Moral hazard and financial systems: A diachronic study of a corpus of financial texts

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Abstract

For many thinkers, language is a communications system used to represent reality without interfering with the message. For others, contrarily, language shapes the message and becomes part of the message; language constitutes the message rather merely representing it. If language is constitutive then changes in the use of certain linguistic artefacts, like the frequency of some single and compound words, will correlate with *real world* data expressed in other modalities of communication – numbers for instance. We have looked at an iconic term, used frequently during the 2008-financial crisis, *moral hazard,* in a corpus of newspaper texts comprising 718926 tokens published between 1999-2009. A similar study was conducted on a corpus of papers drawn from four journals of economics and finance. The changes in the use of certain keywords correlate with the changes major stock market indices.

1 Introduction

Complex physical systems exhibit repetitive behaviour or cycles. For example, a robust and elastic material when viewed under an electron microscope reveals a repetitive or periodic arrangement of atoms comprising the materials; a lack of periodicity is regarded as a *defect*. We have weather changes – spring in May, snowfall in December in the Northern hemisphere, but the 'early' onset of spring/summer/winter, the more/less than average rainfall/snowfall, or the more/less frequent floods, is variously attributed to the disastrous global warming/cooling. Any deviation from a repetitive behaviour is described through terms of negative affect – *defects, disasters, spikes,* and *crash*.

This paper discusses how terms come to be regarded as a representative symbol of a movement – an icon that keeps recurring in times of change and recedes when the change subsides. Terms sometimes are used as icons to evoke memories, emotions, and traditions based on notions pertaining to ideology and history amongst others. *Free markets* evoke notion of voluntary exchange of goods and services, and *collective bargaining* refers to the power of (oppressed/underprivileged) communities in seeking economic and workplace

salvation. Galbraith (1958/1998:38) suggested that over the last 400 years successive downturns, or 'deep trouble', in the financial markets, have been described by terms that help to 'soften the connotation of deep trouble'; 17th century *financial mania* was replaced by the softer *financial/market bubble* (18th century)*, which, in turn,* was replaced by *market panics* (19th century, see Rothbard 1960). The 20th century begat *market crash* and, and then we have had the borrowing from the physics of wave-like behaviour terms including *economic depression* and *economic recession*. The 21st century downturn (c. 2008) was so severe that the softer terms like *credit squeeze/freeze* gave way to *credit crunch*. It does not mean that the older, 'harsher' terms disappear – 'banking panic', a technical term used in the 1960's, has resurfaced in the research literature (Chari and Jagnathan 1988).

I would like to look at an iconic term – *moral hazard*– that has been frequently used during the 2008 global meltdown: its lexicogenesis from denoting the hazards associated with fire insurance in the 19th century to its use in economic and social policy speeches and documents is quite remarkable. The term is currently used not only for its original purpose, to discuss risk seeking behaviour due to protection provided by the fire insurance company, but has been has been used to discuss other forms of insurance: papers in the leading journal in finance studies, *The Journal of Finance,* shows that the term is used in diverse contexts:

> *disability insurance* (Dickerson Jr., 1958);
> '*risk aversion' amongst wealthy individuals* (Smith and Litzenberger 1975);
> *informational asymmetry in financial transactions* (Lee, Thakor and Vora 1983);
> *incentives for not working because of social security* (Spear and Srivastava 1987)
> *risk aversion amongst higher paid chief executive officers* (Becker 2006); and
> *policy of rotating loans-officer in a bank* (Hertzberg, Maria and Paravisini 2010).

1.1. Spikes in economic cycles and moral hazard

Prices and traded volumes of shares, bonds and commodities, show a cyclical behaviour over a period of time – Jugular (1862) noted a 10 year cycle, then there are 20 year Kuznet *swings* and 50 year Kondratieff *cycle* (Solomou 1998); and for the chaos theorist Benoit Mandelbrot there are 5 year cycles. However, the unexpected surges and devastating downturns in prices remain largely unexplained; we will look at one of the causes – the excessive risk taking of large institutions due to the **moral hazard** created by the existence of a lender of last resort (banks like the Federal Reserve in the USA and the European Central Bank). Speculative lending on the part of banks that might create morally hazardous situations has been a subject of research in banking and finance – a recent paper cites 10 other papers published over the last years that deal with 'moral hazard in banking' (Niinimäki 2009) Recently, it has been observed that *moral hazard* can also be created by complex financial instruments created for hedging against non-payment of mortgages – the so-called collateralised debt obligations (Duffie and Gârleanu 2001, Singh and Hossain 2009)*.* There have been arguments to the effect that major international financial institutions like the International Monetary Fund and others cause moral hazard and political business cycles (Dreher and Vaubel 2004).

It has been argued recently that the aperiodic behaviour of financial systems can be caused by 'excessive' risk taking behaviour and that this behaviour can, in part, be attributed to the fact that the larger risk takers have the foreknowledge that there is a lender-of-last-resort (LOLR): the LOLR has been known to compensate for the losses of the excessive risk-takers – the typical LOLR being the *central banks* of nation states and trans-national entities like the EU. The moral hazard is that risk takers are encouraged to take risks. LOLR started its life as

buyer of last resort in 1837. Walter Bagehot, the British essayist, journalist, business person and constitutional expert, suggested that central banks, in the last resort, should buy off debts incurred by commercial banks. By appearing to lend 'quickly, freely and readily' the central bank will assuage the fears of lenders and thus hold back the panic stricken lenders (*The Economist* 2007), The buyer-of-last-resort doctrine was at the time (1837) called his 'mischievous doctrine'. Central banks have lent 'quickly, freely, and readily' during the 2008 crisis – this practice has been adorned with the term *quantitative easing* – which is yet another term used partially to, what Galbraith has said in other context, 'soften the connotation of deep trouble'.

The cyclical behaviour of prices suggests that when an object is underpriced by its seller, buyers will compete encouraging the seller to discover the correct price; similarly for an overpriced object, buyers shy away and the seller is forced to sell the object at its true value. Prices move towards an *equilibrium* value, much like the physical systems where forces of nature (atomic, molecular, gravitational and so on) help the systems to move towards an equilibrium. The analogy of the physical forces has led some to talk about *market forces* and this has lead to the so-called *rational market theories*, especially the efficient market hypothesis, which dominated the pre-2007/08 credit crunch. Market forces, it has been argued, will discount irrationality and the lender-of-last-resort will be there only to discourage criminal manipulation of prices. However, this (constructivist) Cartesian world of rationally behaved trinity of buyers/sellers/regulators discounted three well documented observations:

(a) *framing – presentation format of a proposition effects the perception of what is being proposed (Kahnemann and Tversky 2000);*
(b) *human herd behaviour in financial markets (Cipriani and Guarino 2009);*
(c) *areas of human brain dedicated to seeking risk unnecessarily and avoiding plausible risk (Porcelli and Delgado 2009).*

1.2 Lexicogenesis of *moral hazard*

According to the *Oxford English Dictionary*, the compound term *moral hazard* has had a complex lexicogenesis. The headword *hazard*, rooted in the Arabic *al hazr* (danger) and Old French *hazard,* was first reported in the English language at the beginning of the 14th century where it referred to games of chance that had a confounding number of rules; the modern sense of the word, *risk of loss or harm; peril, jeopardy*, was first used in the 16th century. The word *moral*, rooted in Old French and its notable uses were *vertu morale* (moral virtue) and *philosophie morele* (moral philosophy), was first used in the late 14th century. The word was subsequently used in philosophy in the 16th century; the modern sense of the word moral has not changed much from the original meaning: of or relating to human character or behaviour considered as good or bad; or of actions having the property of being right or wrong.

The compound moral hazard entered the English language in 1875 denoting: 'the effect of insurance on the likelihood of the insured event occurring; the lack of incentive to avoid risk where there is protection against its consequences, e.g. by insurance' (OED 2010[1]). Moral hazard appears to have roots in games of chance (hazard) and in being righteous (moral) and

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[1] *Oxford English Dictionary – Online Edition* (http://dictionary.oed.com.elib.tcd.ie/about/ - site visited 25th April 2010)

is used currently used both to describe risk seeking behaviour, for example as in casino banking, or in risk averse behaviour related to social security or its corporate equivalent.

1.3 Post Mortem of a disaster and the *ultimate* moral hazard

Financial and economic news over the last two years appears to have been dominated by a negative feeling: financial reports and the associated commentaries and opinions talk about contagion and ultimate collapse. To paraphrase this discourse appears to suggest that the financial contagion which led to the collapse of financial institutions has been caused, in part, by the moral hazard of the state being always available to underwrite risks, large and small. Even when the financial systems have been partially rescued, the term moral hazard still dominates discussions amongst policy makers and executives. Consider, for example, the exchange in the UK House of Commons' Select (Oversight) Committee on Finance, between the then Chair of the Committee (Mr John McFall, 2005-2010) and the chief executive of the UK LOLR, Governor of the Bank of England, Mr Mervyn King (2003- to date):

> *Q[uestion] [.]: [by] Rt. Hon. John MacFall: [...] How have you avoided moral hazard in the design of the liquidity scheme [in which the UK Government took over 3 major banks and underwrote the liabilities of a few others]?*

> *[Answer] Mr. Mervyn King,: [...] the way we have protected against moral hazard is by ensuring that the credit risks stayed with the banks, [...] (Uncorrected Transcripts [i] of witnesses and politicians and cited in the House of Commons Report HC-524i, 2010 [ii],)*

Despite the fact that the potential credit risks 'stayed with the banks', public and party-political reaction to the post-2008 operations of the banks remained skeptical. Indeed, King's suggested elimination of moral hazard appeared to have become the *ultimate moral hazard*:

> *We do not hear about moral hazard any more; moral hazard was fashionable about six months ago and seems to have disappeared under the weight of billions of taxpayers' money. Is this not the ultimate moral hazard?* (Forsyth 2009 [iii].)

The law makers in the above exchange do appear to subscribe to the conventional theory of moral hazard – that excessive risk taking is facilitated by the existence of a lender of last resort: central banks are not the only LOLRs, it turns out that exotic financial products – like derivatives and collateralised debt obligations, are used to defray the risk associated with investments or loans – were also in the frame. The size of a financial institution appears to determine the magnitude of risk the institution takes – the bigger the institution, the bigger the risk (Ekholm and Pasternack 2007). A concordance of the use of the *term* shows this small shift that is only apparent we have a diachronic organisation of documents (Table 1).

1999	Acting as **lender of last resort**, **central banks**	*create*	moral hazard
1999	**big public bailouts** may	*create*	moral hazard
2000	**Fed(eral Reserve Bank of the USA)** [has been criticized] for	*creating* a	"moral hazard"
2000	**Fed's success in steering the economy may** have	*created* a	moral hazard
2007	**credit derivatives**	*create* a	moral hazard
2007	[Central banks] **Pumping in liquidity** too eagerly may	*create*	moral hazard
2008	[**announcing rescue**] **terms** beforehand can	*create*	moral hazard
2009	[Fed's rescue of] **Bear Stearns** [.] drew criticism in congress [...]for	*creating*	moral hazard

Table 1: Selected concordances of the term moral hazard from *The Economist*, covering two periods 1999-2000 and 2007-2009; both periods comprise a financial crisis. (Bear Sterns was a bank that collapsed in September 2008.)

The question for us is this: are there signals for the onset of the *aperiodic* behaviour of the markets other than the purely numerical ones related to prices and volumes? How do economic actors communicate their intent? How are the key components described by Vernon Smith, home grown principles of actions and 'morality', articulated?

1.4 Key results of a genre-varied and diachronic corpus
Our corpus-based analysis shows that the usage of the term *moral hazard* in a genre varied corpus, including texts from newspapers, financial magazines, and economics and finance journals, does show signs of fluctuations over a 10-year period (1999-2009). These fluctuations have been confirmed by an analysis of the distribution of *moral hazard* in a representative corpus of American English. The fluctuation and appears to anti-correlated with the movements of a major index of US markets – *Standard & Poor's 500*.

Our method may be of use to explore changes in a specialist subject domain by looking at the diachronic behaviour of key terms.

2 Method and Data Sets
2.1 Method
The basic method of analysis is based on a heuristic that the lexicon of a language is the result of a consensus amongst the users. Such a consensus may be found in a set of texts or speech excerpts, written and spoken by the users: this set, if systematically collected and shown to represent what language users do, can be used to find evidence of preferential or censorious attitude towards vocabulary items, syntactic and morphological patterns, and, perhaps towards key semantic units (Halliday 2004, Sinclair 2004). In times of change, words are re-lexicalised and assigned newer senses of meaning, and sometimes new words are coined. Evidence of such changes, especially during the changes, can only be found in a text corpus – the claim here is that only a detailed examination of texts can lead us to the inherent causality underlying the changes, a hermeneutic approach of sorts (Teubert 2003).

My approach to the ebb and flow in scientific matters has been to focus on (a) creating a corpus of texts that is as representative of a domain as is possible; and (b) on ensuring that the corpus is diachronic (Ahmad 2008a, 2008b). The question of representative corpora is a vexed one and invariably involves the opinions of the corpus makers and nebulous concepts of copyright (Ahmad 2007).

I will look at the frequencies of number of texts and number of tokens within a text.

2.2 A note on the lexicogenesis of compound terms

Compound terms have an interesting genesis – the manner in which two different linguistic tokens, different etymologies, different usage patterns, different meanings, are used together to form a semantically coherent linguistic token (McMohan 1994) and has been termed *lexicogenesis* by Picone (1996). The lexicogenesis appears to hallmark major changes in science and technology (Ahmad 2000). The meaning and the genesis of words are recorded in historical dictionaries where entries in the dictionary are dealt according to 'various groupings of senses [..] in chronological order according to the quotation evidence words'(OED 2010). Lexicogenesis shows a carrier word in a domain, referring to a key concept, object, or event in a specialist domain, which is used to make an ontological commitment within the domain. Ontological commitment suggests that certain members of a domain have decided on the importance of a concept, an object or an event, and then will pursue investigations committed to elaborate on the concept, object or event. Single words like *atom* and *nucleus, acid* or *base, wealth* or *poverty, freedom* or *liberty*, and *kinship,* and *grammar,* are some of the keywords in domains as diverse as physics, molecular biology/bio-chemistry, economics, politics and anthropology, and linguistics respectively. These words become *carriers of meaning*: In physical sciences, this has lead to physical atoms (antiquity-18th century), chemical atoms (early 19th century), atomic structure (late 19th-20 century), nuclear atom (20th century), (unstable and artificially produced) pionic/muonic atoms (late 20th century[2]). The observation that the atom was divisible and that it comprised *elementary particles* (electrons, protons, neutrons) was a major ontological commitment by some of the early 20th century physicists; the stable nucleus of the mid-20th century was stable because the neutrons and protons exchanged short-lived pions – initially called the Japanese electron as the particle was postulated by the Japanese born Heide Yukawa! The commitment has now changed and the *new elementary particles* are the quarks. The genesis of all these terms is recorded in the journal papers, notebooks, monographs and ultimately in textbooks before being consigned to history books (see Ahmad 2007, for an example of this genesis in four different subjects). Lexicogenesis now can be better observed in the accessible corpora of digital texts in all their confounding varieties – online learned papers, popular science literature, and blogs for instance.
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2.3 Data Sets used – A *dialled-up'* corpus of newspapers, magazines, journal papers and Google *Trends*

The advent of the Internet and digital publishing has allowed us to access, for example, newspaper texts over literally tens of years, and the entirety of all the volumes of many a journal. Advanced search engines, like LexisNexis®, allow complex combinations of keywords to be used to search the digital content of a given library. The advanced search engines also have a facility to deliver the texts to bona fide users of the search engines. So now one can dial-in a corpus; a notion propounded by the late John Sinclair - one of the founders of the corpus linguistics (Sinclair 2005).

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[2] In a muonic/pionic atom instead of an electron orbiting a nucleus we have *unstable* particles orbit a nucleus in laboratory conditions

I will focus on the reporting of financial markets in the Northern Hemisphere between 1999 and 2009. The period is demarcated by two major downturns in the market – the failure of mortgage markets in the USA and sovereign defaults in Russia around 1999, and the *credit crunch* of 2007-2009. The texts were selected by a simple criterion: if the term, *moral hazard*, occurred in the text: our measure of usage is the yearly count of the number of distinct texts within the collection that comprise one or more instances of the term.

The digital collections we have sampled include the LexisNexis News Online Information Service that provides access to over 1500 newspapers and magazines published in English, and the digital collections of journal publishers and their agents in order to access four journals in economics and finance. The sampled texts form our *moral hazard* corpus – the corpus was analysed and subsequently deleted in conformation with the terms and conditions of the agreements between the subscribers and the information providers.

2.3.1 Newspaper Corpus

We selected two newspapers (*The New York Times* and the London *Guardian*), two business news magazines (*The Economist* and *Business Wire*), and transcripts of political news shows of one TV station (*Fox News*) and trawled through texts over a 10 year period. The newspapers represent liberal/left point of view, the news magazines are pro-business and free enterprise oriented, and *Fox News* is generally regarded as a right-wing broadcaster. The details of each of the sources are given below (Table 2).

News Source	Mission Statement/Objectives
New York Times	*'Conservative*, in all cases where [..] conservatism is essential to the public good; [..]*Radical* in everything [.. that requires] radical treatment & [..] reform. […]'
The Guardian	Founded as "an organ of the middle class", and generally on the mainstream left of British political opinion
Fox News	Delivery of "fair and balanced coverage of the day's news events" – accused sometimes of right-wing/conservative bias
The Economist	Free trade and globalisation, [..] for health and education [...],of banks & financial enterprises against bankruptcy.
Business Wire	disseminates full-text news releases from [….enterprises….] worldwide to financial markets and news organisations

Table 2. News Sources that comprise our newspaper sub-corpus and their mission statements. Texts selected between 1999 and 2009

The LexisNexis systems retrieves newspaper/magazine etc sources for given time frames and exports all the text retrieved as one single file: the annual number of stories containing at least one instance of the term *moral hazard* in each of the five publications during 1999-2009. The total number of stories we extracted for the 11 year period is 650 – an average of 59.1 stories containing *moral hazard* within the collection (with a standard deviation of 50.1). We have noted, however, that the average for the period 2005-2009, comprising the world-wide financial crisis, is 85 which is just over twice for the period 1999-2004: the maximum yearly total was in the year 2008 (Table 3).

Year	News source					Total
	The Guardian	*New York Times*	*The Economist*	*Business Wire*	*Fox News*	
1999	14	23	24	0	0	*61*
2000	2	10	13	0	0	*25*
2001	0	12	10	1	0	*23*
2002	2	16	14	8	1	*41*
2003	5	9	30	6	1	*51*
2004	1	7	10	1	3	*22*
2005	0	20	14	7	2	*43*
2006	1	0	5	3	1	*10*
2007	39	22	15	4	6	*86*
2008	**45**	**83**	**29**	**13**	**13**	*183*
2009	18	43	16	7	21	*105*
Total	**127**	**245**	**180**	**50**	**48**	*650*
Average	**11.5**	**22.3**	**16.4**	**4.5**	**4.4**	59.1
Std Dev	**16.2**	**23.1**	**8.0**	**4.1**	**6.7**	50.1

Table 3. The diachronic composition of our newspaper corpus comprising articles published between 1999 and 2009. The number of stories per year was below the mean for each of the news sources for most of the 11 years in some cases by as much as one standard deviation of the mean in the year 2006, except for the years 2008 & 2009 when the number of stories across the five publications were one standard deviation of the mean and in the case of *The Guardian, The New York Times(NYT)* and *Business News Wire(BNW)*. During 1999 the number of stories was above the 11 year mean for *The Guardian, NHT and BNW.* The same was the case in 2003 for *NYT* and *BNW*.

2.3.2 Journal Corpus

The specialist texts were looked at using the following searchable archives: (a) JSTOR archives include over 1,000 humanities, social sciences, and sciences journals. The archive can be searched using keyword(s); (b) Business Source Complete database that comprises searchable cited references provided for more than 1,300 journals; and (c) Science Direct which comprises 2,500 journals that can be searched; the system also provides yearly summary of articles containing user-specified keywords.

I have looked at four journals – two in the area of banking and finance (*Journal of Banking and Finance* and *The Journal of Finance*), one in economic behaviour *(Journal of Economic Behavior and Organisation*) and one in development economics (*J. of Development Economics*). These four represent different view points about the efficacy of the markets and the objectives of economics and finance (Table 4).

Title	Publishes research into
Journal of Banking & Finance	Financial institutions and money & capital markets
The Journal of Finance	Financial economics
Journal of Economic Behavior & Organization	Economic decision, organization and behavior, and change.
Journal of Development Economics	Economic development, growth, intl. trade and finance, labor economics, […] social choice and political economics

Table 4. The composition of our journal paper sub-corpus together with a brief remark on the research the journal publishes. We have selected papers that contained the term *moral hazard* anywhere in the paper during the period of 1999 and 2009.

Over 600 papers comprising the term *moral hazard* were published during the decade 1999-2009. The average number of papers per year is about 55 with a standard deviation of 15. Now if we look at the average number of papers containing the term *moral hazard* between 1999 and 2004, the average is 44 but in the period containing the financial collapse, 2005-2009, the average is 67: a ratio of 1.5 before and after the crisis. This ratio remains valid for individual journals and indeed the *J of Finance* shows a four fold increase during 2005-2009 when compared with 1999-2004. The diachronic variation in the number of papers that appeared in these journals containing the term *moral hazard* is shown in (Table 5).

Year	Journal of				Total
	Banking & Finance	*Finance*	*Economic Behavior & Organization*	*Development Economics*	
1999	20	1	7	13	41
2000	12	2	12	10	36
2001	11	2	12	4	29
2002	19	1	5	11	36
2003	15	6	8	17	46
2004	16	7	10	8	41
2005	22	15	11	9	57
2006	21	15	12	11	59
2007	19	**17**	14	12	62
2008	26	11	23	6	66
2009	**28**	5	**28**	**20**	81
Total	**209**	**82**	**142**	**121**	**554**
Average	**19**	**7.5**	**12.9**	**11**	**50.4**
Std Dev	**5.3**	**6.1**	**6.8**	**4.6**	**5.31**

Table 5. Diachronic details of the contents of our journal sub-corpus comprising journal papers that have at least on instance of the term *moral hazard*. Papers selected were published during 1999 and 2009. In the period 1999-2004, the number of papers in almost all the journals is below the 11 year mean; *J. of Development Economics* (JDE) is an exception in that in 1999 and 2003 the number was above the mean. During the 2005-2009, the mean number of articles in the *J. of Banking & Finance* (JBF) is above one standard deviation of the 11 year-mean, and number of papers in the *J. of Finance* (JoF) is above the 11 year mean and during between 2005-2007 and dropping below the mean in 2009. The numbers of papers published in *J. of Economic Behavior and Organisation* is above the mean rather later between 2007-2009. There is no discernible difference in *JDE*.

2.3.4 Confirmatory Analysis

I will use the movements of a major index of market movements to see whether the diachronic distribution of *moral hazard* reflects the changes in the index. I have used the US-based *Standards & Poor 500* (*S&P500*) – a composite of the movements of the major US stocks and regarded as a bell weather for booms and busts in the USA (Table 6).

Date	Index	Volume Traded
01 December 1999	1469	9.1
01 December 2000	1320	12.3
03 December 2001	1148	13.0
02 December 2002	880	12.9
01 December 2003	1112	13.1
01 December 2004	1212	14.5
01 December 2005	1248	20.6
01 December 2006	1418	24.6
03 December 2007	1468	33.6
01 December 2008	903	53.2
01 December 2009	1115	41.6

Table 6: Variations in the value of the S&P 500 Index; a benchmark of the US economy comprising 500 major US corporations, each with a capitalization of more than 4 Billion US Dollars. Index value is given for the end of each year.

3 Lexicogenesis of *moral hazard* : Three Case Studies

In this section we look at frequency distribution in our three corpora or archives. First, we look at the term *moral hazard* in a contemporary corpus of English language and then go on to with a similar study with the newspaper and journal papers. We look at the total number of texts comprising the term published annually together with the distribution of single and compound words that occur in our corpora. The frequency distribution of the term over a ten year period (1999-2009) is then compared with one of the benchmarks of US economy, the S&P 500 index.

3.1. Moral hazard in 'contemporary language'

Language learning literature, and latterly corpus linguistics literature, comprises discussion of what should the learner learn about a language – language used in high literature or language used in detective fiction, language used in science and technology or language used in popular science literature? The notion of representative corpus was developed – where the corpus curator will select a broad range of texts, fiction, serious and popular newspapers and then focusing of reportage and editorials, science and technology, law and government and so on (see Ahmad 2007). I have chosen a contemporary corpus of English comprising diverse genres of texts published between 1990-2013, and used an influential magazine of wide circulation and some repute, to see how the usage of the term *moral hazard* changes over time..

The Corpus of Contemporary American English (COCA) comprises over 450 million words and is available for browsing on the World-Wide Web.

The use of the term appears cyclic both in specialist literature on economics and finance. We have looked at the frequency of this compound using the COCA web interface. The peak usage of the term in COCA was in 1999, 2002, 2006 and 2008; more than half of the usage

was in academic publications. Contrast this with the use of the term in *The Economist* magazine over the same period: the peaks of usage of the term were in 1999, 2003 and 2008. It appears that after 2004, the distribution of *moral hazard* is anti-correlated in COCA and *The Economist* – peaks in one of the two corpora will correspond to troughs in the other (Figure 1).
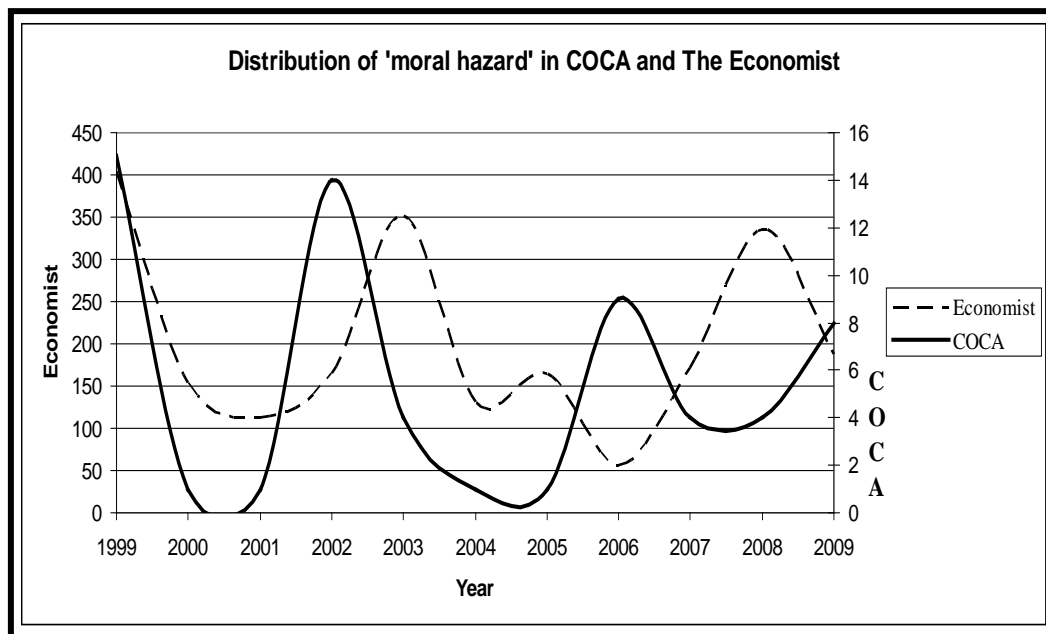

Figure 1. The variation in the absolute frequency of the term *moral hazard* in Contemporary Corpus of American English (404 Million token, right vertical axis), and in our selection of texts from *The Economist* (140 articles comprising 176062 tokens, left vertical axis).

The variation in the use of the term in The Economist goes through similar cycles as is the case in COCA – if one shifts the COCA curve in Figure 1 by one year the reader will see that the diachronic distribution is not much difference – except that the use in general language lags by 'one' year. Note that the relative frequency of usage of moral hazard in COCA is very low (between one and two occurrences per million words) as compared to The Economist – where the term occurs between 300-2000 per million words.

3.2 A business and political news corpus

To explore the ebb and flow of this term we dialled LexisNexis and explored the use of the term in five different publications: two broad sheets the UK *Guardian* and the US *New York Times*, two economic, business and financial news outlets, the mid-Atlantic *Economist* and the US-based *Business News Wire*, and the highly political excerpts of transcripts of *Fox News*. We used LexisNexis to search for the total number of articles comprising the term moral hazard published between 1st January 1999 and end of February 2010. The search engine retrieved over 500 news stories comprising 718926 tokens; the 'corpus' was retrieved in a few minutes from the LexisNexis site. The texts were deleted soon after the analysis was completed. On average there were 10 stories per publication per year: the Economist, NYT being three biggest 'users' of this term (Table 7).

Publication	Total no. of Stories	No. of Tokens
Business Wire	48	50140
Economist	140	185385
Fox News	42	152192
Guardian	103	96758
New York Times	171	234451
Total	504	718926
Average	101	143785
Standard Deviation	56	72461

Table 7: Composition of our 'moral hazard' corpus. Texts in the corpus were published between 1999 and 2009. The total number of stories and the associated total number of tokens comprising the stories is generally within 1 standard deviation of the mean. The *New York Times* texts dominate our collection both in terms of number of stories and tokens (1.3 standard deviation above the mean), however, we have had fewer number of stories from *Fox News,* one standard deviation below the mean, as the agency was only formed in 2006, the number of tokens made up for the smaller number of stories and the mean is just below one standard deviation. *Business Wire* texts are below the mean both for the number of stories and the number of tokens (one standard deviation below the mean). The variance perhaps is an indication in the bias in our analysis.

The total number of stories across all the five publications comprising the term moral hazard shows a cyclical behaviour and the cycle lasts between four and five years – peaks occur in 1999 (61 stories), 2003 (51 stories) and 2008 (183 stories). Theses cycles are present in all the publications individually (Figure 2).
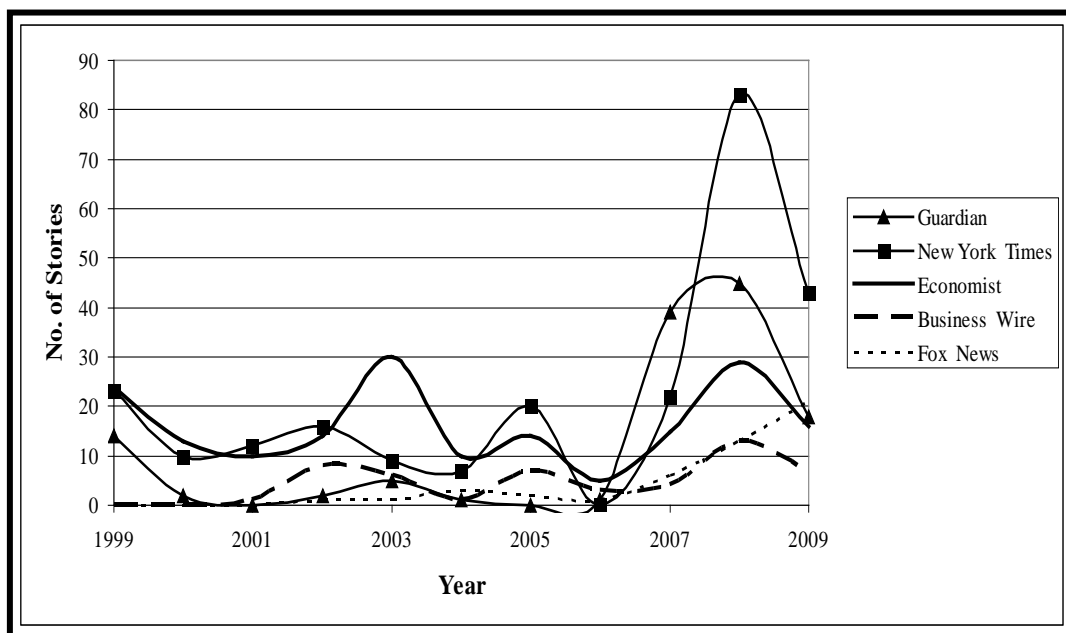

Figure 2. Variation in the number of stories comprising the term moral hazard across 5 publications

An analysis of the single and compound word frequency in the five sub-corpora also throws some light on the association between the use of the term *moral hazard* and the contents of the news stories in our corpora. The first ten most frequent open class tokens, that is words that do not belong to the closed classes including determiners, prepositions, pronouns, conjunctions and verbs-to-be, give some indication of the topics that may be under consideration in a text (sub-) corpus: All the 5 sub-corpora, except Fox News transcripts (FNt), include tokens like *market* and *financial* amongst the ten most frequent words. The business publications (*Business Wire* and *The Economist*) frequently use *risk* and *capital* and in the two newspapers (*Guardian* and the *NYT*) we see frequent use of *crisis* in their ten most frequent words. *Fox News'* fixation with (Presidential candidate and then President) Obama shows itself in our corpus as the 2nd most frequent token; *The Guardian* mentions Mr. King, the Governor of the Bank of England (Table 8).

Rank	News Source (1999-2009)				
	Business Wire	*Economist*	*Fox News*	*Guardian*	*New York Times*
1	business	bank	people	bank	bank
2	market	market	Obama	financial	financial
3	financial	financial	government	government	market
4	insurance	capital	president	market	government
5	risk	risk	money	rock, money	company
6	credit	America	time	King	money
7	capital	economist	bill	Northern	Fed
8	company	credit, money	house	crisis	federal
9	Fitch	countries	year	economy	people
10	report	prices	America	system	crisis

Table 8. The rank order of ten most frequent single words in our five sub-corpora comprising news reports containing at least one instance of the term *moral hazard*.

The frequency of compound words shows similar focus on certain key terms, organizations and people involved in creating and regulating the *moral hazard*: we discuss the first 10 most frequent compound terms to surmise the possible topics under discussion: *central banks* as generic term and its instances like the *US Federal Reserve* and the *European Central Bank* are amongst the most 10 cited compound terms. Similarly, *banking* and *financial institutions* are referred to generically and through instances largely of the failed institutions (*Bear Sterns, Lehmann Brothers, Fannie Mae* and *Freddie Mac* in the USA and *Northern Rock* in the UK). *Business Wire* uses specialist terms (*capital markets, credit derivatives, housing correction* and so on) and *The Economist* focuses its discussions on *asset prices, share prices* and *monetary policy.* The two newspapers focus their discussion on *credit crunch* (*The* Guardian) and *financial* crisis together with a list of failed US financial institutions (NYT); *Fox News* appears keen on the current US President, Barrack Obama who has three variants of in the 10 most frequent: *President Obama* and *Obama Administration* together *Hillary Clinton*, Obama's Secretary of State are amongst the top 10 compound words. The compound *moral hazard* appears in all – but this is an artifact of our search – the only moralistic term used is *corporate social responsibility*, it is used frequently in *Business Wire* (Table 9).

Rank	Business Wire	Economist	Fox	Guardian	NYT
1	corporate social responsibility	**moral hazard**	Barack Obama	Northern Rock	**moral hazard**
2	**moral hazard**	central banks	White House	**moral hazard**	Federal Reserve
3	financial institutions	financial system	**moral hazard**	financial system	Wall Street
4	capital markets	Asset prices, central bank	President Obama	credit crunch	Bear Stearns
5	financial markets, Geneva association, systemic risk	World Bank	Hillary Clinton	Wall Street	central bank
6	Fannie Mae, financial system	monetary policy	American people, health care, Wall Street	Federal Reserve	financial system
7	credit derivatives, holding company, re-insurance industry/subsidiary	Federal Reserve	Federal Reserve, Freddie Mac, stimulus package	central bank, financial markets, money markets	financial markets
8	financial crisis, housing correction, IFS ratings, missile defense, Secretary Paulson	share prices	Barney Frank, Fannie Mae, Federal government, John McCain	banking system	Mr. Bernanke
9	American people, analyst blog, financial stability	financial markets	North Korea, Obama administration	financial services authority, housing market	financial crisis
10	Bear Stearns, capital model, credit derivative market, credit protection, financial guarantors, Freddie Mac	Wall Street, banking system	beltway boys, Paul Gigot, President-elect Obama	European Central Bank	Lehman Brothers, *financial institutions*

Table 9. The rank order of ten most frequent compound words in our five sub-corpora comprising news reports containing at least one instance of the term *moral hazard.*

In all the different texts, except *Fox News* perhaps, moral hazard is associated with financial institutions – I say this on the basis of the proximity of rank order of the two terms; *Fox News* focuses on the White House and Obama.

3.3 A finance, banking and economics corpus
We used Science Direct, a vendor of over 2500 scientific journals which has powerful search facilities like LexisNexis. The system allows its bonafide users to download PDF and HTML versions of the papers. We chose *Science Direct* to search for the term *moral hazard* in papers published between 1st January 1999 and end of February 2010 in four major journals in economics, banking and finance: journals entitled *Banking and Finance, Development Economics, Economic Behaviour & Organisation, and (The Journal of) Finance*. These four journals have different foci: The *Journal of Economic Behaviour and Organisation* which publishes papers that emphasises the role of human behaviour in financial markets; *The Journal of Finance* focuses on efficient market hypothesis that perhaps discounts human behaviour in financial markets. *Development Economics*, focuses away from wealth creation to poverty alleviation. *Journal of Banking and Finance* is empirically oriented and concentrates on current practice in the two subject areas. The search engine retrieved 58 papers in four journals comprising 659161 tokens.

In a journal paper the term *moral hazard*, and for that matter any term, may appear in the main body of the paper, as a footnote, or (in the titles of articles) in the bibliography which typically accompanies the paper. I have counted the occurrence of the term *moral hazard* in the three components of the journal papers in the journals' corpus used in this paper. The term appears most frequently in the *J. Banking & Finance* (0.095%), followed by *J. Dev. Economics* (0.048%), *J. Banking & Finance* (0.024%), and lastly *J. Finance* (0.011%) on the whole, the term occurs once for every 2478 tokens in the journal papers in our corpus (Table 10).

Title	Number of Articles	In Text	Foot notes	Refs.	Total	N	f/N (%)
J. Econ. Behavior & Organization	28	50	8	15	73	301905	0.024
J. Dev. Economics	12	53	6	17	76	159697	0.048
J. Banking & Finance	8	80	18	10	108	113408	0.095
J. Finance	5	5	2	2	9	84151	0.011
Total	53	188	34	44	266	659161	0.0404
Average	13.3	47	8.5	11	66.5	164790	0.045
Standard Deviation	10.2	31.1	6.8	6.7	41.5	96556	0.037

Table 10. The occurrence of the term *moral hazard* in our journal sub-corpus comprising journal papers published between 1999-2009. Different numbers of papers were retrieved from each of the four sources: a computation of the mean and standard deviation across the number of articles suggest that number of articles in the JEBO and the other two journals are within a standard deviation of the mean, whilst the number in JoF were more than one standard deviation of the mean. The same is true of the frequency distribution of the term moral hazard in the journals as well. The distribution of the frequency across different segments of a paper – the term occurring in the main body of the text of the paper, in the footnotes, and in the titles of the papers/books cited in a paper's bibliography, show similar results. The proportion of the number of times the term occurs in the main body of the text, and the footnotes and cited titles, is 70:30 except in the case of the JoF where this ratio is 56:44. The one minor conclusion perhaps is that moral hazard is not used as frequently as a key word in *The Journal of Finance* when compared to the other three.

The single word distribution shows that except for the *J. of Economic Behavior & Organisation*, the journals have the terms *bank* and *risk* amongst the first 10 most frequent terms; the term *firm* is amongst the top 10 most frequent terms in all journals except for the *J. of Development Economics* (Table 11).

Rank	J. Banking & Finance	J. Development Economics	J. Economic Behavior & Organisation	J. Finance
moral hazard	0.095%	0.048%	0.024%	0.011%
1	**Bank**	loan	agent	*firm*
2	Loan	country	*firm*	*risk*
3	Value	agent	team	agent
4	*Firm*	*risk*	effort	loan
5	Finance	**bank**	investment	finance
6	Collateral	information	economic	agent
7	**Banking**	group	equilibrium	**bank**
8	Growth	contract	principal	rights
9	Insurance	development	capital	debt
10	*risk*, ratio	model	behavior	value

Table 11. Single word frequency distribution in our journal sub-corpus. The frequency has been computed by analyzing 266 journal papers, comprising 659161 tokens, published between 1999 and 2009. Each journal paper has at least one occurrence of the term *moral hazard.* (The relative frequency, given as a percentage, of the term *moral hazard* is given in the 2nd row of this table).

The compound word frequency distribution throws further light on the orientation of the journals. The reader should note that that ours is a small corpus and the collection of texts was based on that stipulation that each text in our sub-corpus should comprise at least one instance of the term *moral hazard.* The *J Banking and Finance* focuses on issues related to banks as in *state owned banks* and *joint equity banks* and one key issue related to banks world-wide: *deposit insurance* – an American English term that refers to the insurance provisions for protecting the deposits of the individual customers in a (US) bank. The most frequent compound terms in *The Journal of Finance* deal with an issue related to deposit insurance that is *debt capacity* – the capacity of an organisation to borrow without jeopardizing its financial well being; the most frequent term is *creditor rights.* The *J of Development Economics* deals with *World Bank, foreign assets,* and *medical effort*. The *J of Economics Behavior and Organisation* comprises frequent compound terms that deal with the rather negative aspect of modern day finance and governance: *preemptive collusion* and *preemptive bribe* for details of the distribution of the compound terms in our journal sub-corpus (Table 12).

Rank	J. Banking & Finance	J. Dev. Economics	J. Econ. Behavior & Organisation	The J. Finance
$f_{moral\ hazard}$	0.095%	0.048%	0.024%	0.011%
1	state-owned banks	world bank	team members	creditor rights
2	deposit insurance	credit bureau	preemptive collusion	mature firms, property rights
3	joint-equity banks	precautionary savings	preemptive bribe, team output	young firms
4	financing rounds	foreign assets	public signal	stock returns
5	ceo stock option grants	medical effort	estimated mean thresholds	debt capacity

Table 12. Distribution of 5 most frequent compound terms in our journal sub-corpus extracted from papers published during 1999-2009 and containing at least one occurrence of the term *moral hazard*. (The relative frequency of the term *moral hazard* is given in the 2nd row of this table).

3.4 Summing up: What does a word count have to do with the 'real world'?

The appearance and disappearance of terms in scientific, technical, commercial and other specialisms indicate changes in the specialisms. Causal links can be discerned but this is all there is to it – a discernment. Recent developments in the study of finance, marketing and politics, under the umbrella term *sentiment* or more accurately *affect analysis* appear to create a causal link between the appearance of negative affect terms to the decline the value of stock markets, consumer goods, and political parties or individuals respectively (see Ahmad 2011). The textual turn in *finance* has come about quite recently perhaps after questions appeared related to the so-called efficient market hypothesis (EMH), which has influenced the free-market oriented minimal-regulatory approach to all matters financial. The EMH is based on the idea that there is a process of price discovery that is driven by the so-called market forces: an over-priced item will be shunned by buyers and eventually the seller will move towards what the buyers perception of the true value. Vice-versa, for an under-priced equity there will be a rush to buy and the seller will be motivated to raise the prices until it reaches its true value. Price is discovered through information being relayed about an equity's value and here any other source of information will be discounted altogether by price related exclusively about prices. The ontological position of the proponents of the EMH was even more profound: the actions of the buyers and sellers will regulate the market and all we need is soft-touch regulation. However, many a clear thinker has suggested that the fears and ambitions of traders in a market place do influence their behavior (Kahnemann and Tversky 2000, Mandelbrot 2005) and there is a need for closer and tougher regulation.

There are a number of publications in the mainstream journals of finance, for example *The Journal of Finance*, now carries papers on the influence of news on the movement of equity prices. These papers focus on comment columns – often referring as *agenda setting* columns that appear in financial newspapers like the *Financial Times* and the *Wall Street Journal* -- contain speculation and humour about companies and individuals. Researchers have found that the negative affect found in these columns does account for the downward movement of indices measuring the performance of financial markets (Tetlock 2007); more refined versions of this approach suggest that a negatively-minded commentator of these comment columns can exercise downward pressure on financial indices and positively-minded commentator has the converse effect (Dougal et al 2012). In this spirit we will look at the S&P 500 index and

see whether the appearance and disappearance of the key word *moral hazard* has any relation to the changes in the value of S&P 500.

The S&P 500 is an aggregate value of the value (market capitalization or the value of the share price or equity price on a given day multiplied by the total number of shares) of 500 US companies – each selected by a committee employed by the US-based consultancy Standard & Poor's; each company in the S&P 500 should have a market capitalization of 4 Billion US dollars amongst other requirements. The consultancy provides 'market intelligence' and provides consultancy to investors amongst other activities.

S&P 500 has been increasing year-on-year since 2003. This growth is remarkable in that the index fell from its peak value of 1518 in August 2000 – at the height of dotcom boom – to half its value of 841 in February 2003; ostensibly the reason was the dotcom boom/bust during 1999-2003. The index *recovered* eventually four years later to 1531 in May 2007 only to fall a new low of 735 in February 2009. The traded volume, the number of times the index was bought or sold and a sign of market activity increased during two periods of downturn, 2003 and 2008 as compared to a period of upturn 2000 and 2007 respectively: During the dotcom boom (c.2000), the 9.3 billion indiceswere traded at S&P500's peak value of 1531, but in the downturn 14 billion indices were traded when S&P500 was nearly half its 2000 value of 735 in 2003. Similarly, the index reached a value of 1549 in the 2007 property/mortgage boom, when 14 billion indices were traded, and when the index halved (again) in 2009 to 735.09. The traded volume appears to be another bellweather of ups and downs in the markets (Figure 3).
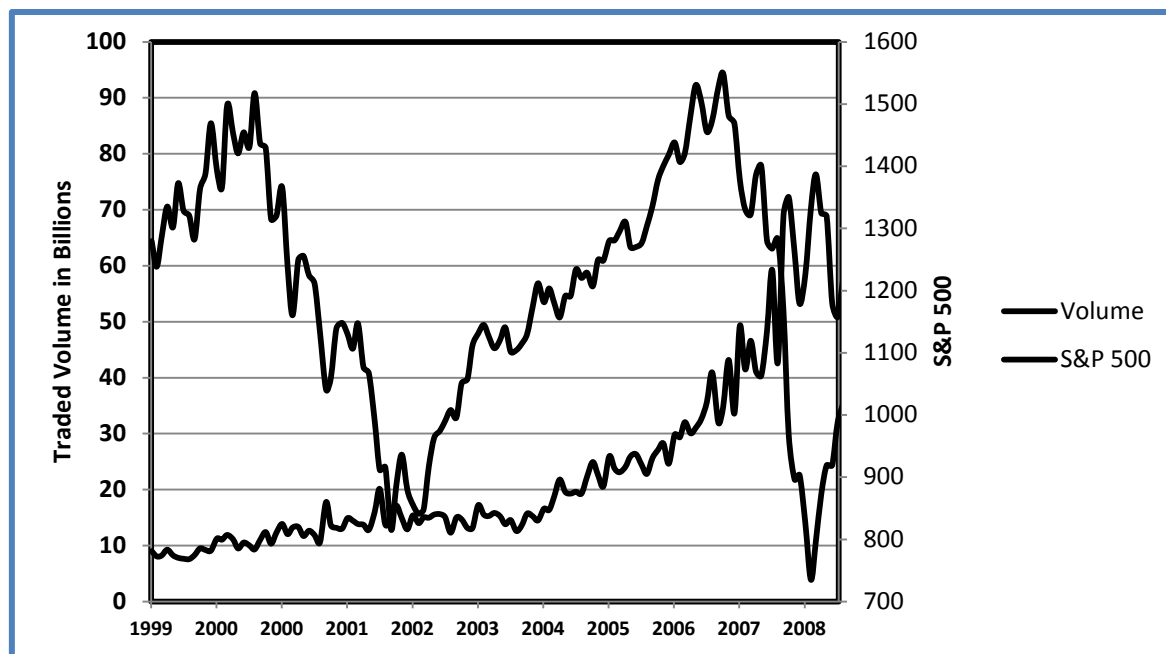

Figure 3. The movement of the S&P 500 index during the 11 years 1999-2009 together with the traded volume (index bought and sold).

The correlation of the frequency of articles containing *moral hazard* in our newspaper corpus and the journal are anti-correlated with the movements in the S&P 500 index : -15% and -7%

respectively, whilst the correlation between the frequency of articles in the two corpora is positively correlated (66%). In a limited sense the increased appearance of the term *moral hazard* appears to be a harbinger of the downturn of the equity markets and vice versa. It also appears that the appearance of this term in journals is also related to its appearance in newspaper articles (Figure 4).
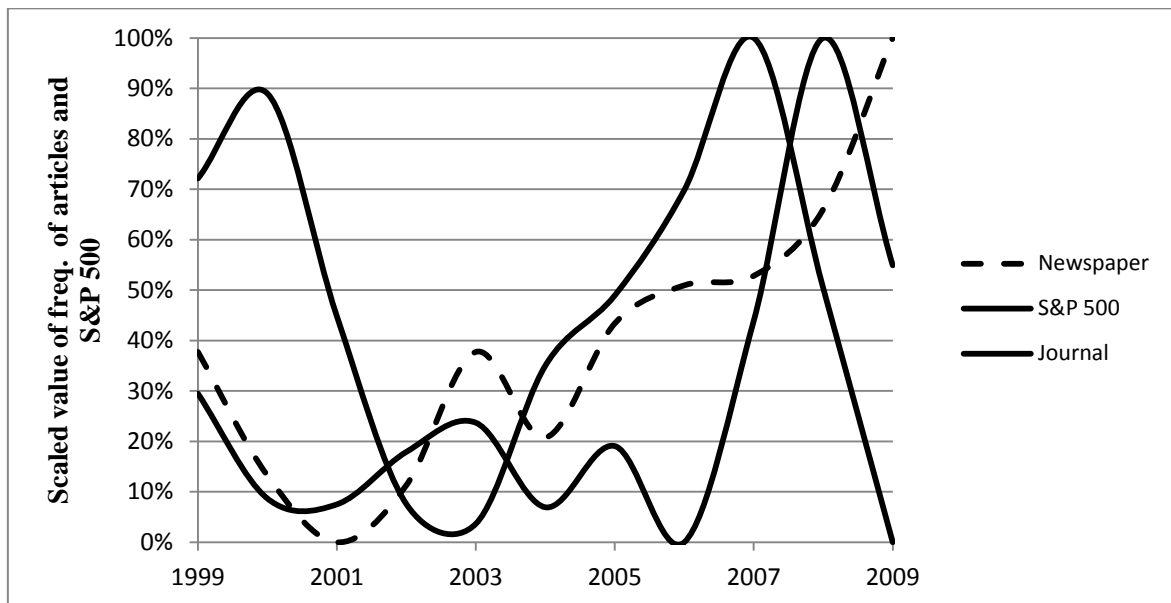

Figure 4. The variation of the S&P scaled values, the average value for the year less the minimum value then normalized by the difference between maximum and minimum value: this means the maximum value is represented as 100% and the minimum is 0%. Similarly for the scaled values of the frequency of articles comprising our two corpora – newspaper and journals.

4 Afterword

We started by observing one well established pattern of trading in financial markets – the cyclical change in prices of equities. There is auto-correlation in prices: today's prices are mildly different to yesterday's or this month's to the next month, and this perhaps engenders stability in the markets. It is assumed that uninformed speculators (termed *noise traders* in finance literature) lack the information that is possessed by informed traders – and the erroneous bets made by noise traders can be discounted by the informed folks – traders, financial institutions and others. The idea is that through auto-correlation and information markets can become self-regulated. Not so, it turns out to be the case: the informed traders panic and tend to follow the uninformed and the stability of the market is threatened by this herd behavior. So we not only have cycles but super cycles of boom and even longer periods of deflation and bust. There are apparently signs in journals, financial news papers and news casts signaling the onset of a boom or a bust: affect words related to the economy at large or affect words associated with individuals, do appear to have an impact of prices. This impact is not accounted for by many of the theories of the financial markets.

We have focused in this paper on a keyword – *moral hazard* – used as a proxy for the existence and operations of lenders of last resort – whether such lenders are national

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governments, federations like the European Union, international institutions like the IMF, or super-rich individuals like Warren Buffet in the USA or oligarchs in post Soviet Union states. Moral hazard was used in economics and finance on the introduction of *fire insurance* – the fear was that people will not be careful with fire appliances if they knew that there in the *last resort* an insurance company will pick up the tab for their erroneous behavior. The term was used in recent times on a range of key topics – disability insurance, investment protection and a host of others.

If signals do exist then how can these signals be discerned? More specifically, can we learn something if we follow the use of an iconic proxy like *moral hazard*. The answer is mildly positive as we have shown through the analysis of a general language corpus, a corpus of financial/political newspapers and telecasts, and the analysis of learned papers in economics and finance. The focus was not a detailed analysis of the use of the keyword – in that we were content with the fact that the keyword occurred at least once somewhere in a newspaper article or a learned paper. The diachronic changes in the frequency of occurrence were plotted and correlated with a major index of the 21st century equity market (S&P 500). There was an anti-correlation between the frequency of the keyword and the S&P 500, whilst there was a positive correlation in frequency of the keywords in the newspaper corpus and the learned paper or journal corpus.

We looked at the other frequently co-occurring words in our two corpora and found that the newspaper corpus had a high frequency of terms like *financial crisis* and *financial systems*. The journal corpus comprised frequently used text related to *deposit insurance* and *debt capacity*. The newspaper corpus had key terms referring generally to a *crisis* in a *system* caused by lapses in *insuring* debts and in overextending the capacity of financial institutions in lending money. This insight, although with considerable hindsight, was achieved not by using an economic or financial theory but by looking at the genesis of the use of lexical tokens in a variety of texts. Sinclair (2004) suggested that we should trust the text – and that is what has been done in this paper.

More can indeed be achieved by examining random samples of papers in financial newspapers and learned papers in finance and economics to systematically investigate the use of language by the key stakeholders. We should not forget one key source of information – prices and traded volumes of equities and commodities – in that there is a significant amount of information about the behavior of the markets and many of its traders in these numbers. The task of folks interested in *language for special purposes* is now to bring forth the accumulated wisdom of the last 100 years in the studies of *fachsprache* to bring to bear upon pressing concerns in one important specialist area of human life – wealth or the lack of it. There is a need for systems to be in place to automatically sample texts for creating and analysing balanced and representative corpora of texts written in special language of a given domain. These corpora should contain texts that comprise a range of genres -- from the newspaper texts, journal texts, speeches and blogs. Such a system will *dial-a-corpus*: this term was coined by the late John Sinclair for a joint project proposal initially proposed by myself and then finessed by John and Yorick Wilks. Alas, John's untimely death has only left a trace of this ambitious project in the form of his tongue-in-cheek phrase *dial-a-corpus*.
This paper was written with the intention of informing the reader on a variety of topics. My apologies if I have confused or mis-informed the reader.

Acknowledgments

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[i] http://www.publications.parliament.uk/pa/cm200708/cmselect/cmtreasy/uc524-i/uc52402.htm. (Site visited 5 April 2010; The transcript is subject to correction and is not yet an approved formal record of these proceedings.)
[ii] HC-524i-*Re–appointment of Mervyn King as Governor of the Bank of England*, *Tenth Report of Session 2007–08*, *Report of the Treasury Committee, House of Commons, UK,* London, HM Stationery Office, London, pp Ev 2;]
[iii] Forsyth, Lord of Drumlean. (2009) House of Lords Economic Affairs Committee (2009) Banking Supervision and Regulation, Second Report. Question/Answer session on 10 March 2009.
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