The Future of the Stock Market
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The Philoctetes Center

Levy:	**Francis Levy**
Nersessian:	**Edward Nersessian**
Fox:	**Justin Fox (moderator)**
Madoff:	**Bernard Madoff**
Roell:	**Ailsa Roell**
Schwartz:	**Robert A. Schwartz**
Seibert:	**Muriel Seibert**
Stampfli:	**Josh Stampfli**
Audience:	**Speaker from the audience**

Levy**:** Good afternoon and welcome to The Future of the Stock Market. I'm now proud to introduce Justin Fox. Justin Fox is the business and economics columnist for *Time* magazine, and writes the Curious Capitalist blog at Time.com. Before joining *Time* in January, Fox spent more than a decade at sister publication *Fortune*, where he covered a wide variety of topics related to economics, finance, and international business. Fox's book, *The Myth of the Rational Market*, will be published by Collins in April 2008. Justin Fox will moderate this afternoon's panel and introduce the other panelists. Thank you, Justin.

Fox: Thanks, Frank. I just had a conversation with my book editor the other day and now he's saying August at the earliest, so I don't know if that book is ever coming out. But anyway, we're going to talk about the future of the stock market, which I think of necessity will require us to talk about the past and the present. We have a really cool panel, here, of people who—most of them—are extremely specialized in certain areas of the market. I'm a generalist; I assume most of you guys are generalists, not Market Microstructure experts. So it's going to be a challenge, but I think it's going to be this really wonderful opportunity to make a little more sense of these things we read in the financial pages than we normally do. So why don't I just introduce everybody and then I'll start asking questions and you'll see where we're going to start.

To my left is Ailsa Roell, who is Professor of International and Public Affairs at Columbia University's School of International and Public Affairs. Her academic specialty is financial economics, and in the past she did a lot of work on regulation of financial markets. Lately, she's working more on corporate governance matters.

To her left is Bob Schwartz, the Marvin M. Speiser Professor of Finance and University Distinguished Professor in the Zicklin School of Business at Baruch College, CUNY. I have to say, university titles are even more complicated than magazine ones. His research is in the area of financial economics, with a primary focus on the structure of securities markets
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To his left is Muriel "Mickey" Siebert, who runs Muriel Siebert & Co., a brokerage. She is the first woman to own a seat on the New York Stock Exchange and—what year was that?

Siebert: December 28, 1967.

Fox: We're going to get back to that in a minute because I think the market was a little different then.

Siebert: A little bit.

Fox: She also served, during a really interesting time, as Superintendent of Banking for the State of New York, basically right when the banking industry was first coming to terms with this whole new world of financial markets and a lot of banks were struggling with it.

To her left is Bernie Madoff, who is Chairman of Bernard L. Madoff Investment Securities LLC, which he founded in 1960. That name may not say a lot to you, but go over to Madoff and you talk to Bernie and he mentions "Oh, by the way, ten percent of stocks traded in the United States are going through this firm right now." It's one of those really important parts of our financial system that doesn't show up in the headlines. Most people outside of markets don't understand the role it plays, but it's a major factor in American and global financial markets today.

Next to him is Josh Stampfli, who is the head of the automated market-making group at Bernard L. Madoff Investment Securities LLC. I'm just going to read the sentence right here because it's so beautiful. "He designed the trading logic to manage position risk and handle the order flow inherent to the firm's business of providing liquidity to its customers." He's going to explain what that means in a little bit.

But I want to start with Mickey Seibert. When did you first arrive on Wall Street?

Siebert: Well, I moved from Cleveland to New York December, 1954, from Cleveland, Ohio — and I'm a college dropout with 18 honorary doctorates.

Fox: When people talked about Wall Street then, was it really all down around Wall Street?

Siebert: It was down around Wall Street. I had been to New York once before on vacation, which included a tour of the balcony, and I said, "This looks exciting. Maybe if I ever move to New York I'd like to work down here."

Fox: Did you work on the Exchange immediately?

Siebert: No. Actually, I applied to the U.N. for a job first because my mother was the youngest of eleven children. They were all born in Hungary and they came here in three tranches. My Uncle Ben's oldest son was one of our representatives to the U.N. So I applied there for a job. Thank God I was not accepted. I would have been a messenger girl with fallen arches. Then I applied to Merrill Lynch and they said "College degree?" I had to say no. And they said, "No job." So the next day I applied to Bache. They said "College degree?" I said "Yes." And I kept that lie going until I put the big card in for the seat, which I bought because I wanted to be paid equally.

Fox: As I understand it, the people at the Stock Exchange didn't exactly bend over backwards to help you with that.

Siebert: They did not welcome me with open arms, but I had been a partner of a couple of small firms. I was doing research and I had a following from institutions. I had become the first woman member of the Wings Club. I used to specialize in aviation stocks. And when you're from a small firm, you can prove it's your business. If you're from Merrill Lynch, is it their business or your business?

Fox: Why did you feel you needed to have an actual seat on the Stock Exchange?

Siebert: I wanted to be paid equally and I asked a client of mine—and you'll know him, Bernie—Gerry Tsai, the Chinese money manager—he gave me the idea. I said, "Jerry, what firm can I go to where I'll be paid equally?" He said, "Don't be ridiculous. You won't. Buy a seat. Work for yourself." I said, "Don't *you* be ridiculous." And he said, "I don't think there's a law against it."

Fox: At that time all of the trading—was anything automated yet by the late '60s?

Siebert: Nothing. They had started about the time of that DOT system, Direct Order Turnaround, which was started originally for small orders. It really took hold when Discount Brokerage started, which was May 1, 1975.

Fox: And before that you had to charge a certain commission?

Siebert: You had to. Commissions were fixed.

Fox: And you were one of the pioneers in saying, "Okay, we'll charge—

Siebert: I started as what I called "an execution-only broker" from day one. I was on the front page of the *Wall Street Journal*.

Fox: What does that mean, "execution-only"?

Siebert: I stopped doing research. At that time I had three or four analysts that did research and we stopped because there were two laws coming together at one time. One had come in and then the other one, but there were two laws: one that said commissions could be negotiable and the other one was ERISA, which at the time we called Everything Ridiculous Invented Since Adam.

Fox: In the IRS they call it the Employment Retirement—

Siebert: Yes, so it said if you were a fiduciary. You had to get the best execution at the lowest cost. Now, without the negotiator rates, we were all charging the same. It would have been a non-event. But it was those two laws coming together. And the head of manufacturers at Hanover Trust department had said to me, "You know, we've been having meetings. How are we

going to continue to pay for research?" And that's when I decided that whenever you see a change of that magnitude, there's got to be an opportunity.

Fox: Somebody else who saw an opportunity in all the changes going on—

Siebert: I take my hat off to him.

Fox: Well, describe your history. You started your firm in 1960?

Madoff: 1960, correct.

Fox: And what did it do initially—because that's before all this change happened

Madoff: At that time we started what was an over-the-counter dealing firm, primarily just making markets and trading in over-the-counter stocks.

Fox: I have to stop you, because I think this is a phrase that's going to come up a lot. What is "making a market"?

Madoff: Making a market is the over-the-counter, dealer equivalent of a specialist on the floor of an exchange. It means providing a two-sided, quoted market to other dealers. If you wanted to buy, let's say, Intel, and you went to your broker and you said, "Buy me 500 shares of Intel," he would take that order and execute it by going to any number of other brokerage firms, like myself—who were called wholesalers—that provided a ready market for that stock by risking our own capital. So we would provide liquidity to Merrill Lynch by offering him the stock at a quoted price or buying stock at a quoted price. If you executed an order in IBM at that same time, you would take that order—in those days—to the floor of the New York Stock Exchange, and that order would be executed with a specialist, who is also a market-maker, but primarily trading on the floor of the Exchange in a franchise that he was given by the Exchange in a number of stocks.

Fox: So you'd be doing it for stocks that weren't on the New York Exchange.

Madoff: In those days, yes. Correct.

Fox: So obviously things developed over the next two decades.

Madoff: Well, I guess from our standpoint—we still had the firm in 1960. In those days, over-the-counter stocks were traded always over the telephone with no automation. So you would call a broker; the broker would call up over the telephone any number of dealers like myself, and there were hundreds of dealers around the country that were making these markets. It was an arduous process of saying, "Okay, where can I buy 100 shares of Intel or 100 shares of Apple," which of course didn't exist at that time, nor did Intel. We would negotiate over the telephone. If you wanted to see what the price of the stock was, there was a publication that came out daily that was just circulated throughout the brokerage industry, called The Pink Sheets. It was just a stack of sheets this long, this wide, that would basically list all the dealers like myself that were

willing to make a market in that security, and the prices that we were willing to trade the security at. Of course that was a day old, so it didn't really mean much. It was just a phone directory of telephone numbers. That was the way the business was done for many years.

In about 1971, computers were showing up and being used. So we saw—meaning my brother and myself—that there was an opportunity to bring automation into the over-the-counter marketplace and create some visibility and transparency in the marketplace. So we came up with the concept of developing a screen-based trading mechanism where prices would appear on a computer screen. That was the start of NASDAQ. There were five firms: ourselves, Allen & Co., Merrill Lynch, the old Prudential Bache, and Goldman Sachs & Co. We got together and went to the NASD, which was called The National Association of Securities Dealers. We made a proposal to build a screen-based trading system, which then became NASDAQ. Then that went through various stages of automation, so that you were able to turn on your computer screen and any brokerage firm in the country would list all the dealers that were willing to trade the security and the prices. Then that eventually went on to where you could actually execute the trades automatically. At that time, that was literally the only automated trading environment that existed in the world. Everything else was floor-based systems where there was a central marketplace.

Fox: In terms of NASDAQ, obviously, by the '90s everyone knew about it. I imagine it was smaller, more obscure companies, but a lot just sort of stuck with it as it grew?

Madoff: Yes. The over-the-counter market primarily was a marketplace that had smaller companies that did not qualify for listing on the New York Stock Exchange. But at that time, 90% of all corporate bonds that traded in the United States were traded over the counter, and all currencies trade over the counter. The over-the-counter market is far larger than any exchange market, basically than all the exchange markets put together. But most people looked at the over-the-counter market as being a marketplace for sort of unseasoned companies at that time. NASDAQ was lucky enough to basically be the home of all the technology companies in the United States: Apple, Intel, Microsoft, MCI. I know I sound like a salesman for NASDAQ, but that's what gave me whatever success we achieved. Those securities all had a home in NASDAQ and for the most part never left NASDAQ, even when they qualified for listing on the New York Exchange.

Fox: Now Bob, how long have you been studying the structure of markets, how they have been put together?

Schwartz: I knew you were going to ask me that. And I'm sitting here thinking, "God, I never incorporated. I never went for a job interview to study markets. When did I get started?" In the '70s, the early 1970s.

Fox: Had there been a lot of academic interest in it before, or was that a relatively new field?

Schwartz: It was new and it was lonely. All my buddies would say, "We're modeling price setting. We're modeling what a stock should be trading at, given its risk and the capital asset pricing models and that sort of stuff. And you're looking at bid-ask spreads at an eighth of a

point? Twelve and a half cents?" It was not only lonely, it was a little bit negative to what we were doing. And then, of course, you don't study something if it's just a totally efficient market. What's there to study? And you can't publish a paper—well, some people did, actually. There were a lot of tests of what was called the efficient market hypothesis: that stock price changes are uncorrelated and they follow what we call "random walks." That's a pretty common term, I think, especially on 3rd Avenue after happy hour.

But then we started looking at this data, and in those days it was very hard to study the markets because a big benefit of electronic trading is that it gives you the data. We have all the intra-data—they call it "high-frequency data." Our high-frequency data were collected by hand by doctoral students—slaves—who would arduously build up a database. We started looking at daily data in a special way and we saw evidence of inefficiency. We tried to get those papers published. It wasn't easy. So I sort of slid into it. But I was at NYU at the time. I was there for many years. And NYU at that time was right next to the American Stock Exchange, or as I say, "Just across the graveyard from the NYSE." It was easy to go and visit those markets and see what was happening. I grew up near the exchangers and I was always more sensitive to the exchange type of markets than the OTC market. But of course the issues span both of them. My research topics got me into it. The topic didn't have a name then. There was a paper by Mark Garman that Ailsa knows that came out—

Fox: This was "Market Microstructure"?

Schwartz: "Market Microstructure." It was a very good pioneering paper. A bunch of us, it turns out, started working on related topics and we got in touch with each other and we came together and said, "Help!" You need friends in this lonely field. We decided one day, about four of us who roomed at NYU, if we're going to cull this interest in this topic, we have to give it a name. Mark Garman's paper title sounded like a great one and it miraculously stuck. When I talked to you yesterday, Justin, I said, "Hey, you know the term 'microstructure'?" And when you said yes, you made my day.

Fox: Yes, I said I knew the term, but I don't really know what it means.

Schwartz: You're like my students.

Fox: Exactly. I guess my initial thought is, when you're studying Market Microstructure, does it mean there's a big difference between the way people arrive at prices on the floor of the Exchange or on the NASDAQ, depending on how you set up the system?

Schwartz: Yes, that's a very good example. My background is economics; I'm not finance—that's a very different area. My first years at NYU, I taught microeconomics. Microeconomics, if you think of it, has a lot to do with market. But how intensely do you put the microscope on the markets and look at the real details of what's going on? With Microstructure, we are looking at those details—the orders that come in, how they're handled, what mechanism they're brought to—is it to Bernie or Muriel or the Exchange? How does that work? How are they translated into prices and trade prices, and how do the prices behave? It all feeds back, for me, to market structure. I care a lot about how you structure a market to perform better.

Fox: Well, have we? In this great transformation of our markets over the past 40 years, is it set up to perform better?

Schwartz: Well, the intention is always to perform better. Yes, in lots of ways it is better. When I look at the markets today and I go back—I was around in the 1970s—I still hate to think what they were really like then. That is the era when academics—I'm glad that Ailsa's here because you can support me; it's us against a lot of colleagues—were all touting the Efficient Markets hypothesis. I think a big reason why is that when you get a PhD in Economics—my PhD is from Columbia—you've got to fall in love with the free market. We're very free market people, lots of us. You're in favor of the free market because it gives you good results, but when you start studying actual markets, nothing is that perfect. It just plain isn't. And the imperfections in the exchange market add up to a lot of dollars. Some win, some lose, but is it really good for us collectively? I think the answer is no.

Now, are the markets really that efficient today? Let's put it this way: I think I have a lot more work that should be done. I'm not ready to get onto a different topic or retire.

Fox: I assume you aren't either, Ailsa. You can take this wherever you want, but my thought is, are we moving towards markets that get closer to the right price than we used to because of all this change toward more electronic trading, or not?

Roell: I do think that the electronics has made it possible to bring together quotes and orders from a very large group of people, a much larger group than before, instantaneously. And so in that sense, we have a better chance to find the right price. Now, in terms of talking about is the market more efficient than it used to be, there are different definitions of efficiency. I do think the market has become informationally more efficient, that it brings information together better. It has become operationally more efficient in the sense that the cost of performing the transactions have fallen dramatically, both through the electronics and through the deregulation of commissions—what Muriel was talking about. Still, though, there are always conflicts of interest between different groups of actors in the market, the intermediaries, the small customers, the big pension funds. Different constituencies have different ways to profit, and to some extent, there is some back and forth in the sense that one constituency may gain from a change that others may lose from. So we're trying to be on the Pareto frontier, as it were, but there are still some issues as to the divisions of gains and losses.

Fox: What's the Pareto frontier?

Roell: By the Pareto frontier I just mean that you can't really make that many people better off without making someone else worse off. So we're there, but the division of the gains—

Madoff: I just want to say something. Bob was not a very popular person on Wall Street when he first started looking at these subjects. You have to understand, Wall Street is one big turf war. So as Ailsa just said, by benefiting one person you're disadvantaging another person, and the basic concept of Wall Street, which sometimes the regulators lose sight of, as do the academics, is it's a for-profit enterprise. In every aspect of it the person that is buying the share of stock is

convinced he knows something that the other person who's selling it to him does not know. There's no zero-sum game in Wall Street. So when Bob first started to look at market structure, whether it be macromarket structure or micromarket structure, and he started asking questions of the established ways that business was done on Wall Street, no one wanted to deal with that because everybody was very happy with the way things were. Commissioned rates were 80% higher than they presently are today. Everybody was making a very good living.

Fox: Obviously, with deregulation commissions have dropped a ton, but have they kept dropping since then?

Madoff: Well, they've gone down to virtually nothing. So what you have now, outside of Mickey and a number of other discount firms like hers, is that nobody really wants to do retail business any longer because nobody wants to do business for 5 cents a share when it used to be 75 cents a share. Wall Street—just so you understand the scale of it—is one of the few industries where the cost of doing business for the consumer has gone down dramatically from a commission standpoint. Yet the expense of doing business, from the industries perspective, has dramatically increased. The course of regulation has dramatically increased. Now, no one is going to run a benefit for Wall Street, so whenever I go down to Washington and meet with the SEC and complain to them that the industry is either over-regulated or the burdens are too great, they all start to roll their eyes, just like all of our children do whenever we talk about the good old days. So that being said, even though Wall Street has resisted these changes, they've made the changes, though not easily. The academic community that started to look at the structures of the marketplaces, and people like Mickey, who started the whole movement towards negotiated rates and the discount type of operation, were the driving forces that caused that. People blame me for a lot of this because we were the ones that started the automated trading that was servicing clients like Mickey in the old days, and Charles Schwab and so on. In those days, everybody hated the discount firms. No one wanted to do business with the discount firms because they were the first ones that were driving prices lower. They were dragged kicking and screaming into the 20th century, so to speak, but they did make the changes. But it created a lot of issues along the way.

Fox: You sort of raised this question that commissions are almost nothing and yet you are a for-profit enterprise. Maybe we can bring Josh into it, too. How do you guys make money, then?

Madoff: Today, basically the big money on Wall Street is made by taking risks. Firms were driven into that business, including us, because you couldn't make money charging commissions, primarily because the rates were lowered and because of the regulatory infrastructure you had to have dealing with clients. Everyone said, "Listen, I might as well risk my own capital and trade." So if you looked at the earning reports of firms like Goldman Sachs, or almost everybody today—any of the large investment banks—the great majority of their income comes from risk-taking. In other words, proprietary trading, putting up the firm's own capital, providing liquidity to institutions or to individual investors, primarily institutions. That's where the money is made.

Fox: When you're doing all this trading for other people, is that something that—I've just never fully understood—is that a completely separate operation? Is there information going back between people who are doing the trades and the ones that are taking the bets?

Madoff: There are so-called Chinese Walls that are required to be established at every brokerage firm. They're called Information Barriers—a term most people would understand—to sort of wall off a brokerage firm from taking advantage of information that he has as to what clients are basically going to trade or not going to trade. There are separate divisions within the firms and it is very carefully enforced and surveilled. It doesn't mean there are not abuses, for sure, but by and large in today's regulatory environment, it's virtually impossible to violate rules. This is something that the public really doesn't understand. If you read things in the newspaper and you see somebody violate a rule, you say well, they're always doing this. But it's impossible for a violation to go undetected, certainly not for a considerable period of time. And when you consider the volumes of trading, the trillions of dollars of trading that go on today in Wall Street—I mean, our firm, for example, we trade an excess of $1 trillion dollars a year and that's one firm—and you look at what we would consider to be the infractions, they're relatively small, primarily because of all the regulation. Most firms do try to comply with that.

Fox: I want to get back to regulation in a bit, but I want to put Josh on the spot, finally. So basically—well, just describe what the heck you do.

Stampfli: Okay, so the way I view market making is let's say you're Joe Retail and you want to buy a hundred shares of CitiBank or something. So you give your order to your broker and then your broker can either send that order to the New York Stock Exchange, at which point you trade against somebody—somebody sells those shares to you—or they can send it to another destination that will sell the shares, because the broker isn't the one selling the shares. For you to buy the hundred shares, somebody has to actually take the other side and to sell those hundred shares. We're a destination that brokerage firms route their order flow to and then we satisfy the execution side of their customer order. As a result, we're constantly being put into a portfolio of positions—long some stocks, short other stocks—as a result of the customer order flow. You have to manage that risk and work your way out of it. So that's how I see the business of market making.

Fox: What is your background? What does one have to do to end up building these models?

Stampfli: I took the long route, which means I started off actually—

Madoff: Now you tell us this?

Stampfli: I so wasn't going to tell you in the interview.

Fox: You went to the first firm and they asked if you had a PhD and you said, "No," and at the second one you said, "Yes."

Stampfli: Exactly. No, I didn't make that mistake. I traded bonds for a little while, then went to a hedge fund and fixed income and another hedge fund. Then I went back to school briefly,

participated in the start-up internet mania, and when I finally figured out that that wasn't going to work either, I'd been working at a firm where our product was an automated system to internalize a brokerage company's order flow. The idea was maybe instead of taking the order flow and routing it out to another destination for execution, maybe the brokerage company itself should be providing some of these executions to its customers. It was a natural fit for Madoff because that's their business: providing executions on order flow. Like many start-ups, we ran out of money in the crash. We were burning as fast as we could fund and then the funding disappeared, so I went out and talked to some of the people we talked to while I was with the company, and Madoff, Mark and Andy, Bernie's sons, brought me in and gave me the opportunity to build automation into their existing business.

Fox: Again, I visited Madoff and it's a very quiet place, considering the history of Wall Street, and even now, still, in the Chicago Exchange there are all these people yelling. I guess I'm just struggling with this idea that humans are setting these policies, "Okay, here's what we're trying to do." But then do you let the computers and the algorithms take over from there because they can do it much more efficiently on a case-by-case basis? This is sort of for both of you.

Madoff: Let me try and explain to you how orders are handled. I think if we take a few minutes there, people will understand it. And you can look at the transition that occurred over a number of years. I covered a little bit of this in the past, but I think it's worth going back.
If you're the average person you call your broker, whether it be Muriel Siebert & Co., whether it be Merrill Lynch, and you say, "Buy me 500 shares of stock." Depending upon whether the stock is a NASDAQ stock or whether it's a listed stock, meaning a New York Stock Exchange stock, you can take it to either the floor of the Exchange or you can take it to a dealer. Now also what's changed during this time is NYSE stocks trade everywhere. They trade, actually, as much off the Exchange as they do on the Exchange, but that's sort of unimportant.

So you put an order in, you call your broker, say, "Buy me 500 shares of stock," and they'll send that stock to the floor of an exchange, either here or in Europe, or they'll send it to a dealer, what we call an "upstairs trade." Normally in the past that trade got handled in a totally manual mode. If it went down to the floor of the Exchange, everything you see, all these crowds on the floor—people would physically walk an order over to a specialist post and they would say, "I'm looking to buy 500 shares of stock." The specialist who was assigned to that stock would execute the trade with them. Either he had an order from another person to put the orders together, or if he didn't have an order, he would risk his own capital to provide liquidity on the other side of the transaction. If you did an over-the-counter trade, originally, going back pre-1970, it was done the same way.

Then automation through computers started to come in, to be able to use computer technology to make those orders be handled more efficiently. The average order that used to go on, as late as probably the mid-'80s, would probably take as fast as 20 seconds to as slow as two minutes. Correct? I'm being generous to my competitors, the Exchange. That's how long an order took place. It wasn't that much faster. In the dealer market, too, you made all these phone calls. But with automation today our average turnaround time for orders is a tenth of a second. So, for example, we built linkages to all the discount firms in the early '80s, where we provided technology. Sorry, I'm going to have to use Charles Schwab as an example because they were

the first client we did this for. You could call—they had an ad where somebody was driving in a car and called up on a cell phone and said, "Buy me 500 shares of IBM." Then within literally, let's say, six seconds, you would hear the broker calling back on the cell phone, "You just bought your stock." Now, on the floor of the Exchange today, with the automation that they've done, the timeframe has also dropped, maybe not to a tenth of a second, but certainly probably in the 5-second range. Would you say Bob, turnaround time?

Schwartz: Oh, yeah.

Madoff: That is the way orders got handled in delivering an order from a customer into the marketplace. So that's literally one half of the order because if a customer wants to buy and sell, he has to get that order into the marketplace, whether it be through an exchange or a dealer. What no one really knows, or pretty much doesn't care about from the public's standpoint, is what happens to that order after that. What do they do? No one really thinks about it because as long as they got their execution they don't care what happens on the other side. Of course they want to make sure they bought it at the best price, which you're required to do by regulation today. What happens once the order gets delivered to either a specialist on the floor or to a market maker like myself is we have to determine what to do with that order. If we have a ready buyer, that's the ideal situation. Then we match it and we make either the spread or we make commissions on both sides, depending upon the structure of the firms. If we don't have that, then we risk our own capital.

Now, where Josh comes in is, if you look at our firm as recently as, I would say, ten years ago, all of our orders were delivered automatically into our firm. But what we did after that was a manual process, meaning what we call a market maker or a trader sat there. We had, say, 100 traders sitting in one room and they would make a decision. Do I buy that stock? Do I keep it or do I sell it out or do I hedge it? What do I do with that position? The firm is at risk during this whole time, assuming he didn't have a ready buyer or a seller on the other side of the trade. As profits started to become less and less, the commissions were less and less. Firms couldn't afford to spend a lot of manpower in handling and processing these orders. So what we did is we used technology to be able to handle the orders without individuals, as well as automating the industry from the delivery side. We now had an automated way of turning that order around, of making a profit on that order. While it was great relying upon a very smart young person—and it was only young people because the average burn-out time for a trader on Wall Street, up until about ten years ago, was literally six years—nobody lasted on a trading desk for more than six years because the stress was so great. So what we did was totally automate the process and we provided a tremendous amount of information through technology to help the traders make decisions by giving them all sorts of news screens, all sorts of economic data and currency. If you go to a trading firm today, they sit in front of twenty different information screens.

Fox: How can they take all that in? I mean, I see that whenever—

Madoff: You'd see that if you went to our firm. They're young and they obviously don't digest all of it properly, which is why we hire people like Josh to say, "Okay, look. Let's take the human factor out of the equation." We went through a period of time where we didn't hire anybody who didn't have a MBA because we felt that MBAs were the right people to have

working for us. Then we went through another stage. Actually it was my wife who said, "Why don't you hire math people? Why don't you go to MIT and hire math people, because everything you're doing is related to algorithmic trading and they're probably the best people." That was true, but we didn't have much success with the people from MIT. It's nothing to do with the institution, I believe. They just spend too much time thinking. I understand that's not something you people want to hear, but that's what happened. You could actually watch them; they would deliver an order. My brother and I and my sons would look at them saying, "Well?" And they would say, "I'm getting there." By that time the price would usually have moved against us.

So we determined that the best thing for us to do was basically to take the human being out of the equation. That had two advantages in our industry. Number one, when you take the human being out of the equation, you solve your regulatory problems because the nature of any human being, certainly anyone on Wall Street, is the better deal you give the customer, the worse deal it is for you. You're on the other side of the transaction. It's like going into any store—the store sells you a television at a higher price, they're going to make more money. They sell you the lower price, their profit goes down accordingly. As honest as you try and get people to be, there's this normal, natural pole that you have to deal with. By taking the human being out of the equation to a great extent and turning it over to a computer to make your decision—I guess you could also program the computer to violate the regulations, but we haven't gotten there yet. The issue is, by taking the human being out of the equation and getting someone like Josh to go back and run all sorts of algorithms—he can explain that to you because every time he tries to explain it to anyone in the Madoff family, we walk out of the room after fifteen minutes.

Fox: Maybe we don't want him to do that, then.

Stampfli: Exactly.

Madoff: But by doing that, you were able to automate the process. Let me give you an example of the scope of that. You're probably going to ask me for a raise after this. We were able to take an operation where we had, let's say, forty people doing 300,000 transactions a day, which is what our normal transaction count would be. We have a team headed by Josh and—what, five, six people?

Stampfli: Seven.

Madoff: Okay, seven people handling that same thing that fifty people might have been involved in. This is what all market making firms do today. That's the way they operate.

Fox: So this is great, we've gotten rid of all these irrational, flawed, error-prone corrupt people, potentially so. And then also when you hear about that old system of having to call up every single dealer, it's clearly much better in a lot of ways now. But have we reached market nirvana? Are prices set perfectly now? Is the market any safer than it used to be?

Siebert: No, markets are still influenced by stories, by fashion trends. It's the same companies, but why are they selling twice as much six months from now, or half as much? The public has

changed the way they're putting in their orders. Two-thirds of our retail trade orders every day are put in by the computer.

Fox: Do people trade more frequently than they used to because of that?

Siebert: Some yes, some no. We still have customers that want to talk to a real broker. They pay more, they're very happy doing that. For the most part they're larger accounts, but there is—we don't cater to them, but there are the day traders today. They're aggressive, and some of them blow themselves out of the water very fast and furious, and there are firms that cater to them. We have, for the most part, larger accounts. They're self-made people and they know the markets. What you lose on the commissions—because you don't make much money on the commissions anymore; they're a fraction of what they were—you're making on some of the others. You're making some of it on the money markets.

Fox: Yes, because there are some discount brokers that even offer zero commission trades in certain cases, right?

Siebert: Yes, but they're making it up in fees. They're making it up in so many different ways that the public doesn't see. Like, we're competitive on margins, and we have a pretty good margin rates.

Fox: Margin is when you're borrowing money to buy—

Siebert: When you're borrowing money. But the firm makes money on that. Not a lot per dollar, but it's a good source of income, as are some other products. We make money. I did something right ten years ago. We took over the largest black-owned firm in municipal bonds. The founder left, hired Johnny Cochran, and we created Siebert Brandford Shank. We were just appointed by California to senior-manage a $2-billion-dollar deal. We qualify either as a minority firm because of Brandford and Shank or we qualify as a woman-owned firm because of myself and Suzanne Shank. I think we're #15 nationally now, in terms of senior-managed deals. So we found niches in the marketplace. But you have to find a niche or do a tremendous volume because basic trading has changed.

Fox: So trading is faster and cheaper—

Siebert: But it's electronic—they get the quotes electronically. They can get Level II; they can see who's bidding what.

Fox: I guess I just want to ask Bob—faster, cheaper, also better?

Schwartz: No.

Fox: Why not?

Schwartz: Well, it's better in certain respects. When you talk about the linkages—they can pull all the quotes together in one screen. I go back long enough where I remember going up to a

broker's office and I had a bond and I wanted to sell it, and he called a dealer. I said, "Call another dealer." He calls another dealer. "Try a third dealer." I mean, he goes through the telephone. That's terrible. Now, these linkages are much better, no question.

Technology, though—we keep forgetting technology is neutral. It doesn't care. It can help you or it can hurt you; it depends on how it's used. Now, I would like, if I could, to raise a question. The question that we could all think of is what is it that a marketplace does? You can look at specific players in the marketplace and what each individual does, but what does the market do? Why do we need markets? Of course we need markets because if I want to buy something, I have to find somebody who sells it. But the transfer of ownership is trivial. It's necessary, you do it, but that's not the big problem. The big problem is finding the price to make the trades at.

I come from a business school background, as does Ailsa. We both trained in similar ways and you can take our corporate finance courses, our investment courses and the like, and it's all about give me information about a company. How do you value the company? Give me growth rate, risk, discount rates, all that sort of stuff. What price do you put on it? You get the impression that you can value companies in that way. I suggest, Justin, that you can't. The reason why you can't is that we all look at this information about companies, and God knows there's a ton of them. It's huge, it's complex, and it's imprecise. You look at it and we come to different decisions. So where does price come from? If you do your best, you sharpen up your pencil and you go through and you figure out that stock's worth $32.12. You've got a hell of a sharp pencil if you got it down to the 12 cents. But you come up with $32. And I say it's $42 and Josh says it's $40 and we're all over the place. So where should it trade at? What is the price? That's what we need a market for. We all have our ideas and we come to the market. Think about it: the process from going from our individual assessments to a price that a thing is trading at is an integration process. We have to integrate our orders.

Fox: Because it's different from a vote. I mean, one way you get everyone to agree is everybody votes. And clearly a market is a different way—

Schwartz: You vote with your dollars and if you're bigger you have more votes. But still, dollars vote. Each dollar is one impact. So you come together. And that's where I come in with market structure because if you view it as an integration process—how are your orders integrating, either buy or sell? How does it come together to find a price? Technology helps and you can get the orders in, but technology can do two things. It can compute and that's great; we call it a computer. But it can also convey: it transmits orders; it transmits information. Now, if everybody else is walking at a certain speed and I can go faster, I'm better off. What's happened now is that the computer has sped it up for everybody. What happens in a minute used to take an hour, or, if you go back long enough, a day. Now we go into, "Oooh, I can beat you by a minute. I can beat you by a second. I can beat you by a millisecond." It's so damn fast. But our standard market mechanism is called a continuous market. We start trading at 9:30—our standard hours here in the U.S.—and we trade until 4:00. It doesn't mean that you continuously have trades; it means that market's continuously open. Anytime a buy meets or crosses a sell, boom, you got a trade. So it's stretched out.

Now, when you talk about consolidation of orders, you can think of orders all being consolidated in the same trading venue, like the NYSE or Madoff or whatever. And Siebert—but you handle; you're not a market maker.

Siebert: No.

Schwartz: You handle. But in any event, the typical view in all the regulatory discussions of consolidation is always spatial, in one place. Time is a terribly important factor. The orders get stretched out over time. Now, what we've done with this rapid handling is we've compressed time. But at the end of the day, one order is going to come in before the other order. And Josh, you have to do it fast or the guys from MIT are thinking for five minutes. Now let the MIT guys think for a second. They missed it. So in what way has technology helped us with that?
Now, I have an analogy that is not kind to me, but it still works. I go to a ball field; you see an exciting play. I don't want to bring up the Mets or Yankees. Dismal play, but in every field, boom, a ball's hit and everybody leaps to their feet because by doing it, you can see better. I see worse because I'm shorter. I can't see better, but everybody individually thinks that. You can't improve everybody, but the analogy to height is how fast you get in there.

Now, the order, the sequence in which things happen matters. It's just like a horse race. You know, people bet on the horse and they want to know who crosses the finish line first. So you have so-called photo-finishes. When you have a photo-finish you can say, "Ah. Horse A won by a nose." Well, now our cameras are so damned precise and our timing is so exact that you can say Horse A won by a milli-nose. Is that good? Well, you have to find a winner with horses. Can't we at some point say the secret, the millisecond, there's no information in it. It really didn't matter. We're not using the computer right. If we could integrate these orders better, we'll get better prices. Now if you ask me how to do it, hey, I have some ideas, but it's complicated.

Siebert: Yes, but at the same time, these orders change fast according to the news. News comes out from a company; you look at their earnings; you see the orders changing on the spot.

Schwartz: Oh yes, you certainly do, but you see them changing without news, too, because a lot of the news is in the other orders.

Madoff: Yes, but you know, this is not a problem—this is not the fault of the markets. It's a whole life. It used to be you look at fax machines, you look at cell phones—everybody wants everything immediately. That's the way the world is. Investing used to be about the average person, a little old lady from Pasadena we used to call them on Wall Street. You always had to be on the other side of her trade because she knew nothing, as opposed to the hedge fund manager or the market professional who had access to all sorts of data, but he was making his decision to buy or sell. Investing has gotten so fast because the average person who used to go home and read the newspapers or read a research report or speak to his broker—the old type brokers that you would call to speak to—they virtually don't exist anymore. That took time. That was a slow process. I guess we'd all like to go back to lots of different aspects of our life and say, "Does it have to be so quick?" But that's the reality of life.

Fox: Because doesn't wisdom come in contemplation to a certain extent, and if you're a trader sitting there with eighteen different sources of information coming at you—

Madoff: Well, there are long-term investors in the marketplace, plenty of them, and they're quite successful. So there's long-term investing and they don't care about a lot of this data and getting it instantly because the value of a company's stock changes instantly, based upon anything that happens. It could be currency news; it could be world economies that are changing. All of that impacts the stock price. What I guess Bob is saying and what other people have always asked is if you like Intel does it really matter whether you pay $46 or whether you pay $47, even if a company is going to develop, if it's going to be worthwhile. We used to argue with regulators about this all the time, where the industry was held to everybody being within one penny of each other on an execution. We would say, "What difference does it make if the customer pays an extra penny?" We used to say that by making it so costly to do business, by us taking the spreads away so that the dealer couldn't make the right commission or the right spread to reward him for whatever risk he had to take—and the cost of doing the business—by taking that away, then people said, "I don't want to deal with the public." So we used to say it's not worth our while to do business with them, if you're going to hold us to that standard.

So whether you as an investor pay $46, or whether you pay $47, if the stock is going to go to $50, it's not really going to matter that much. But that's the average small investor that thinks that way, or the long term investor, but they don't control the market today. The market today is all institutional. And all institutions do is measure themselves against other institutions. So to them, a penny is a lot or a second is a lot because if they're taking a second more to execute a trade than another institution somebody is measuring them.

Fox: Well, I guess the question then is just is that a good thing? There's this long tradition in economics, definitely going back to Kane and through James Tobin and Larry Summers—although he has totally sworn off this after he actually had power in the treasury department—of saying maybe we should have a tax on every transaction so people don't trade so much.

Roell: No.

Schwartz: No, no.

Madoff: No.

Fox: Obviously there is this law. People have made these arguments and there are all these people in Europe who lobby for the Tobin tax.

Roell: Certainly there's a lot of academic evidence now from colleagues of Bob's at NYU that show that just adding a little bit to bid-ask spreads, to trading costs, has a big impact on the value of the stock, an unexpectedly big impact. So that if you start taxing trade or increasing those bid-ask spreads, you will see stock values going down. And that's really important.

Fox: Because the ability to trade in and out really quickly—

Roell: Yes. The cheap trading is very much a part of making the cost of capital low for companies trying to raise capital.

Schwartz: It's the idea of throwing sand on the tracks to slow the train, which is absolutely absurd. It's nuts. The thing is that bigger markets are better markets. Bigger markets are generally more liquid markets. Trading per se doesn't create the volatility. If you come to the market and you place an order on the market, it's called a limit order and you're helping to build the book. Then you're bringing liquidity and that speeds things up. It improves and lowers transaction costs. But you can't start putting a transaction cost on people who go and buy market order and not a limit order; that's absolutely absurd.

Fox: Ailsa just brought up something that's a crucial part of the whole stock market equation that we haven't really talked about much. The cost of capital. It's how companies either raise money or figure out what they're worth and help steer their investments, and it's how individuals like us save money and invest money for our retirements and whatever else. Could we step a little away from the Microstructure and get back to that bigger question of are we any better than that? I mean, do markets do that any better than they used to? Is there anything that ought to change?

Roell: Let me start off by saying that of course there's a huge debate these days about are we being over-regulated—Sarbanes-Oxley, for example—and is there too much security litigation. Those are two things that people worry about a lot and that might make the listing on U.S. markets less attractive. There has been research showing that indeed, foreign companies tend to be a little less enthusiastic about coming to the U.S. than they used to. The same is true for smaller companies. They're looking for ways to raise capital privately, perhaps not go public. I think this question should be thrown out to the practitioners because it's a very recent development. What do you see?

Siebert: Markets are going global. Within a few years, you'll be buying foreign stocks with the same ease that you buy the stocks on the board or on NASDAQ. That's happening and that's happening fast. I happen to think that we need global securities regulations the way we need global banking regulations, the way we have them. We've seen the worst. There's a lot of debt out there. Some of these private equity companies are being bought seven, eight, nine, ten times debt. One of the institutions told me they just sold one at twelve times debt. It doesn't give the company much room for error. I think you have to see it, because hedge funds left the U.S. because they couldn't borrow enough money. So they went to London, where there are no margin requirements. Now, if you want to turn the markets into a crap game—

Fox: But that really limits what you can do in terms of regulation within just one country.

Siebert: But I think that England bailed on a bank—

Fox: Right.

Siebert: Germany bailed on a bank. You're starting to see things that are talking about regulating certain things because it's started to hit them in their ballgames. When it hits their

banks and their public, then they will start to say, "Should we have any margin requirements?" If we get three days like yesterday, you're going to see margin calls. I saw people wiped out in 1987. You know, 25% equity is a fed-call. And itt's not nice when people come in crying. I saw it when we wouldn't extend more margin to a woman, and she said, "Well, look what I've made. I'm worth half a million dollars." She came back begging for us to take the account back when she was worth $20,000 in six months. So if you see people starting to lose because of some of this, it might affect whether they play the market, whether they invest in the market or not. I think the capital-raising system is partially responsible for the success of this country, that there was money, that you had these geniuses and these firms got fifty people to back this genius. They've turned into good companies and good people and technological breakthroughs. So I don't know. You've got a lot of debt out there. And if you see a soft margin, that is fine in a rising market.

Nersessian: Justin, I guess Muriel has started a little bit talking about the future. Since this panel is about the future of the stock market, maybe there should be more comments about how you see things evolving. I don't mean in terms of what the market will do next week, but how you see the industry evolving and how you see pricing evolving and so on.

Schwartz: Well, you talk about going global. That's absolutely right. A lot of the trends that we're talking about here have started in Europe. They went electronic for major markets well before we did.

Fox: Other than on stock exchanges, other than New York, are there any other exchanges that still have a trading floor?

Schwartz: Oh, there are other floors. Frankfurt still has a floor because they still have a niche place for it. I was on their floor about three weeks ago. Boy, is it quiet. I asked, "What time does it open? Aren't you trading yet?" "Yeah, we are trading."

Madoff: They have physical floors, some of them, but there's no business transacted really—

Schwartz: They have computers on their floors and there are people by the computers.

Madoff: But first of all, it's much more efficient to operate off a floor. The reason why is it's quiet. When you went up to our firm you said, "Well, I'm surprised at how quiet it is." I find it difficult to get used to that because I'm used to a lot of noise and screaming. When we were doing 10% of the business that we do now, we had 1,000% more noise. But you go anywhere today, any trading firm, there's virtually no noise. 99% of our trades run through automated systems like the ones Josh builds or others.

Fox: So in answer to Ed's question, we're going to get even quieter in the future.

Nersessian: The future is silence.

Madoff: Right. The future is silence. I don't see a lot changing in the marketplaces. It's hard to of course say that because everything always changes, but I cannot imagine what else we'd do,

from an automation standpoint, even in the clearing side of the business here. Europe has a lot further to go on the clearances and settlement of transactions, but on the actual trading, if you go to almost any brokerage firm, any trading firm, whether it be mine, whether it be Goldman Sachs or anything else, the technology is as pretty much as good as you need to have. You know, this is a psychoanalytical group, I guess, right?

Nersessian: There are one or two.

Madoff: One or two, okay. I'm sort of curious—maybe because no one got a chance to ask any questions about it yet—what are human beings contributing to the marketplace? Is there any change in their actions?

Levy: That's sort of the question I was going to ask you when you were talking before. Do these computer-generated programs take on a life of their own? They become a veritable force in the marketplace.

Stampfli: Absolutely. I think this should come up at some point. So there's this idea of emotion in the marketplace and the greed and fear question. The internet boom is a good example of human greed and fear. Once people sort of realized the internet was going to be big, everybody wanted to be in on it. So over time, the herd aligned itself all in the same direction. The alignment is a gradual process. Greed is a slower, more gradual process, where everyone kind of gets pointed in the same direction. Then, at some point, valuations reach their limit; everybody's bought that can buy; as much margin has been taken out that can be taken out. You run out of people that can continue to support the trend. A catalyst occurs. Someone within the herd turns around. And now, all of a sudden, the market goes down, say. Everybody in that herd starts to feel a very sharp pain. The greed, again, is a more gradual process because you may say, hey, it's up 10% this month or it's up 20% next month and look at the money I could have made. But you don't have to be in the market, so the initial orientation of the herd is a gradual process. But the pain is immediate. When people see that they're losing the money that they think was really earmarked for their house or their car or their kid's education or their retirement, it gives a sense of urgency to their actions, and that's why markets fall much more quickly than they rise, because all of a sudden, everybody in the herd needs to turn around and run for the exit and the door simply isn't large enough for everybody to get through.

With computerized models, you almost exaggerate the greed and the fear. It's sort of a paradoxical statement that computers would feel more greed or more fear than human beings. In some ways, I think the reason why people value computerized trading is the discipline of the machine. It lends itself a confidence and it standardizes the model. In August this year there was a big dislocation due to quantitative funds—they pick longs and shorts—very diversified longer-term funds that are all based on computer models. It sort of evolved over a long period of time, where people first started looking at this maybe in 2000 or a little before—these particular types of longer-term, fundamental quant models. The returns were good and more people went into the strategies, and so the funds themselves were raising more and more money, and they're sort of self-supporting, because it's a means of earning strategy. Essentially, it's people buying cheap stocks and selling expensive stocks. When you buy a cheap stock and it declines in price, it actually looks cheaper at that point, so you buy more.

As more and more money flows into this strategy, they become self-supporting. So if I bought a stock and it goes down a little bit, well I know that I'm going to buy more and ten other funds are also going to buy more. It tends to dampen the volatility. So these funds have a very nice characteristic: they were succeeding, they had low volatility; they didn't suffer big losses because they were all sort of self-supporting. But what was really happening was that over time, all of these funds that were pursuing a similar strategy were orienting themselves in the same direction. And because they're all quant-based, everybody's looking the same data; everybody's doing the same analysis; everybody used essentially the same statistical techniques. The models end up being very, very similar. The nice thing about having people controlling trading is that people are idiosyncratic. Even though I like the internet and you like the internet and everybody likes the internet, we all like different aspects of it and we all express our views in our own sort of idiosyncratic ways. But the nature of the quant funds is that all the decisions are being made by the algorithms and all the algorithms are fundamentally the same, so the herd gets very concentrated, very strongly oriented in the same direction. Because of the success of the strategies and the low volatility, people are willing to increase leverage in the strategies, so that they're magnifying their own events, and that also further concentrates the herd because you have a small number of very large animals now that are all pointed in the same direction. When you got that break in late July and August of this year, which was actually due probably to something completely unrelated—the sub-prime problem—maybe it hit some other aspect of one of these funds and they had to liquidate positions to raise capital because of losses somewhere else. That was the catalyst, where all of a sudden, one of these very large animals had turned around, and now everybody running these strategies, and everybody that had levered up and were committing an awful lot of capital—and all of these bets that they thought were uncorrelated all became exactly correlated. Because if they're all the same bets, once one company starts selling all the stocks that it owns and buying back all the stocks that it's short, those are all the stocks that everybody else has the exact same position in. You get this enormous magnification, where—

Levy: It's a storm. It's like pressure weather—

Stampfli: Yes. You build up and then you have this very turbulent explosion, where everybody is suffering the exact same losses at the exact same time. I read a story on Friday, actually, where a Goldman Sachs guy looked at August and I think called it a 25-standard deviation event, the type of thing that would only happen once every 100,000 years. Again, that's based on the assumption that all of these bets were uncorrelated. But the problem is that when the entire herd is pointed in the same direction and you're just like the big animal next to you, and one of those animals turns around and starts running for the exit, all of a sudden everything runs against you and the fear explodes and you get one of these very sharp market breaks.

Schwartz: There's the concern about algorithmic trading. What can be good for the individual often isn't good for the group. To have good markets you have to have people trading for different reasons or different motives. You have to have different algorithms. What's the overall effect of everybody's individual approach? In the '87 crash, it was very much portfolio insurance and it was largely a technical thing. When I was on the Frankfurt floor, I was there because of a meeting of a small group of people having to do with algorithmic trading. Just so that everybody

knows, algorithm is a more recent part of our vocabulary, unless you're a professor and have been using it for years. It just means "decision rule." When we talk about algorithmic trading, it means computer-driven decision rules. You're telling the computer ahead of time: if this, this, and that happen, then this is what I want to do. I was at a trading desk in Morgan Stanley recently, sitting next to a guy who was in front of the computer watching the screen, and he was deciding whether to put in an order or to activate an algo. When you get friendly with algorithms, you call them algos. So you can use algorithms in different ways. Somewhere in the equation is a human being who writes the algo; there's also a human being who pushes a button that says run the algo.

But circling back, I have to tell you, I heard a description of the exchange of the future—to get back to the future. The exchange of the future is a computer, a man, and a dog. The computer does all the trading. The man feeds the dog. The dog is there to keep the man away from the computer.

Siebert: Who puts up the capital?

Schwartz: Not me.

Fox: The dog.

Schwartz: The dog, yes.

Fox: I think little vignettes of the future are probably better than all of us trying to do big pontifications on it.

Stampfli: One thing Bob said which I think is very, very important is this idea of diversification within the herd. The danger in the marketplace is when the herd is all pointed in the same direction and then it has to turn around. One of the nice things about technology—and also the way trading has evolved and how costs have basically gone down across the board with smaller commissions, smaller execution fees, smaller clearing fees, tighter bid-ask spreads—is that it allows the development of a much greater diversification of strategy. So if you look at the big market crashes—'87 or even the NASDAQ crash—the magnitude of the market decline is very, very significant, and that's because there's not a lot of diversification of strategies. For example, with the internet, the strategy was to be long. It was "I want to own something. Anything to do with the internet, I want to own it." As a result, when everybody turns around and runs for the exits, everybody sells. That's what drives the market down. The little guy is the guy that's generally the simple strategy of just long, and it's the decline that hurts the little guy.
The event of this August, the turbulence, was not so much in the decline of the market. It was in the specific funds and the specific strategy, where they have a basket of long stocks, a basket of short stocks, and their longs plummeted while their shorts rose in price. A small segment of the marketplace, which had a very concentrated herd, suffered very significant losses, much more significant than any absolute price change in the market. Whereas the little guy, or the guy that was just long, suffered a mild decline. The diversification of the herd is the important thing and I think that diversification over time just increases as the reduction in costs allows more and more different opportunities to be explored.

Fox: But at the same time, you're saying that by having some of these algorithms and all everybody learns the same things.

Stampfli: Yes, but again, it's a concentrated subset of the market. Subsets of the marketplace now get very concentrated. I think the concentration in the subset of a marketplace now can become more extreme because of the sort of standardization idea. But the marketplace as a whole becomes less concentrated. You can think of the marketplace as a giant herd that had a lot of chaos to it—a lot of people were pointed in a lot of different directions—but within the specific segment, the portfolios were very similar and that's the segment that really got burnt.

Levy: Justin, do you want to open it up to the audience?

Fox: Yes, I was just about to.

Audience: Hi. I trade stock for my own account. I've been doing this for about 20 years and I advise other people. My expertise is preservation of capital, which is something that you people are talking about. As usual, just the way the market goes on a daily basis, this conversation is going in a completely different direction than I thought. By the way, Josh, that was a terrific explanation of black box trading. That's exactly how it works with everybody running for the same door, but I don't know if the room is familiar with that.

I am a product of what Mr. Madoff and Muriel have done, meaning that people sitting at a computer, who have a fairly good intelligence, can accomplish so much today that they've created. But it takes a little bit of work and it takes a little bit of knowledge. Bernie mentioned this stock called Intel. I think Intel has been public for around thirty years. The guy who started Intel is named Gordon Moore, and there's a rule called Moore's Law, which is used in the market. You can find out just about anything about this company that you want sitting in a quiet room by yourself: what their stock traded at for the last twenty years, what it did in the last quarter, what it did in the quarter before that. The point I'm trying to make is that when an individual today who's looking to invest money—a retail guy—unless he really does his homework he's at such a disadvantage, unless he's a long investor. Like Bernie said, it really doesn't matter if he pays $47.00 or $47.25 or $47.50, but it should matter. Because it all matters. Because on the downside, it matters. If you have to sell it for $46.75, it's your money. I assume that the greater percentage of the people in this room are retail investors interested in their own money, and they want to know how the market works. People like Bernie and Muriel have set up a system where you can really be efficient if you want to. You can sit at home at your computer and research everything you need.

Now, what I look at, as far as the future of the market is concerned, is what has been driving the retail guy—meaning someone who says, "I want to buy $10,000 worth of stock." This morning I read an article about municipal bond ETFs. It's not efficient for people anymore to buy municipal bonds on their own, so you can buy them in an ETF—an Exchange-Traded Fund. To explain it briefly, take a whole basket of different things, lump it into one basket like a mutual fund, except it's an ETF so you can buy and sell it 50 times a day if you want to. If you open up the *Wall Street Journal* today, you'll probably see about 500 ETFs, meaning that if you want to,

on Monday morning you can buy an Indian stock, an Indi-ETF, a Chinese-ETF—it doesn't really matter. These are the things that are being created that really drive the market forward on the retail side and also on the professional side.

As far as the way the systems are set up, I listened to a talk by John Thain, who used to be the president of Goldman Sachs, and is now the president of the market. Josh was talking about the event that happened in August: it was a little bit of a meltdown; it forced a whole lot of people to do the same thing at the same time, which is never good. I think John said there was something like 32,000 messages a second that could be transmitted on the NYSE at a time. Now, can you imagine that? Thirty-two thousand messages per second. And these messages all represent trades. Am I correct, Bernie?

Madoff: Correct.

Audience: Now they're moving the system up to where they can have 64,000 messages per second. It's almost astronomical to think about it. What goes on now as far as the retail guy or the wealthy person, the person who has a million dollars, $3 million dollars, $10 million dollars, who's really not an expert on the market—they've accumulated this capital and they want to invest it. These new products and these different situations are really what draw people into the market.

Fox: Is it good for them to have so many new products?

Audience: I think it is good. I'll give you an example. Let's take technology, like Intel and these companies that came to market on the NASDAQ stock exchange. You have to decide on Monday morning, do I like Apple or do I like Intel? Do I like Microsoft? Do I like Google? What do I like? I don't know which one to buy, but I can buy a technology ETF that's a blanket, that's a combination of all these different things and they come to you in one little basket. This is a little bit more efficient for the person who doesn't really know what to buy. But I think the future of the market—I think Muriel said it—that there will be this global market that is seamless from one end to the other. I really don't know if that's going to be good because should an event like Josh spoke about occur—meaning a contagion that begins in China and maybe ends up right on our doorstep—there may be no way of stopping this thing unless you just shut down the systems. But there's so much liquidity here now, and there are so many people operating, and the amount of transparency that exists is so much greater.

This credit crunch has really opened the eyes of a lot of people. We were talking a little bit in the green room beforehand that last week, between CitiBank, Merrill Lynch, and a few other different banks, they wrote off about $20 billion dollars in losses. Now those are real losses. Those are bets that people made. We said we wrote off against our earnings, but these are real losses.

If you sit down at a computer and you are not the total expert and you want to do your homework, you can learn an awful lot of stuff. You can really find out what's going on. The trading has become so efficient that you can sit there in a quiet room and do a lot of trading.

The professional trader finds his niche all the time. I really don't know how the retail trader is going to deal with this global market on a regular basis. I handle high net-worth people and I try to give them a little advice as to which side they should go on. Should they do something or shouldn't they do something? This is the fear that most people have. Most people that I deal with have accumulated an awful lot of money somewhere else other than the market and now want to spend it in the market to make more money. How that will happen, as far as what's going on, is really what the question is.

Madoff: First of all, there's been a lot of discussion about the speed and everything else. There's no reason that the average investor has to worry about that. You can still make your investment decisions. The fact that a market goes up 300 points or down 300 points—it's a scary event and you always assume that there's something going on that you don't know about. But take my word for it: for the most part, you can ignore all of those moves. If you go back historically and look at the long-term performance of all of the marketplaces, it really doesn't matter, whether it be '87, whether it be '98, whether it be last August, had you just held on.

Fox: You can go twenty years—

Madoff: You can go back forever, but let's live in the real world that we have deal with. If you ignored almost anything that's happened in most of our lifetimes—at least the people sitting around here—you would be fine had you just held on. It's not your business. It's unfortunate for me that I have to deal with this every day. I have clients that do care about what happens every day, but for the average investor, you don't have to do that. If you're investing for your retirement or whatever, you don't have to get involved in all these insane moves that occur in the marketplace. There are people that want to do that because that's their business, but you don't have to really get preoccupied with that stuff.

Nersessian: We had a conference here on neuroeconomics, about how neuroscience is being used in terms of understanding how people make decisions. If I understood some parts said here today, there was an implication that psychology plays a role in the price. Is it possible that in the future you would say Intel is worth $40 and it's worth $40? It's not worth $45 because somebody anticipated there's going to be great news. In other words, the product has a relatively fixed price, just as a pair of shoes has a relatively fixed price.

Fox: How could you do that as long as the future is uncertain?

Siebert: The products change.

Nersessian: They change over a longer term than the way the prices change. The ultimate price change is much faster—

Fox: That's true.

Nersessian: So is there going to be a time –let's with computers and so on—that the prices will not have the same degree of—

Madoff: No. Not in my view, because the computers are reacting to external events. So a company like Intel can be a great company under the present conditions, but if something happens in the environment or external to Intel itself—a competitor develops a better mouse, perhaps, or all of a sudden, people start driving cars that run on alternative fuels—it's going to impact the company. So no, you can't program it just the way you're saying, to have it be just dependent upon what's happening in the company itself, because the companies are changing.

Nersessian: What if one analyst says Intel is worth $40; one analyst says $36; one analyst says it's worth $44; one analyst says sell the Intel. These are people who have studied the company based on what you were saying. They spend their life studying these companies. Why can't they come up with—

Madoff: They're all wrong.

Fox: Josh has just explained why if they did all agree, we should be really scared.

Stampfli: It would be a bad thing, yes. Chaos is good.

Audience: I wonder if we're in a different situation today in terms of being at risk for an event that could really sink the market because everybody heads for the exits at the same time in a wide variety of ways. Is that type of leverage actually something that mirrors what went on in the sub-prime world, which most people don't really understand anyhow, in terms of how those mortgages got sliced and diced?

Fox: Is there a lot more leverage among individual investors than there used to be? I didn't think there was.

Siebert: Your hedge funds are totally leveraged.

Fox: Right. But hedge funds are mostly doing that to do relative value—

Stampfli: Exactly. It's not leveraged long; it's leveraged long and short. So if I'm a hedge fund and I'm long a million dollars of stock and I'm short a million dollars of stock, if I unwind that position, I'm buying and selling a lot of individual stocks, but the market as a whole shouldn't be moving up and down a lot.

Fox: Yes, you could have really wrenching changes between those—

Stampfli: In the individual stocks. Actually, that's why diversity is the one free lunch on Wall Street. You want to diversify your holdings if you can, because if you only own one stock, well, it might double, but it also might get cut in half or even go to zero. Individuals don't like to face that kind of risk on their holdings. By owning an ETF, you get this automatic diversification at a low cost. It's hard for an ETF to move sharply up or down in volume. Its individual constituents might, but the average of a lot of stocks generally doesn't.

Audience: I'm actually a professional in the markets and I trade for a large electronic market maker, similar to Bernie's but not one that does it against wholesale, but in the actual exchange.

Madoff: Where do you trade?

Audience: I'd rather not say the firm. You wouldn't have heard of it; we only trade anonymously and electronically. We don't have any outside investors. We only trade the firm's capital.

Levy: That sounds very mysterious.

Fox: Wow. Yes.

Audience: My question is, having been a student of history, I've read probably everything I could get my hands on of Bob's and of Muriel's background and certainly Bernie's public comments with the SCC. I have a question that is slightly different. The one trend that I've noticed that I don't know that there's much precedent for, and which I think that some of you are uniquely qualified to address, has been the change of our markets—and when I say 'our markets,' I mean places like NASDAQ, places like the NYSE—from being these quasi-public utilities to mutualizing themselves and becoming for-profit entities. The New York Stock Exchange is now out to make a buck and it wasn't before. Individual members were probably some of the most aggressive people out there, trying to make a buck, but the company itself was really serving a public good. The whole concept of market data and asset prices being a public good, is that the trend of the future? Are our markets going to be out to make a buck, and is that the best thing for asset prices and for us in general?

Madoff: It's a very good question. It's something that has very much caught the attention of the regulators and the academic community. And the answer is: no one really knows. The issue is that they were always for-profit entities, but indirectly. So the NYSE was serving the interests of its members, who clearly have a profit motive, and the NASDAQ market was serving its members, like myself, who certainly has a profit motive, although sometimes Josh forgets that. I'm only kidding, Josh. I think the regulators are extremely concerned about it, but right now don't know how to deal with it. And the regulators, as much as they would like to do the right thing, are at a loss a lot of the time. Events change, so they just don't know. Their attitude—which is not a bad attitude—has always been, let's wait and see what evolves, and then we'll react based upon the circumstances. It's not a question the average person spends much time thinking about. You do, because you're in the industry obviously. It's a very important issue and my guess would be that that is what Bob and Ailsa's next projects are going to be. That's *the* most important thing in my mind that's changed in the marketplace in the past ten years.

Siebert: I think we're witnessing a change. Archipelago they say "merged" with the NYSE, but they basically bought them.

Fox: Archipelago is an electronic trading network.

Siebert: Electronic, yes. And the specialist system which was becoming outmoded is almost now non-existent.

Fox: Is it really just there for Fox Business News and CNBC to be able to—

Siebert: Well, they've chopped the size in half. Some firms have liquidated their operations or cut them down very sharply. My only comment is that the electronic systems have no capital base and they have no obligation to make an orderly market. So we have to see what happens, because it's now a bid and ask. I think if I were the FCC I would be doing my homework now and just asking questions on it, to see what the result is of this, because we don't know until we get something that is sudden. When you had a specialist system—and it was like a candy store—if you wanted to buy General Motors, you had to go to the specialist post where General Motors was traded. But originally, if you wanted to open that stock up or down a quarter of a point you needed the permission of a floor governor, so you did have an obligation. I remember when the Ford Foundations loaned some of the specialists' money during one of the crashes to keep them alive so that they could open again. I think that was when Kennedy was killed. Some of the specialists took a stand. I remember little Lenny Wagner, who was a specialist in Xerox. They took a stand and they lost their shirts. I think it was Ford Foundation who loaned them money—wasn't it?

Schwartz: I don't recall.

Fox: I imagine they're less likely to do that with a publicly-traded company.

Siebert: Oh, no. You won't do that because you don't have one place, and the electronic trading has taken control of the process.

Schwartz: It isn't a trend of the future. It's something that's happened.

Siebert: Yes.

Schwartz: I mean, there might be some left, but it's really swept internationally. It started in Stockholm, by the way—

Fox: Yes, they're all buying each other, right?

Schwartz: It was a very good move in Stockholm. I'll point out two things that have happened as a result of this that I would deem as good things. One is that in the past and in conversations with the exchanges in NASDAQ, you say to any company, "Who are your customers?" NASDAQ and these markets would say their members were their customers. Bernie and Muriel—you were the customers. What about the investors, be it the retail or the institutions? "Oh no, those aren't our customers. They're your customers, but not the exchange's." I think it's very good for the exchange to be looking for what's best to the ultimate investors and that's very good and that's happened, without question.

The other thing is that there was excessive intermediation in the market. There were human agents involved in trading. Now, I like the human agents. Maybe we've gone too far and we're worshiping the computer too much—that's a great topic to talk about more. When everybody gets on the computer, can it be destabilizing, it's certainly more brittle. But there was too much human intermediation. How do you get around this? Well, you see what's happening in the NYSE. Boy, this intermediation has been dis-intermediated. The floor is collapsing. But okay, you can point to that as good.

On the other hand, there is something that distinguishes a securities market from Intel producing chips and cars and whatever else. There are real public good aspects to market making, to making good markets. "Public good" means that you have an exchange, but the broader public is affected by it, just like a negative public good is air pollution. And the stability of markets, the resiliency of markets. One of the forecasts for the future isn't just that we here can buy European stocks. It's that Europeans can buy American stocks in Europe, or Americans can buy stocks in Europe. Money flows, trades flow. Markets can all of a sudden emerge somewhere, but not here. So what happens to our main capital-raising ability? I started off thinking it was a brilliant move for the Stockholm Stock Exchange to go public. The exchange was on the brink of not making it competitively. They went public; they went electronic; they innovated in all sorts of ways, and the only thing I regret is that I didn't buy their stock at the IPO.

Audience: Is that Vertex, or—

Schwartz: No. Now it's OMX. Not initially, but then it started spreading. At this point I'm worried about it. I don't know if it's a good thing.

Audience: I have a question directed to Bernie and Muriel and it's really a historical hypothetical. Bernie, you said that when fixed commissions went away, the business participants in the industry had to find other ways to make money. Part of the way they did that was putting their own capital at risk. So my question is: if the fixed commissions didn't go away, how quickly would the whole financial services industry have evolved, and would the risks—the business, the market, even the overall economy—have been the same if those fixed commission hadn't gone away, or had taken longer to go away?

Madoff: Well, I think the lowering or the negotiating of fixed commissions affected the marketplace from the practitioners' standpoint. Clearly we said okay, we're going to go into different types of businesses. That was easy for us to adapt to. The overall market itself really didn't change. The way that it affected the individual investor is the quality of service to the individual investor with lower commission rates. That suffered. Now everything is relative. The commission rates had to come down. To have fixed commission rates was absurd. It's one thing to say okay, we're going to have negotiated rates. That's good—negotiation is always good. But then it got driven down much further than was originally anticipated, and that's where the problem came in. Now people say okay, is that bad? It depends upon who you're asking the question to. It was fine for the discount firms, up to a point. Then everybody cannibalized everybody else and it really affected every aspect of the business. This is SCC's concern today because they call us all the time and ask us: should we be concerned about the fact that certain firms have left certain areas of the industry and are not serving the public, or not serving even

other parts of the industry itself? The answer is it's too late, because you've done it. So there's always this friction that goes on between the regulation side of the industry and the practitioners that say okay, where do you draw the line? I'm very close with the regulators so I'm not trying to say that what they do is bad. As a matter of fact, my niece just married one.

Siebert: My condolences.

Schwartz: Did the SCC approve?

Madoff: He's an attorney.

Siebert: Okay.

Madoff: The issue is, the way they tend to look at the industry if you're making a profit there's something wrong, even though intellectually they know that shouldn't be.

Audience: Part of my question was related to when the companies in the industry, as you said, put their capital at risk but really needed to find other ways of making money. The kind of financial structure and various investments that didn't really exist now became part of the market and therefore made the market more volatile, more risky. Perhaps that process would have been slowed down and maybe we'd have a more stable, less volatile market today than we currently do.

Madoff: I'll just take a quick shot at that and then let Mickey or somebody else in. I would say the answer is no, because the market would have grown. The risk-taking would have continued to grow just because the whole capital markets have grown.

Siebert: Look, the commissions, frankly, became too high. I used to deal with institutions, just placing a medium block, putting together the buy and the sell. I remember having lunch one day and I joined people and I was a little late, and I said, "I made more money today, this morning, than my father made as a dentist, standing on his feet all year." So when you were paying the same per share for crossing 50,000 shares or 100,000 shares as a person was paying who bought 100 shares, they were out of line. But you know, we can continue that because you could say what happened was good for the marketplace. Whether that was good for the capital-raising system or not, that would take a long time to find out.

Schwartz: Could I add something to that? The commissions without a doubt were too high and it's good that they came down. They started to come down before—it was the 1975 Securities Act Amendments that did it. I've heard it said that the acts really precluded us from going back to fixed commissions. They didn't do it. But now they have come down, and I'd say for a long time that commissions is not the cost that we should be focusing on, especially for the institutional traders who are big. There are two things that get a lot of focus: commissions and bid-ask spreads. And why do they get so much focus? Because we can measure them. There are other costs of trading that are much harder to measure and the regulators can't pay the attention to it because how do you monitor the whole thing? As you turn to structure these markets, you assess these markets and you regulate these markets. There's too much attention being given to

what we can quantify, and not enough to bigger picture items that are underneath the currents. You see the ripples on the surface of the ocean, but the currents underneath go unstudied.

Audience: I'm actually a futures trader.

Schwartz: Did I front-run your question?

Audience: I'm a futures trader and a student of modern psychoanalysis, but what's the future of human capital? I'm somewhat directing it to Josh, but to all of you—what do you see as the role of the human—because there does need to be some interaction between the algorithm and the human, when all the algorithms are on the same side of the trade.

Stampfli: There's also a human obviously behind every algorithm. I think in terms of the structure, as Bernie mentioned, there's just been an enormous amount of automation in the business as a whole now, so there's been a huge transformation from 30 years ago to today. I think he said that it's not clear what more could be done. I think there's always someone behind the machine.

Audience: What's the process of turning the machine on—when you take an August event—

Stampfli: I spoke about the August event as a very turbulent event. I don't want to be seen as someone who has a negative view. I think, honestly, for the retail investor things are as benign now as they've ever been. The internet has been such a powerful agent to push financial information, pricing. Everything that used to be only in the domain of the professionals now is in the hands of the individual. Maybe not the most important thing, but commissions are way down; bid-ask spreads are way down; the customer gets a faster and better execution now than they've ever gotten before. I think in general, it's benign. Even the concentration that you see. I believe the danger is when the herd is all pointed in the same direction, but I think on a macro scale in the markets, there is more diversification of the herd than there has ever been, just because there are so many more different participants. It's just kind of in these very isolated little segments—I might have strayed off topic.

Madoff: Let me reassure you of something. As his theoretical boss, I guess—

Schwartz: What are you doing for dinner, Josh?

Madoff: You know, my theory—and I've always said this even though we were one of the ones that started all this automated algorithmic trading—was that I never wanted to get into a cockpit of a plane and see there wasn't a pilot sitting there, regardless that I knew the plane was going on autopilot. So behind every algorithmic trading desk, obviously there's somebody who's writing the algorithms, the systems, somebody's doing that. But more importantly, in our firm—and I don't know that we're unique, but I know there are other firms that do not operate this way—we have a group of traders that are watching the systems work and the results of the systems to make sure that from their sense of trading things look right. With all due respect to Josh and a lot of other people that we have with similar backgrounds, programmers—not that he's a programmer—but people of his ilk can tend to believe too much in the math and in the model.

They fall in love with it sometimes. Not so much Josh, which is why he's with us, but we have a lot of people like Josh that we employ and deal with. They're different. The thing that separates somebody that is a good algorithmic trader from somebody that is dangerous is somebody that just always believes the machine is right. There are people like that. It goes back to what Bob said about the joke of the dog. It's supposed to make sure that nobody touches the machine. You always want to have the human factor involved in the process because that makes it better. At least that's been our experience.

Audience: I agree.

Madoff: Absolutely.

Audience: I'm the organizer of the New York Investing Meet-up. It's a group of 1,200 people in New York City who are all independent traders and investors. These are people who trade their own money and work independently mostly, or just they want to make their own investment decisions. My question is about bubbles and crashes. How is technology influencing this? It looks like it's making the possibilities much worse. I'm specifically talking about '29, '87, and what can be coming in the future. Since people haven't changed, I assume crashes are going to still exist. Right now we have massive bubbles forming in mainland China, in the Shenzhen and the Shanghai markets, which are going straight up and blowing up. That bubble has spread to Hong Kong, which has gone up almost 50% since the first rate reduction in mid-August, and is spreading to the rest of Asia right now, where a number of markets have hit all-time highs. I would like comments on this and on how bad crashes can become now, compared to the past, and how much faster they can come.

Schwartz: Yes, we've lined the discussion up a lot in terms of humans versus machines. Humans interact with machines and integrate with machines. I'd like to suggest a different way of partitioning the discussion, and that is between individuals, which can be with computers—Josh and a computer, and the like—versus the crowd of people who are trading. I referred to this before as an integration problem, but there's another aspect to it. I find this intellectually very compelling. I'm wondering if some of you know the book by Surowiecki, *The Wisdom of the Crowd*? It's absolutely fascinating, and Josh, while you were talking, I was thinking of it because a crowd can have enormous collective intelligence, in excess of that possessed by the most intelligent individuals in the crowd, if the crowd of decision-makers is acting independently. That term "independent versus herding" was pervading a lot of what you're talking about. Now, do computers cause us to herd more? Gee, I don't know, because if I know your algorithm, I'm going to have my own algorithm, which feeds off of your algorithm. You can have contrarian algorithms, all sorts of things. It's not an obvious thing, but I think that the wisdom of the crowd is really there if the decisions of the individuals are independent. But look, that leads to an irony, because if you guys are all making independent decisions, and I know that the crowd decision is intelligent, I as an individual will follow the crowd. But as more people do this, then that collective wisdom deteriorates and decays.

Fox: It's like the more people that believe the market is efficient and just buy index funds that sit there, then the more efficient the market will get.

Schwartz: It's the same thing. Now, what happens in reality is the marketplace sort of wobbles between herding and diversity, and at times focusing on similar things. Do emotions play a role? Yes, they definitely do. But what do you label as an emotion? If I'm listening to the collective wisdom of the crowd and going along with it, it can be rational. But you could call it—who is the psychiatrist lawyer?—it could be called emotional, too. I don't know. But it definitely plays a role.

Audience: My question is a little basic. It's open for the whole audience. How do you feel that the baby-boomers retiring, starting this year, will affect the future of the stock market, considering there were probably about 60 million people who are going to retire in the next ten years?

Madoff: Good luck.

Siebert: Wow, that's a question. It's going to bring more attention to the market because they'll have more time. It's going to put more pressure on performance because they're going to want the money. They're going to want to see that money grow so that they can spend some. Frankly, I don't know. I'd like to see more transparency in the market—for example, in the hedge funds because they've become a very important factor in the marketplace. So I think we should know how much they're leveraged, how much they owe—not everyone should be registered, but we ought to know what's out there as an industry and what the leverage is. But that's not answering your question.

Fox: I don't know that anyone has an answer.

Audience: Do you think people take more risk after they retire or less risk? They should take less—

Siebert: They may be forced to take more. There are two areas of concern. The GAO had a meeting last year and they invited forty of us; two of us were women. They told us the purpose was to consider the problems financially in the country. They listed social security, which they said can be dealt with. You work longer, you raise the limits. They say Medicare is beyond—they can't even put the numbers on it because people are being sent out for thousand dollar scans. They can't even give the numbers because they can't put them together. I think that's going to be a major thing to the people retiring today. They believe they are entitled to medical care and it's going to put a tremendous strain on the country. I think it'll force people to go into their own money faster.

Levy: Thank you very much.