

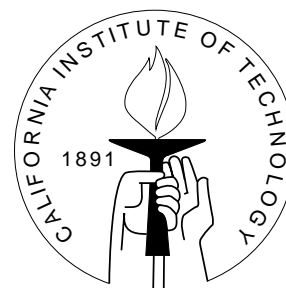
DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES

# **CALIFORNIA INSTITUTE OF TECHNOLOGY**

PASADENA, CALIFORNIA 91125

## MARKETS, TECHNOLOGY AND TRUST

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# Markets, Technology and Trust

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## Trust in financial information

Investors in the U.S. stock market are in the midst of a crisis of confidence. Back in the days before Enron, the level of trust in financial information was sufficiently high to satisfy a broad base of investors. That satisfaction is slipping.

During the nineties, the rapid growth of the Web expanded the availability of financial information. Meanwhile, the corresponding ability of millions of people to act on information with confidence made markets more efficient. But as the recent corporate scandals have shown, when people have doubts about any aspect of this process they pull back and do not participate. Markets suffer as a consequence.

People in academic and government settings are expressing concerns about the darker sides of rampant market technology. In their paper, “Technology, Information Production, and Market Efficiency”, Harvard Business School authors D’Avolio, Gildor, and Shliefer observe<sup>1</sup>:

“A well functioning securities market relies on the availability of accurate information, a broad base of investors who can process this information, legal protection of those investors’ rights, and a liquid secondary market unencumbered by excessive transaction costs or constraints.”

Roger Ferguson, Vice Chairman of the Federal Reserve, discussing these issues at a Fed sponsored seminar, had this to say<sup>2</sup>:

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<sup>1</sup> “Technology, Information Production, and Market Efficiency” Gene D’Avolio, Eli Gildor, and Andrei Shleifer, Harvard Institute for Economic Research, Discussion Paper 1929, September 2001.  
<http://post.economics.harvard.edu/hier/2001papers/HIER1929.pdf>

<sup>2</sup> Remarks by Vice Chairman Roger W. Ferguson, Jr. at a symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming August 31, 2001  
<http://www.federalreserve.gov/boarddocs/speeches/2001/20010831/default.htm>

“This line of research has generated important insights concerning economic behavior and the functioning of markets, showing in particular that imperfect information can lead to outcomes that are distinctly less favorable than those under complete information.”

Loss of trust is one of those less favorable outcomes. Restoration of trust in our markets will take a great deal more than just technology. But just as technology has transformed information dissemination and order execution, there is a clear role for technology in improving public confidence in our markets. And a good starting point is the SEC. While the SEC today is almost fully electronic, the agency’s transformation from paper and microfiche has been slow and sloppy. The specific implementations of the technological means of information disclosure of the less than perfect information available today do not bode well for the future. In the wake of Enron, WorldCom and all the rest, investors should demand that the SEC heal itself technologically.

In its own words, “the primary mission of the SEC is to protect investors and maintain the integrity of the securities markets.” There has been a lot of technological effort to this end. Nearly all company filings must now be submitted electronically. Investors who want to read them have to use the web. The regional SEC reading rooms have been closed. In theory, the Net is the enabling technology for creating a level playing field, and assuring “fair disclosure” to all under Regulation FD.

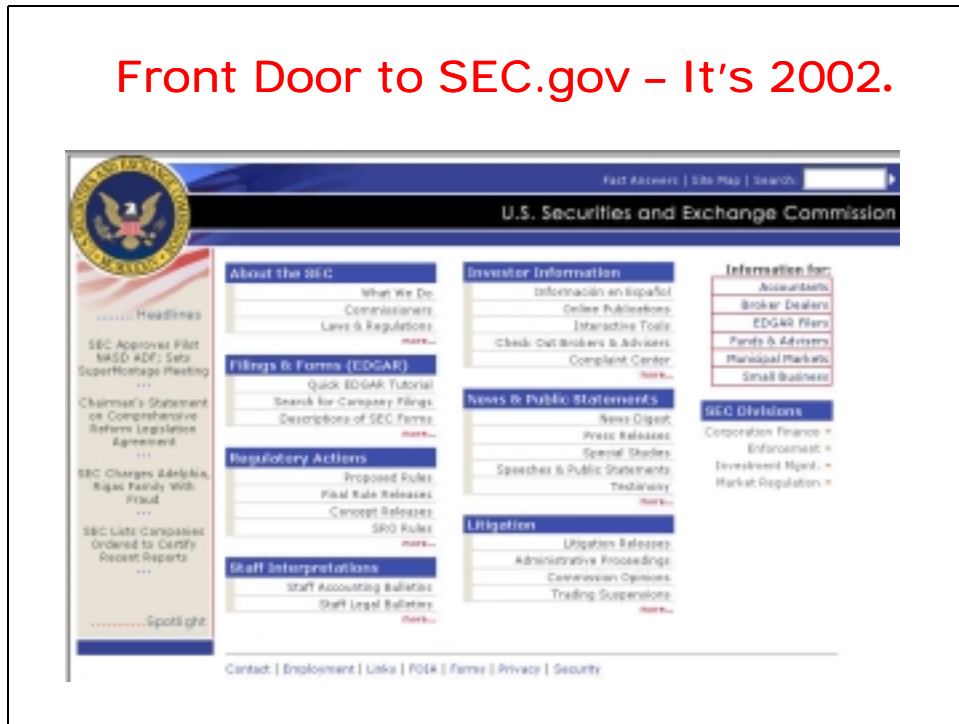
A closer look shows that the field has not been all that level. The SEC provides two kinds of access to this electronic information. Anyone can go to the SEC.gov website for free, using basic search facilities and tools on the website. People who pay a premium can use a much more extensive set of tools from private resellers to analyze SEC filings.

Electronic SEC filings have required since 1996. It took until summer of 2002 for the SEC to release this information to the public in real time.. Direct premium subscribers, and their customers had a 24 hour lead on the public using SEC.gov. It seems amazing, but subscribers willing to ante up the annual fee (roughly \$40,000) and install a private line for the curiously named “Public Dissemination System” were first in line, all the time. TRW, the SEC’s web contractor, spelled it out clearly in their specification: “By design, the SEC Internet site has a 24-hour upload delay; only the SEC and PDS subscribers receive submissions in real-time.”

The elimination of the time advantage for ordinary investors, paying only with their taxes, and using the SEC.gov website is an overdue improvement in a system that delivered yesterday’s news for six years.

On an average day, the SEC information machine pumps out 1.5 gigabytes of new filings.. There is more information than anyone can cope with. Premium users have access to a variety of modern tools to access and analyze current filings. Ordinary investors using the government website see a veneer of modernity when they try to locate a particular filing, but once they get there, they’re back to 1980.

## Front Door to SEC.gov – It's 2002.



*The SEC website has a stylish looking modern front door.*

The content of the actual filings shows up looking like it was typed in a bygone era. Finding the relevant sections and footnotes in filings is remarkably tedious. Tables of contents don't have active links to sections. Many don't even have page numbers. In fact, there are no links at all inside the electronic SEC filings. People have to scroll through ever longer filings with less navigation assistance than would be found on any commercial website.

## Number of Links in an Electronic Filing: **ZERO**

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*But when you look at the content, even the most rudimentary tools for using the information are absent. It's a time machine back to 1980.*

Comparisons of one firm's filings over time or between firms are particularly tedious. The only practical way to do this is to pile up reams of printouts and get out the old red pen. Don't even think about extracting and analyzing financial tables unless you're willing to cut-and-paste yourself into an advanced state of carpal tunnel syndrome. Amazingly, enforcement actions against companies are buried in a well-hidden zone of the website, away from all the other filings.

It's truly an eye-opening experience to compare the crude SEC.gov tools to a modern website, one that actually has to work for a living. Amazon is a fine example. Bookmarks automatically track what you've been looking for recently; comparisons are practically done for you. Related and similar items are automatically brought to your attention.

If **amazon.com**.  
ran **SEC.gov**

- Side-by-side comparisons
- Document history
- Cross linkage
- Related filings
- Related firms
- New & interesting



*Once you get into the content of filings, and look under the modern veneer, SEC.gov provides none of the tools that have become standard commercially.*

This is a key area where technology can help restore trust. For starters the SEC should eliminate the delay between first-class and coach dissemination of information. They should also make that information transparent and accessible, by using modern software tools we have come to expect elsewhere. One example: using Current HTML tags control only *how data looks*. XML (extensible markup language) tags that tell you *what the data is*. (Examples would be “SEC Enforcement Action” or “Qualified Auditor Report.”) This would make it much easier to use technology to keep up with what comes down that humungous SEC data pipe.

The XML idea isn't news to the SEC. They've issued a hefty tome listing hundreds of meaningful tags. The problem is that the most are “optional”, or works-in-progress. The only ones that are mandatory are of the “name, rank and serial number” variety. So you can locate a filing pretty easily, but once you get there, it's like sitting in the reading room, turning pages. Other industries have implemented comprehensive XML standards, describing thousands of components, chemicals and the like in fine detail. The aggressive implementation of these standards deserves a place high on the list of post-Enron SEC reforms.

Australian financial regulators are the leaders in this, but progress in the US has been slow. Microsoft and a few others have started reporting in XBRL<sup>3</sup>. A glimmer of progress is better than none at all, but to say these efforts are moving in low gear is rounding up.

<sup>3</sup> Go to [www.xbrl.org](http://www.xbrl.org) for more than you probably want to know about this.

## Open Standards and Information Transparency

Delivering SEC financial information in an open transparent form can go a long way in allowing investors to make informed decisions. NASDAQ has sponsored a demonstration system containing SEC and market information from 21 technology firms. They are motivated by exactly the same needs that have been discussed here.

“We believe greater transparency will enhance trust. The effectiveness of the world's capital markets depends on public trust, and trust depends on the timely availability of complete, relevant, and reliable information—in a word, it depends on appropriate levels of transparency. Corporations have an obligation to provide the most accurate financial information to their stakeholders so that they can make informed decisions. Given today's environment stakeholders are demanding a much higher level of transparency. The demonstration provides an example of how XBRL, Web Services and simple desktop analytical tools combine to enhance the transparency of company reported information to the markets.” (Note 5)

**Excel Investor's Assistant**

Fiscal Period  
Quarter Year  
Start: 1 1997  
End: 4 2002

Industry: All Industries  
Company: BROADCOM CORP

Financial Measures  
Ratio Analysis  
Financial Statements  
Notes  
XBRL Instance Documents

Add Symbol

Del	Symbol	Company Name	Status
<input type="checkbox"/>	ALTR	ALTERA CORP	XBRL documents found: 11
<input type="checkbox"/>	AMCC	APPLIED MICRO CIRCUITS CORP	XBRL documents found: 10
<input type="checkbox"/>	MSFT	MICROSOFT CORP	XBRL documents found: 11
<input type="checkbox"/>	NVDA	NVIDIA CORP/CA	XBRL documents found: 10
<input type="checkbox"/>	BRCM	BROADCOM CORP	XBRL documents found: 10

Delete Symbol Build Analyses

Build Analyses successful  
Click on each worksheet for detailed analysis.

For questions or comments please [click here](#).

**XBRL**  
Ultimate Business Reporting Language  
**NASDAQ**  
**Microsoft**  
Powerful. Proven. Possible.

*The NASDAQ XBRL demonstration, which uses five years of SEC reporting from 21 tech companies, shows the flexibility of transparent reporting for both numerical and textual information in EDGAR filings.*

Investors looking to use these kinds of tools would not be limited to one analytical viewpoint. The openness would allow “a thousand points of light” to flourish, from valuation models, to portfolio analysis tools, to fraud detectors.

Millions of people look to the SEC to play a leading role in the restoration of trust in the markets. A real commitment to open information is central to the agency's mission to serve the investing public.

## **Trust in trading**

Trust in the information people use to make trading decisions is one aspect of a market transformed by technology. Trust that those decisions will be executed fairly by their brokers is another. Investors are increasingly concerned with the "quality of execution". Following a talk at here at Caltech by the outgoing president of the NYSE, almost all of the questions were complaints about unsatisfactory trades, executed at prices less favorable than those they could see on their computers or rolling across the bottom of the screen on financial cable television networks. The little old ladies from Pasadena and their husbands practically hijacked his talk with complaints about bad executions from their brokers.

This is another symptom of the technological transformation of stock markets. Economists call it market fragmentation. Brokers and their clients have more alternatives to NASDAQ and the NYSE than ever before. ECN's such as Instinet, Island and Archipelago have captured more than a third of the volume for NASDAQ stocks, and with the repeal of NYSE's rule 390 (which effectively prohibited exchange member firms from trading away from the exchange) their share of the volume in listed stocks is rising rapidly.

Market fragmentation can be good news for large institutions with the technological resources to "comparison shop" their orders over multiple venues to get the best prices. It can be bad news for individuals, whose order flow may be sold to the highest bidder, looking to use their transactions to provide the other side of a "price improved" trade for a large customer.

In theory, there is an "Intermarket Trading System", designed to consolidate market fragments, so all orders will be able to execute at the best prices. In practice, it is a technological antique that dates back to the 1970s, and doesn't assure best execution in today's fragmented markets. This is precisely why those Pasadena retirees were so cantankerous about their brokers.

Think of how well the railroads might function if every line across the county used a different gauge of track and you are thinking about the direction the equity markets are headed. A mandate for a 21<sup>st</sup> century replacement for the creaky ITS deserves a place on the SEC's technological "to do list" to help restore trust in markets.

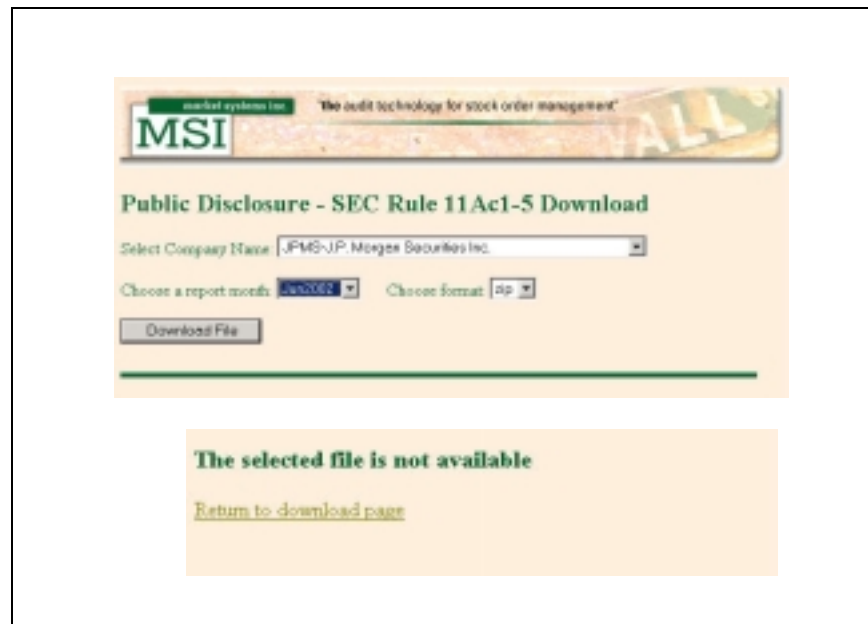
Unfortunately, this is not going to be as easy to do as a modernization of the electronic Edgar system. The rapidly changing market fragments are a complex and dynamic set of moving targets. What the SEC is doing instead is to require that brokers and market centers provide the sufficient information for individuals to obtain "best execution" on



their own. Two SEC rules, adopted in 2001, are supposed to do this. They are called “Disclosure of Order Execution and Routing Practices” and designated Rules 11Ac1-5 and 11Ac1-6. You can read them on the SEC website<sup>4</sup>. It is noteworthy, and commendable, that these rules do have the active links and references that are absent from Edgar filings.

The rules sound good. They “are intended to spur more vigorous competition among market participants to provide the best possible prices for investor orders”. Brokers are “required to disclose the identity of the market centers to which they route orders on behalf of their customers.” These disclosures are described as the “minimum step necessary to address market fragmentation.” and detailed standards are set for the “basic measures of execution quality” in those disclosures.

It sounds good, but the implementations that the SEC has allowed for these standards make the feeble Edgar system look like it is run by Amazon. The information disclosures required by these rules are almost invisible. At many brokerage sites it is buried so far down, you need to use a separate search program to locate it. Much of the reporting has been contracted out to vendors like Market Systems and the Transaction Auditing Group<sup>5</sup>. A recent attempt to get this information was instructive. After spidering a brokerage site and being linked to the contractor, most of files seemed to be inaccessible.



*Best execution? The lights are on, but nobody's home.*

<sup>4</sup> <http://www.sec.gov/rules/final/34-43590.htm>, Final Rule: Disclosure of Order Execution and Routing Practices, 17 CFR Part 240 [Release No. 34-43590; File No. S7-16-00]

<sup>5</sup> <http://www.marketsystems.com/> and <http://www.tagaudit.com/>



Even when you can actually get to read this information, it is reported in bulk - Monthly compendia with prodigious quantities of raw data that obfuscate and obscure.

### **A Simple Solution Ignored**

Brokerage firms have the technology to allow large institutional traders to monitor their quality of execution in real time. It would require almost no effort to provide individuals with the quality of execution information mandated by the SEC rules. It could easily be delivered along with the trade confirmations. People could see what is happening to their money, without having to wade through the current smokescreen.

### **F for Effort**

These examples are embarrassing examples of a lack of effort in using simple readily available tools to help restore investor confidence.

We have seen markets transformed by technologies for hundreds of years, from telegraphy, to ticker tape, to telephones to computers to the Web. It isn't slowing down, and it isn't always for the better.

Every business newspaper or magazine today offers a list of proposed SEC reforms. Most are long overdue, but let's combine them with technological reforms to restore and maintain trust in markets. Providing one without the other is a disservice to the public. Improving technologies without improving information quality will serve only to mislead and confuse a broader base of investors.

Technology is arguably the most powerful agent for change in the modern world. It is our responsibility to use it to improve the quality of our financial system, not just its bandwidth.

Markets will be better when market information is not a barrage of bull buried in a barrage of bytes.

### **Acknowledgements**

I'd like to thank Lance Davis at Caltech and Gene D'Avolio at the Harvard Business School and Jacob Sisk at UCLA for their helpful comments on this topic. It is gratifying to see that the SEC has gone to real time pass through of current filings on their website. We can hope for further improvements.

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*billion in quantitative equity portfolios and was the founder of two financial information technology firms. His webpage is <http://www.hss.caltech.edu/~djl/>.*