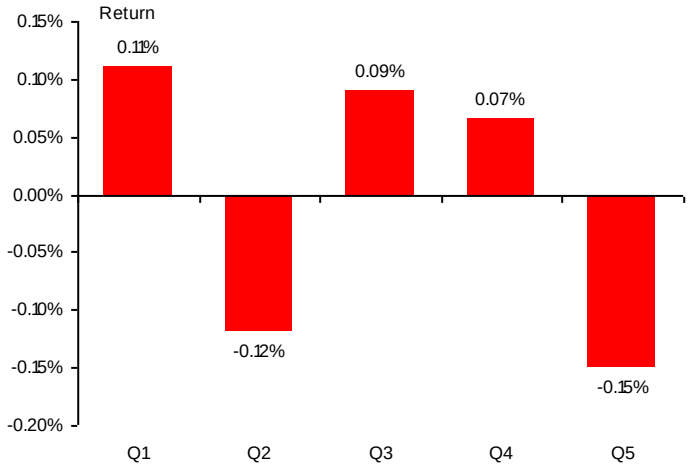
Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Performance of a Complexity Score after Controlling for Change in ROE

Controlling for change in ROE also has a negligible effect.

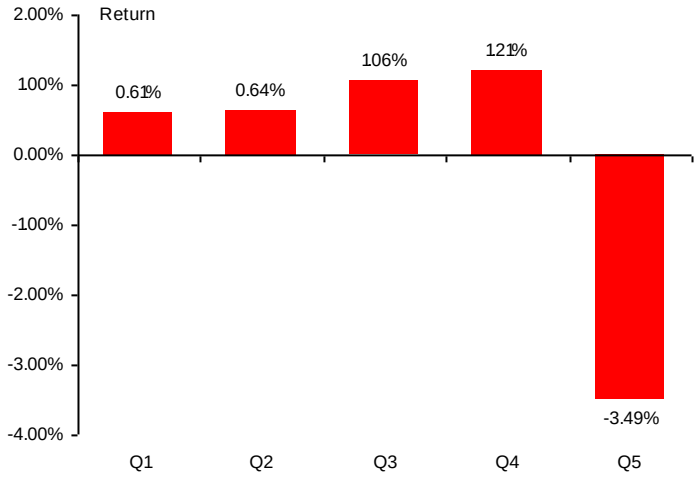
For additional robustness, we also control for changes in ROE. Similar to the previous analysis, we find this does not have a meaningful impact of the backtesting results.

Fig 86 Average Quintile Returns (1 Month)



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 87 Average Quintile Returns (12 Month)



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Fig 88 Monthly Spread Returns (1 Month)

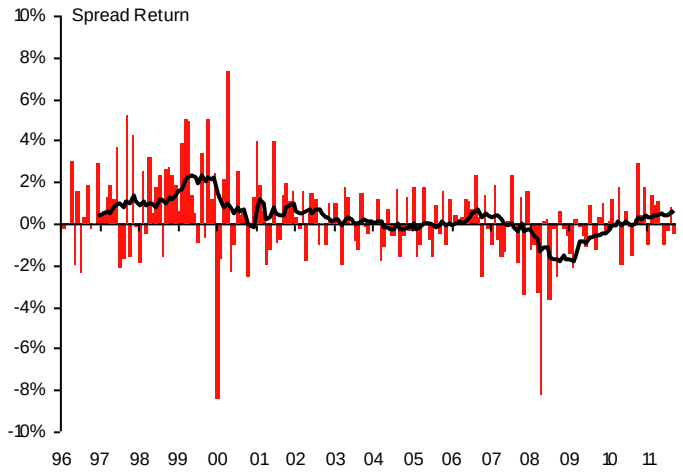


Fig 89 Monthly Spread Returns (12 Months)

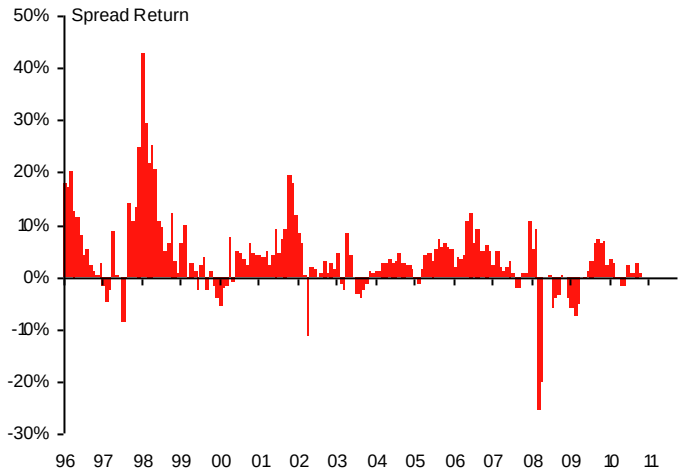


Fig 90 Average Spread Returns

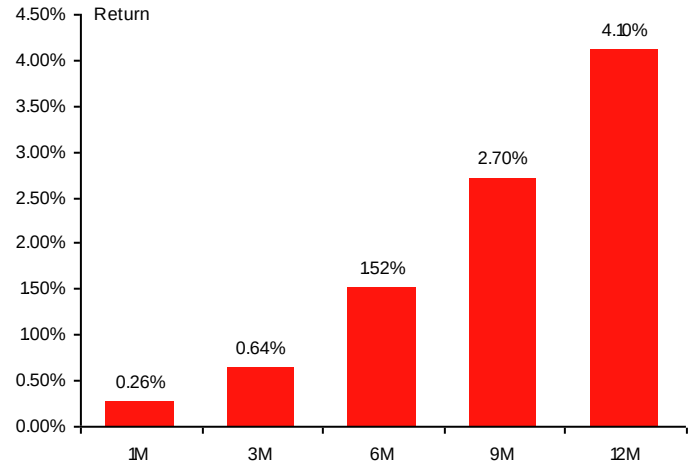
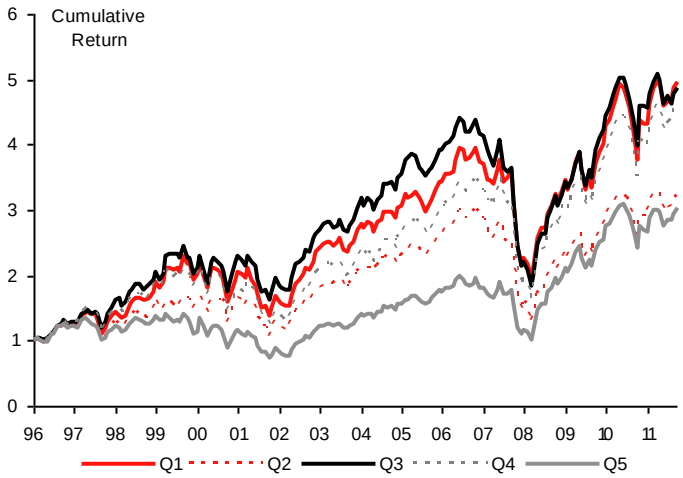


Fig 91 Cumulative Quintile Returns



Source for Fig 88-91: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Does Plain English Matter?

Alternative Measures of Complexity

To finish our analysis we examine measures of complexity motivated by the SEC Plain English Guidelines.

In 1998 the SEC published its Plain English Handbook. It presents several recommendations on how to prepare clearer disclosure documents.

They outline common problems that can make disclosure documents more difficult to understand. These include:

- Long sentences
- Passive voice
- Weak verbs
- Superfluous words
- Legal and financial jargon
- Numerous defined terms
- Abstract words
- Unnecessary details
- Unreadable design and layout

The SEC offers several solutions to fix the above problems. We focus on these fixes to identify additional ways to capture our concept of complexity.

We examine word count relating to personal pronouns, superfluous words, negative compounds, legalese, and the word respectively.

Applying an additional filter on the fixes based on what we think we can accurately quantify, we measure the following:

- Personal pronouns – higher levels of personal pronoun usage are seen as improving the clarity of writing. We count the number of times the following personal pronouns are used throughout the filing – we, us, our, ours, you, your, yours.
- Superfluous words – The SEC handbook provides several examples of superfluous language. These include – 'in order to', 'in the event that', 'despite the fact that'. We build a comprehensive list of phrases that are examples of superfluous word usage. A full list is available on request.
- Negative Compounds – Positive sentences are shorter and easier to understand than negative sentences. We count the number of negative compounds in a filing – 'not able', 'not accept', 'not certain', 'not unlike', 'does not have', 'does not include' etc.
- Legalese – Legal phrases and words can be incomprehensible to people outside the industry. Replacing legalese with short, common words makes a document much easier to understand. Examples include 'elucidate', 'all and sundry', 'from now and henceforth'. We compile a comprehensive list of legal words and phrases and count their frequency throughout a filing.
- Respectively – The use of the word 'respectively' forces the reader to go back and reread the sentence.

Each measure is scaled by the number of words in the filing.

Using these new constructs of complexity we repeat our previous analysis. We note that the one recommendation relating to shorter sentences is already captured in our earlier analysis. Additionally, the SEC does recommend the use of active voice in writing a disclosure document. We were not convinced we could accurately capture this with our algorithm and consequently excluded this measure from our analysis.

The analysis we do using the Plain English measures have been sector adjusted and neutralized with respect to total assets and asset growth.

Measures of 'Plain English' and Stock Returns

The analysis we do using the Plain English measures in levels suggests there is not much power in them as stock selection signals.

Fig 92 Personal Pronouns – Quintile Returns (12M)

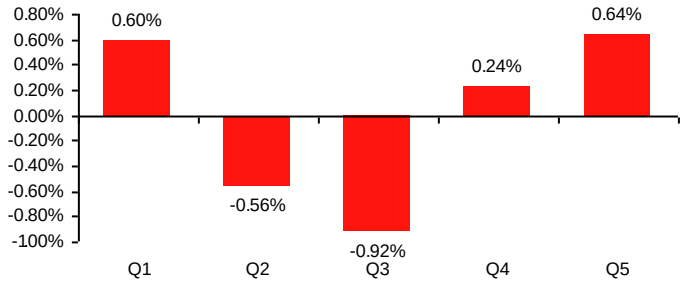


Fig 93 Personal Pronouns – Average Spread Returns

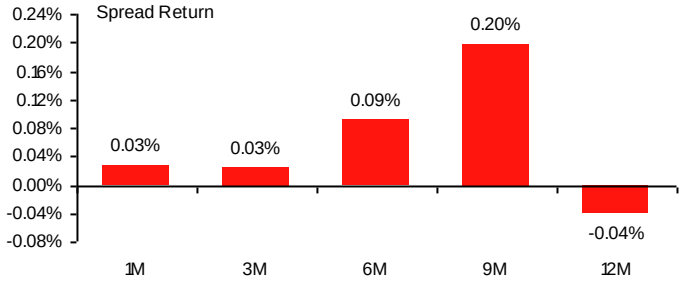


Fig 94 Superfluous Words – Quintile Returns (12M)

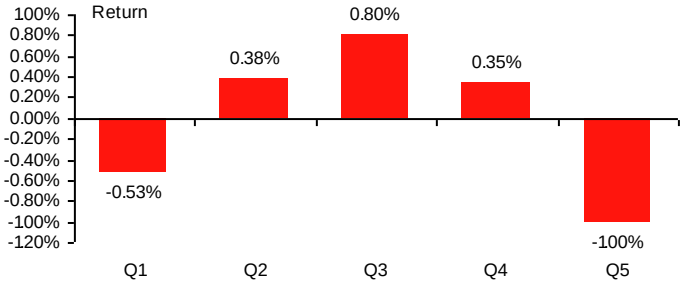
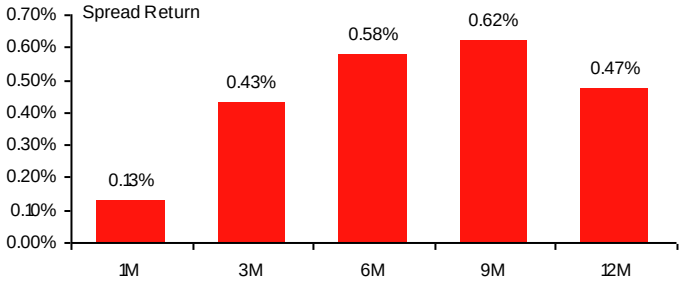


Fig 95 Superfluous Words – Average Spread Returns



Source for Fig 92-95: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Fig 96 Negative Compounds – Quintile Returns (12M)

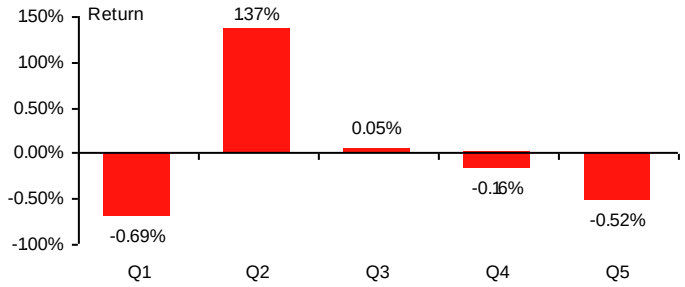


Fig 97 Negative Compounds – Average Spread Returns

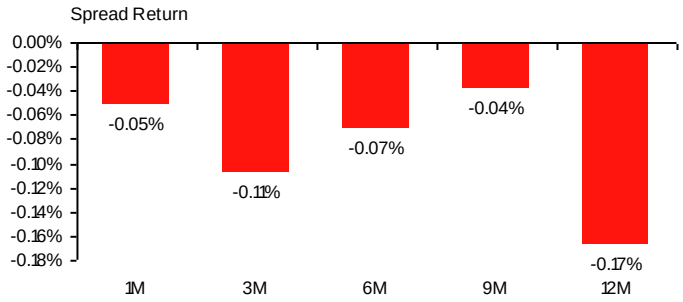


Fig 98 Legalese – Average Quintile Returns (12M)

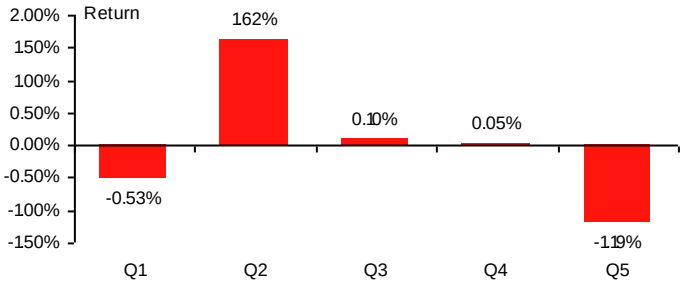


Fig 99 Legalese – Average Spread Returns

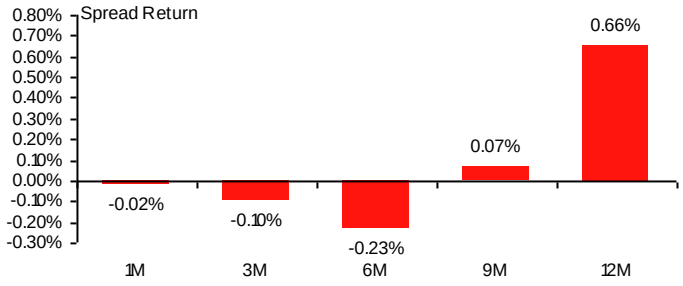


Fig 100 Respectively – Average Quintile Returns (12M)

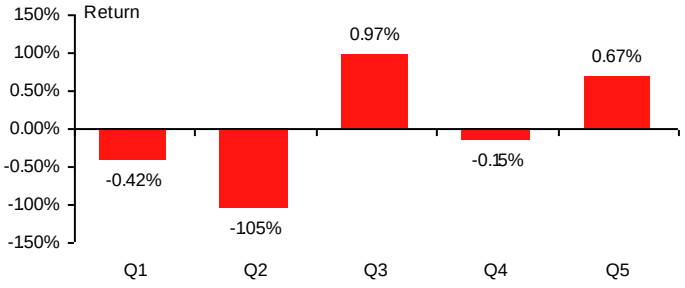
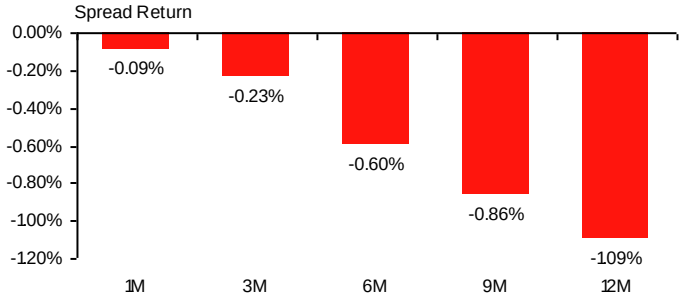


Fig 101 Respectively – Average Spread Returns



Source for Fig 96-101: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Changes in 'Plain English' Measures and Stock Returns

Looking at changes in measures of Plain English do not yield performance improvements.

Given the earlier analysis showed that looking at changes in complexity improved results, we give the Plain English measures the same treatment. Across Fig 102 to Fig 111 We find there is no notable improvement in performance if we look at Plain English measures in changes.

Fig 102 Change in Personal Pronouns – Average Quintile Returns (12M)

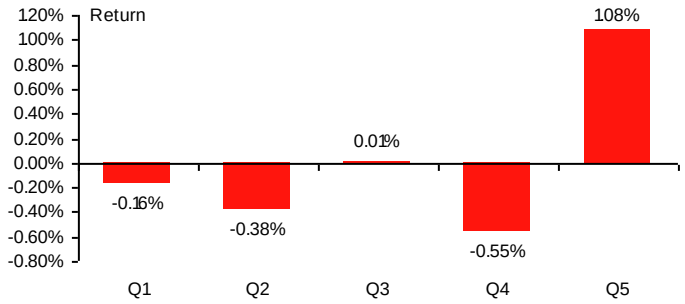


Fig 103 Change in Personal Pronouns – Average Spread Returns

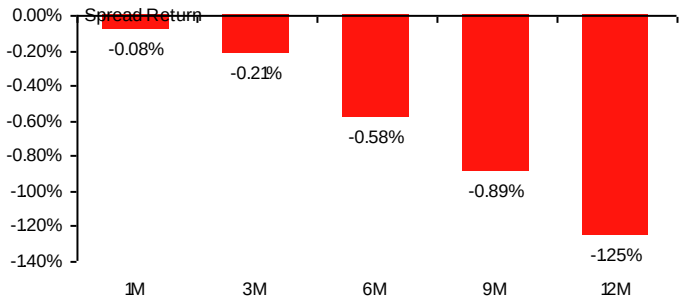


Fig 104 Change in Superfluous Words – Average Quintile Returns (12M)

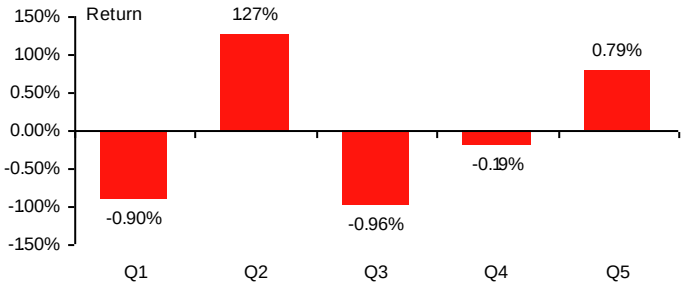


Fig 105 Change in Superfluous Words – Average Spread Returns

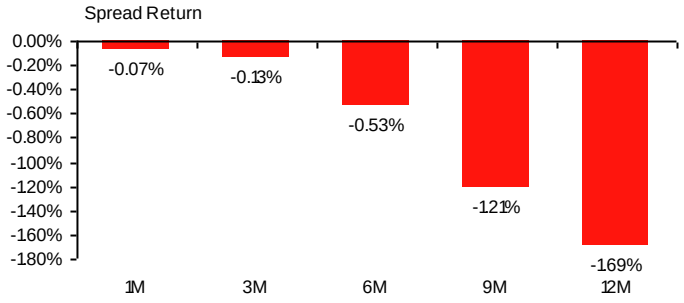


Fig 106 Change in Negative Compounds – Average Quintile Returns (12M)

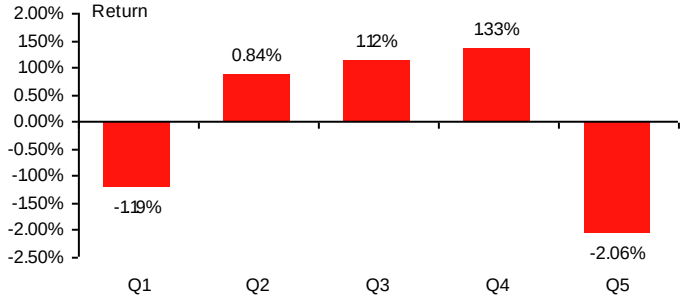
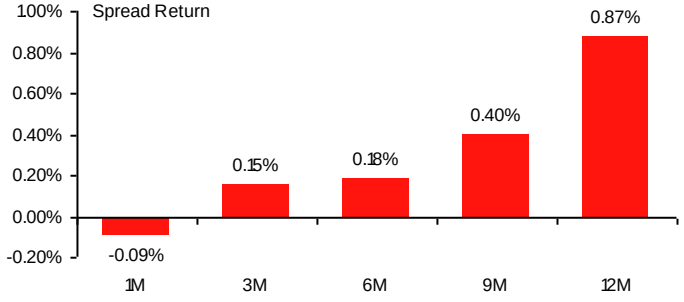


Fig 107 Change in Negative Compounds – Average Spread Returns



Source for Fig 102-107: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Fig 108 Change in Legalese – Average Quintile Returns (12M)

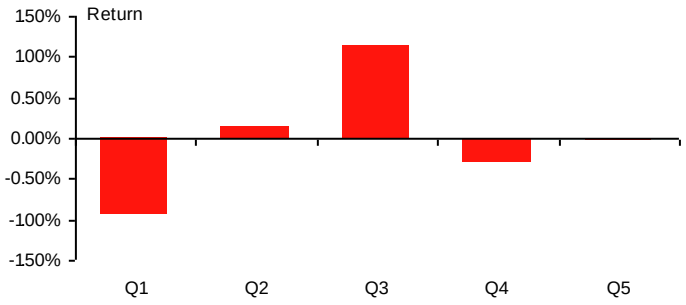


Fig 109 Change in Legalese – Average Spread Returns

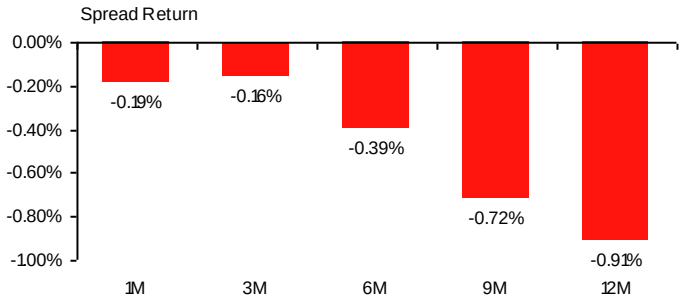


Fig 110 Change in Respectively – Average Quintile Returns (12M)

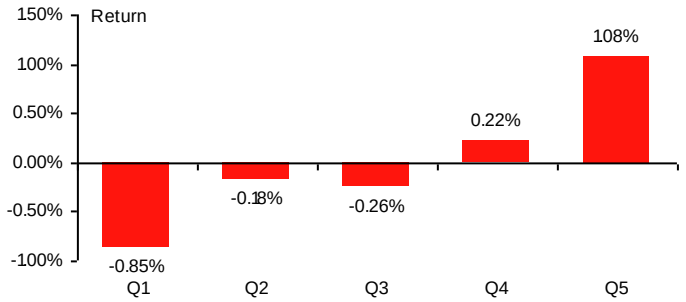
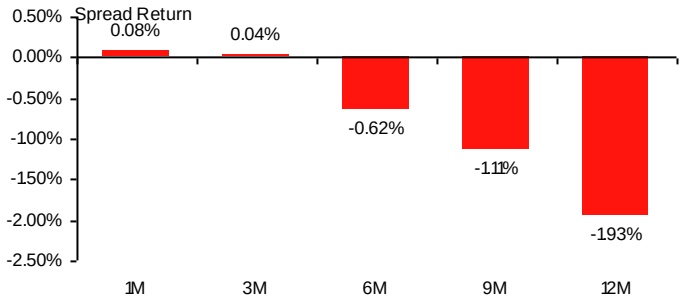


Fig 111 Change in Respectively – Average Spread Returns



Source for Fig 108-111: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

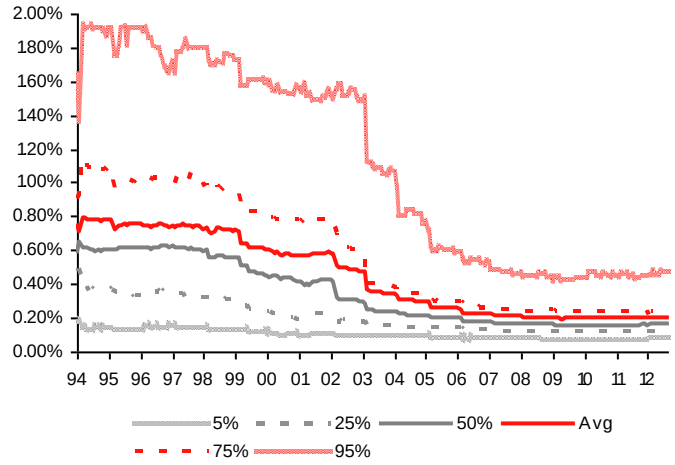
Why don't Plain English Measures Work?

Effective implementation of the SEC guidelines could explain the lack of information content.

We are intrigued as to why the Plain English measures produce much noisier results. Loughran and McDonald (2011) for instance find that better written documents based on Plain English guidelines are more informative to investors leading to larger market reactions around filing dates.

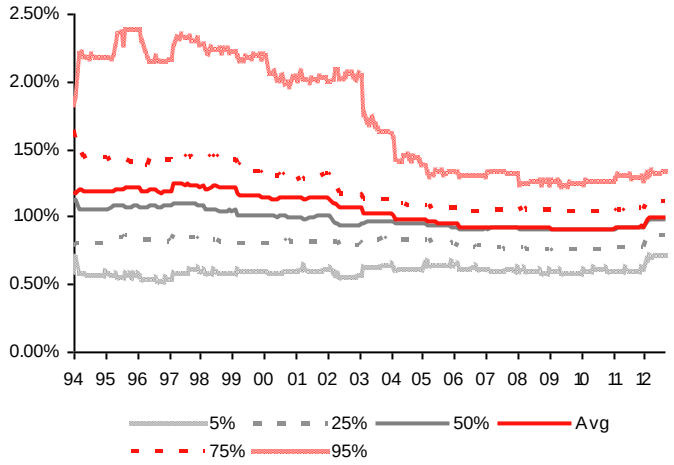
One explanation could be that more firms are complying with the SEC disclosure style directives. As we show in Fig 112 to Fig 114, there has been a large reduction in legalese, negative compounds, and superfluous words.

Fig 112 Trends in Legalese



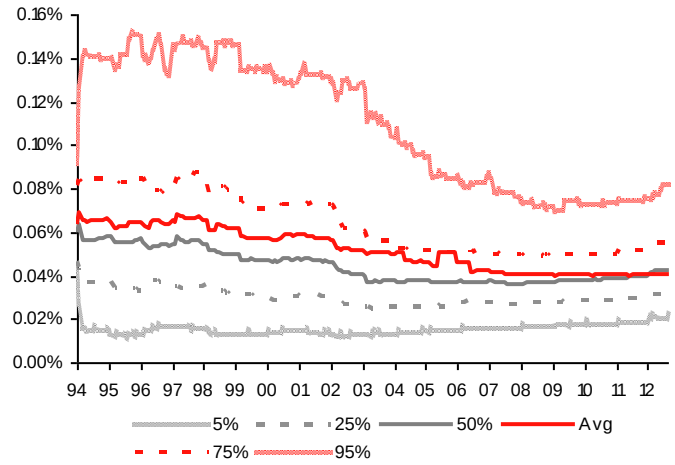
Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 113 Trends in Number of Superfluous Words



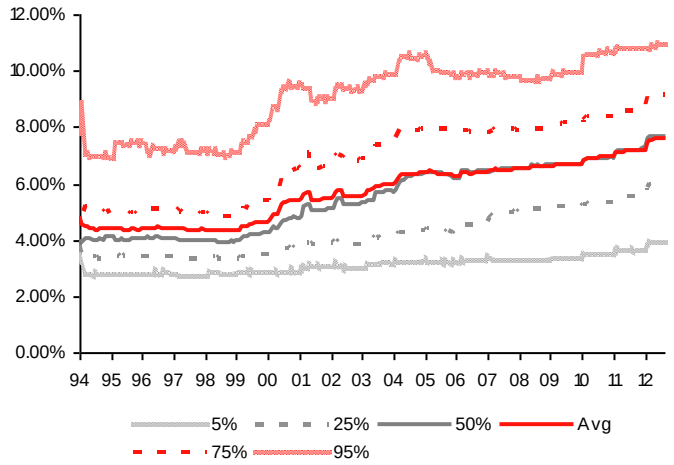
Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Fig 114 Trends in Negative Compounds



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013

Fig 115 Trends in Personal Pronouns



Source: Securities and Exchange Commission, Russell, Compustat, Macquarie Capital (USA), February 2013.

Concluding Remarks

How could investors use this signal?

Our first foray into text analysis has yielded encouraging results. We think the results are most useful for longer term investors who can short sell.

We think textual analysis is an interesting space for quantitative research. What we have done in this note only scrapes the surface in terms of insights to be gleaned from soft information in company disclosure filings.

Our take on the complexity signals computed in this note is that they are not a short-term alpha signal – this is clear from our analysis. Over longer holding periods, changes in complexity measures have significant explanatory power. This does not appear to be a result of sector, size or transactional effects. More so, we believe the benefits of this signal can be best used by long-term investors who have the ability to short sell.

The interesting feature of our work is that we are able to link changes in complexity with changes in the operating performance. More so, we find that combining hard information relating to operating performance with soft information produces more powerful results.

The Future

Possibilities to extend this research into transcripts of conference calls or analysing audio recordings.

As our first foray into the text analysis space we are encouraged by the results of our research. We think there are many other dimensions that could be explored and also other ways to examine the idea of management deception. As an example, academics are going even further nowadays, looking at transcripts of conference calls (see Larcker and Zaklyukina, 2012) and also audio recordings from conference calls (see Hobson, Mayew and Venkatachalam, 2011).

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Macquarie - Australia/New Zealand
Outperform – return >3% in excess of benchmark return
Neutral – return within 3% of benchmark return
Underperform – return >3% below benchmark return

Benchmark return is determined by long term nominal GDP growth plus 12 month forward market dividend yield

Macquarie – Asia/Europe
Outperform – expected return >+10%
Neutral – expected return from -10% to +10%
Underperform – expected return <-10%

Macquarie First South - South Africa
Outperform – expected return >+10%
Neutral – expected return from -10% to +10%
Underperform – expected return <-10%

Macquarie - Canada
Outperform – return >5% in excess of benchmark return
Neutral – return within 5% of benchmark return
Underperform – return >5% below benchmark return

Macquarie - USA
Outperform (Buy) – return >5% in excess of Russell 3000 index return
Neutral (Hold) – return within 5% of Russell 3000 index return
Underperform (Sell)– return >5% below Russell 3000 index return

Volatility index definition*

This is calculated from the volatility of historical price movements.

Very high–highest risk – Stock should be expected to move up or down 60–100% in a year – investors should be aware this stock is highly speculative.

High – stock should be expected to move up or down at least 40–60% in a year – investors should be aware this stock could be speculative.

Medium – stock should be expected to move up or down at least 30–40% in a year.

Low–medium – stock should be expected to move up or down at least 25–30% in a year.

Low – stock should be expected to move up or down at least 15–25% in a year.
* Applicable to Australian/NZ/Canada stocks only

Recommendations – 12 months
Note: Quant recommendations may differ from Fundamental Analyst recommendations

Financial definitions

All "Adjusted" data items have had the following adjustments made:
Added back: goodwill amortisation, provision for catastrophe reserves, IFRS derivatives & hedging, IFRS impairments & IFRS interest expense
Excluded: non recurring items, asset revals, property revals, appraisal value uplift, preference dividends & minority interests

EPS = adjusted net profit / efpowa*
ROA = adjusted ebit / average total assets
ROA Banks/Insurance = adjusted net profit /average total assets
ROE = adjusted net profit / average shareholders funds
Gross cashflow = adjusted net profit + depreciation
*equivalent fully paid ordinary weighted average number of shares

All Reported numbers for Australian/NZ listed stocks are modelled under IFRS (International Financial Reporting Standards).

Recommendation proportions – For quarter ending 31 December 2012

	AU/NZ	Asia	RSA	USA	CA	EUR	
Outperform	47.87%	54.89%	54.41%	41.93%	60.86%	44.14%	(for US coverage by MCUSA, 6.10% of stocks followed are investment banking clients)
Neutral	37.94%	26.41%	38.24%	52.16%	33.70%	27.73%	(for US coverage by MCUSA, 4.91% of stocks followed are investment banking clients)
Underperform	14.19%	18.70%	7.35%	5.91%	5.44%	28.13%	(for US coverage by MCUSA, 3.33% of stocks followed are investment banking clients)

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