

Communicating Finance

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Abstract

There are dimensions to information that the traditional propositional view of information as used in economics and finance may or may not accommodate. When we talk about *interpretation*, *credibility*, and *impact*, are we talking about just facts, or is there an inescapable personal emotional component to the facts arising from the interaction between the information, the medium, and the individual? This paper summarizes a variety of research findings which suggest that the medium by which financial information is communicated can matter. The impact of the medium on securities markets is mediated by its emotional effects and their subsequent effects on human information processing. It's not simply a matter of inputting data into a mental model which turns it into buying and selling decisions. The medium by which the data arrives determines the model by which it will be processed.

I. Introduction

Information economics has been one of the major accomplishments of economics in the twentieth century. But when economics and finance consider information, they do not consider its form; that is, the medium by which the information is communicated. So far, it hasn't mattered whether one finds out that the DJIA has fallen below 10,000 from a colleague, from CNBC, from Reuters.com, from the *Wall Street Journal*, or from *Forbes* except that the timing of the receipt of the information from these sources may differ. Perhaps the medium doesn't matter. But perhaps it does.

There are dimensions to information that the traditional propositional view of information as used in economics and finance may or may not accommodate. For example, many of the models of theoretical finance include an assumption of homogeneous information. Does the assumption that everyone has the same information include attributing the same *meaning* to it? Does the assumption that everyone has the same information include having the same *belief* in it? Does the assumption that everyone has the same information include paying the same amount of *attention* to it relative to all other information? When we talk about *interpretation*, *credibility*, and *impact*, are we talking about matters which are a part of the propositional view of the storage and processing of information or are we talking about matters which concern a different sort of storage and processing of information involving images, which is much different? (Skubic and McGoun,

2000) Are we talking about just facts, or is there an inescapable personal emotional component to the facts arising from the interaction between the information, the medium, and the individual?

Another important issue is whether the creation of new media creates a new finance along with it. The standard view of information has been that an efficient market's response to it is immediate and unbiased. Recent work has suggested that there is widespread overreaction or underreaction to information. This may not just be a change in our understanding of the market; rather, the market itself may be changing as a consequence of the way in which information is communicated. Does new media simply speed up our markets or does it effect fundamental changes in their character? Is there information of an event, information and an event, or information as an event?

We can not claim that it is possible to definitively answer the questions in the preceding paragraphs, as it is well-known that the effects of media are often not apparent for up to hundreds of years after their introduction. (Stephens, 1998) But the questions can and should at least be posed, and it is possible to shed some light on them. In the following three sections we present a brief theoretical justification for a connection between the media and information. The first link in section II is between the medium and the emotional associations of a message. The second link in section III is between emotions and information processing. And the third link in section IV is a more direct one between the medium and data. We conclude

in section V with some suggestions on how media might be an influence upon finance and how this influence might be studied.

II. Media and Emotions

Each medium has its own objective (speed, etc.) and psychosocial (anonymity, etc.) features (Griffith and Northcraft, 1994) which give it certain strengths and weaknesses for different tasks. These features also cause a medium to change the message it carries in different ways. There may be some confusion, however, between the terms “medium” and “genre”. A “genre” is a form of communication (memorandum, letter, bulletin, etc.) that can be physically created, transmitted, and stored in different “media” (regular mail, fax, electronic mail, etc.). Since some “genres” have always been connected with a single “medium”, such as quality circles meeting face-to-face, it can be easy to confuse the two. But tradition should not keep us from separating them and thinking about new combinations such as quality circle meetings using group decision making software. (Yates and Orlikowski, 1992)

Approaches to Media Selection

Russ et. al. (1990) describes three theoretical approaches to media selection: message equivocality, media richness, and symbolic interaction. In a sense, each of these approaches is included within the next one on the list. According to the first, message equivocality, language has a quality referred to as “variety.” Art,

music, and painting, for example, are high variety languages that can communicate many different ideas and emotions and allow the receiver of the message to understand it in many different ways. Mathematics and statistics, on the other hand, are low variety languages that communicate very few ideas with great precision. Daft and Wiginton (1979) recommend using high variety languages when talking about complex social matters (highly equivocal messages) and low variety languages for exact, well-understood topics.

This approach may not seem to be very important in finance, which is obviously going to do most of its communicating in mathematics and statistics and in a natural language and not in art, music, or painting. But it does make us think that for a complex, equivocal thing such as the corporate image which a company may want to present to the investment community, a high variety style of the language, with frequent use of metaphors for example, might be best. Images are not communicated well by using numbers, because the subjectivity of the images in the minds of people does not fit together well with the objectivity of numbers. (Daft and Lengel, 1984) So a lot of statistics about the size and financial strength of a company, for example, may *measure* strength and stability but still not be enough to communicate an *image* of strength and stability.

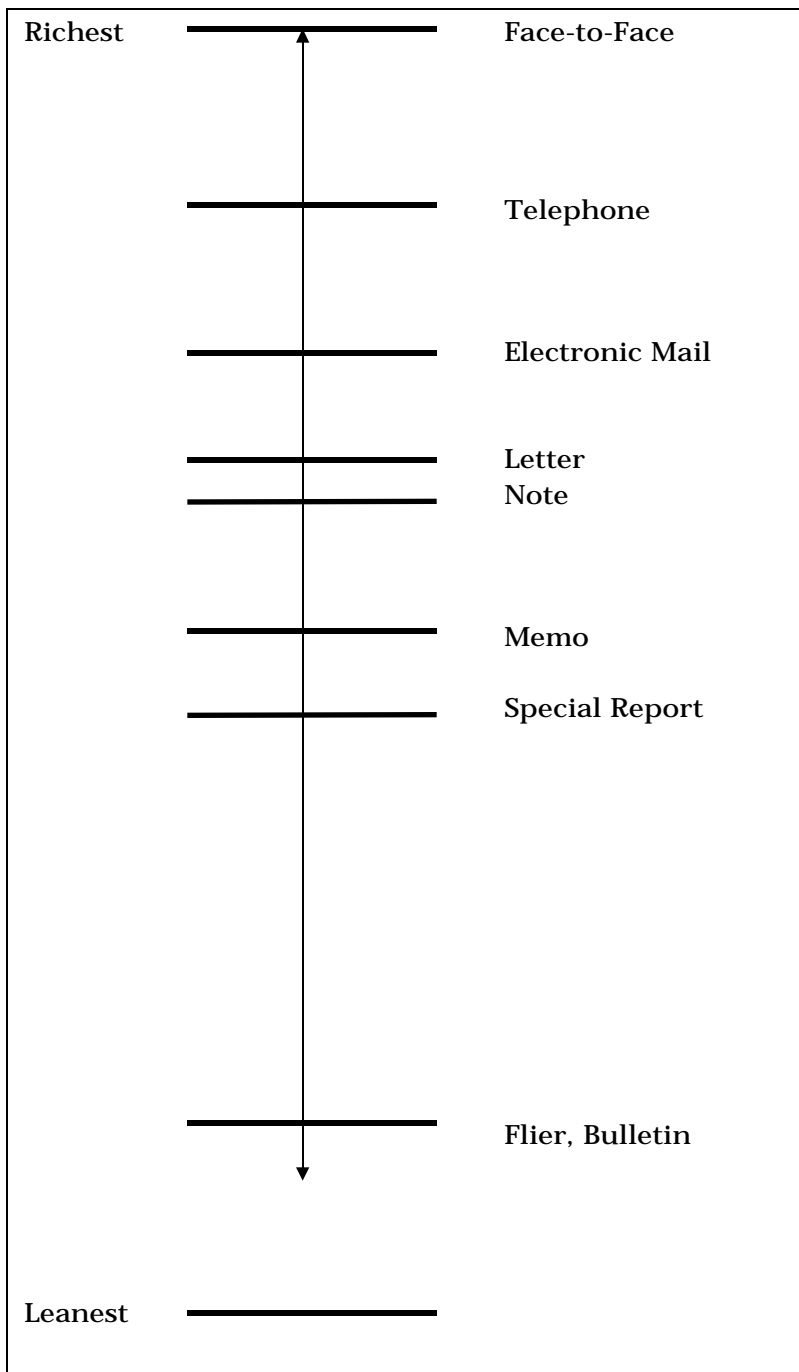
Another approach is media richness. Media differ in their ability 1) to permit timely feedback (interactivity), 2) to communicate a lot of different visual and audio cues (such as eye contact, gaze, blush, head nods, posture, gestures, voice tone and inflection, formatting, handwriting, etc., which are really multiple

channels of communication that let a message repeat itself in different ways), 3) to be changed to fit different personal conditions (contextualization), and 4) to accommodate language variety. (Huber and Daft, 1987; Rice and Williams, 1984) Not surprisingly, these four characteristics are correlated.

“The term ‘richness’ refers to the ability of information and media to change human understanding, overcome differing conceptual frames of reference, or clarify ambiguous situations in a timely manner.” (Markus, 1994, page 505) Rich media give us immediate feedback and use multiple cues, and they make it possible to make immediate changes to fit the situation. They are sociable, sensitive, warm, private, and personal. Lean media are the opposite of rich media, and they are more unsociable, insensitive, cold, impersonal, and private.¹ (Rice and Williams, 1984) Generally, spoken media are richer than written media, and synchronous media (real-time interactive) are richer than asynchronous (delayed) media. (Markus, 1994)

The following diagram from Trevino et. al. (1990, page 76) was described as a hierarchy of media richness, although it actually ranks both media and genres.

¹ These descriptions make it sound as if the richer a medium is, the better it is, but this is not true. There are certainly times when messages should be impersonal and private, which is how lean media can communicate them, and usually lean media are more permanent than rich media. While lean media’s message might not have as strong an immediate impact, it can have an impact which will be around longer. (Howard, 1996) It can also be a follow-up to reinforce a message originally sent via a richer medium. (Howard, 1998)



Daft and Lengel (1984, page 197) have a different way of looking at this.

Richness	Medium	Feedback	Channel	Source	Language
High	Face-to-Face	Immediate	Visual, Audio	Personal	Body, Natural
	Telephone	Fast	Audio	Personal	Natural
	Written, Personal	Slow	Limited Visual	Personal	Natural
	Written, Formal	Very Slow	Limited Visual	Impersonal	Natural
Low	Numeric, Formal	Very Slow	Limited Visual	Impersonal	Numeric

When choosing what medium to use for what message, the more equivocal the message; that is, the more complex it is, the richer the medium that you should choose to communicate it. This principle is summarized in the following diagram, once again taken from Trevino et. al. (1990, page 81)

	Unequivocal	Equivocal
Rich	<u>Communication Failure</u> Rich media's excess cues cause confusion and surplus meaning.	<u>Effective Communication</u> Rich media match equivocal message.
Lean	<u>Effective Communication</u> Media low in richness match unequivocal routine message.	<u>Communication Failure</u> Lean media used for equivocal messages provide too few cues to capture message complexity.

The symbolic interactionist approach is the most complete of the three approaches, but it is also the hardest to see. It says that groups create their own symbols with their own meanings and can communicate more efficiently among themselves using those symbols. We could even say that communicating with the investment community is actually symbol creation. The problem, of course, is that this can be very difficult when different people have different backgrounds and different values and do not have the same symbols. This can make the communication of equivocal messages, those about corporate image for example, very difficult.

An especially interesting and useful thing about the symbolic interactionist approach is that it doesn't just look at the symbolic interactions of people with each other, but it also looks at their symbolic interactions with media. There are important effects that come from the features of the situation and of the medium itself and not just the message the medium contains. In other words, media should not just be chosen according to their own richness and the equivocality of the message they are to convey but also for things that are special about the situation that is going on for that specific communication (importance of timeliness, distance, accessibility to the medium, critical mass of users, etc.) and media symbolism (organizational culture, tradition or protocol, need for legitimacy or documentation, desire to appear serious, authoritative, competent, or intelligent, desire to build trust, goodwill, or teamwork, desire to show concern, compassion, or empathy, etc.). In short, the medium itself has an image that it adds on to the images

created by the message it carries. (Markus, 1994; Trevino et. al., 1987 and 1990)

Electronic Media

The electronic media which are expanding explosively today can be a little difficult to fit into these three approaches, which were mostly developed before or shortly after these new media began to be used. They include fax, voice mail, electronic mail, group decision support systems, the internet, intranets and electronic bulletin boards, video messaging, CD-ROM, video, and video-conferencing. Of course just by using the most modern electronic media of any type, a company can get a high-technology image. (Trevino et. al., 1987)

Electronic mail is an especially interesting medium because it allows written communications to be much richer than was possible in the past. So even though electronic mail is on the diagram above, it doesn't fit very well into the scale. (Markus, 1994) It is able to avoid intermediaries such as secretaries and distribution systems, which have usually taken care of written communications. Its language is often more informal and colloquial, and errors in spelling and grammar are not a problem.² It is short-lived (or at least often intended to be short-lived) and usually not available for

² Although e-mail is richer than other forms of written communications, it is still less rich than face-to-face and telephone communications, since it doesn't have most if not all non-verbal cues. Some people have said that this makes e-mail feel both informal (less formal than other written media) and anonymous (less personal than conversation), which can sometimes lead to rude and offensive behavior, (Bordia, 1997)

future reference. And although it is asynchronous, feedback can occur fairly quickly and, with instant messaging systems, sometimes almost as quickly as in a face-to-face conversation, depending on how quickly someone can type. (Yates and Orlikowski, 1992) On the other hand, because e-mail is sent over wires and is read from a computer screen, it does not have all of the cues that other forms of written communication have, although it has become possible to easily change typeface, formatting, and color in an e-mail message and to add photos to it, which cues can be very important.³

Video is another interesting, and also a little unusual, medium. It is very rich in the sense that it can have almost as many cues or communications channels as face-to-face communication. But at the same time, it is very lean because it is very impersonal and feedback takes as long as with a more traditional written medium like a newsletter. Because it is interactive, video conferencing is richer than video, and because it is visual, it is richer than the telephone. It is not as rich as face-to-face communication, but of course it can be sent over great distances. It is still so new, however, that it is only possible to guess how effective it really is.

Finally, it is hard to say how the internet, intranets, and video messaging are more or are less rich than the written documents they replace. Certainly, information can be sent around more quickly

³ The cues are important but subtle.

The typographic design, and in particular the letterform, adds a rich and complex message to our associative engagement but operates at the margins of the center of attention. . . . The moment we direct our focus on it, it slips away. To become aware of it would require us to shift focus, negating its effect. (Mau, 2000, page 432)

and less expensively in these ways, and they can easily link to, or even include, information which comes from outside the company. But the effects of viewing information on a computer or television screen are still largely unknown. Televised video messaging has to be kept short, and so far people recommend that internet and intranet messages be kept short too, since it is more difficult and more tiring to read information from a computer screen than from a printed page (Kroll, 1997) and things can look longer on a screen than in print. (Pretzer, 1998) It can also be harder and take more time to log onto the internet or intranet than to pick up a newspaper, newsletter, or magazine. But then it is also harder to read a newspaper, newsletter, or magazine than it is to watch a video message on a television in a public place. (Ladio, 1996) Some people have even said that unlike a computer screen, a newsletter has “personality” -- something which is especially important in communicating a corporate image. (Elsasser, 1998)

III. Emotions and Information Processing

There are a number of different research programs concerning the effect of emotions upon information processing. Two of them are nicely summarized in articles with useful bibliographies in the *Handbook of Emotions* (Lewis and Haviland-Jones, 2000) written by leading researchers in their respective areas. In the first article, Forgas and Vargas (2000) present their Affect Infusion Model in which “mood influences the content of cognition (*what* people

think)” and “the process of cognition (*how* people think). (ibid., page 351) “Temporary mood may selectively prime the ideas, memories, and interpretations used by a judge, influencing the ways complex and often ambiguous social stimuli are perceived, learned, interpreted, and responded to.” (ibid., page 353) “Several studies have found greater affect infusion when people need to take longer to process complex, atypical, or otherwise cognitively demanding targets.” (ibid., page 354)

This is perfectly consistent with the claims made for investor relations (Skubic and McGoun, 2000) that it is not enough to provide information to investors, but also to call attention to it and to interpret its meaning. These are emotionally-laden tasks. Although Forgas and Vargas’ stated concern is with social judgement and reasoning and not the scientific judgement and reasoning which finance would claim ought to be used in investment decisions, they do apply their model to consumer choice, which may share many common features with investing. (Allen and McGoun, 2000) And they propose stronger mood effects in decisions requiring the substantive processing such as investing would require.

The second article by Isen (Isen, 2000) elaborates on this general idea. According to Damasio’s (1994) somatic marker hypothesis, emotion plays a role in memory organization and access, and research has shown that “people who are happy may find it easier to learn material that is compatible with their positive state, and this ease is reflected in their recall of the material later, even if they are not made happy at the time of recall.” (Isen, 1987, page 215). The emotional associations of information also interact

with judgements concerning risk. Positive affect increases subjective probabilities of positive outcomes, but it may also reduce one's willingness to take risks by increasing the perceived disutility of negative outcomes. (Isen, 1987 and 2000; Lowenstein et. al., 2001) Furthermore, research findings suggest that positive affect in general leads to more creative, more flexible, and more intuitive (automatic or heuristic-based), but also to more deliberate decision making in decisions demanding greater effort or care. (Isen, 1987 and 2000; Hanze and Meyer, 1998; Luce, Bettmann, and Payne, 1997)

One clear implication of these findings is that a positive corporate image, independent of any specific information concerning a corporation, can have benefits. If an investor "likes" a corporation in the same way that he or she would like a person (McGoun and Skubic, 2000; Skubic and McGoun, 2000), then that would clearly put a positive spin on all information concerning that corporation and favorably dispose an investor towards investment in that corporation without extensively deliberating the decision. In short, the psychological research suggests that someone who uses Apple Computer Corporation products and likes them is likely to invest in Apple Computer Corporation without a thorough financial analysis.

The connection between the medium through which financial information is communicated and the processing of that information is not quite so clear cut. If it is true that the medium can have an emotional impact independent of the information it communicates, then this can positively label the information and

influence its subsequent recall and use in line with Tversky and Kahneman's (1974) framing hypothesis. In broader terms, effective use of the most appropriate media to communicate corporate information can have a positive impact on the image of the corporation which can then work to its advantage as described in the preceding paragraph.

IV. Data and Media

Stimulated by McCloskey's work in economics (McCloskey, 1985), there is a growing interest in the role of rhetoric in the social sciences. The medium is one component of rhetoric.⁴

Tables and Printing

Aho (1985) makes a convincing case for the profound impact of double-entry bookkeeping on the image of organizations and accounting. With its simple and direct tabular form, the ledger presents economic activity with at least the appearance of honesty, accuracy, and completeness – there is no attempt to hide or to deceive. With its balance between debits and credits, the ledger presents economic activity with at least the appearance of being just – there is no unfair advantage or undeserved gain. The balance implies some sort of equality (although certainly does not guarantee

⁴ it is difficult to distinguish between a medium and a technology and between a medium and certain features of the content. Printing presses and CRTs are clearly different media; however, there are important similarities as well as differences. Narratives, tables, and graphs can all be produced in print or by an electronic display; however, there are important differences as well as similarities.

it) between assets and claims on the assets, between costs and benefits to the organization, and between resource flows into and out of the organization. Overall, recording economic activity in a table endowed its image with some of the beauty and purity of Euclidean plane geometry.

The technology of printing was an appropriate, if not necessary, complement to double entry bookkeeping.

Quantified and spatialised tableau of this character became a way of thinking after the invention of printing made them durable and easily duplicable. . . . The pagination of a printed presentation helped further to reinforce the almost stark spatialisation and non-precisability of the financial picture that double entry bookkeeping constructed of the enterprise. Printing helped consolidate a deliberative, diagrammatic, silent, private and calculative mode of thinking. In this way, it helped “turn” the analytical mind. It stimulated that calculative approach so typical of commercial practice. It did not just “represent” it. (Thompson, 1991a, pages 592, 595)

Clearly, the balanced, geometrical, printed, tabular representation of economic activity reflects, enhances and perpetuates the image of the organization as a well-lubricated, smoothly-functioning machine and accounting as its honest historical record. Every organization is thus driven forward by the same deep laws that drive the mechanistic universe toward its inevitable future. Such associations are so strong that it is difficult to recast organizations and accounting using different images until the medium for the expression of those images changes.

Graphics

Thompson (1991b) makes the somewhat astonishing observation that figures and diagrams were not common in economics texts until the 1950s.⁵ Articles addressing graphics are rare in accounting practitioner journals before the 1980s. Johnson, Rice, and Roemmich (1980), Jarett (1981), Taylor and Anderson (1986), and DuPree, Hartgraves, and Thralls (1987) are some of the first. By 1988, the profession had still not defined graphics standards. (Jarett and Babad, 1988) It appears as if the long delay in the use of graphs is attributable to the artistic difficulties accountants would encounter before simple and inexpensive graphics software was available for the personal computer. After all, amateur hand-drawn graphs do not have the precision and beauty of printed tables, and to hire a professional graphics artist to prepare the graphs would be prohibitively expensive. A few years before the advent of the personal computer, one author comments that “[graphs] are considered to be management ‘working tools,’ and no efforts are wasted in trying to produce artistic masterpieces.” (Sias, 1970)

There has been a scholarly neglect of the subject as well, consistent with the classification of accounting graphics as a sub-sub-subdivision of a subdiscipline. (Libby and Lewis, 1977)⁶ some

⁵ This is “astonishing,” for Peter Ramus, an influential educator who taught Descartes, promoted the use of visual schematics in the sixteenth century (Heim, 1991), and the expression “a picture is worth a thousand words” has been around for a long time.

⁶ The hierarchy runs from accounting (the discipline) to human information processing (the subdiscipline) to the information set/input (the subdivision) to the method of presentation (the sub-subdivision) to format (the sub-sub-subdivision).

of the most general work on the effects of graphical presentation has been done by statisticians (Bertin, 1981; Tufte, 1983, 1990, and 1997; Cleveland, 1985; Cleveland and McGill, 1987); however, the discussion of the article by Cleveland and McGill (1987) contains a number of statements indicative of how rare work on the subject of graphics had been even among statisticians. What little work has been done specifically in accounting has found that graphic presentation can result in better decision performance if the form of the presentation is an appropriate one for the decision (Blocher, Moffie, and Zmud, 1986; and Davis, 1989) but that the improvements resulting from the use of graphics may be slight. (DeSanctis and Jarvenpaa, 1989) Nonetheless, there are many opportunities for future research. (DeSanctis, 1984)⁷

Perhaps the most serious limitation of graphics usually used in accounting is their limited dimensionality. Two dimensions are most common. Simulated three-dimensional graphs are rare, even though the computer software can design and prepare them. Other techniques are available to represent multiple variables on a single two-dimensional figure, and Tufte (1983, 1990, and 1997) provides a number of extraordinary examples of how this has been done very cleverly and very artistically. It may even be possible to infer a number of relationships between variables or perhaps among variables. Yet two dimensions remain the norm.

A serious limitation of all extant studies regarding the use of graphical representations of accounting data is a bias regarding the

⁷ Henderson's (1999) study of visual representations and visual culture in

subjects on whom the tests have been conducted. Usually, tests are given to undergraduate accounting students, who have had no practical experience, and/or to more advanced accounting business students and practitioners, who have had greater experience. These groups are most likely to have a numerical orientation, having preselected themselves into some association with accounting. Missing entirely are those whose education, experience, or background evidence no interest in accounting at all. These are precisely those whose mental abilities might be expected to benefit most from the use of graphics (West, 1991) While graphics enhance the judgement of those predisposed to an interest in accounting only slightly, they may enhance much more the judgement of those totally unfamiliar with accounting and hitherto uninterested in accounting. Their judgmental skills given the appropriate graphical aids might even exceed those of accountants, whose intuition might have been inhibited by their formal training. This is an extremely fertile area for research, given the vast advances in the visual representation of data.

Computers

It is clear that personal computers have caused the recent resurgence of interest in graphics; however, it is not clear what other effects computers may have had. It may be too soon to tell – it will be many years before scholars can prepare an analysis of the computer revolution comparable to Eisenstein's *The Printing*

engineering is an exemplar of what could be done.

Revolution in Early Modern Europe. (1983) Of course, there has been considerable speculation regarding the current “revolution”. Printing completes a process, presenting a finished product to the information consumer. Purely electronic documents are still open to modification and reconfiguration (Heim, 1987) And if it is possible for the information consumer to recast electronic information in many ways, why should any one be the sole standard? (Heim, 1991)

This question is closely related to a number of other questions. Why is it that accounting has stuck with tabulations on a flat printed surface for several hundred years? Why have multimedia integrations of auditory stimuli and sophisticated visuals been so slow to take hold? Why has there been little or no effort to seek better ways to model the multiple dimensions of a complex modern organization? Gambling (1985) attributes it to a desire for certainty. Accounting by the traditional standards may be inadequate, but it is standardized. It is under control, whereas there are no controls on the alternatives. Accounting originally served the mechanistic image associated with the dominant worldview of a clockwork universe. Now, we are stuck perpetuating that image as image has become subservient to the accounting.

This explanation, however, is incomplete. Such conservatism is not universal. While accounting may have to conform to standards for external reporting in most countries, there is no prohibition on creative internal managerial systems. While mainstream accounting research is resistant to unusual ideas, alternative research is not precluded from undertaking some radical

experiments. A deeper reason for the failure to change is that no meaningful change has yet been possible. Graphics are merely reconfigurations of the tabular data. While they facilitate decision making under certain conditions, research has shown the improvements to be slight. No matter how accounting models may be tarted up with sound, color, or animation, they are still reconfigurations of the same flat, gray numbers. The decision maker must still stand outside and look down at or out at them. There are as yet no truly different alternatives. It was not simple conservatism which led Apple to use the so-called “desk-top” metaphor to guide the design of the Macintosh interface (Briken, 1991), since copied by Microsoft for Windows, and to configure the layout of the computer screen as if it were a printed page. (Benedikt, 1991)

V. Conclusions

Much of our day-to-day contact with finance consists of statistics, from the crawling ticker across the bottom of the CNBC screen to the seemingly endless listings in section C of the *Wall Street Journal*. Much of finance research consists of mathematics (in the “theory” section of papers) and statistics (in the “empirical” section). Recall from section II that mathematics and statistics are low variety languages that communicate very few ideas with great precision. In finance, the precision of the mathematics and statistics overshadows the paucity of ideas. The medium masks the real message.

Prices are very precise numbers, and from childhood we become accustomed to such numbers meaning that we can contract for a good at exactly that price. The price on the box of cereal on the shelf is the price we will pay at the checkout counter, and we can buy as much as we want at that price. Numerical prices for financial securities, however, mean something quite different. They are marginal prices at which the most recent transaction occurred. They are not necessarily the price at the “checkout counter” if we want to buy or sell, and there are unknown limits on the amounts that can be bought and sold at that price. The effects on personal wealth held in securities portfolios as prices rise and fall is frankly unknown, even though it can be computed and communicated with apparent precision.

A similar phenomenon occurs in finance research. There, elaborate mathematical models and sophisticated statistical tests on massive data bases communicate the image of great precision. But once again the assumptions such as perfect information on which the models are based, which by tradition are not to be tested, the assumptions such as random sampling on which the statistical tests were devised, which by tradition are ignored, and the meaning of the data such as prices, which the preceding paragraph has argued can be equivocal, all contribute to confusion as to just what ideas the precise statistics and mathematics are really about.

Yet it is not really mathematical or statistical precision which convinces us to purchase a security or believe in a theory. As comprehensive as the price listings are in the *Wall Street Journal's* section C, it is columns such as “Heard on the Street” that have a

real impact. As immediate as the prices updated in real time on the CNBC screen are, it is the commentators who for good or ill transform them into something that stimulates investors. As many pages as an academic paper may occupy in a prestigious finance journal, it is a long process of discussion and debate over many years and a compatibility with common sense that cements a theory, again for good or ill, in the discipline. Clearly, the richer the medium, the greater the effect, which belies the aphorism common in finance that the facts speak for themselves. It really takes an interpreter to speak for them, as the statistical messages of finance are much more equivocal than they appear.

One could argue that the major change in financial communication in recent times has been the explosion of cable television financial journalism and the internet. The former is a rich medium that has the power to grant legitimacy, to appear serious, authoritative, competent, and intelligent, and to build trust. The latter is a leaner medium in some ways, but richer in others. Investment chat rooms permit interactive communication and have the power to convey concern, compassion, and empathy almost as if the communication were face to face. One might argue that increasing price volatility is a consequence of bombardment by an increasing number of credible message-the credibility being a consequence of the medium and not the content.

Of course when we are speaking about such things as legitimacy, authority, competence, trust, concern, compassion, and empathy, we are talking about human society and human emotions. The impact of the medium on securities markets is mediated by its

emotional effects and the their subsequent effects on human information processing. It's not simply a matter of inputting data into a mental model which turns it into buying and selling decisions. The medium by which the data arrives determines the model by which it will be processed. This adds another layer of complexity that finance has as yet declined to address and which is as yet not a part of so-called "behavioral finance." There is much here that demands research.

And a final opportunity for research is the interaction between the presentation of data and its evaluation. Does it matter how rapidly prices are updated; for example, would watching them change more frequently change how they are perceived? Does it matter how rapidly prices scroll across the bottom of a computer screen; for example, do they even need to be read to have an impact. Does it matter how to indicate gains and losses; for example, do different typefaces and colors change how they are perceived? Does it matter how data are listed in print; for example, are the more extensive listings in the *Wall Street Journal* interpreted differently than those in the *New York Times*? There are numerous profound issues concerning information that information economics has never touched.

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