EXHIBIT

38

IN THE UNITED STATES DISTRICT COURT

FOR THE SOUTHERN DISTRICT OF FLORIDA

IN RE JANUARY 2021 SHORT SQUEEZE TRADING LITIGATION No. 1:21-MD-2989-CMA

_____/

DEPOSITION OF STEVEN GRENADIER, PH.D.

Remote Zoom Proceedings

Menlo Park, California

Wednesday, April 19, 2023

REPORTED BY:

LESLIE ROCKWOOD ROSAS, RPR, CSR 3462

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Deposition of STEVEN GRENADIER, PH.D., taken on behalf of the Plaintiffs, Remote Zoom Proceedings from Menlo Park, California, beginning at 9:05 a.m. Pacific Daylight Time and ending at 4:11 p.m. Pacific Daylight Time, on Wednesday, April 19, 2023, before Leslie Rockwood Rosas, RPR, Certified Shorthand Reporter No. 3462.

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I N D E X

Wednesday, April 19, 2023

WITNESS	EXAMINATION
STEVEN GRENADIER, PH.D.	
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QUESTIONS WITNESS INSTRUCTED NOT TO ANSWER

(None)

DEPOSITION EXHIBITS

STEVEN GRENADIER, PH.D.

NUMBER	DESCRIPTION	IDENTIFIED
Exhibit 175	Corrected Expert Report of Professor Steven Grenadier, 02/24/23	6
Exhibit 176	Rebuttal Expert Report of Professor Steven Grenadier, 03/28/23	6
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Exhibit 179	Inefficient Markets, by Andrei Shleifer	93

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Menlo Park, California; Wednesday, April 19, 2023

9:05 a.m. Pacific Daylight Time

PROCEEDINGS

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(Exhibit 175, Corrected Expert Report of Professor Steven Grenadier, 02/24/23, was marked for identification by counsel electronically.)

(Exhibit 176, Rebuttal Expert Report of Professor Steven Grenadier, 03/28/23, was marked for identification by counsel electronically.)

STEVEN GRENADIER, PH.D.,

having been first duly sworn, was examined and testified as follows:

THE WITNESS: I do.

THE REPORTER: Thank you, sir.

You may proceed, Counsel.

EXAMINATION

BY MR. ROSEN:

Q. Good morning, Professor Grenadier. How are you doing?

A. Very well. Thank you.

Q. All right. So let's see, where are you now?
A. I'm in Menlo Park, which is right near Stanford University.
Q. All right. And what office are you with?
A. This is Cornerstone Silicon Valley office.
Q. All right. Is anybody with you now?
A. Just the -- just the two Cravath attorneys.
Q. Two Cravath attorneys are with you?
A. Yes.
Q. Okay. Let's see.
So you're a professor at Stanford; is that right?
A. Pardon me?
Q. You're in the business school?
A. Yes, I am.
Q. Okay. And I'm going to introduce exhibit -- well, we've already introduced Exhibit 175 and 176. The first is your opening expert report which was corrected for some typo, I think, and then -- so I have the corrected version. And then there's a rebuttal report which is Exhibit 176.
Could you just identify them and tell me if those are your reports.
A. Sure. Just give me a moment. I'm going to -- I see them on my screen. I just have to download them.

Okay, I have them.

Q. All right. Okay.

So now in addition to being a professor at Stanford, you've also had some outside professional activities related to finance; is that right?

A. Yes.

Q. Okay. And it shows here you're a director of E*TRADE funds; is that right?

A. That is correct, yes.

Q. And what -- what did E*TRADE funds do?

A. Sure. So E*TRADE, the brokerage firm -- I don't know if they still do, but for a while salvaged their own proprietary fund family, and I was an outside trustee for that fund family.

So it grew from maybe two to approximately ten mutual funds, and then at one point, they shut them down.

Q. I see. And what was your role as a trustee of the funds?

A. So I was an outside trustee, and there were also inside trustees. And the outside trustee is a -- my understanding, was a fiduciary area looking after the investors in the underlying funds.

Q. Okay. And do you know approximately how many funds they had?

A. I think it grew to about ten.

Q. And do they have specific strategies, those funds?

A. They were -- it's all -- as I can recall, all of them were index funds. And so it was a mixture of different types, but your sort of classic stock, bond, international, that kind of index fund.

Q. So an index fund, does that mean -- were they equally weighted or if they valuated the index funds? How does that work?

A. Most index funds are market valuated.

Q. So an index fund that's market valuated would purchase and maintain a portfolio of an equal weight of every fund, every stock in that portfolio; is that how it works?

A. So it would not be like that. So a classic example -- and I'm sure we had one of them -- would be an S&P 500 fund --

Q. Uh-huh.

A. -- which is approximately the 500 largest by market value US stocks. And what you would do to manage a fund like that would buy each of them in their market value proportions. So, for example, today you would put much more in Apple than you would do in some other one like Walmart or something like that.

And then it's actually because they're market

weighted, they're relatively easy to maintain because you can essentially buy and hold them. They float. So as Apple goes up, and you hold the same number of shares, it moves up with Apple's market cap.

So valuated indices are generally quite easy o maintain and low cost to index because you don't really have to really do much. You just buy in the right proportions, and then they essentially move in proportion over time.

Q. Okay. And what if suddenly you had a hundred million dollar of new investment to the fund; would you then buy the same proportion of the portfolio that you already have with that hundred million, then?

A. Yes. They would get their pro-rata share of that pie. And so everybody in the fund would have the same fractional weights in the underlying stocks, and then as new money comes in, they just get another slice of that pie.

Q. All right. And it says here that you also worked as a director of Nicholas-Applegate Institutional Funds; is that right?

A. That is.

Q. And what was your role there?

A. Sure.

It was again as an outside trustee, and

Nicholas-Applegate was, as it says, institutional funds. It was different than E*TRADE funds in that the underlying owners were essentially institutional investors, not retail investors.

And that -- I don't remember exactly. It's been a while. Nicholas-Applegate funds had a mixture of mostly active funds, and they were much more hedge fund like. So they may have even involved some amount of shorting in them.

Q. I see.

Is Nicholas-Applegate still in business?

A. Ha-ha. I think so. They -- but I haven't followed them in like years. They were -- my understanding when -- at least when I was there, they were a -- they were subsidiary of Allianz. I believe it's a larger international bank, and that -- that was my recollection. I don't know if that's still true, though.

Q. And what about AQR Funds; what was your role there?

A. Sure. It's the same thing.

So AQR is mostly known as a hedge fund, but they started mutual fund family, and when they started the mutual fund family, I was one of their outside directors. And I did that for around five years or so.

Q. And what type of investing did AQR do?

A. So it was hedge fund like. So there were some unusual funds in there. So there was one relatively small fund that actually I would call hedge fund in the sense that they did things like merger arbitrage and stuff like that, which is unusual for a mutual fund. They had some more conventional funds that were international. They even had a fund when I was there that was a momentum fund.

So they were -- I don't know. They don't fit neatly into active versus passive. They're somewhere in between. And like I say, I left there --

Q. Passive would be E*TRADE, for example?

A. Correct.

Q. I see. Okay.

All right. Okay. It says you're a senior advisor to Cornerstone. What does it mean to be a senior advisor to Cornerstone Research?

A. So I don't know specifically what that -- what that means in general. In my circumstance, I have a relationship with Cornerstone where I do my expert witness -- my expert witness work mostly exclusively with them.

So when I have -- help on a case such as this one, I work with Cornerstone, and because I work exclusively with Cornerstone, I have a contract that has,

you know, some additional terms because of that.

Q. Some additional terms?

A. Yeah.

Q. What do you mean by "some additional terms"?

A. So normally when I work with -- in the old days, when I'd work with a litigation consultant, it would be on a per-deal basis. You know, there would be some split and understanding of who I bill. You know, very basic stuff.

When I work with Cornerstone, I have a contract that will say exactly how much of their revenues, as it's defined in the contract, that I would get a percentage of.

Q. So Cornerstone would bill the client for this case, and you would just get a cut out of that?

A. Yes. You said it correctly. I just was self-correcting. When I said a percentage of revenues, obviously no revenues that I had no dealings with. So you put it correctly.

If I'm working on a case with them, I will bill my hours, and Cornerstone bills their hours, and subject to some sort of description of what hours I have a fraction of, that's the case. I get a fraction of their hours on the case.

Q. Okay. All right.

You're familiar with Professor Fischel; is that right?

A. Yeah. I am.

Q. You know he -- he produced two reports in this matter?

A. I do.

Q. Have you had a chance to read those reports?

A. Yes.

Q. And when did you -- did you read a draft of the reports before they were finished?

A. I did not.

Q. Do you consider Professor Fischel to be an economist?

A. Yes.

Q. Now your reports have very similar narratives and conclusions, and I'm just wondering whether you had an opportunity to discuss with Professor Fischel the case prior to drafting your respective reports?

A. I did not.

Q. Have you ever represented a plaintiff, plaintiffs, in a securities class action?

A. Yes, I believe so.

Q. Okay. Can you tell me which case that was?

A. So my recollection is there were many. Let me see if I can think of some here. One was -- this was a

long time ago. It was -- so one of my very first cases was on a class action. I'm trying to think. What's the -- I forget. It's like the largest German telecom funds -- telecom firm, and it was a class action against them. I'm just forgetting. Most people would know the name. It's not coming to me.

I believe I did some life insurance companies, several of them that I worked for the plaintiffs in a class action suit for.

Q. Were those securities, though, or was that like more of a consumer contract type of case?

A. I don't recall. It's -- I did -- I wouldn't have known the distinction. I assume that the one with the German telecom was a securities one. And there were others. You know, when I first started as an expert, I think I predominantly worked for plaintiffs.

Q. And why did you stop? They weren't paying you enough?

A. It was all the -- I charge the same. I enjoyed working with those attorneys, too. But I started getting asked more often by defense sides. Of course, from my standpoint, a lot -- some of my cases, they're not class action, and I can't really distinguish is one a traditional -- you know, they're banks on both sides. So I don't see the normal distinction that others may see.

Q. So let's talk about Robinhood. You're familiar with the defendant in this case, Robinhood Markets?

A. Yes.

Q. Okay. And how do they -- do you know how they make money?

A. I have a vague understanding, but I'm certainly not an expert in their business.

Q. Are you aware that they derive a material portion of their revenue from selling their clients' order flow to market makers?

A. That's my general understanding, yes.

Q. Do you know why market makers would pay to have that order flow?

A. I have a general understanding. It involves things such as they can make money just on the transactions themselves. It's possible that there are other benefits of understanding order flow, but that's really all I know about that.

Q. So is it possible that the order flow contains valuable information for Citadel?

A. It is possible.

(Discussion off the record.)

THE REPORTER: Excuse me, Counsel. Can we go off the record, please.

MR. ROSEN: Sure.

(Discussion off the record.)

MR. RYAN: If there's anybody listening in, could they please identify themselves on the record. I was unaware that anybody was listening in.

MR. ROSEN: I'm not sure anyone is, but I know there's other people in my office who have a link and may or may not log in to listen at some point. But they're not making appearances, but they're just going to listen. So I don't know.

But it sounds like nobody's -- nobody's there at the moment.

All right. Let's go forward.

Q. So you read the Complaint in this action, Professor Grenadier; is that right?

A. I did.

Q. All right. And what do you understand the allegations of misconduct are against Robinhood and its subsidiaries?

A. So I'm -- I'm looking at the first exhibit that you shared with me, my original report, and it's paragraph 7 where it starts. Let me go to paragraph 11, please.

And I say -- this is, of course, my understanding -- "Plaintiffs allege that the share prices of the affected stocks" -- that's nine stocks that are

named -- plummeted because of Robinhood's unexplained decision to prohibit all share purchases."

And so my understanding is in paragraph 11 -- and it does show up in more detail below, but it's my understanding that there are these restrictions on purchases during this class week, and in 2021, that plaintiffs allege caused the prices of these stocks to fall during that week.

Q. And did you -- you're aware that the Securities and Exchange Commission issued a report about the what they called the meme stock market events, something like that; right? Are you aware of that SEC report?

MR. RYAN: I apologize. Objection to form. It was an SEC staff report.

THE WITNESS: So I cite a report from the SEC talking about this matter, which had explicit emphasis on -- yeah. So I do mention that in my report, and I am familiar with that report.

Q. BY MR. ROSEN: Yes. It's titled "Staff Report on Equity and Options Market Structure Conditions in Early 2021."

A. Correct.

Q. All right. Okay.

So you read that report?

A. I have.

Q. And in issuing your two expert reports in this matter, did you assume the truth of the findings in the SEC report?

MR. RYAN: Objection to form.

THE WITNESS: I have not thought about it that way. If you're -- you're welcome to ask me specific questions. There are so many things mentioned in that report. I certainly did not assume all of them as facts in the sense a lot of the report -- my view of reading it was it was some things reporting, some things hypothesizing about. I didn't view it as a normal like statement of facts. So I've never thought of it in the way you're characterizing it.

Q. BY MR. ROSEN: Now did anyone at Cornerstone Research participate in preparing either of your reports?

A. Yes. Cornerstone, which obviously is a group of individuals, assisted me in the preparation of my reports.

Q. And do you know about how many people over there helped?

A. So I never know exactly because there's people that move in and out, and also, there's always people behind the scenes, generally more junior people. So I don't know.

But I would guess in terms of regular contact,

it might have been something like six or so individuals.

Q. And what function did they perform in your report for you?

A. Sure.

So this would be no different than my other cases. It's a matter of -- so one of the -- one of the things that they did for me in this case, which is very typical, is in terms of under my instruction, doing things with data. I know that's very generic. But for example, collecting data. For example, in this case, running regressions, as I describe how to do that. Doing -- basically acting as a professor would call a research assistant. And so helping me draft my report, which means commenting on my draft, me commenting on their updates, proofreading, that kind of stuff.

So it's generally like one would consider a research assistant, but not for an academic paper, but for a report of this kind.

Q. And approximately how many hours have you spent so far working on these two reports or this Robinhood matter in total, you personally?

A. Yes.

So I never -- you asked approximately, which makes it very fair because I never really know. But I think between the two, I think something like 150, maybe

200 hours between all this, and I'm maybe including also prep.

Q. And do you know how many hours the research staff at Cornerstone who assisted you spent to date?

A. I don't.

Q. What is your definition of a meme stock?

A. It's obviously a term of art, and it really shows up in this case. It's not something that's generic. And it's a general mention of the stocks that are named in this case. GameStop is obviously -- I would view as the quintessential one. But it's stocks that had lots of social media discussion during this time.

Q. During this time?

A. Yeah, during the time of this case. So, for example, you know, January 2021 would be sort of a big period.

Q. Okay. Is there a joke element to meme stocks?

A. I'm not aware of that.

Q. Okay. Have you ever purchased equity securities?

A. I have.

Q. Do you have one or more investment strategies that you've implemented in the past in purchasing equity securities?

A. Investment strategy broadly defined, yes.

Q. And what type of investment strategies have you used in the past?

A. So I am basically an index person. So I have a very well-diversified portfolio, and I mean diversified across countries, asset classes, all that kind of stuff. So I'm very much -- very diversified. I would say I -- my only -- only idiosyncratic nature is I'm probably less risk -- more risk averse than the average person so I generally keep a higher component of my money in low risk fixed income than -- than most people do.

Q. Like corporate fixed income or government fixed income?

A. Generally government fixed income. So of that, of course, is for tax reasons, I hold a lot of California municipal bonds, but I also own a lot of relatively short-term treasury bonds.

Q. Do you -- do you ever trade on momentum?

A. I do not.

Q. Do you ever make short-term trades in equities?

A. I never have.

Q. What is the fundamental value of a stock?

A. So generally, so that's -- that's not a -- that term can be defined different ways by different people. Let me try to give you my best understanding of a sort of umbrella meaning to that.

Fundamental value of a stock is the present value of all future cash flows that you will receive by holding stock.

Now that might sound sort of definitional, but it's actually a very important concept. We hold stocks -- they're not like widgets. We hold stocks for a particular reason, and that's because we want earnings from them. We want cash flows from them.

And so given that basic idea, anything that determines those underlying cash flows is what we would consider a fundamental value. So, for example, type of things that influence those future earnings would be expectation -- excuse me, cash flows, would be expectations of things like revenues, profits, competition, and of course, underlying riskiness.

So it's these company-specific characteristics that would drive a fundamental value as opposed to non-fundamental things such as frenzies and bubbles and madness of crowds, that kind of stuff.

Q. Is there -- do you know how to derive the fundamental value of a stock?

A. Unfortunately, there is no one fundamental value of a stock. We try our best to get a good estimate of it, but it's -- it's a -- something we try to approach. But I don't believe there is a known fundamental value.

In a metaphysical sense, maybe there is one that's known to some sort of deity, but in general, all we can do is estimate it.

So I've never thought that there is a fundamental value that I can grab onto, but we try very hard to estimate it.

Q. You've done damages analyses in securities class actions before; is that right?

A. Yes.

Q. All right. Now have you ever used the term "true value" in connection with a securities class action damages analysis?

A. I don't know. It's possible. It's not the type of term that falls right out of my lips. So it's possible. It's not the normal term I use, but it is possible I've used that in some report.

Q. Okay. So, you know, in the typical Section 10(b) securities class actions, you know, stock drop case, how would you measure per-share damages? What's the simple calculation you would typically use to measure?

A. So generally in most of these cases, there's something I would call conceptual, which is the difference between an actual value at a time, you know, in the real world, versus a but-for value, which is a

value -- I'm not using it in a legal sense, but sort of a logical economic sense, the value that you imagine would have been in place at that time had the circumstances been different.

So a classic example would be there's a statement at a point in time, earnings equals ten, in the but-for world is what if the market thought earnings was eight. And you would try to figure out what the but-for price would be had earnings been announced as eight. And it would be the difference of those two at a point in time.

Q. So in trying to do the damages analysis, you're not trying to find out what the true value is absent the fraudulent statement, but it's you're trying to get the but-for value, but for the fraudulent -- allegedly fraudulent statement of value?

A. So let me answer that again with the caveat I'm not quite sure -- excuse me -- what "true value" may mean, but I am trying -- I would be trying to figure out in that but-for world what the stock price would have been had circumstances been different.

So it sounds similar to true value. I just wouldn't normally use that term. You're trying to figure out, as best you can as an economist, what the stock price would have been had, in my hypothetical, earnings

been announced at $8 versus $10. You were trying to figure out as best you can what the stock would have traded for in that but-for world.

Q. And is it -- is it necessarily true there the but-for value is equal to its fundamental value?

MR. RYAN: Objection to form.

THE WITNESS: So, again, I don't normally think of the fundamental value there. I don't know. I would normally think of it -- I think the best way I convey it is the but-for price would have been an economist's best estimate of what the price would have been in the actual world had the circumstance -- circumstances had been what is described in the but-for world, what the price would have been in that world.

Q. BY MR. ROSEN: Do you have any sense of what portion of the volume of trading on the NYSE and NASDAQ that is represented by investors who buy primarily based on their view of the fundamental value?

A. I don't know the answer to that question.

Q. Okay. So, well, you know, is it true that there's a quite a lot of people or there are many people who -- who are considered -- who consider themselves value investors or value investing is sort of a strategy, an investment strategy that people use, some people use.

Is that fair?

A. It is fair. But I would add that what one person called a value investor is very different than others. I -- I teach a class that's primarily on value investing. And even people who are real-world value investors, they have very different views of what value investing is. It's sort of a constant shock to me.

But value investing as a term is used all the time among certain kinds of investors.

Q. Have you ever heard of the investment strategy called technical analysis?

A. I have.

Q. And what do you understand that to be?

A. So, again, with the caveat that that's a very broad term, technical analysis is -- technical analysis is generally used by investors who focus more on what I would call trends and timing issues.

So an example of a technical analysis put to work would be somebody who believes in what you asked me earlier about momentum. They may believe over certain time horizons stocks that went up are more likely to go up again.

There are also technical analysts who do the exact opposite, and they try to find stocks that moved up recently, and they think they're going to go back down.

So for any sort of drawing I could do on a

chalkboard of a price path of a stock, I could find analysts that see all different -- technical analysts that see all sort of things. But in general, technical analysis is focused on trends and pattern spotting.

Q. And are there -- are there investment funds that use technical analysis as an investment strategy?

A. I'm sure there are.

Q. What about high-frequency trading? Could -- what exactly is this?

A. Sure.

It -- a lot of high-frequency trading would fit into technical analysis. So high-frequency trading, very generally, is doing some sort of pattern recognition, but as the name implies, over very short frequencies, sometimes fractions of a second.

And generally nowadays, they're computer driven, and the competition in that world has gotten down to who has the fastest connection to the trading platform. And so they compete over large amounts of investments in some sort of wire or wireless technology to trade as fast as possible, seeking profits from very short-term trading patterns.

Q. Now I've heard the term "program trading" in the past. Is that -- is that a broader -- is -- is high-frequency trading a subset of program trading?

A. I would say so because they're both often -- obviously for high frequency, they're computer generated, there's not an individual that's thinking in split seconds. They're both computer driven.

But there's a large body of trading that's program trading that's very different. So an example might be a strategy that uses a computer to formulate hedges.

So an institution might use computer trading that would invest in an equity that the computer figured out how to get an insurance like put option on it at the same time to get rid of some of downside.

And that's not necessarily the same thing as high-frequency trading.

Q. And earlier the term "momentum trading," I don't know if I mentioned it or you mentioned it. Could you explain what "momentum trading" is?

A. Sure.

Let's just be generic for the moment and just say there is a horizon, which could be a week or a month or a day. And momentum generally believes that what we call there is positive auto-correlation. That is a rise in a security's price over a particular period of time is more highly to be followed by a subsequent rise.

So that's a particular pattern, and momentum

traders sometimes believe there are such patterns over these split seconds that we previously spoke about. But they also believe that it may also be true over longer periods like weeks or months.

I am not aware of a momentum trader that believes they last for many years. In fact, generally people believe the opposite over longer periods of time.

Q. What about the investment strategy called trend following? Is that separate from momentum trading?

A. I would put -- so that's not a term that I use. I would view trend following as a -- as an analogous term for technical analysis.

Q. Okay. So what about "swing trading"? Do you know what "swing trading" is?

A. I don't.

Q. How about the investment strategy called "moving average crossover"?

A. I know what a moving average is. That's sort of a -- you know, if you have a list of data, you can calculate an average, and then every day that data shifts forward another day, and you can calculate another average. And you can track those averages over time.

That's all -- I know what a moving average is. The strategy you're talking about conveys that it uses the moving average, which sounds like technical analysis,

but I do not know that particular strategy you mentioned.

Q. Okay. And you mentioned index investing. That's another separate strategy; is that correct?

A. I would say so. In my view, yes, it is.

Q. And what about growth investing? Is that separate from value investing?

A. It is. With the same caveat. Some people say growth investing sounds just like someone else's value. But in general, growth investing is what it sounds like. You're trying to find stocks that are going to grow faster than others in the future.

Q. What about socially responsible investing; is that a separate investment strategy?

A. So I would mostly say yes. I'm not 100 percent sure I would call it wholly an investment strategy. It could also be a more broad strategy of what people view as something that's good for society as opposed to what's good for their portfolio. They get enmeshed.

But social investment strategy is a strategy where investors take into account things other than financial values, and you can come up with your own list of what they're looking at, but it could be whatever they think is good for society, they may take that as an attribute and something that makes them want to invest more in it.

Q. What about the investment strategy called "events-driven investing"? Have you heard that term?

A. I believe so.

Q. And that's, for example, mergers or investing when a merger is announced? Is that an example of events?

A. That would be my understanding. There's a hedge fund strategy that they will call events driven, and sometimes it's things that are even broader in a macro context. Like I think of a George Soros as doing this kind of thing. About sort of like large events dealing with monetary policy and things like that. So I'm familiar with events, not just corporate events, but also macro events, too.

Q. Now we -- your -- your -- your report mentions, it uses the term "short squeeze," and you understand what that -- you have a general idea of what a short squeeze is supposed to be; right?

A. I think that you put it correctly. I have a general idea. It's a bit of a term of art. As I think I convey in my report, the definitions vary, but we all agree on some basic principles of a short squeeze.

Q. Do you -- do you think it would be fair to characterize investing because you believe there is a short squeeze to be a form of event-driven investing?

A. I -- I don't really have a good answer to that because I don't use the phrase "event-driven investing." I don't disagree with it. It's just -- it's not a phrase I would normally use so I'm not sure how to answer that one.

Q. Is that because the term "event driven" is so -- is very vague?

A. I wouldn't even go that far. I would just simply say event-driven investing isn't the kind of term I normally do. So I don't really want to venture out and offer an opinion on a phrase that I normally don't do.

Part of it's vagueness, but it's vagueness in my own mind. It's possible there are traders on Wall Street who would say, "I know exactly what you mean by that." But "event driven" to me is a very broad term. So I'm not really sure how I would convey that.

Q. What about "contrarian investing"? Is that a type of investment strategy that people use?

A. Yes, it is.

Q. And how does that work?

A. So --

Q. Or not work?

A. Sure.

As a general principle, a contrarian does what it sounds like. They try to make investments that are

currently out of favor with the idea that they think that things will turn around.

So I would view a contrarian strategy as being somewhat the opposite as a momentum trader.

Q. All right. So there are nine stocks that are the subject of this litigation that are listed in the Complaint. I'll name a couple of them. AMC, GameStop, Koss, Bed Bath & Beyond, Blackberry, et cetera.

You're familiar with those nine stocks; right?

A. I am.

Q. I'll just -- I'll just use the term "nine affected stocks" or the nine stocks if that is -- and if you don't understand my use of the term, let me know, but I'll -- rather than list all nine.

So do you -- is it your opinion that those nine stocks were overvalued as of close of trading on January 27, 2021?

A. So that is not part of my opinion. It's related -- the question is obviously related to my opinion that as of that period of time, I don't believe they traded in efficient markets. That's my opinion.

Now whether they were above or below some sort of value, I didn't form an opinion on that. I -- my opinion was whatever their value was, it wasn't tethered to value-relevant information.

THE REPORTER: Excuse me. Nicholas Lin is asking to join the deposition.

MR. RYAN: Yes, he is with Robinhood. He's an inhouse lawyer at Robinhood.

(Nicholas Lin enters deposition room.)

THE REPORTER: Thank you.

MR. RYAN: Thank you.

THE REPORTER: You can continue, Counsel.

Q. BY MR. ROSEN: Professor Grenadier, would you agree that price is typically the best estimate of value for publicly traded stock?

A. I'm sorry, I actually didn't hear the -- I didn't quite hear the end of your sentence. I don't hear everything crystal clear. I hear everything pretty darned good, but I didn't get that one.

MR. ROSEN: Let me close my window because it could be noise from the outside.

Q. Would you agree that typically price is the best estimate of value for publicly traded stocks?

A. So in the context -- if I believe for these stocks, they are traded in an efficient market, which is often the case, then yes, I would agree with you.

Q. Okay. And for stocks that are not traded in an efficient market, what is the best estimate of value if not price?

A. Then that's an almost impossible question to answer. Because if you can't rely on the price as the best estimate of value, in an efficient market, we're left to individual calculations. So I don't know what more I can say is investors would have to use other resources to value them, not necessarily silly resources, but sometimes very sophisticated resources to value them. In some grand scheme of things, the people with the best information and the best methods would probably come up with the best estimate of -- of, you know, true value or whatever you want to call it of a security, but there's no one thing that we would all rely on.

Q. And you didn't perform any tests to try to estimate the value of any of these nine affected stocks either in the pre-class period or the class period?

A. Let me make sure I understand your question.

So in terms of did I do any tests to try to value? Can you -- can you give me an example of what you might mean?

Q. Well, I don't know. Did you do a discounted cash flow analysis of any of the nine stocks?

A. I did not.

Q. Did you perform any other analyses in an effort to try to determine what their fundamental value was at any time during the pre-class or class period?

A. I did not. My focus was on the prices themselves, or more importantly, the movements of the prices themselves of the -- I think you call the affected stocks, and what was the value relevant information that was conveyed at those times. That, of course, was the substance of my report.

Q. Can you -- do you recall what the specific restrictions were that Robinhood imposed on these nine stocks on January 28th, 2021?

A. So I'm happy to answer that with a general conveyance of that information. Of course, there was a table with my specific understanding about literally which stocks, which time of day.

But my understanding is they changed over time, but there are these so-called PCO restrictions from Robinhood.

Quick question: My understanding is you said Robinhood restrictions; is that correct, in your question?

Q. Yeah, yeah. I was just asking about Robinhood.

A. That was my recollection, but before I went on and on, I wanted to make sure.

Yes. And those restrictions are essentially sell only, no buy. And then over time, they changed. But in general they weakened to things such as limits on

how much you could buy rather than zero. And they moved over time.

Q. And there were also some restrictions on -- I think, on options or did they not have -- or they can -- they cancelled purchase orders of stocks; right?

MR. RYAN: Objection to form.

Q. BY MR. ROSEN: Also?

A. I don't recall that. It's possible I read that. I was focused mostly upon the restrictions on purchases of equities. So whether it was zero or some small positive number. Also, my understanding is there were some margin requirements that were changing, too.

Q. And do you know -- could you tell me why Robinhood submitted those restrictions, the purchase restrictions?

A. Did you say why Robinhood like used those purchase restrictions; is that your question?

Q. Yeah, why they implemented those restrictions.

A. Sure.

So my understanding is that Robinhood did this because of regulatory requirements about sort of their own margin that they had put down on these stocks which had high VARs. And so they were very expensive for Robinhood the post these amounts, and these were the stocks -- generally the ones that are at issue in this

case are ones with the very highest VARs.

Q. Now there were also some restrictions on options trading. Now I know interactive brokers, for example, had some restrictions in options trading on the 28th; is that right?

A. I don't remember.

Q. Uh-huh. Do you have any opinion as to whether restrictions on options trading would affect the prices of the nine stocks?

A. I -- I can't answer that. I have not been -- I have not looked into that in this case. It's a fair question, but it's not something that I was asked to look at so I really can't answer that question.

Q. Now the Complaint also alleges that Robinhood cancelled buy orders that it already had placed.

Do you have any opinion as to whether cancellation of buy orders already placed would affect the value of stock, the nine stocks?

A. So I do to the extent that what I say in my report is in terms of the sort of behavior, that in an efficient market, restrictions on a subset of retail investors should not impact the stock price.

Q. Do you have any empirical evidence to back up that opinion?

A. I would say I would base this on fundamental

principles of finance and economics and belief in investors' profit motive to arbitrage away simple profits.

Q. So it's a theoretical opinion?

MR. RYAN: Objection to form.

Q. BY MR. ROSEN: It's an opinion based on theory rather than empirical evidence?

A. So I would argue no. There is ample empirical evidence of those principles I just said, and that is clear and obvious public kinds of arbitrage opportunities don't last for long. We would all -- if it was obvious that somebody could say, I am going to institute something that impacts a small segment of retail investors," and hypothetically assume for a moment's time that impacted the price, say it lowered price, that is low-hanging fruit. And investors would see that, and it would not last very long at all. They would rush to arbitrage that and purchase it if it was at too low a price.

And there's -- just to finish up. Sorry. There's a lot of empirical evidence that such arbitrage opportunities, to the extent they ever exist, are much -- are very fleeting.

Q. So is it your opinion that the restrictions imposed by Robinhood had no impact on the price of the

nine affected stocks in any way?

A. I don't have -- I don't have that opinion either way. There is -- I don't form an opinion in my reports about causation. I have an opinion that I talk about that there is not an efficient market in these nine at-issue securities during the period of time that I analyzed, which is one week prior to the class period and the class period itself.

I also related to your question do say -- and I'll be slightly repetitive because I said this a moment ago -- that if we believe that the stocks traded in an efficient market during the class period, then it is fundamentally inconsistent with that assumption to believe that a restriction on a subset of retail investors would cause the price to change.

So that's my opinion, but I don't vary from that and assume what could happen in an inefficient market and what caused the price to decline. I -- I was not asked to do that in these reports.

Q. Okay. Have you ever heard the term, quote, assumption of reliance on an efficient market free of manipulation, unquote?

A. I believe I have, yes.

Q. It's -- it's in the Court's opinion as an element of one of the plaintiff's claims that is the

10(b) claim?

A. I -- that's my recollection. It may even show up in one of by reports, probably as a quote or reflection of that.

Q. And what is your understanding of what that means, that term?

A. Can you assist me by isolating that term again for me?

Q. Assumption of reliance on an efficient market free of manipulation. I can show you the Court opinion if it helps.

A. Sure. I might even be able to find it in my report.

Q. It's page 38 of the Court opinion.

A. Is that something you're sharing with me.

MR. ROSEN: I could. Hang on a second. Give me one second. I don't think I've introduced it before so it will be Exhibit 177.

(Exhibit 177, Court Order, was marked for identification by counsel electronically.)

Q. BY MR. ROSEN: Okay. So if you go -- you should be able to see it now. It's in Exhibit Share.

A. I do.

Q. Go to page 38. 38, second paragraph. The Court's -- the elements of a market manipulation claim in

element number 3.

A. Sorry, I was absorbed with downloading it. So can you give me the -- where --

Q. It's page 38.

A. Okay.

Q. Second paragraph in three.

A. Is that the paragraph that begins with "to assert"? Yes.

Q. Yes. It's item number 3.

A. Like I said, I was absorbed downloading it so that's why I missed that. Give me one second to just sort of review that.

Q. No problem.

A. Okay. And just to be clear -- I'm sorry -- "caused by reliance on an assumption of an efficient market free of manipulation." That's the phrase at issue in your question?

Q. Yes.

A. Okay.

Q. And what do you understand that to mean?

A. Sure.

So obviously, I'm going to be careful about legal terms. I'll do my best as an economist. As a common phraseology meaning, it also has a legal term. So I'm not going to be an expert on what "reliance" means.

And also, "manipulation" has both, too. So I'm not going to be an expert of defining what act would constitute legal manipulation. So with those caveats, let me do my best to answer your question.

So an efficient market has an -- obviously a strong meaning in economics. So the assumption of an efficient markets and reliance -- I'm going to just -- for purpose of my answer, I'm going to talk about reliance not as my understanding as a legal term. So reliance will be sort of something that you believe to be true as an individual or class of individuals.

So in the assumption of an efficient market. So in my report I define what economists define as an efficient market. But broadly speaking, an efficient market is where prices of securities react quickly and fully to new value-relevant information.

And then the last part of this phrase is "free of manipulation." So generally speaking, in sort of an economist meaning, I would view a manipulation as something that would make a market that is efficient not efficient.

So it would mean that if a market had manipulation that was effective in impacting the stock prices, then that price would no longer be under the definition of an efficient market that I just defined.

Q. Are you offering any opinion in this case as to whether plaintiffs' class are entitled to an assumption of reliance on an efficient market free of manipulation?

MR. RYAN: Objection to form.

THE WITNESS: So that is not part of my report. My report focuses, among some other things, on whether as an economist I believe that these nine affected stocks traded in an efficient market during the week prior to the class period and the week of the class period.

So it was I viewed my role and my opinion as focusing on whether I believed those stocks in reality traded in an efficient market or not. And it's my opinion that they did not during that time period.

Q. BY MR. ROSEN: All right. Now you've heard the term "reliance on the integrity of the market price in a efficient market"?

A. I have seen that before.

Q. That's part of the -- well, in my -- my view, it's part of the -- part of the market presumption of reliance in the securities class actions -- in the typical security class action misrepresentation case; right?

So do you -- in your -- in your view, what does it mean for an investor to make their investment decisions by relying on the integrity of the market price

in an efficient market?

MR. RYAN: Objection to form.

THE WITNESS: So I'm going to answer that as I always say as an economist, because I do understand some of that phrase, in particular, reliance involves a legal concept, and I don't think anyone's interested in Professor Grenadier's legal concept understanding.

When I -- I am certainly well aware of cases where there's fraud on the market, legal construct behind it. And my role in those cases, just like in this case, is to come up with an economist's opinion about whether or not the market was efficient or not during a particular time period.

So just to be clear in my answer to your question, all that I am offering here in my reports is my opinion about whether or not I believe these nine stocks traded in an efficient market during those time periods. That's my contribution to it.

Then my understanding is the trier of fact can use that to formulate her opinion. But it's I don't go beyond that and make any legal ramifications on that. I'm simply acting as an economist to give my opinion, in this case, that these nine stocks did not trade in efficient markets during that two-week period.

Q. BY MR. ROSEN: Now do you understand there to be

a difference between an assumption of reliance on an efficient market free of manipulation --

THE REPORTER: Excuse me. Can you repeat, Counsel? You cut out there at the end.

Q. BY MR. ROSEN: -- as the Court wrote in page 38 of his opinion and the term "a reliance on the integrity of the market price in an efficient market"?

MR. RYAN: Objection. Calls for a legal conclusion.

THE WITNESS: Are you -- are you quoting from page 38, Mr. Rosen?

MR. ROSEN: The first one, I was quoting from page 38, you know. Well, we can go back to it, if I can find it here. "Reliance on an assumption of an efficient market free of manipulation."

THE WITNESS: Yes, that's still on my screen.

Q. BY MR. ROSEN: All right. So you don't have an opinion or an understanding one way whether it's the same or different from reliance on the integrity of the market price?

MR. RYAN: Same objection.

THE WITNESS: Yeah. That sounds like a legal opinion. I don't. I'm an expert on what an efficient market is, and that's my opinion. I am not an expert on reliance and things like that.

So I don't want to -- I don't want to offer opinions that are outside my field of expertise, which is financial economics.

Q. BY MR. ROSEN: All right. So in your rebuttal report -- see if I can find it. It's paragraph 28.

A. Approximately what page?

Q. It would be page 11 of the PDF, page 9 of the report itself on the lower right.

A. Perfect.

Q. Paragraph 28. This is the March 28th rebuttal report you issued.

A. Okay. Is that the paragraph that begins with the word "furthermore"?

Q. Yes.

A. Okay.

Q. So there's a sentence in there that says, "Therefore, during the proposed class period to the extent that putative class members were aware of Robinhood's restrictions and what plaintiffs allege were 'artificially distorted' prices, they would have transacted based on their own individual information or preferences without trusting the integrity of the market prices."

A. Yes.

Q. So I'm going to ask you some questions about

that sentence.

What do you mean when you say "they would have transacted based on their own individual information or preferences? What does it mean to have -- to be transacting based on one's own individual information or preferences?

A. Sure. I will most certainly answer that.

I'm just going to read that. While you were talking, I did not read the sentence. I'm just going to read that now.

Q. Go ahead.

A. And if for some reason I forget, just prod me to answer your actual question.

Okay. So to answer that, it's important to read earlier on in 28. Because I am saying that if we suppose something, then the markets would be inefficient.

So in context to your question, I am now assuming that the markets were not efficient during this period. And when the markets are not efficient, then an earlier question you asked me, what is -- in an efficient market, I said the best estimate of a stock price's value is the stock price's value.

In fact, the best estimate of a stock price's value one minute from now in an efficient market is essentially -- is a stock value.

When we leave the assumption of an efficient market, which is what I'm getting at in this paragraph here, then as I said earlier, all bets are off. And in fact, what investors will make their beliefs -- will form their beliefs for what to do, whether to buy or sell or hold, it's going to be subject to their own personal preferences and knowledge.

And I know that sounds vague, but that's what happens. If you can't take the current stock price as its best estimate of its value, then all bets are off, and I don't know what you're going to do and you don't know what I'm going to do because we have different beliefs, we have different liquidity preference and the like.

And basically what I'm saying here is if there are not efficient markets, then investors will make their decisions like buying and selling and holding on idiosyncratic rationale.

Q. Well, don't they do that, anyway, even in an efficient market? Why does it change -- why does their decision making change when the market becomes inefficient?

A. Sure.

The major issue is the -- while investors in an efficient market will make buy and sell decisions based

on some idiosyncratic understandings, it's way more involved in an inefficient market.

So what I mean is: In an efficient market, you may have liquidity preference and the like, but it's still going to be based on an understanding that the current value is the true value.

On the other hand, when markets are not efficient, not only are you making decisions based on liquidity and preferences, but you're making decisions based on what you think the value is divorced from what you're seeing in the stock market page.

It's way more involved and much more complicated to figure out what an investor would do in an inefficient market. Because they have nothing to base their valuation decisions on that's publicly available. What they have to do as an investor is essentially do something that you asked me to do earlier: Did you value the stock?

And I said how?

And you said maybe an MPV analysis or maybe I'm a momentum trader. I don't know, but that's the kind of things investors would do.

Just to be very clear on this, without an efficient market, any decisions that I make that embodies a view of the value of the stock compared to its price,

without efficiency, I need some model. And it could be MPV, it could be momentum, it could be mean reversion. I don't know, but every investor is going to have to have some sort of model, and that is vastly more complicated than in a world where everybody would agree that the best estimate of the value is today's stock price.

Q. Well, what about fear? What about investors' fear if they think there's an inefficient market or if there is an inefficient market and -- and they don't have a basis to value the stock all the sudden. Wouldn't that fear enter into their analysis trading decision?

MR. RYAN: Objection to form.

THE WITNESS: So in your -- in your -- your question, were you assuming an inefficient market?

Q. BY MR. ROSEN: Yeah.

A. So let me rephrase it to make sure I understand, that you're asking me in inefficient market, would an investor's degree of fear influence their trading?

Q. You said "inefficient market"?

A. Correct.

Q. Yeah, yeah, that was my question.

A. Sure.

So in an inefficient market, a investor's fear certainly could influence their trading behavior. And fear I would put into the general category of

preferences.

Q. And could -- and let's say in an efficient market, couldn't fear also play a role in their preferences? How would it differ in an efficient market, in an efficient market?

A. Sure.

So preferences would influence an investor's behavior also in an efficient market, but that would be entirely separate from any concern the investor has over the difference between the market price of the stock and what they think its value was.

And so all of that kind of calculus becomes much more meaningful and complicated in an inefficient market. Because, for example, in your question, the amount of fear you have is going to be a function of how much faith you have on the market value being a fair value.

If you don't have any faith in the market value being a fair value, your fear would be manifested much more highly.

Q. Okay. So let's -- in paragraph 28 in your rebuttal report, there's another sentence that begins -- I think it's the last sentence, that begins, "As a financial economist, I am not aware of a class-wide approach to determine which putative class members believe that prices were efficient when transacting in

the at-issue stocks and which believed the prices were artificially distorted without asking each putative class member individually."

What -- what is your definition of "artificially distorted"?

A. So I believe when I used that phrase I was quoting from earlier in the paragraph. So in the -- so because remember here the premise here is an assumption, not my opinion. In other words, what I'm saying is like a "what if" or a hypothetical, as you might call it.

If plaintiffs were able to show that the alleged manipulation, these trading restrictions that you asked me earlier about, resulted in artificially distorted stock prices and inefficient markets.

So what I mean by that, artificially distorted would be prices that deviated from their efficient market values.

Q. Okay. Does somebody -- does a class member or investor have to consciously believe that they're trading in an efficient market to be permitted to rely on the integrity of the market price?

MR. RYAN: Objection. Calls for a legal conclusion.

THE WITNESS: I don't know the answer to your question. Because in particular, it uses the word

"reliance," and in my understanding, that's a legal term.

Q. BY MR. ROSEN: Well, that last sentence in paragraph 28 says, "I'm not aware of a class-wide approach to determine which putative class members believed that prices were efficient when transacting the at-issue stocks."

I'm just wondering why that's important to your opinion or important enough to make that statement.

A. Sorry, I don't quite understand your question.

Q. Well, the sentence you wrote in that report says, "I am not aware of a class-wide approach to determine which putative class members believed that prices were efficient."

Why is it important or even relevant that a class member believe that prices were efficient?

A. So it certainly could be important if we have a world where the markets are not efficient, and Dr. Werner, for example, is coming up with an approach to estimating but-for stock prices.

So hypothetically, if he was trying to estimate what a stock price of GameStop would be in a world without these trade restrictions, but with trade restrictions of E*TRADE, for example, he would have to come up with the market value in such a world. We talked about that earlier.

Trying to come up with a market value in a world where some investors believe in efficient market and some investors don't believe in efficient market is quite a complicated endeavor.

You would have to -- to come up with that but-for stock price, look at the interactions of those subsets of investors, and in particular, for the subset that do not believe in efficient market, try to ascertain what they used to motivate their trading restrictions, which would, of course, involve their estimate of what the value of the stock would be.

MR. ROSEN: We've been going about an hour and a half. Do you guys want to take a break, a short break?

MR. RYAN: Sure. Makes sense.

MR. ROSEN: So you guys are all on Pacific time; is that right?

THE REPORTER: Off the record, Counsel?

MR. ROSEN: Yeah, go off the record.

(Recess.)

Q. BY MR. ROSEN: So prior to the break, we were looking at paragraph 28, that last sentence of your rebuttal report, and I want to focus on that a little bit more, you know, particularly the clause that says, "I am not aware of a class-wide approach to determine which putative class members believe that prices were efficient

when transacting the at-issue stocks."

Is it your opinion, Professor Grenadier, that if somebody believed the prices were distorted by the restrictions, the purchase restrictions, that means they're not allowed -- that means that they knew the market was not efficient?

A. So was your question if somebody -- actually, maybe it's more efficient if you just ask it again for me, please. The last part of your question.

Q. Is it your opinion that if -- if an investor during the class period believed that the prices were distorted because of the purchase restrictions on the nine affected stocks, that means they knew the market for the stocks was not efficient at that time?

A. So I want to distinguish between my determination of what's an efficient market and what might be in a investor's head. So I'm not contending that an individual investor literally uses the phrase "efficient" versus "non-efficient."

What I'm saying is if an investor believed that there was an artificial distortion, meaning that the price of the stock was not that which would be an efficient market, where prices are tethered to value-relevant information, if that investor no longer believed that the market price was not the best estimate

of its value, then they would be trading in a world where it was not an efficient market.

As an economist, I would say if an investor trades in a world that's not an efficient market, as I said earlier, all bets are off. They will make their decisions based on some belief of what value is versus what price is.

Q. Well, what about an investor that's engaged in program trading or high-frequency trading. Suppose that investor has no -- I mean, these programs, I assume these programs aren't reading the news, necessarily, and learning about Robinhood's restrictions.

I mean, would a stock sale that was implemented because of a programmed trade, would such an investor be aware of distorted prices?

MR. RYAN: Objection to form.

THE WITNESS: So the nature of the kind of investments that I'm talking about in this case are very different than what you would think about with people who use computer programs to trade over tick-by-tick prices. So those are not even essentially statistically distinguishable.

So, for example, the firms that trade intraday tick by tick are trying to make money on very small basic points. So that's -- it's not something that I'm even

picking up in this.

So I understand the nature of your question, but that's -- that's a very different world that these high-frequency traders are trading not on dollar differences but like penny differences. And I'm not -- that's like nothing I'm talking about in this case. I'm talking about, you know, meaningful differences in values.

So when stock prices move, for example, on costs and they move up a thousand percent in a week, that's a world that's totally disconnected from what your question is talking about.

So I'm not really concerning myself with microfractions of a dollar. I'm talking about what happens in a market that's no longer efficient in a world, as in this case, where prices, for example, in the week prior to the class period, went up by GameStop by something like 700 percent. It's just orders of magnitude difference.

So my answer is I don't even think about that tick-by-tick kind of trading. I'm talking about these sort of 700 percent, thousand percent price rises.

Q. BY MR. ROSEN: Well, okay. What about two retail investors. Three -- let's say there's three types of retail investors. One retail investor never reads the

news, doesn't go to social media, lives in his own little world.

Another retail investor is addicted to social media and the news and The Wall Street Journal and financial media, and that investor believes the prices were distorted.

And then the third investor also has equal access to news media, looks at Reddit nonstop, looks at The Wall Street Journal, all the financial news media, but that investor doesn't necessarily take a view as to whether the prices are distorted. Maybe that investor's just confused, unsure, doesn't really take a position.

So the first person who's completely ignorant of anything other than what he looks at when he sees the price, just sees that the price has changed, but doesn't know -- have any view as to why or how or what. When that person transacts and sells, would that person presumably believe that the prices were efficient when transacting?

MR. RYAN: Objection to form.

Q. BY MR. ROSEN: Or would have no reason to believe otherwise, at least?

A. So in a normal circumstance, it doesn't matter. What I mean is, in a normal circumstance, we mostly think of stock markets as efficient. And so in most markets

that I believe are efficient, there are undoubtedly traders that do all sorts of things. But that doesn't impact the price. And the reason it doesn't is because we have institutional investors and arbitrageurs -- excuse me -- who ensure that the market price is tethered to value-relevant information. And so the actions of individual traders that are a small section of the market generally don't matter.

And so in an efficient market, I never believe that every investor is this super-intelligent person that just floats with the market. All sorts of investors exist in the real world in efficient markets.

What the point of my paragraph 28 in my opinion is, in a world, which is what I believe is the case for these two weeks for these nine stocks, the markets were no longer tethered to value-relevant information.

That's a very special world. It's the normal one, but it's the one that I truly believe existed at that time for this set of stocks. That's where it does matter.

And the reason is because for those three investors that you talked about, I can imagine them having different reactions to what happened after, for example, costs went up a thousand percent in a week.

One of them may decide that that's a trend and

will buy; another may believe that it's overvalued and would sell. That is because they no longer -- these investors now matter because the arbitrageurs aren't making sure that the price is connected to value-relevant information.

So your question is relevant to me only in the notion of a market that's inefficient. And my point is, basically from your question is that I would care about the distinction between those three investors only in an -- in, I-N, an efficient market.

Q. You've used the term "noise trader" in your report in paragraph 109 in your opening report. Could you define the term "noise trader"?

A. Sure.

I'll just be quick. I'm just going to go to that paragraph, and then I have an answer for you. Can you tell me the page on the PDF for that?

Q. Oh, wow. It may take me a second to figure it out. Paragraph 109.

A. I think I found it. So it looks like it says 56. My eyes are bad. But it looks like it. 54.

MR. RYAN: This is in your opening or your rebuttal report, Steve?

THE WITNESS: Opening.

Q. BY MR. ROSEN: So that's paragraph -- it's page

51 of your opening report; right?

A. 54.

MR. ROSEN: Yeah, 54 of the PDF.

THE WITNESS: Yes. We're on the same wavelength here.

So I do remember -- your question was asking me what a noise trader is?

Q. BY MR. ROSEN: Yes.

A. Sure.

So a noise trader, there is an academic literature that calls some investors noise traders. And I'm referring to that, not some sort of real-world connotation. And in this literature, a noise trader is an investor who trades on what we would call -- makes decisions based on non-value-related information.

So it's generally undefined, but it could be something idiosyncratic, like a need for liquidity. Like they get divorced or they're fired or something like that, that causes them to trade.

But in general, it's something that motivates a noise trader to trade is not related to the value -- the underlying value of the company. So that's what "noise trader" is.

Generally, in that older literature -- so this is a 1990 paper, and most of that noise trader

literature, noise traders, information that causes them to trade is what we call sort of idiosyncratic, meaning that it's not correlated across investors so that if you and I were noise traders, you may have an unexpected shock that makes you want to buy a week ago, but that's not correlated with mine. Mine might have an unexpected shock to sell two weeks from now.

But in both of our cases as noise traders, it's something unrelated to fundamentals or things that drive the earnings of stocks. So that's what a noise trader is.

Q. Well, what about somebody, an investor who goes to the supermarket, and he buys some Naked juice, and he really likes the taste and says, "Wow, what a great product, I'm going to buy this stock," based on his belief that it's a nice product, that he likes the juice.

Would that be a noise trader trade?

A. I think -- so it depends, but I would say yes. And keep in mind this is, you know, similar to questions you've asked me earlier, I don't doubt there are investors like this all over the place.

The question is in an efficient market, this doesn't matter. It doesn't affect the stock price. As you can imagine intuitively, that investor that you just mentioned is not going to dissuade Warren Buffet from

taking advantage of a mispricing. But in this literature, they combine noise traders with frictions.

So this literature is based on the type of person that you had mentioned before, if there is enough of them, and there's frictions that prevent Warren Buffet and arbitrageurs from being able to take advantage of arbitrage opportunities, then you have impacts on prices.

So it's combination of significant noise trader activity with frictions. Frictions that I talk about in my report on lending fees and high short interest, those are the things in the literature that can impact prices.

Q. Now are all retail investors noise traders?

A. I don't believe so.

Q. Do you have any sense of what percentage of retail investors are noise traders?

A. I don't.

Q. Are the investors who were on Reddit or Wall Street Bets, B-E-T-S, Wall Street Bets, were they noise traders?

A. So I haven't come to that opinion. My understanding is there are many individuals chatting about these kinds of stocks, and they're all types, and some may be what you consider a noise trader and some may be considered what you wouldn't believe is a noise trader.

Q. Is it true that a noise trader is price insensitive or insensitive to the price of the stock?

A. I don't believe that's necessarily the case.

Q. Is it fair to say that the vast majority of Robinhood's customers are retail traders, small guys?

A. I'm sorry, you said Robinhood in your question.

Q. Yes. Yes.

A. That's my understanding.

Q. Now you also discuss in your report institutional investors. Could you give some examples of institutional investors?

A. Sure.

Hedge funds, active mutual funds, passive mutual funds, but I'm more thinking about active mutual funds. Some of the portfolio managers for pension funds and the like. Investors who are making active decisions with lots of resources and capital and well-informed traders and the like.

So those would be examples. Generally, I'm anything about hedge funds and professional investors.

Q. Are arbitrageurs also institutional investors?

A. My understanding is yes, usually.

Q. And are they a subset of institutional investors?

A. It's a term of art, but I would say yes.

Q. And how would you describe their role as a subset of the institutional investor base?

A. Sure.

An arbitrageur is generally focused on deviations of values from values tethered to value-related information. So they're looking for price deviations based on nonfundamental information. So I mean, the classic example would be that if there was a general -- this is a hypothetical -- a general agreement that arbitrageurs believe that the stock price's value should be a hundred dollars.

And then for some idiosyncratic reason, the price falls to 90. And idiosyncratic meaning had nothing to do with the underlying firms -- the underlying firm. So they would see that $10 sitting there, and they would buy it up because they know it's going to go back to ten at some point.

So they're essentially looking around the market, scouring the market for pricing deviations that are not based on rational value-relevant information. And they make their decisions based on that, either buying it or selling it to take advantage of that.

Now arbitrageurs don't necessarily always make the money that very instant, but they have confidence that in the fullness of time, they will make that money.

Q. Are they always right?
A. They are not.
Q. Could two different arbitrageurs disagree fundamentally on the value of a particular security?
A. So, yes, that's true. The question is how obvious an arbitrage is. So if an arbitrage was very subtle, then I think that would fit the nature of your question. But if an arbitrage is a very obvious one, so a classic example would be you have gold traded in New York and London, the same gold, and it trades at different prices. Subject to transaction costs, that's an obvious arbitrage, and they would not disagree on that. That's the cleanest example.

As we go away from that, they become less obvious arbitrages. So I would never use the argument of this $100 versus $90, avoid it very quickly for the case of a very subtle arbitrage. That's not my belief.

But for very obvious arbitrages, where prices deviate from rational values for no obvious reason other than some sort of idiosyncratic event, those are obvious arbitrages that don't last very long in an efficient market.

Q. Can institutions be noise traders?
A. They can. Generally, there's a belief that noise traders don't last very long in some sort of

Darwinian sense in the investment world. It's a very competitive world. And people can succeed or fail based on luck in the short run.

But there's a general belief that financial markets are very competitive. And if you are trading based on whims and irrational thoughts, generally you're not going to last in the long run.

And that's what most people believe. It doesn't mean that you can't be successful in the short run. It's just we don't think that's sustainable.

Q. Do noise traders' actions or trades offset each other in the market?

A. So the noise traders that you're asking about, as I said, comes from an academic literature, and the answer is it depends on the model. So broadly speaking, that the earlier models of noise traders, like the 1990 one that I cite in paragraph 109, those I would say could offset because they're uncorrelated. Depends on how many there are and their fraction of the market.

There are more modern models, like a paper I cited from Lasse Pedersen from around 2022, where they assume something more akin to what I would call coordinated what I would call noise traders. So investors who trade on sort of non-value-related information. But en masse, together, sort of what the

press and analysts thought was happening with the meme stocks.

That would be non-offsetting noise trader behavior, which is a relatively new phenomenon that they can coordinate this way through social media. So it's a new area. In that case, the answer to your question would be no. These kinds of noise traders may not offset it. They may reinforce each other.

Q. Paragraph 110 uses the term "destabilizing speculation of noise traders."

Is it your opinion that retail traders or noise traders destabilize the market?

A. So no, not necessarily. And to sort of re-say something I said earlier is that in a normal functioning what I would call as an economist efficient market, noise traders don't matter.

So as I said, you can name a stock, and I could analyze it and say, "As of today, I believe it trades in an efficient market."

And then you ask me, "Do you think there are people doing your scenario about Naked Juice?"

And I'd say yes.

You'd say, "Are there people trading on looking at moving averages?"

Yes.

Does it matter?

No.

Because in a normal functioning efficient market, if any of that affected the stock price, arbitrageurs would swoop in and correct those prices.

So in this research literature that I'm talking about, they are looking at markets that have some sort of friction that prevents them from being efficient markets.

And just to be clear, what paragraph 110 is laying out is -- I find as an academic very interesting, is that there's this -- a movement in the literature to talk about traditional noise traders that you characterized pretty well about sort of what I would call uncorrelated to this modern literature where they are correlated. And I think the big word here is "coordination."

So in traditional noise traders, these sort of idiosyncratic, hard-to-explain, random movement of retail investors are essentially one off and idiosyncratic. But in this modern world, if they can coordinate. And coordination are not really simple in the real world. It's hard for you and I to coordinate. But if we have social media, there is the potential coordination.

And that's what the Lasse Pedersen paper is getting at, and people believe -- some people believe in

the case at hand that these investors basing their trades on idiosyncratic information are now working together and trading similarly. That can move prices much more than if it was idiosyncratic.

Q. Some of the literature -- and I don't know if your report mentions this -- they use the term "stubborn investors" in this context of noise traders.

And is it your opinion that stubborn investors are irrational?

A. So that phrase does come out of, I believe, this 2022 paper from Lasse Pedersen. He was a student of mine like 25 years ago.

So he uses that phrase. If you're asking me about stubborn investors, that's a -- that's a theoretical model there. Stubborn investors are ones who have what we call priors. These are sort of initial beliefs that only change those beliefs under lots of pressure, lots of new information.

Now in the real world, there are investors whose opinions are more difficult to change. I would never unilaterally call them rational or irrational. It really depends on the circumstances.

Q. So in paragraph 112, sums up, it says, "Academic studies have documented that constraints on arbitrageurs imposed by 'noisy' retail traders can inhibit competitive

trading activity among investors and lead to departures from market efficiency for a temporary period."

Is it your opinion that that is what happened here in the -- in this case for these nine stocks?

A. So I haven't formed that opinion. Let me be clear. My opinion on these nine stocks or one of my opinions is that they did not trade in efficient markets during this two-week period that I laid out in my report. One week prior to the class period and the class period itself.

What I'm -- and so that's my opinion. What I'm saying here is that while I generally believe that efficient markets are normal and typical, there are periods where they're not. And what I'm summarizing in this section of my report is there is academic literature on this that says, well, how could you have arbitrageurs who are trying hard to make money and still not have efficient markets?

And as I said earlier, you mentioned some what I would call sort of noise investor traders, and my response was in an efficient market, it doesn't matter.

And so this literature asks and answers a very interesting question. It says you have these noisy traders, and you have arbitrageurs, and normally the noise traders don't affect it.

And what this literature does is isolate what frictions can exist in theory but also in practice on these institutional investors that can at least temporarily prevent them from what I would call policing the market and restoring equilibrium.

And the examples are, for example, if these noise traders, for example, are -- become a larger or more importantly coordinated segment of the market. If they're coordinated and could potentially have a price impact that's lasting, then it induces a lot of risk on investors.

And so, for example, if temporarily through coordination retail investors are noise traders -- not all retail investors are noise traders -- could proper up the price temporarily, and you're an arbitrageur who wants to correct that for your own profit motives by shorting it, in a normal efficient market, the price would go back down and all would be done.

But now suppose that there were frictions. And this is not true in every market, but in a particular market a friction could be suppose the lending fees are relatively high on these stocks. Suppose the amount of short selling at the time was relatively high. Suppose that through coordination there is a risk that while the price may fall in the future, in the short run, it may

continue to rise and these arbitrageurs may hit margin calls.

All of these sort of frictions that I'm talking about are ones that could prevent these arbitrageurs from returning the market quickly to an efficient market.

So just to summarize, my point here is that there's an academic literature that address this very interesting conundrum. You have noise traders that can temporarily change the stock price from their efficient values and arbitrageurs, who we normally think in efficient markets will police this market and return them quickly to efficient.

Why -- how is it possible that they may not in all cases? And the answer is friction. And those were examples of the frictions I'm talking about.

Q. Now you said the noise traders could temporarily change the price of the stocks. How lasting an effect could noise traders have on the stock price?

A. So as an empirical matter, in the most case, it's very short. And so my answer is very related to my previous one, is that if there aren't large frictions that prevent these arbitrageurs from making like easy money, it won't last long.

So just to preface this, keep in mind that I'm not someone who is so looking for perfection in the

efficient markets that says there is never an impact of noise traders in an efficient market on the price. I believe that to the extent they do exist, it's unusual and they're fleeting.

And so the idea is that these investors can influence the price, but without friction it doesn't last for very long. And, you know, empirically, it would be a matter of an hour or less. It would be very quick.

Because it -- keep in mind like all of this is not because these arbitrageurs are trying to save the world or trying to save the integrity of the markets. Maybe they like that. I am just basing it on competition and people trying to make easy money when they can.

Q. Well, you said the effect, the noise trader effect is an hour or less. But what about in the case of this Robinhood thing, where stock prices were going up throughout January, and I believe your report said there was coordinated trading for some period of time. I mean, I think it was at least a week.

How long did you say there was coordinated trading going on?

A. So I don't opine on that. I certainly cite other sources. So, for example, the Franklin Allen paper has some tables that look at the amount of, for example, Reddit and social media conversations about these meme

stocks, and they were, to my understanding growing rapidly around one week prior to the class period. There is discussion in the literature that there was some of this even before that, but it seemed to heat up about one week, around the 21st, I guess, of January 2021.

Q. So from January 1st until 27th or -8th is maybe six days, maybe, I don't know, four, five, six trading days. So those noise traders, if you will -- I mean, if it's true that those noise traders are what caused the stock price to go up, the effect lasted at least a week; right?

A. So let me put it in my own words and, of course, you can reask the question if I -- if you have more questions.

So number one is you may have said January 1st, but you probably said January 21st.

Q. I meant January 21st.

A. Yeah. And I don't mean that to pick on you. Like my hearing of you is like 90 percent. I don't think there's anything we can do about it, and so I will always ask that just to be sure.

So it is my opinion during that, I believe, five trading days, in my opinion, these stocks were not efficient, and I don't opine on why that's the case. But to the extent that others, including academics, opine

that at least part of this was due to coordinated trading, we have something that is unusual.

So as I said earlier, in an efficient market, even I believe that prices can deviate from efficiency for a short period of time, but normally it's not very long lasting, and I said like an hour.

And this is very different here, and it is unusual to have markets become inefficient or what I would say, obviously inefficient, for relatively long period of time, like two weeks in this case.

That's why academics are writing papers on this and that's why analysts were talking about this. It is unusual, and it's also related to the questions you were asking previously about the academic literature.

There is an analogy here between what we normally think about retail investors and their trading being essentially uncorrelated across them, and having an impact, but not necessarily a lasting impact.

In a world where retail investors can coordinate -- and by the way, this would be true for institutional investors coordinating, too. But when investors can coordinate, it seems to be the case, obviously, that these price impacts could be more sustained.

It's sort of a new world we're in; right? So

normally, like I said, it's hard to coordinate across people. Because we have all different motives and incentives and there's lags between how we talk about things. But if there's a modern means that investors can coordinate, then this is a new world here, and it's possible in that new world where retail investors can coordinate, it seems quite possible that these can last longer than traditionally they have.

Q. Did you say you don't have an opinion as to what caused the prices of the nine affected stocks to increase during that period of time in January?

A. Yes. To be clear, I do have an opinion during that week that I believe you're referring to, the week prior to the class period, that the prices of those nine stocks were not trading in -- those stocks were not trading in efficient markets.

And then I point out what other commentators, like academics, stock analysts, and the media posit was causal, and I mention that.

But I have not come to an opinion which one or what combination of things such as short squeezes, attempted short squeezes, or retail coordinated trading caused it. I don't have an opinion on that. I'm just pointing out that to put it in context, this is what other people are saying.

Q. Now comes the fun part.

Do you believe that markets are efficient?

MR. RYAN: Objection to form.

THE WITNESS: That's quite hard to answer because you didn't say markets, you didn't say -- that's quite vague. I'm happy to answer that question, but do I think all markets are efficient at all moments in time?

Q. BY MR. ROSEN: Fair enough.

Do you think stocks traded on the New York Stock Exchange and the NASDAQ are generally efficient?

A. So yes, I think most of the time stocks that are traded on organized exchanges meet the sort of standard weak form notion of market efficiency. Yes, that's the normal case.

Obviously, I don't believe it's always true, but that's my general presumption before I start investigating the facts of it. But yes, generally I do believe markets are efficient for most traded stock.

Q. So you're adhering to the efficient market hypothesis?

A. So I believe the efficient market hypothesis is most of the time empirically true, and I am very careful when I -- when I teach my students that this is not religion where you believe "yes" or "no." It's a range. And I put myself in the category that markets are close

to the line of efficiency than they are close to the line of what we normally think of inefficient markets.

And in particular for most traded securities, because as I said earlier that there are arbitrageurs out there who are in it for themselves to make money, they are the enforcement mechanism to make markets typically efficient.

Q. So you've read -- I don't know -- many if not all of Professor Fama's papers on the subject; is that correct?

A. You know, he's an outlier. He's written so many papers, I don't know if I could even say most of. But I have certainly read most of his famous papers, and I have met him on many occasions.

Q. Is there anything specific about his definition of the efficient market hypothesis that you disagree with?

A. No. That being said, he's -- in his papers and speeches has come up with different versions of it, and it depends on the context. But I can't recall -- I mean, I'm pretty sure I cite him in my report. I believe Dr. Werner probably cites him in his report. In general, he's quite an authority on the theory of efficient markets.

Q. So in paragraph 13 of your opening report --

A. Did you say -- did you say my original report?
Q. Yeah, opening. I said opening report.
A. Got it. I just missed that word. Okay.
Q. So that would be page 8 of the PDF, page 5 of the report, paragraph 13, you cite -- I think it's footnote 21, this Fama article from 1970 on efficient capital markets.

And you say, "Widely accepted definition of efficient market is one in which prices always fully reflect available information." And you took that from the 1970 Fama article listed there in footnote 21.

A. Yeah. This is his sort of famous original paper on market efficiency. He has sort of a synopsis and a summary of more recent evidence in like a 1991 paper. But yes, this is the classic original Fama market efficiency academic article.
Q. Next sentence says, "In an efficient market prices should rapidly and fully adjust to incorporate new value-relevant information."

Now you don't cite any authority for that sentence, and it differs from the prior sentence only in the sense that it uses the term "value relevant" rather than simply "available information."

Where do you draw the modifier value relevant from for that sentence?

A. Sure.

I draw this from a large academic literature when they get more specific about what they mean by "available information." And they're talking about things that are related to the value of the firm itself.

I believe Dr. Werner in his opening report also mentions quotes that talk about things like earnings, companies, things like that, just so that the reader of this report understands that when I say "fully reflect available information," I'm not talking about prices reflecting sun spot activity. I'm not talking about stock price of IBM reflecting the temperature in Alaska. I'm talking about the stock prices of IBM reflecting market public information about IBM itself. Things that are value relevant.

So people who talk about efficient markets, when they talk about information, they're referring to information that's relevant to the valuing the present value of future cash flows of the stock.

Q. Is that -- if -- if the price has to or should, I should say, if the price should incorporate all value-relevant information, would that also mean that the stock price is fundamentally efficient?

A. So that's -- fundamentally efficient, there's nothing silly about that expression, but it's -- it's not

a normal definition of market efficiency. So what I mean is in typical finance textbooks, academic articles, and I guess I would say I've been at Stanford long enough I've probably been in thousands of finance seminars over the years now. When we talk about market efficiency, we say "market efficiency," and we don't break it down by fundamental and something nonfundamental.

To the extent somebody -- if I saw an article in a legitimate academic journal or in a seminar from a -- from a relatively famous finance professor, and they said "fundamental market efficiency," I would assume they're talking about market efficiency just like my definition you just mentioned, the Fama definition.

Q. Right. So would that -- well, if you're saying that the efficient market hypothesis assumes all value-relevant information, meaning all -- all information that could affect stock -- all cash flows related to the stock in the future, that's -- I mean, if you're looking at the net present value of future cash flows, that's essentially a fundamental value; right?

A. I think that's fair to say. So I'm not going to make a big deal about what fundamental value means. It's essentially the present value, the expected present value of future cash flows.

It's in the nature of bringing fundamental into

efficiency. That was what I was talking about is that it's not a normal term that academics use and they say, "Let's have a discussion about fundamental market efficiency." They just don't say that.

They'll say market efficiency. And it implies what I'm saying here is market efficiency in the academic or financial literature means what I say it means. It means that the prices reflect they will change fully, quickly to new value-relevant information.

I just think that's ubiquitous. And I'm just being very careful about that. But I don't think there's a sort of a common academic vernacular that would call that fundamental efficiency. We just mean market efficiency.

MR. ROSEN: I'm going to show you -- I'm going to introduce as an exhibit, if I can figure out how to do this, an article from -- I think it's 1991.

This is going to be Exhibit 178. It is -- it is an article by Professor Fama. In a moment, you should be able to see it.

(Exhibit 178, Efficient Capital Markets: II, by Eugene F. Fama, was marked for identification by counsel electronically.)

Q. BY MR. ROSEN: I think you cited it in one of your -- probably in your rebuttal report. Take a look at

it and tell me if you've read it before and you're familiar with it.

A. I'm still in the process of downloading it.

Okay. So I have it downloaded. I'm sorry, when I download it, it takes up all my concentration. You referred me somewhere in the article or you asked me --

Q. Oh, start with the first page. I'm not going to delve too deep into it.

A. Okay. Do you mind if I look at the first page for a second?

Q. Yeah, look at the first couple of pages.

A. All right.

Q. Actually, look at whatever you feel you need to.

A. Yes.

Okay.

Q. All right. So in this paper -- this is from doctor -- Professor Eugene Fama, and he sort of updates his views on research and market efficiencies.

Is that a fair --

A. Yeah.

Q. -- view? Okay.

So it starts out, the second paragraph, he says, "I take the market efficiency hypothesis to be the simple statement that securities prices fully reflect all available information." Right?

He doesn't -- well, okay. So earlier you said economists in the know don't modify it with fundamental value or fundamental -- okay. Fair enough.

And then he says, "A weaker and economically more sensible version of the efficiency hypothesis says that prices reflect information to the point where the marginal benefits of acting on information (the profits to be made) do not exceed the marginal costs."

Is that statement true? I mean, is that his updated view, that second sentence I just read?

A. Yes. And I -- so I think this is a great -- great statement. It's very -- from an academic standpoint and also connected to the stuff we spoke about earlier, it's really a great framing of this here, is that -- let me first put this in context. Because he cites this paper by Grossman and Stiglitz, two very famous economists. And they initially point out a conundrum or puzzle. If you believe that stock prices are absolutely perfectly on value, then why would there anybody doing any what we would call fundamental research to create the value.

If everybody just stared at the stock price and said it was correct, then nobody would be doing any research. So it unwinds; right? So we all agree with that one.

So what Grossman and Stiglitz were saying in a sort of a very mathematical way, but a very common sense way, obviously there has to be some incentive out there for investors -- some investors to be doing fundamental research to create the efficiency in the first place.

And so we agree that there has to be some benefits of being a professional investor or else none of us would be.

That being said, we also believed -- to put this in context -- there's a lot of competition out there. So that yes, professional investors have to have some ability to make money. If it was too much and there's free entry into this industry, it would push that down.

So we believe that markets are not what we would call absolutely perfectly efficient at every point in time or else there would be no incentive to be an arbitrageur. So he's putting that out there.

And then when he says here about the marginal benefit and the marginal cost of being what I would call being a professional investors, that's what I was getting at earlier, is that we generally believe that -- that the marginal benefits, the sort of arbitrage opportunities out there, they can't be trivial to trigger arbitrageurs to enter and fix the price. But to the extent that it's greater than the transaction cost, they will do so. I

think that's sort of noncontroversial.

And like a big point that the academic literature is making to explain why you might see these sort of deviations like in the case at hand is if those marginal costs are high.

So it just as an intuitive matter is that we might believe that there are these arbitraged opportunities out there, and we say why aren't arbitrageurs fixing this?

And the answer that Fama is getting at here is that if for some reason their marginal costs are high. And that's why I go through the list. What could possibly be a marginal cost that would be high at a point in time for an institutional investor? And that would be examples that we cite in this case.

If there is coordinated retail trading activity that props up the price making short selling very risky. If it's lending fees. Anything that's sort of a marginal cost increase, that's what he's getting at there.

And he's saying -- I believe Fama is saying in most markets these aren't that big a deal, but don't call me, you know, taking this too strongly. There's always going to be, you know, a little bit of deviation from market values and true values, and it's driven by this marginal cost. And I agree with that.

I'm just saying in the case at hand, these marginal costs may be very high.

Q. The other -- so I guess to shortcut this, in this paper he admits that -- or acknowledges that there has been research by others in the field that shows that stock prices, future stock returns are predictable from past returns; is that right?

A. So I don't recall -- so academics call these anomalies, which is -- I'm not saying that's like the greatest term, but I forget -- I can glance through this paper -- if he lists some of these anomalies. But this is back, you know, over 20 years ago, and the list of anomalies has changed.

But there is a belief that there are some sort of observable variables that may predict future returns more than just by chance, and he may be listing those, yes.

Q. Yeah. I think on page -- well, it's page 3 of the document, page 1577 and 78, 79, he goes into some of the studies? French and Roll and --

A. Yes.

Q. How there's -- you call them anomalies, but there are, I guess, positive auto-correlation and other instances where you can predict future returns from past returns.

So but that doesn't necessarily change his view on the efficiency of markets; is that right?

A. So that's true. And I just wanted to say briefly about these what I call anomalies, but like the example he gives is the January effect, which I haven't looked at it in years. And the reason why I'll give you in a second is the reason is if you buy stocks almost at random, at the end of the calendar year and then sell them at the beginning of the year, you make abnormal returns.

It was a sort of belief about investors taking advantage of tax losses. Like there's nothing unusual about these stocks, but they sell at the end of the year because if they have losses, they want to realize them by the end of the tax year, and then they buy them back.

So there was this January effect. That was a typical story. There was other things like that. There was a day-of-the-week effect. I forget if Monday was the best day. These things basically aren't around, anymore.

So I think Fama was well aware of the fact that there are these what I call anomalies, but empirical studies that demonstrate some of these effects, but I'm sure he's aware that these things probably, if they are true, go away, and they do.

And I find it -- because I've been in finance

long enough now that I actually find it mildly amusing how anomalies or predictabilities that were very famous when I became a professor are gone.

So for the longest time, there was this value effect. Like AQR made its fortune on this, is that there was belief that low PE stocks would outperform. And to some extent, they did for decades, and then over the last few decades, it's been the exact opposite.

And so I think Fama's aware, and I'm sure he's certainly aware today, that whatever is the nominally at one point in time seems to go away and new anomalies emerge, which makes people like me think that these kinds of obvious anomalies are really just what we might may call data mining.

If you look -- if I gave you thousands of months of data on thousands of stocks in the past and asked you to find some weird stuff, not in any silly sense. I'm just saying find stuff that sort of repeats itself, you would find it.

And you could run almost any statistical test on it, and you'd say, wow, this seems real. And the ultimate test, of course, is does it actually work ten years from now.

And for most of the part of things that he talks about here, they don't last.

Q. But you said AQR made some money for a while; isn't that right?

A. They did. They made a lot of money. And I think they're doing really well now again. But there was a period of time, if you read the press reports on them, is, wow, these guys are -- everything they're doing is wrong. Because the quintessential non-value stock would be something like Facebook and Google. And that's where most of the returns in the last two decades have been in those two stocks. So it makes that value approach not look so good, even though the value approach for many decades earlier did look good.

So my point is I'm not saying anything good about or bad about any of these anomalies. It's just that I think Fama realizes that -- then and now, that you can always find some trading strategy that worked in the past, but that doesn't necessarily prove that markets are inefficient.

Q. Now you cite a book by Andrei Shleifer. Is that -- am I pronouncing his name right?

A. Yes, exactly.

MR. ROSEN: And I'm going to introduce this book for the record.

(Exhibit 179, Inefficient Markets, by Andrei Shleifer, was marked for identification by

counsel electronically.)

MR. ROSEN: It's Exhibit 179 now. It's going to take a moment to download.

THE WITNESS: Okay. I have it on my screen.

Q. BY MR. ROSEN: Before I ask you questions about, is it Professor Shleifer? I don't know.

A. Yeah, he's a very famous Harvard economics professor.

Q. Before I ask you questions about Professor Shleifer, I just remembered there's a couple questions I wanted to ask you generally --

A. Okay.

Q. -- about the market.

So who or what is the best arbiter of a stock's fundamental value?

A. So you asked me this earlier in some sense. In an efficient market, the price. In a market that's not efficient, that's very hard to answer. We all are going to have different opinions. Even sophisticated investors will have different opinions.

Q. Have you ever heard of the term "price discovery"?

A. Yes.

Q. What does that mean?

A. So it really is contextually dependent, but it's

a process of obtaining inferred prices from observing prices. So let me give you an example.

So an example would be if I am trying to figure out -- this is not quite a price, but it's very similar -- if I want to figure out what the market thinks the volatility of Apple stock's going to be over the next month. Okay? A very useful way of doing that is to be observing options trading on Apple. And since there is very good empirical support that the value of options is related to a formula called Black-Scholes, you essentially reverse engineer it.

It's actually a simple concept, but it's -- it's amazingly -- it's amazing that we actually can do that. So you can look at the stock market -- sorry -- the option price on Apple and from that trading price, back out what the market is inferring Apple's volatility is over the future.

So that's an example of what we call -- even though it's not a market price, it's a price discovery. It's essentially using market prices to learn what's in the market's mind.

So obviously, in the most rudimentary application of this, in an efficient market -- it's almost definitional -- the -- you can infer the value of Apple stock from observing its market price because

that's -- the market price is the best forecast of its true price. Or another way of saying it it's the best forecast of its price in the next few moments.

Q. Now I put that book in front of you, the Professor Shleifer's book, because in part you cited it in paragraph 64 of your opening report. And --

A. I also -- since my page is there, on page 5 I cite it there, too, but that's fine.

Q. Oh, yeah. And in paragraph 64, somewhere in there you say you -- ah, yes, it's towards the bottom of page 29 of the PDF. It says, "As summarized in a prominent finance textbook examining potential deviations from efficiency in financial markets, 'Since the securities price must be equal to its value, prices should not move without any news about the value of the security. That is, prices should not react to changes in demand or supply of the security that are not accompanied by news about its fundamental value.'"

So that comes from Professor Shleifer's book?

A. Correct.

Q. Okay. Now does -- now that -- and that's also an inference from work on the -- you know, surrounding the efficient market hypothesis. That's not actually part of the efficient market hypothesis, is it?

MR. RYAN: Objection to form.

THE WITNESS: So it really -- so we're -- obviously I'm talking about the academic context of efficient market hypothesis. It -- so the efficient market hypothesis, as you've probably seen, is described in more than one way. I have citations in my report. Dr. Werner has citations in his report. They're all very similar.

I would say this is more of an implication of the efficient market hypothesis typically as opposed to a definition. So I would not have necessarily disagreement if this was part of the definition of an efficient market, that it doesn't move based on -- it doesn't move significantly in the face of non-value-relevant information.

Q. BY MR. ROSEN: But for example, let's say, I -- I could identify a hundred days during a year when General Motors' stock moved statistically significantly without there being value-relevant news.

Would you say that means General Motors stock is not traded in an efficient market?

A. So let me -- because you gave me a hypothetical. I'm not picking on you. But that's -- if it's -- if it -- if a stock moved significantly a hundred days, that's almost half of the trading days of the year.

So I would be shocked if half of the trading --

every other day a stock moved by a statistically significant amount. Because in the fullness of time, statistical significance means that it should happen one out of 20 times.

So just on the face of it, if you told me a stock had statistically significant moves on half of the trading days, I would ask, one, is there something wrong with your model, and two, I think there is something fishy going on here.

Q. Okay.

A. Again, I'm not picking on you, but it --

Q. I'll give you a better -- you make a fair point, and I miss -- I misspoke. I didn't frame my question properly.

So suppose there are trading days when the stock price moves a statistically significant amount, but only half of them are associated with value-relevant news. So 50 percent of the time is moving in response to value-relevant news, and half the time, it's not.

Does that mean the market for the stock is inefficient?

MR. RYAN: Objection to the hypothetical.

THE WITNESS: So let me -- let me try to put it this way. There is no what we would call sort of bright-line rule that tells you exactly the fraction of

days where the stock moves by a statistically significant amount that should be accompanied by value-relevant information. Obviously, it should typically be the case.

To answer that question, one has to also apply common economic sense. And so I would never say, for example, that if a stock moved by on a day a statistically significant amount, and I could not discern on that one day value-relevant information, then I would say I can tell you in my opinion I'm confident that it doesn't trade in an efficient market.

However, I certainly don't do that in this case. And just, you know, not to belabor the point what I'm looking at in this case is I'm not going to rely on that bright-line rule. I'm looking at nine stocks that have not just unusual -- let's just do the week before the class period -- not just unusual increases, but historic increases.

Like it's fair to say I'll show you numbers that they're like one out of a million movements. The highest movement of any stock that day. The highest movement in any -- their whole trading history.

And so I'm not talking about a 5 percent statistical significance. I'm talking about stocks that move up 800 percent in a week, 100 percent in a day. In the absence of value-relevant information, for that one

day, I can say the stock on that day doesn't trade in efficient markets. And when they're correlated across stocks over a period of a week, I can say that more strongly.

So it really depend on the context. And this is a case where we see something that's -- I don't know what to say. It's so unusual. I'm not faced with cases very much where a stock like Koss goes up by a thousand percent in a week. I'm not faced with cases where something like GameStop goes something -- I'm sorry -- like 700 percent in a week.

And so I'm not such a stickler on efficient markets that I say, oh, on one day GameStop didn't have value -- potential value-relevant information and it went up; therefore, it's not efficient. I would never do that.

What I'm saying is when I look at all the facts together here, and I'm conveying that to GameStop moving up 700 percent in a week, and I'm looking at the information that was conveyed to the market on those days, and I don't see anything even marginally close to being a value-relevant explanation for that.

I'm trying really hard to find it. If I found some information that said, GameStop -- you know, we now expect its earnings to go up by 50 -- 50 times in the

next five years, that would help me. But I'm not finding anything like that. And that's why I can be so confident in my opinion that these stocks are not trading in an efficient market during this period of time.

Q. BY MR. ROSEN: So I introduced an Exhibit Number 117 previously, and I'd like to -- I don't know how to show it to you without having to remark it.

A. Can I ask you -- I deleted -- I didn't keep one of them up. But can you tell me which one it is, which article?

Q. This is a Richard Roll article from The Journal of Finance from 1987 which I had introduced in Professor Fischel's deposition. And I wonder if I could --

MR. RYAN: What we can do, I think, Larry, is we can go back to the different folder, which is the Daniel Fischel deposition folder.

MR. ROSEN: Yeah, that's where I am. I'm reviewing to figure out.

MR. RYAN: And then it says Marked Exhibits, and then we can go to 117. So I'm pulling up the --

THE WITNESS: I do have the article in front of me if --

MR. RYAN: Yeah, I'm just pulling it up.

MR. ROSEN: I just didn't know how to put it up -- put it up on Professor Grenadier's screen.

THE WITNESS: I'm good.

Q. BY MR. ROSEN: Anyway, I assume you've seen this article by Richard Roll in The Journal of Finance, 1987, which is Exhibit 117?

A. I do remember seeing this as a grad student. It's like the orange juice paper. Very interesting.

Q. Among other things.

So I find this article interesting because I think -- I think his finding is that only like maybe -- so there's -- I think it starts with the premises there are three things that could affect, you know, cause and effect and impact stock price. One is market factors, the other is an industry factor, and the third is idiosyncratic firm-specific factor.

Am I getting that right?

A. So I don't recall that. Let me just say that that -- factorization is not just implicit, but explicit when I do what I call a regression study. I have a -- I decompose a return of a stock into market movements, industry movement, and what I would call firm-specific movement, and what you said is consistent with that. That's sort of a way of conceptualizing information.

Q. Okay. All right.

Now you may need a few minutes to answer this question, but do you disagree with the proposition that

Professor Roll found that only about 30 percent of statistically significant stock price movements were caused by these -- by one of these three factors?

MR. RYAN: Objection to form.

THE WITNESS: So I don't recall if he uses the word "cause." If he did -- that's -- I have like --

Q. BY MR. ROSEN: Shall we say "associated with"?

A. I have -- so Richard Roll, I have a lot of respect for. He's written some very famous papers. He actually was a real rocket scientist. He actually worked on rockets. And so hopefully, I didn't use the word "causation."

This is a statistical phenomenon. I don't know exactly how you would -- I don't think I personally in this day and age would translate these sort of fractions as to even implying anything causal. Not that he is.

I'm not -- I don't understand what we learn other than empirical. There's an empirical phenomenon.

Let me put it this way. What we do nowadays is we do decompose stock returns -- and I think these must be futures, but I'm making an analog to stocks -- that they move according to those three factors.

And the third factor, which we call company specific, depending upon the stock, may have a very large what we call standard error. Just think about there's

lots of volatility on that third component.

There's nothing weird about that. And in particular, companies -- and then I'll finish the analogy in a second -- that have -- that are very sort of product or field specific or industry specific and not diversified could have very high idiosyncratic volatility.

So in the old days, GE -- so GE is a very different company now -- GE was basically like a mutual fund. And I would bet because of all their subs that the idiosyncratic component of GE stock was relatively small.

Then if you look at something like an orange juice future, where it's just product specific, it would not surprise me today to see that it has a very large residual standard error.

So I personally am not sure how much you can infer from that other than orange juice stocks, orange juice futures have a lot of company-specific information or product-specific information.

Q. I don't know if this is the orange juice paper, actually.

A. I'm sorry. Excuse me.

Q. I think that may be a different paper. But if I'm not mistaken, I just didn't -- I mean, unless you're stating it better than I did, but I'm pretty sure this is

not the orange juice paper. Let me see. Because I think Shleifer -- Shleifer -- Shleifer, he does talk about that paper, but I don't know if this is the same one.

A. I think you're right so thank you for pointing that out.

Q. And I think this is just dealing with stock returns.

A. So looking at the abstract, he does seem to be talking about what I said earlier, just the residual standard error being relatively high.

Q. Yeah. No, I'm not disagreeing with that. I'm not disagreeing with that. He's looking at stock price returns if you look at the charts.

But I guess what I really want to get -- as we say, get down to brass tacks. I'm not sure what that means. Maybe if you're a carpet installer, you know what it means.

But what -- I mean, your sense, is there some range, in your mind, is there some range of the percentage of statistically significant stock price movements that should be explained by value-relevant information, like between 20 and 80 percent, or I don't know, something, some minimum?

A. So I view this as a similar question you asked earlier, and I don't have a number of that. It's a fair

question, but it doesn't -- I don't have an answer because it really depends on magnitudes. And that's why I was talking about the case at hand.

In another case, if you had, for example, a stock price that went up by 5 percent, and let's suppose that was on one day. And let's suppose that was statistically significant, meaning that on average, that price return or higher only occurs on less than one out of 20 trading days. And then I looked at that day and I could not find any evidence of value-relative information. And maybe that was true for a third of the days.

I don't know. There is no statistical test for that that's in academic journals. So that would be tricky. And that's why I point out, and I know it's not a -- it's just a very obvious point when I approach the case at hand here, is that we're not talking about 5 percent. We're talking about unexplainably rare events. And that's why I have so much confidence here.

If the facts were different in this case, this would be a very hard job to be able to look at these residual statistically significant returns and map them onto the absence of value-relevant information. It becomes an easy job in this case because of the extreme magnitudes of the returns and the extreme lack of

value-relevant information coming out.

So that's why I can do that. Your question is, is there a rule of thumb for this? There isn't. It really depends on the facts at hand.

Q. Now Professor Shleifer wrote this book which I put in front of you as Exhibit -- Exhibit 179. It's titled "Inefficient Markets: An Introduction to Behavioral Finance."

Have you -- did you read the whole book at one point in time?

A. No.

Q. Really? I won't tell him. Don't worry.

A. He was one of my professors when I was a Ph.D. student, too.

Q. I think I read this once. I don't remember it too well.

But so, generally, what is behavioral economics?

A. Sure.

So behavioral economics is a field of study where they look at -- there's a host of them -- sort of what they believe is empirical or laboratory-tested individual behavior categories.

So, for example, individuals have shown a psychological effect of sort of not admitting mistakes sort of kind of different types of biases.

Q. Kahneman, Professor Kahneman would -- has a number of articles on that concept. Is that what you're referring to?

A. Precisely. So there's -- there's two components. One is a list of these sort of behavioral regularities that people like Tversky and Kahneman find and describing them. Like there's just so many classic -- and they're all really fascinating, you know.

And then there is a question about whether those types of observable behavioral biases manifest themselves in markets. And I'm being broadly in markets.

Then in terms of behavioral finance, there's a question of how those behavioral biases, to the extent they exist, manifest themselves in finance.

So, for example, one of the papers I cite -- I'm forgetting -- oh, by Terry Odean, he has a stream of papers on behavioral biases manifesting themselves in trading behavior.

So like one example he does is he looks at -- this is a -- in answer to your question, this is a classic behavioral finance paper -- of he looks at trading activity of men versus women in what is now known as Schwab, Charles Schwab data. And he shows that men trade way more often than women, and after fees have lower returns. And he attributes this to overconfidence.

So that's a classic example of behavioral finance. So that's an area of it.

Now the area of that try to then move that over and try to explain pricing is much more controversial and not as powerful simply because of you and I may be biased and like to buy stocks that start with the letter B, but that doesn't mean we're going to impact prices.

So the literature about behavioral biases is pretty strong and influential in explaining mistakes that people make, like selling their winners and hanging onto their losers. That's a behavioral bias that we observe. That's a mistake. It has tax consequences.

That's different than behavioral literature explaining what happens to stock prices. Not that it doesn't exist. It's just sort of two strands in the literature.

Q. And what is the premise of this particular book, Professor Shleifer Inefficient Markets?

A. It's an overview, a broad overview for the sort of the maybe un -- you know, undergraduate or graduate student in behavioral finance.

Q. And isn't the premise that the efficient market hypothesis is not 100 percent correct all the time; that there are inefficiencies present in the market for many stocks?

MR. RYAN: Objection to form.

THE WITNESS: So I don't -- that was not my reading of it. I think he's exploring those issues. I'm not sure he comes to the conclusion that many stocks are trading in inefficient markets.

But the story of recognizing that market stocks may trade in inefficient markets in some cases is ubiquitous. It's been around -- it was -- I noticed it in the Roll paper you showed me. He called it occasional frenzy. That sounds like inefficient market.

So yes. I just don't know -- you're asking a legitimate question. I don't know if I would characterize Shleifer's book as saying that markets are generally efficient.

Q. BY MR. ROSEN: Well, I didn't say that his -- the premises that the markets are in -- for these stocks are inefficient markets, but there are inefficiencies present in the market at times.

Is that not two different things? Can a market be generally efficient but there be an inefficiency present for -- that doesn't really affect its -- the efficiency of it much but still be present?

MR. RYAN: Objection to form.

THE WITNESS: So we've talked about this earlier. So I never foreclose the possibility that in a

generally efficient market, that there can be temporary instances of prices deviating -- deviating and moving based on non-value-relevant news. But they're very temporary and small.

And the reason I'm saying that is that of course life is complicated and the world's are not perfect according to any paradigm, but it's notion of arbitrageurs seeking easy money that prevents those things in general from being large and significant. That is the general view of most finance professors.

Not that markets are always at every point in time perfectly efficient. There would be a minority of finance professors. But the belief that those things could be large and lasting is very rare.

Again, I wouldn't belabor but be very brief, is that while we might -- it wouldn't shock me for a stock to move for some non-value relevant reason at a point in time. But it would shock me if it was a thousand percent return over a whole week with no new news. That -- that would shock me.

So I don't -- I never want to be accused of being a stickler and saying that markets are very efficient at every trading second.

Q. BY MR. ROSEN: Now is a stock necessarily inefficient or its market inefficient if its price

responds to information that is not necessarily value relevant but price relevant?

MR. RYAN: Objection to form.

THE WITNESS: I'm not sure what you mean by "price relevant."

Q. BY MR. ROSEN: Okay. I'll -- maybe I'm assuming something, and I'll -- I'll start from the beginning, then.

So let's go to say -- let's look at Dr. -- Professor Shleifer's book. Let's look at some of the stuff he talks about, some of his -- some of the papers. He mentions a number of papers. Let's say go to page 17 of his book.

So, for example, in the middle of that page, there's a -- he cites the De Bondt -- I'm not pronouncing that correctly, probably -- and Thaler's 1985 article or study comparing the performance of two groups of companies' extreme losers and extreme winners. And it shows that for quite some period of time, if you, you know, are selecting stocks that had been losers for a while, they'll end up becoming winners and you'll make above average return.

And some -- and conversely, if you sold short a selection -- a winner portfolio, you'd get -- you'd actually also do well because a winner portfolio went

down. So he has that graph, for example.

So that would be an example of an investment strategy that is successful for a period -- long period of time. It doesn't necessarily mean that stock -- those stocks are inefficient, but it's still possible to have a successful -- a successful strategy that's not based on fundamental value; right?

MR. RYAN: Objection to form.

THE WITNESS: So I do remember reading this paper, the De Bondt and Thaler. You pronounced it correctly.

So the -- the basic -- my basic recollection of this, it shows that over I think a three-year period, if you buy the worst-performing stock over the previous three years and short the ones that had the highest returns, you would on net make what you would consider above-average returns.

So that's -- that's interesting. And we would call that -- sometimes we call that mean a version. Earlier you asked about momentum. It's the exact opposite.

This is an old paper. My understanding over time is that not that this phenomenon didn't exist, but we don't normally cite as much anymore for various reasons. One is this effect seems to have gone away. So

it would be in this sort of anomaly that was just data mining. I'm not imputing their motives, but it just doesn't exist.

Also, when you get into three-year returns, and also, a lot of these winners and losers are the most idiosyncratic highest volatility stocks and also the hardest to trade. Because a lot of them make up -- they're sort of like small cap stocks, that this is really not as implementable as they made it sound.

If you take into account the transaction costs and also the standard errors of this, it really is on the borderline of even being statistically significant. Even though the magnitude looks big.

But the longer the horizon for these kinds of -- this sort of pre -- the mean version effect really doesn't really satisfy statistical significance.

So this paper is interesting, and it was very early on in this, but it's not really cited much any more in terms of something that's real.

So I'm not saying there aren't -- what you're talking about here is similar to stuff we talked about earlier when I mentioned weekend effect, January effect, day of the week effect, and this is sort of winners versus losers or meaner version. There's a host of these.

What becomes the one that's predictive now is going to be different than the ones that are predicted in five years.

So I never know what to make of these studies. Most finance professors view them as interesting anecdotes, and in this case, a very well done one, but not something that we would use to prove or disprove the efficient markets we're talking about.

Q. BY MR. ROSEN: Well, is it possible that they don't last that long because once professional traders learn about them, they implement them, and then the competition drives down the returns from them?

A. It is possible. And I would call that a version of what I talked about earlier about arbitrageurs in efficient markets. So it's certainly the case that there is probably -- at this moment in time, there's some exploitable phenomenon that exists that we're not aware of, and if an academic finds it and publishes it and it's new, it's not going to last long.

And question is always are there these unpublished phenomenon, anomalies that exist that we don't know about or traders know about.

I don't know the answer, but I suspect that there's a reason why hedge funds hire people not just finance Ph.D.s, but physics Ph.D.s and computer science

Ph.D.s, that are scouring the world for stuff just like this that's not published.

But your story about these being self-defeating I agree with.

MR. RYAN: So we've been going, Larry, for about an hour and 40 minutes.

MR. ROSEN: Oh, do you guys want to take lunch?

THE REPORTER: Off the record, Counsel?

MR. ROSEN: Okay. Off the record.

(Recess.)

THE REPORTER: Back on the record.

Q. BY MR. ROSEN: Professor Grenadier, can you go back to that Andrew Shleifer article or, I'm sorry, book that I had marked as an exhibit previously.

A. I have it.

Q. I wanted to address one other issue.

So if you go to page 20 of the book, page 29 of the PDF, the first full paragraph in the middle of the page, it begins, "Finally," with the basic proposition that stock prices do not react to non-information.

A. Yeah.

Q. Just take a quick look at that paragraph and I'll ask you about it.

A. Okay.

Q. So Professor Shleifer mentions a few different

events for this proposition that stock prices actually do react to things that are not value-relevant information. And so he has -- he has three -- he mentions three examples.

One is the crash of -- the stock market crash of 1987. I think they call Black Monday, October 19, 1987, where the market drops 22.6 percent, the largest one-day drop in history, without any apparent news.

And so that was one example he gave; right?

MR. RYAN: Objection to form.

Q. BY MR. ROSEN: And then he gives another example, there's, I guess, a paper by Cutler 1991, where he examines the 50 largest one-day stock price movements in the US after World War 2 and found that many of them came on days of no major announcements.

So how -- I mean, that seems to rebut your -- your earlier statement that stock prices did not react to non-information; does it not?

A. I don't believe it does. But let me talk about the cite that I know more about, and that is the 1987 crash.

So at one point -- it's been while -- I used to teach about this to my students. I believe it was a Richard Roll paper that discussed this, and it's a clever paper and comes to a conclusion like this, is that a lot

of people in retrospect viewed that there was some very important information on that day, but it was unusual because it was a -- an issue with market-wide illiquidity.

And what I mean was there was lots of trading on that day, and what we learned is some markets that we thought, like the US market, we thought was able to accomplish very large amount of trades in a short period of time if needed, and they couldn't. It literally is a technical matter, the US market could not keep up with the number of trades.

And that's an important information because it's information about the ability to trade stocks in the US, and that was new information.

There was also new information in that time about I believe in a House Committee in the US Congress was going to do some sort of anti-takeover litigation. That was news. So there was news.

I just think that some people didn't believe that that news was important enough on an international scale, but I think in retrospect, a lot of us believe that something that's going to impact the US market is highly likely to impact other markets.

So if, for example, it was a surprise to the market that you were going to a Court -- curtail

takeovers, in general that's considered a bad thing for markets because most takeovers are value increasing. Not all of them. And if you take away from the economy the ability to do those value-increasing transactions on a long-term basis, that could have large economic ramifications.

So it is not my opinion that the 1987 crash was without value-relevant news. There was a lot of value-relevant news. And I don't believe that there's a strong consensus with that statement there that Professor Shleifer lists. I think a lot of us believe that there was important and large value-relevant news preceding that crash.

Q. BY MR. ROSEN: What about the Cutler paper? Are you familiar with that or?

A. Just vaguely. I -- I read that probably around 1991 so that's a long time ago. And my recollection is that dealt with the overall market, the whole stock market, not stock by stock. It's a little different kind of issue.

But I -- I have not revisited that in a long time so I just don't have a strong recollection of that one.

Q. Okay. Now he also on the next page, page 21, he mentions the phenomenon of what happens to a stock when

it gets included in the S&P 500 index. And looks like it's accompanied by a 3.5 percent on average permanence -- permanence price -- I'm sorry -- permanent abnormal return. It's page 22. There's a graph.

So my question -- well, take a second and just take a look at that. I don't want to make you answer a question if you haven't read -- read that. I just want to make sure.

Are you familiar with that -- that phenomenon?

A. Yeah, that's a -- that's an Andrei Shleifer paper. The author of this book wrote this paper that I believe he's citing here.

Q. Yeah, I see. Shleifer 1986.

And it says, "These increases are relatively permanent and have become larger as the relative share of the market-held index funds has increased."

So do you have any fundamental disagreement with that research about the S&P 500?

A. So I'm familiar with that paper. I'm not an expert in that paper, but two points I'll make. One is I don't believe it's without controversy that being added to the S&P 500 index is without information.

There is -- my understanding is, at least at that time, there's discretion of which stocks the S&P may allow in.

I mean, there was some issue recently, I believe, when Tesla wasn't added, even though technically they were one of the largest 500 stocks. They have some discretion in there.

And so it's not clear that the inclusion in the S&P 500 is a purely mechanical thing. It could be based on other types of information.

So I've certainly heard finance professors argue that this -- they don't agree that it has no information content.

And the other thing I'll say is: I have no idea if this is a persistent thing today, but I have to say in my answer that a three-percent increase in a price is a very different phenomenon than a thousand percent increase in price.

And so I may not be shocked if you'd come up with examples of something going up by 3 percent that's it's hard to nail --

Q. Three and a half. Three and a half.

A. Three and a half. Thank you. A three and a half percent increase without obvious value-relevant information is very different than a thousand percent.

And I just -- I just think that can't be lost in this case. I do not want to be characterized as a straw man that would say three and a half percent unexplained

increase is powerful evidence of a lack of efficiency. That would be a straw man and a caricature that I don't think would be fair to say to me.

I'm opining in this case about these stocks for a two-week period. I'm not saying over the life of these stocks. I'm not saying all stocks.

I'm saying this is a very monumental and unexpected phenomenon, and as I wrote in my report, there's three ways of making this clear. One is for most of them, it was either the highest increase during this week they've ever had in their history, if not first, maybe second; it was among the very highest of all stock movement like one, two, three, and four, of any stock traded in an organized exchange in the US during the time. And if you go through a 20-year history and try to randomly select portfolios that perform like these meme stocks, it is a one our of a million event.

So I just want to make clear: I am not arguing against this graph that there's a three and a half percent puzzle. I don't try to explain every three and a half percent puzzle in the world.

I wish I could because this is very interesting, but a three and a half percent puzzle is a very tricky one. But a thousand percent puzzle over one week is more than tricky; it's impossible to explain with a rationale

efficient market argument.

Q. Well, Professor Shleifer -- Shleifer refers to I believe something called a demand shock. And he says that he suggests that these price increases are resulting from increase in demand.

Is that right?

A. That's -- that's my understanding of his explanation.

Q. Are you familiar with any other academic research that talks about demand shocks causing price changes in securities?

A. So I have some recollection of some papers finding examples of this. But the reason -- I bet this paper has many, many cites. And why do I think this paper, this Shleifer paper on this demand effect, has so many cites?

Because A, it's a very obvious thing that we all knew anyway, or B, it's a very rare event that's fascinating. And it's B.

So, yes, there probably are other papers that talk about demand shocks having a price impact. Hypothetically, someone could have something that is added to the Wilshire 5000 and showing no noticeable effect. That's possible.

But if this was the normal state of affairs, why

would anybody cite or care about this paper? The reason this paper is shown to us and the reason it's cited so many times is it's essentially the exact opposite. Its whatever it's called, that proves the rule. It's the exception that proves the rule.

It's an unusual thing that I -- that we have a hard time explaining, but not it's ubiquitous or else it wouldn't be a very interesting paper.

If every time there was some sort of demand shock, like a restriction on demand or an increase in demand that exogenous, and we saw this, why would anybody care about this paper?

It's a very unusual phenomenon, and as I said, the -- we were talking about a -- you were careful about saying a three and a half percent, a three and a half percent, that is surprising to finance academics and that's why we're taking about it.

Instead of saying a three and a half percent, it said a thousand percent, this would be the most cited paper in history if this was normal.

Q. I mean, couldn't that sharp price increase in these nine affected stocks be caused by a demand increasing the demand for the stocks by the retail investors or whoever else was interested in purchasing the stocks?

A. So as I -- as I said earlier, even if I said hypothetically that was true, I don't know. As I said earlier, I'm not as ascribing causation to the price run-up.

But just for argument's sake, suppose due to this increase in demand by retail investors, and in this -- in this hypothetical that I'm offering, it's not based on anything that's dealing with cash flow. It's based on something, but not based on forecasts of cash flows.

If it did increase, and it was not based on forecasts of cash flows, then this price would be above its efficient value and arbitrageurs would swoop in and short it.

And the fact that we did not see that is consistent with the type of evidence that people offer, and to some extent, I offered some empirical evidence on this, that there were frictions to shorting during this period of time. In particular, there was very high short interest in some of these stocks, and there was very high borrowing and lending fees on these stocks.

So the fact that if demand pressure unrelated to value-related information caused the stock price to go up, which I'm not contending. But if it did, then this would be the classic examples for arbitrageurs to come in

and profit from this and short it.

And the fact that we don't see evidence of the price going back down based on some arbitrage activity makes me suspicious that there are impediments to shorting during this time, and I document some of that.

Q. Well, I mean, certainly there were a lot of people going short on these stocks during this time frame; right?

MR. RYAN: Objection to form.

THE WITNESS: So I don't know, as I sit here, how many people were shorting it. I do know that there was very high short interest. Could be by one or two institutions or many. I literally do not know. But some of these stocks, of course, did have very high short interest. I think GameStop at some point had more than 100 percent short interest.

Q. BY MR. ROSEN: Yes. So -- so if a stock's got 123 percent short interest, doesn't that mean that's there's no impediment to shorting the stock?

A. I think if you asked the people who were shorting it and asked them if they had an impediment to shorting this stock, they would say yes.

Q. How much more than 123 percent do you want to go for short interest?

A. I have no desire to go above or below that.

What I'm saying is there was obviously pressure on these people who were shorting it. One was it was getting expensive to short it because there were so many shorting it.

The fact that many were shorting it, all that tells me is that there were many bearish investors. I don't know what else to glean from that. The people who were shorting it were bearish.

And the fact that there were at this time the transaction costs of shorting, and importantly, to the extent that others say that there was coordinated retail trading activity pushing up the price, that puts margin pressure on those short, making -- on those shorts, making their position very risky.

Q. Well, yeah. I mean, investing's risky.

A. Investing is risky. Trying to undo some sort of phenomenon, which I don't know the cause of, that causes cost to go up 1000 percent in one week, is a very unusual amount of risk.

So, yes, investing is risky, but -- and I see risk all the time. I don't see what I see in this current case, often at all. As I said, it's a one-of-a-million phenomenon.

So I don't know that I've seen anything quite like this, of nine stocks often talked about in the same

sort of social media circles moving up unprecedented amount in a period of one week with some of them having very large short interest.

I'm just saying facts as I understand that. These are very unusual facts. And I can't think of any analogous discussion that you and I have had today that is anything remotely resembling this.

That's why, again, I don't easily claim a stock trade in a market that's not efficient. I don't do that easily. It's the facts of this case.

If it was a normal case, I wouldn't be so cold. Just the facts in this case, as you know, are unbelievably unusual. And that's why I can say with such confidence that that one week run-up is not tethered to value-relevant information.

Q. Okay. You've made that point, and you know, I'm asking about this because I'm interested in understanding a couple of things. One is why an increase in demand for a stock, for whatever reason, whether it be value-relevant information or simply investor sentiment should necessarily mean that a stock is not being priced in a reasonable fashion, that it's not a fair price, a fair market value price, where buyers and sellers are satisfied that this is a fair price if they want to transact that.

MR. RYAN: Objection to form.

THE WITNESS: So it's important when I answer this question to be clear on what motivated a demand increase. So if counter to what I believe your assumption was in your question, that a demand increase for stock X, because the market perceived that there was information, value-relevant news that dividends would -- or earnings would be permanently increased for this firm, that would increase demand, and that would increase price.

There's nothing unusual about it whatsoever. That makes sense. Because there's nothing for an arbitrageur to take away because that price increase was connected and driven by value-relevant information. There was no money machine there. It moved up for good reason, good value-relevant information reason.

Alternatively, as I said, the converse would be the demand went up for something that was not value relevant. Let's just say it went up because they were in a happy mood that day. The price goes up, and it has nothing to do with future dividends.

That price has increased for no rational value-relevant reason. That's when arbitrageurs come in and would short it in this case. Because they know that that price is not a price that investors are going to

live with because it's a money machine. It's too good.

It means that -- it's too high and that investors are going to be getting lower yield on those stocks and not be happy with it in the long run and the price will go down.

So prices that move because of demand that is unrelated to anything to do with the fundamentals of the stock, value-relevant information, are going to be arbitraged away.

And yes, demand went up. But if demand goes up for reasons unrelated to the future cash flows of the stock, those will be arbitraged away.

So I'm not saying demand doesn't matter. I'm saying if demand goes up or goes down based on non-value-relevant information, then in an efficient market, that should have no impact on the price.

Q. BY MR. ROSEN: You say it should not have an impact?

A. Yeah.

Q. Theoretically.

A. Well, it should not theoretically have an impact on the price. And unless we believe that there are all these fantastic arbitrage opportunities as an empirical matter that are just sitting there, then I also would say as an empirical matter, these easy pickings aren't

available that long.

Q. So put options on these nine stocks. During the pre-class period, was there any limit to the number of put options that could be written on these nine stocks?

A. I haven't looked into that. I have not -- I'm not aware of reading a limit on the put options. I just don't know the answer to your question.

Q. And I think the SEC report said there was quite a bit of options activity on these stocks.

Are put options a close substitute for going -- selling short to these nine affected stocks?

A. They -- a put option onto itself does have similarities with shorts. Because in both cases as the underlying stock price falls, the values go up. Shorting value goes up as the stock price falls and a put option goes up as the stock price falls. So they have that similarity.

Q. So if somebody, an arbitrageur who wanted to make a short position but was finding it hard to borrow the stock for whatever reason, not available or borrowing costs were high, they could have bought a put option and arbitraged away these what you believe to be the rational prices.

Am I putting words in your mouth when I say rational price?

A. I don't use that phrase. I know what you mean by it. I try not to use that phrase I just say whether it's an efficient market or inefficient market.

Q. So couldn't arbitrageurs who were unable or unwilling to pay the cost of selling -- going short, could they have just bought put options and constructed an equivalent portfolio to arbitrage away these perceived inefficiencies?

A. So it is my understanding that an alternative to shorting can be purchase a put option. It's also the case that in typical times when there are high costs of shorting, there can also be high cost of going in put options. And what would I mean by that? There could be very large bid-ask spreads for put options.

I haven't looked into this here, but typically it's the case that put options themselves at times can be illiquid and there could be high bid-ask spreads. There could be all sorts of reasons why put options are not without frictions, also.

Q. Now there was an interview with Mr. Peterffy. I can't recall his first name. The guy who owns Interactive Brokers.

Do you familiar with him?

A. I don't recall his name.

Q. His name is Peterffy, and he was -- he was

interviewed, I believe, on CNBC. In fact, I think -- anyway, he -- he went so far as to say that he thought that because there were so many call options written on GameStop on the 26th and 27th, he thought that because those call options were in the money and people were going to have to buy shares to cover the call options they had written, that if those restrictions hadn't been put into place, the price of GameStop would have gone over a thousand because people would have had to -- there would have been additional demand in the market for those shares.

And does -- does that -- if that were true, would that mean the stock for GameStop was inefficient because the price was rising based on that demand?

MR. RYAN: Objection to form.

THE WITNESS: So I'm a finance professor and a finance expert, but I could not put all that together in my mind in real time to be able to understand it. I was not blaming you. It's a relatively complicated example. That would be kind of one, it would helpful if we go really slow or you put it on the screen, but that had a lot of moving parts.

Q. BY MR. ROSEN: I would have to replay -- I guess I could get this at a break, but the essence of it is that Peterffy, who runs Interactive Brokers, he's, you

know, I don't know, the guy's worth 25 billion or something. So he's obviously smarter than me. I won't say he's smarter than you. But he knows the markets; right? He runs -- he runs a pretty successful brokerage firm.

And his belief is that there were many call options written, and the number of call options that were written meant that there was going to be tremendous demand for these GameStop shares and that those -- price of the GameStop shares would have risen over a thousand had those restrictions on the 28th not be put into place because people would have had to purchase -- the people who wrote the options would have to purchase those shares, and that was one of the causes for the increase in price for the -- based on the demand -- the demand by -- for the shares by those call options.

So the question -- the question is: If that were true, would that necessarily mean the market was inefficient simply because the demand resulting from the call options caused the stock price increase?

MR. RYAN: Objection to form.

THE WITNESS: So the connection between call options and the underlying stocks is sort of a well-known topic area. And more than just a call, but if you look at calls and puts in the underlying stock at the same

time, there's a -- there's a well-known concept called put-call parity that exists. It's not the same thing as talking about market efficiency, but it's very close.

And so I haven't -- I don't know exactly what to make of his explanation or description, but I do know that people have looked at GameStop and others during this time and noted deviations from put-call parity, that is, normally there's a very close formula that connects stock price and its option prices. Because if it deviates from that, there would be an arbitrage opportunity.

So a lot of times in the real world when you test this, it's not perfect, but it's really good.

I believe one of the studies that noticed oddness in the valuation of options relative to the stock price at this time was one of the papers cited by Dr. Werner in his rebuttal report. It was a working paper from a few years ago. I think one of the authors was Jones.

And if you look at that paper, it discusses anomalous behavior in the volatility of options, which is -- we talked about earlier, the function of the price of options.

So, again, I haven't looked into this, but it would not shock me during a time in which I would say

markets were wildly inefficient and at the same time would see prices deviating from put-call parity.

Also, by the way, the Franklin Allen paper, as a test of market efficiency, does something similar to the quote you're talking about, and looks at the connection between option prices and stock prices.

And my recollection is the Franklin Allen paper shows this is evidence of market inefficiency in these meme stocks during this period of time, that the connection between options and the underlying stock, for whatever reason, broke down.

And the Franklin Allen paper used this as evidence of market inefficiency in this time. The -- also the paper -- I'm almost finished here -- the Jones paper also called this some sort of bubble, too.

So the Jones paper that Dr. Werner mentioned is also aware of the sort of non-efficient market story going on during this time. And as sort of part and parcel to this, there was something unusual going on between options and the stock. I just, as I sit here, haven't looked at it enough to be able to disentangle what caused what, whether the options caused the stock or the stock caused the options.

All I know is there's some empirical evidence by some researchers that the normal, non-arbitrage

relationship between these things broke down for these stocks during that time.

Q. Do you know who Professor Gabaix is?

A. A little bit. G-A-B-A-I-X?

Q. Yeah.

A. He's -- yes, he's a -- I forget if he's at NYU. But yes, I'm aware of him. He's a relatively famous economics professor.

Q. All right. And are you aware of a paper he wrote with a guy named Koijen in 2022. I'll show it to you. Well, I don't know.

Have you -- the name of the paper -- let's see. It's called "In Search of the Origins of Financial Fluctuations: The Inelastic Markets Hypothesis."

A. No.

Q. Have you ever read it?

A. I haven't.

Q. Well, it's only 123 pages long. How long do you think it would take you to read it?

A. Longer than most people. It takes me a long time to read articles.

Q. All right. Let's talk about coordinated trading.

What is your definition of "investor sentiments"?

A. Investor sentiments?

Q. Yes. I see that in the literature here and there. Is there like an accepted definition of it?

A. So I certainly do know -- I have definitely seen the phrase used in academic literature. I don't have a great definition of it other than it usually occurs in papers. Because obviously on the face of it, investor sentiment could be anything that investors believe.

But my recollection is the context of the papers that cite it are usually getting at something akin to noise traders. Investor sentiment is usually given that sort of meaning of something that's not driven by sort of value-relevant information. But that may not be the only standard paper. But that's my general reading of that phrase.

Q. Did the investor discussions on Reddit and Wall Street Bets and other social media in January 2021 concerning the nine affected stocks, in your opinion, represent widespread investor sentiments?

A. I don't know if I've come to that conclusion. I certainly -- I mean, I don't have that conclusion. I certainly could find possibly others that may have that belief. I'm sure there are many. But I haven't come to that conclusion.

Q. What conclusions did you come to about the

investor discussions on Reddit and other social media in January 2021 about the nine affected stocks?

A. Sure. Just a few. So in the context, this came up when I mentioned that I have an opinion that the market for these nine stocks during this two-week period that we've spoken about were not traded in efficient markets.

And then to put that in context, I wanted to mention other people. So I mean academics, stock analysts, and the media in general commented at length about this, and many of the comments talked about social media and Reddit and the like. And they had all sorts of discussions about that.

So this is, I would say, contextual. I do not have an opinion one way or another about the content of these other than the fact that I'm aware as an empirical matter that there is an association between the level of activity of social media mentions of the meme stocks and their price activity. So I'm aware of that.

It's in academic articles. It's in a couple of Bank of America analysts reports. It's in a Lasse Pedersen recent paper. That's all interesting and I think provides interesting context and important context for this. But I don't have an opinion one way or another about the underlying discussions on Reddit.

Q. You used the term "coordinated trading" in your reports. What is your definition of "coordinated trading"?

A. Sure.

So it's finding a mechanism for multiple investors to trade in concert in some way. And keep in mind, I'm talking as an economist. I'm not talking anything about conspiracies or anything about the law.

It's just a mechanism for coordinated trading, for people to trade together in a certain way, for whatever reason they may have for that.

Q. Well, so there were people -- a large number of people who -- well, you heard of this term "diamond hands" on social media on January 21 in the context of the nine affected stocks; right?

A. So yes, I have. I don't know what it means, though. I know it and I've seen it. I did not Google it to figure out what "diamond hands" means. I can honestly say I don't know what "diamond hands" means.

Q. All right. I can represent to you that I actually believe someone testified to this, one of the plaintiffs, but I'll -- my understanding is that it means I'm holding the stock forever for, you know, the long haul. I'm not -- I'm not in this for the short term. I'm going the hold this and not -- not let go of it. I'm

going to hold it and not let go, ever.

A. Buy and hold investor. Okay?

Q. Yeah. And so there were those -- you know, there were a large contingent who were diamond hands people, and then there was also people who were talking about short squeeze.

And like I guess to me, the -- the idea of making money with a short squeeze is you're going to hold it until it gets up -- goes up, and then you're going to sell it before, you know, before the shorts cover it; right? Before it goes back down; right?

Is that a fair analysis of how you make money on a short squeeze?

A. So that strikes me as a way of doing it. Of course, it's easier said than done. But yes, the idea of a short squeeze is to ride it up as it puts pressure on the shorts to end up buying back the stock, which feeds on itself and makes it go up even higher. And then generally people believe, for various reasons, the price goes back down. In that time, you want to be out of the stock. But the timing of it is always very tricky.

Q. So would you agree that these would be two very different investment strategies? The diamond hands, long-term investors would be having a very different investment strategy than the more short term, short

squeeze investors?

A. So I'm just accepting as given the premise of your question. I have no reason to doubt your -- your definitions.

So yes, I think definitionally an investor who I would call buy and hold -- I think you called that diamond hands -- a buy-and-hold investor and investor who's trading based on some timing mechanism is very different.

And I kind of think if I was teaching a class on portfolio or investment strategies, I would probably start with the difference between buy-and-hold investors and short-term investors. That's like where I would start as very different strategies.

Q. Is it your opinion that the people who were engaging in coordinated trading on social media were in some way manipulating the prices of the nine affected stocks?

A. I don't have an opinion on that.

Q. Is it your opinion that the people who were coordinating trading on social media for the nine affected stocks were somehow distorting the prices of the nine affected stocks?

MR. RYAN: Objection to form.

THE WITNESS: I don't have an opinion on

causation of what caused what I would consider the incredible run-up in prices during that period. I don't have an opinion on causation, whether it's coordinated trading or short squeezes.

Q. BY MR. ROSEN: Okay. Now in your report, you mention analysts. There's a section on analysts, I believe, somewhere. And you discuss -- let's see if I can find it. I guess it's on page 66. Let's see.

I'll withdraw that question.

So do analysts' recommendations -- would you consider analyst recommendations to buy, sell, or hold the stock to be value-relevant news that could impact the price of stock, move the price of stock?

A. It -- it depends on why they make such a decision. So here's what I mean. A recommendation is not in and of itself information. It is sort of a summary of information in how they base an overall decision based on underlying information.

So if -- I'm just making a hypothetical here to make my point. If an analyst said, "I have updated my opinion that stock A dividends or cash flows are going to increase much more than I anticipated, or much more than other investors think; therefore, I'm raising my rating," I would call that in its totality value relevant.

If on the other hand, the investor said, "I

think we're in a bubble and I suggest this bubble is here to stay for a while, why don't you ride the bubble and buy it and hang onto it for a while, and therefore, I'm going to say it's a strong buy," I would call that non-value relevant information.

I'm not going to judge the recommendation unto itself as value relevant or not, but the basis for that recommendation.

Q. But if an analyst's recommendation is based on his changed view of the cash flows, but that changed view is not a function of any new news coming from the company or any other source as to the nature of those cash flows, why should that new view impact the price of the stock?

A. So analysts in general -- I'm not going to say any one analyst in particular -- provide value in at least two ways. I'm thinking about it as two ways fundamentally: One is uncovering information that's value relevant; but two, and sometimes more common, is interpreting -- interpreting new value-relevant information.

So as an obvious example, a firm could have an earnings announcement on a day. Generally, that's at least fodder for value-relevant information. And the fact that two analysts both mentioned that would not be very interesting. You wouldn't be paid for that.

However, one analyst might say, "This foreshadows more of the same because I believe there's barriers to entering this industry." And then the other analyst says, "Don't be fooled by this. This is an accounting trick because they had a temporary, you know, increase in, you know, goodwill or something like that."

All I'm saying is that analysts also interpret that information, and if one analyst interprets that information in a way that changes the recommendation, and it's based on their interpretation of value-relevant information, like in my hypothetical, then I would consider that potentially value-relevant news.

Q. So in paragraph 109 of your report, you say that academic research has recognized that noise traders can pose risks to arbitrageurs.

A. I have the right page. I just want to see where you got that from. Was that a quote or was that like a summary, what you just said? I couldn't find it.

MR. RYAN: I think it's at the end of the second sentence.

THE WITNESS: Okay. Thank you.

Okay. I see it.

Q. BY MR. ROSEN: So do you think that the retail traders in these nine affected stocks posed a risk to the arbitrageurs who were selling short these nine affected

stocks?

A. Did you say retail? Because that one word, I didn't hear. I think you said retail.

Q. Yes, retail. Yes.

A. So I don't have an opinion on that. That's a causal story. I certainly am aware that some people have the opinion that there was -- that these retail investors either purposefully or non-purposefully coordinated driving up the price, putting pressure on these short sellers.

That's a story that's out there. It's obviously in the Franklin Allen paper and others. I don't have an opinion on that. It's a story that is definitely credible to me, but I haven't formed an opinion on that one way or the other.

Q. Well, wouldn't the flip side of that story be that the short sellers were ganging up against these nine affected stocks to drive the price down so they could profit?

A. So I don't know if either of those stories are true, in fact. All I'm convinced of is that those markets were not efficient during that period of time. Whether you believe it's possible that the line of causation goes from retail investors to the stock price, or alternatively, you believe the line of directionality

goes from the short sellers to the stock price, it doesn't change my opinion.

I would just say that when I read the academic articles and the analyst reports, they mostly subscribe to the hypothesis that the directionality goes from retail investors causing the prices to go up beyond efficient values, putting pressures on short sellers to even exacerbate the price run-up itself.

That's -- I don't have an opinion on that. I'm just saying that's what I view as the common narrative from the academic articles, for example.

Q. Is there limit to how many shares of a company's stock can be sold short?

A. That's an interesting question because most people are surprised that short interest can go above 100 percent. So I don't know if there's a limit. There may not be.

So it is unusual to have short interest go over 100 percent because that would mean more than the number of shares outstanding are shorted, and there's a technical reason why that is the case, is that one person borrows stocks from another, and then that person itself lends it to another person. So it gets turned around twice. It's shorted twice, the same shares. And it can be done even more.

So it's something that we know is possible. I personally wasn't aware how -- that I thought this was a very rare event, and maybe it is. But I'm certainly aware of GameStop, for example, at times having shorts over 100 percent, which is a surprising number.

Q. In paragraph 26 -- let me see which report this is. Yeah, it's your opening report.

On paragraph 26, you say, "My own analysis of data from the stock lending market also provides evidence to the strengths that may have inhibited the ability of arbitrageurs and other market participants to sell short certain at issue stocks."

Now you used the term "may have inhibited," which is uncertain. It implies some level of uncertainty; is that right?

A. So what I would view this as -- I'm not necessarily disagreeing with your characterization. What I'm saying is I have not formed an opinion in this case about causality.

So as I said earlier, I've come to the conclusion that these stocks were not traded in efficient markets during this two-week period. There are stories about short squeezes and coordinated retail trading that are out there.

To the extent we're talking for the moment in

this paragraph about short squeezes or attempted short squeezes, what I point out is I am showing in this report some empirical evidence of constraints to short selling. But because I don't have an opinion about whether, or if so, how much of the price increase was due to short selling -- short squeezes, I do not say as a factual matter it caused it. I'm saying it may have caused it.

That's the story there. I don't have a conclusion about causality.

Q. So in paragraph 132 of your opening report, it says, "In sum, risks and constraints on an arbitrageurs' ability to sell stock short -- whether due to sharply rising stock prices, high costs, or limited supply for borrowing stocks, or risks due to the possibility of loan recall or changes in the borrow rate -- can present impediments to trading that inhibit the incorporation of new, value-relevant information."

Do you have any evidence that there was a limited supply for borrowings these nine affected stocks, more limited than any other company, I mean, that was traded on the market?

A. So the empirical evidence that I showed was certainly not -- in this report, was not directly that variable. I believe I showed borrowing costs and short interest. I believe other papers have touched on that.

I think the Franklin Allen paper does discuss that, and I can't recall it, but I would be -- I think it's quite possible that that paper does shed some light empirically on the amount of shares available to be shorted during that time.

But I didn't independently do that, but there's ample discussion about short-selling constraints and potential short squeezes during that time that are based on that.

Q. Do you have -- do you know of any specific instances in which an arbitrageur was prevented from taking either a long or short position in the nine affected stocks during the pre-class period or class period?

A. I do not have any sort of information about any individual arbitrageur. All of my statements are in the context of what I see in the market itself.

Q. Do you have any opinion as to whether there actually was a short squeeze in any of the nine affected stocks during the pre-class period?

A. So I don't have an opinion on that. I do cite the Franklin Allen paper, where he and his coauthors, I believe, I think was it seven of their stocks? So maybe that's five.

Q. Five.

A. Five of the stocks.

Q. Five of the nine, seven of the thirteen, probably.

A. Yes. But I certainly cite that as an academic's opinion of that. But again, of course, that's -- I'm providing that as -- as context for my opinion that these stocks did not trade in efficient markets during this two-week period.

Q. Do you know how one might go about performing a test to determine if there was a short squeeze in any of these nine stocks?

A. Well, the Franklin Allen paper is a method of doing that, but I haven't considered doing that research myself.

Q. So in paragraph 128, you define -- I don't know if it's a definition, but you say -- you say, "A 'short squeeze' is a situation where short sellers are forced to close out their positions due to the risk and constraints they face."

Is that the definition of a short -- of a short squeeze that you base your opinion on in this case?

A. Not necessarily. That is one definition, and obviously I cite it from this D'Avolio academic article. There are other definitions of short squeezes that are similar, but not exactly the same.

Q. Could you give me an example the other definitions?

A. I'd have to go through it, but I'm sure the Franklin Allen paper has a definition of a short squeeze in there.

Q. I see.

What are the risks and constraints a short seller might face that would constitute or contribute to a squeeze?

A. Sure.

So there are several. This may be not all inclusive. There may be more. So one is borrowing costs. So when you're shorting, you borrow stock until you unwind the position. Not only are you paying interest while you borrow the stock, but that interest rate could go up. And that's a risk.

Another very sort of simple technical risk is that the stock may be recalled and you have to quickly find another source for that stock to be able to short it. You have to borrow somewhere else.

In normal circumstances, it may be very easy to find another stock, but when over 100 percent of the stock is being shorted, it may be very difficult.

Another example, and probably the primary risk at issue at this time here, is that the stock could keep

going up in value. And while it goes up in value, you are going to -- the shorter is going to have to increase their collateral and come up with more money to meet those margin requirements. And if they do not meet those margin requirements, they will be forced to sell those at a price that most likely is above what they sold them for initially and lose money on the position.

So it's the combination of borrowing costs, the scurrying to find new shares if they're recalled, and the risk that even though you might have initially believed that the stock prices were too high, they can become higher. And even though in the fullness of time you might be fine, but they don't have unlimited capital, and they can be hit by margin calls or may simply say "I cannot bear this risk, anymore."

So it's capital constraints, limited horizons, and those sort of frictions that make short selling very risky in these kinds of markets.

Q. If there was an attempted short squeeze but not an actual short squeeze, would that have an impact on a stock's price?

A. So that's a very semantic-driven question. It's obviously a fair question, but when an attempted short squeeze, we all can imagine what I mean by that and others mean by that. It could be something that is

intentional, such as coordinated retail trading to push up the stock, put pressure on existing short sellers.

Now if it's attempted but not successful, yes. It depends. But if it's attempted and it pushes the stock price up into inefficient market territory, that certainly in and of itself can make the market inefficient and cause the stock price to be higher than it should be otherwise.

If the attempt could be you and I try to attempt to engender a short squeeze on Apple stock, we might really try to do it hard, but I guarantee you we couldn't do it.

So what I mean by attempted short squeeze is to make sure I'm clear that the fact that some people claim that investors, retail investors on Reddit, were coordinating to do a short squeeze. I'm sure you can find quotes of people trying to do that. I'm not accepting that as evidence that they caused a short squeeze.

So I'm putting that in the category of attempted short squeezes to say that could also cause the stock price to go up, probably not as much as a successful short squeeze, though.

Q. Is there a minimum amount of short interest required for there to be a short squeeze?

A. I'm not aware of a number for that. I do not know one.

Q. What level of certainty is required for you to give an opinion that the market for a stock is inefficient?

A. I don't have a precise answer. What I would say is I'm not -- it's not my general nature as an academic or an expert to argue that a stock is clearly not trading in an efficient market for a period of time.

So I need a lot -- I need some facts of a case to be very extreme, and I know it's a bit of a broken record, but just to be clear, this is not your normal case.

Q. You know, they're charging you by the word in this transcript.

A. That's okay. This is not your normal case, and so I'm not exaggerating. I demonstrate to -- in my -- in my report that this is really a one-in-a-million event. So this one week for these nine affected stocks, the portfolio of them increased by more than a random drawing of nine other stocks over a 25-year period. A million of them. And not only did it outperform them; it outperformed them by a lot.

So, again, I feel like your question insinuates that I am being characterized as somebody who's imposing

these strict efficient market conditions. I'm a firm believer in efficient markets as being the normal course of events, and I wouldn't rule that out so strongly as I do in this case unless I was really convinced.

And as I said, a one-in-a-million event when many of these stocks had no value-relevant information. Like I forget the ones, but it could have been Trivago, for example. I forget. But Trivago may not have had any -- I couldn't find any value-relevant information going on, yet this was an unusually good performing stock during this time.

So I'm not being unbelievably loose in my definition of deviation from an efficient market. I am just saying that this is so extreme there is no way a finance professor could look at the facts of those nine stocks during this two-week period, just this two-week period, could come away and saying these stock price increases during the first one-week period are justified in any way by value-relevant information.

Q. Is it your opinion that the supposed or alleged short squeeze for these nine stocks was illegal manipulation?

A. I have no opinion about the legality or lack of legality of that sort of behavior.

Q. Are you offering any opinion in this case as to

what caused investors to sell their shares after the PCO restrictions were imposed by Robinhood?

A. I am not.

Q. Do you offer any opinion as to whether investors were aware of fraud or manipulation as a result of the restrictions Robinhood imposed or that others imposed on these nine affected stocks?

MR. RYAN: Objection to form.

THE WITNESS: So I do not, and I don't have an opinion that even of what would constitute fraud or manipulation in a particular case.

Q. BY MR. ROSEN: Did the purchase restrictions and subsequent price decline in the nine affected stocks induce investors to sell shares to the nine affected stocks during the class period?

MR. RYAN: Objection to form.

THE WITNESS: So that's, again, what I would put in the category of causality. I don't have an opinion on that. Other than during that period, the class period, I have an opinion that those nine stocks did not trade in an efficient market.

Q. BY MR. ROSEN: What information did investors have on beginning January 28th, 2021, about the restrictions; do you know?

A. So I don't know a lot about this. I do

recall -- I believe I have a footnote from a deposition of one of, I guess, the named plaintiffs, and my recollection is that -- I believe it was a "he" -- mentioned that his app showed a restriction. And then he went to the website and found that there was a restriction.

That's my recollection, and we could go through that. But that was -- I cited that as a footnote in my report. So that would be an example of what one investor, I believe, in deposition testimony said.

Q. Now did you do an analysis of the Cammer and Krogman factors -- well, you know what the Cammer and Krogman factors are?

A. I do. I don't have them memorized. I am broadly familiar with them, and I know most of them, but I'm familiar with them.

Q. So you know there's five Cammer factors, the fifth being price moving in response to news?

A. Yes. The fifth is the sort of empirical cause-and-effect relationship.

Q. So did you do an analysis of the first four factors?

A. I did not. I certainly had commentary on them, particularly in my rebuttal report, but commentary to the extent of comments on Dr. Werner's treatment of them.

Q. And did you do an analysis of the Krogman factors?

A. I -- if I did, it would only be to the extent that I commented on Dr. Werner's report. And I don't believe I mentioned them. I think I mentioned in my rebuttal report Cammer 2, 3, and 5. That's my recollection.

Q. Did you do an event study in this matter?

A. I would say you could call it that. I don't want to fiddle over semantics. But yes, I did -- in my -- I think they were appendices E and F. I did something very close to what you would call an event study.

Q. And why do you call it -- why do you say it's close to an event study, but not an event study?

A. Sure.

I have no problem with calling it an event study. Generally speaking, what I did was technically a regression, a regression with two right-hand side variables, an industry and a market factor that we talked about earlier. And then I looked at on all of the days for these at-issue stocks for this one-week period prior to the class period and then the class period itself, I looked if I could find any value-relevant information there.

So that's what I did. I didn't call it an event study. If you want to call it an event study, that's fine.

Q. I don't want to call it an event study. I want to call it a reverse event study.

A. Okay.

Q. Is that okay?

MR. RYAN: Objection to form.

THE WITNESS: If you ask me a question about reverse event study, I'm happy to answer questions about it.

Q. BY MR. ROSEN: Well, you know, this is -- this is my issue with the way you did your event study.

So you, at the time you -- you first -- before you selected event study, you did your regression and found out what dates during the pre-class period and class period were statistically significant; right?

A. I'm not sure I agree with that statement.

Q. Well, what was the design? Explain the design of your event study, then.

A. Sure.

So for -- unless you disagree, for purposes of my answers in this section, it's easier if I just talk about the one week prior to the class period. Because there's --

Q. Yeah.

A. -- three different ones. And that's obviously the period under study by Dr. Werner, also. Okay.

So this is -- actually, if you don't mind, there's a footnote in the appendix that I'm going to be referring to because that answers directly your question. Let me see if I can find this.

A. So if you're interested, on the PDF --

MR. ROSEN: I can't hear you all the sudden. Something happened to your voice, to your mic.

THE WITNESS: How about now? Can you hear me okay?

MR. ROSEN: It's still changed. It's not as strong.

THE WITNESS: If it keeps going, I can talk louder. But I will --

Q. BY MR. ROSEN: Now I hear better. Now I hear better.

A. Okay. I moved for a second.

But I'm on page 117 of my PDF.

Q. Okay.

A. And just it helps me recall.

What I would argue is my methodology of the event study is summarized in the footnotes on this page, largely.

So there's two things that are done, and the first is a regression. So you can feel free to ask me more about regression, but I'm just going to briefly describe that part of process. And that's not in the footnotes here. That's talked about elsewhere. And I -- I think footnote 2 mentions that.

So I run a regression over, my recollection is a 120-day estimation period that goes up, I think it ends at just before January 2021. So it doesn't go quite up against the class period and the week before.

And that regression is a statistical technique that is not unlike what you described the Roll paper as earlier. So one regressor for all of these at-issue stocks is the market portfolio, and another regressor is an industry regressor, which you're welcome to ask me questions about the details of that, but I'll leave that out for the moment.

And so that regression is run. And those -- a regression is run means it estimates those parameters, what are called a slow co-efficient on the market and the slow co-efficient on the industry. And each day the difference between those values and what's predicted is called the residual for the company-specific return.

So the regression is run. And then as an output of that, besides those parameter values, you can

determine for each stock and each of those five trading days whether or not the return was statistically significant, say it's a 5 percent level significance. So that's one part of it.

I'm not calling it step one because -- you're welcome to ask me about the timing of this, but I'm just saying that's one aspect of this.

And the other aspect which is much more detailed in the footnotes at hand here is a search for potentially value-relevant information about these stocks on these days.

And so first part of that is where do we search for this value-relevant information. And what I list there is press releases by the companies, SEC filings, equity analyst reports, and then I also include debt rating agencies' changes. So those are the sources that I look at.

And then based on those sources, I determine whether or not on a stock on a given day, there is potentially value-relevant information. And what I mean by value-relevant information is the stuff we talked about earlier, stuff that deals eventually with the cash flows of the firm. Things to do with the firm's earnings and costs and customers and things like that.

But explicitly, as I've put in there in the

footnote, I do not include as value-relevant information information that deals with things such as short squeezes, because that has nothing to do with the firm itself, its earnings. I don't deal with what's going on with coordinated retail investors. I don't -- and lastly, I don't include information of commentary by analysts that, in my words, would say these stocks are inefficient.

If an analyst says this stock is trading in an inefficient market, I wouldn't call that value-relevant information.

Q. Why wouldn't it be?

A. Why would an analyst saying that the stock doesn't trade in an efficient market?

Q. He's saying the stock is overvalued or undervalued; right? Isn't that value relevant?

A. So I'm defining value relevant as -- because I'm doing this on purpose because I'm connecting it to the earlier discussions you and I have had about what an efficient market is.

An efficient market is that the prices quickly and fully reflect new information that I say is value relevant. So if a stock price quickly and fully reflects new information about earnings, that's fine. That's what I'm looking for in an efficient market.

If on the other hand, a stock price quickly and fully reflects information about sun spot activity, that is not value relevant. I'm not saying that's a great or bad thing, but no finance professor would consider that value relevant.

And so as an extreme case, and as I point out in my rebuttal report, ironically, quite a bit of the information that Dr. Werner uses as news is commentary by an analyst, for example, or a market commentator that says, "This stock" -- is in my words -- "this stock is untethered from anything value relevant." And the fact that it's mentioned, he uses that as evidence that it's trading inefficiency.

So under his approach, just briefly, if everybody on a day said GameStop is clearly trading in an inefficient market, and GameStop stock moved, he would use that as evidence that GameStop trades in an efficient market. That's extremely ironic.

So I am looking at -- so that's my procedure. And then I look at this in its totality and try to come to my opinion, which was quite easy in this case because of the nature of the facts, that is there a reasonable basis for me to come to the conclusion or to be able to support what Dr. Werner is saying, that these unusual statistically significant stock price changes of these

at-issue stocks for these trading days is reasonably related to the potentially value-relevant information.

And my answer is no. It's not even a close call. So that's how I did this event study.

Q. Well, January 21 to January 27th is a very short time frame. It's five trading days; right?

A. It is.

Q. Why didn't you look earlier than that?

A. So first of all, I am looking at this period right before the class period as the most relevant one. For example, this is what was going on if -- if, for example, as I do find that the stocks were not traded efficiently during the class period, it's useful to have some context about, well, did that just start on that day or was it a continuation? And obviously, I find that it's a continuation.

I did not want to look at the class period as a snapshot unto itself. I think it's really important -- especially since I believe your expert believes that that January 27th price after Koss went up a thousand percent with some fair price, you need context. Where did that price come from? So that's why I do the one week just prior to it.

On the other hand, if I went back far, again, like Dr. Werner does and looks a year in advance at the

class period, that's not of interest to me. I am not shocked if somebody -- if somebody would show me that one year before the class period, that some of these stocks traded in an efficient market. I didn't look at that, but that wouldn't shock me, nor is it relevant to this case.

We're talking about a meme stock event where there was lots of discussion about these stocks and unusual short interest.

The Franklin Allen paper has figures that show when the discussions on social media started heating up, and it was roughly that one week period prior. So that's another reason why I did that one week prior.

Q. So do you have any opinion as to whether the market for these nine affected stocks was efficient prior to that, to the January 21st?

A. I have not looked at it so I don't have an opinion.

Q. What hypothesis did you test in your event study for these nine affected stocks?

A. So the way I viewed it as, I would start with a null hypothesis that these stocks traded in an efficient market. And what that means is that I need extreme evidence to demonstrate that it did not.

So and the extreme evidence speaks for itself,

and I'll be even more brief not to count up -- add up your word count, but the extreme evidence was the unprecedented increase in these individual stock prices during that one-week period combined with the lack of concomitantly important potential value-related information about those stocks during that period.

It was so clear to me that I could find no rational basis to be able to explain those extreme stock price movements, in that case, increases, based on the value -- potentially value-relevant information that I was able to obtain.

I couldn't even imagine trying to come up with a story based on what I found in terms of information during those days to explain why costs went up a thousand percent.

I -- I don't see Dr. Werner even attempting to do that. It's impossible.

So you might explain it by other things. Of course, everything has an explanation. But my job was to see if I could potentially explain it by value-relevant information, and I could not.

And if you can't explain extreme stock movements for nine stocks over a week of trading by anything approximating value-relevant information, then you have to come to the conclusion you would reject a null

hypothesis of market efficiency.

Q. Have you ever performed an event study in the same manner that you performed this event study?

A. I think all of my event studies are the same. I have a regression that's quite similar. Usually has the market industry effect. I calculate the -- whether or not the stock price was significant, and then on the day of the event study, I look at information on that day and try to discern whether there's any causal relationship between the two.

MR. RYAN: I think we've been going about an hour and a half again, Larry. Is now a good time for a break?

MR. ROSEN: Yeah, that's fine. Ten minutes. So come back at 6 o'clock. 13 minutes, 6 o'clock.

MR. RYAN: Sounds good.

MR. ROSEN: 3 o'clock your time.

MR. RYAN: All right. Thanks.

(Recess.)

THE REPORTER: Back on the record.

Q. BY MR. ROSEN: Okay. Dr. Grenadier, before our break we were talking about your event study, and you said it was found in appendix E and F of your report.

Now are you aware that -- so in appendix E, you selected news and determined whether it was value

relevant to the nine stocks; is that right?

MR. RYAN: Objection to form.

THE WITNESS: So I characterize it as potentially value relevant. So I'm trying to err on the side of being generous to including news that's potentially value relevant.

Q. BY MR. ROSEN: Now you're aware that Professor Fischel went through the news on those days as well, and he selected potentially value-relevant news for the nine stocks. And he selected -- and the two of you didn't disagree -- the two of you didn't agree as to what was potentially value-relevant news.

You're aware of that?

A. So I'm aware that the days that -- at least over the period that I covered, and he covered the same -- the days that I found potentially value-relevant news did not perfectly overlap with his. But, of course, we used different data sources. I used primarily analyst reports, and my understanding is that Mr. Fischel used public press.

So they're different sources. So clearly there will not be perfect overlap between our two determinations.

Q. So you didn't look at the press, the media articles?

A. So I did look at public press articles for context, and I mentioned that earlier in my report. But in terms of the determination of value relevant -- potentially value-relevant information, I did not use popular press articles. I used what's listed in that footnote 1 that we talked about.

Press releases, specific SEC filings, importantly to my answer here, analyst reports, and then lastly, debt rating agency changes.

Q. Do you know for sure whether the only differences between your view of potential value-relevant news and Fischel's view of potential value-relevant news was press articles that were not press releases?

MR. RYAN: Objection to form.

THE WITNESS: So I'm not an expert on his methodology. It's my understanding that he did not use analyst reports, while I used analyst reports, and he used presses -- or press -- not press releases, but news articles, and I did not use news articles in that section.

So we're using different data sources, and I chose mine for my reasons, and he chose his for his reasons. And so because to some extent he is using public press release -- not -- public press articles, news articles, and I'm using analyst reports, they're not

going to be one and the same. We have different sources of potential value-relevant information.

Q. BY MR. ROSEN: Okay. Let's take a look at your rebuttal report. Let's go to Exhibit 1A, which is page 58 of the PDF.

A. Okay, sorry. It took me a while trying to remember what this was. Now I certainly do remember it, yes.

Q. So you did some sort of news/no news analysis in Exhibit 1A, 1B, and 1C; is that right?

A. That is correct.

Q. And 1A, there's a news/no news test using just earnings and guidance releases; is that right?

A. Yes. Let me briefly explain what I'm doing here. So he has what I'll call a technique that he uses in his report that compares the -- I'll use as much as I can his phraseology for this.

He looks at -- to come up with high information flow days, what he does is use that public press reports and looks in the headings of the names or ticker symbols of each one of these nine at-issue stocks, and the days -- the 10 percent of days with the most mentions in the headings, he calls high-information flow days, and the remaining 90 percent he calls low-information flow days. So that's what he does in his report.

What I point out is in these three exhibits that you mentioned is that when I look at earlier reports that are in the public domain by Dr. Feinstein, he uses alternative definitions of news days, widely construed.

So in the one here is in some of his expert reports in the past, it was like five or six of them that I had seen. He counts as a news day when there is basically an earnings announcement, but he also counts a guidance release.

And so what I did is did everything that he did with the exception -- try to replicate it, with the exception of rather than search through headings of news articles by mentions, doing the technique they did in the past by including as news days that occurred on earnings or guidance releases.

And so with that one change, I replicated his analysis. And then if you look at the far right-hand column, what he would call significant would be any of those numbers that's below 5 percent.

And so in this case, we see one, two, three stocks that would be a statistically significant difference between high-information flow days and low-information flow days.

So I think he found seven. Using a technique that he used in many of his previous reports, only three

of them would survive.

And so what I do in these tables one by one is I replicate, just like here, using his previous expert reports that I had found publicly available, and redid it. And I think you find much less, like three, two, or only one stock survives this test.

And I'm just pointing out that this -- which I've already criticized, his defining of news by mentions in the popular press. If we use it -- the definition of news he uses in previous matters, we get much weaker results.

MR. RYAN: You said Feinstein, but I think you may have meant Werner.

THE WITNESS: Sorry. Hopefully, that's the first time I did that. My apologies to Dr. Werner.

Q. BY MR. ROSEN: Now Exhibit 1B, you do a similar test, but you use Form 8-K and 6-K?

A. Yes.

Q. And then Exhibit 1C, you do the similar test using just press releases?

A. Yes. And as you see in this last one, only two of them, Blackberry and Bed Bath & Beyond. I'm sorry. Just -- it looks like just Bed Bath & Beyond would survive this test.

So rather, when he uses this counting mentions

in press -- in the popular press, when he finds, I think, seven of them survive this test, when you do his older approach in other reports of press releases, only Bed Bath & Beyond survive that.

My point is: It makes a huge difference for the particular statistical test that he's using that I'm not advocating, but his definition of what includes for high news and low news days matters a lot.

So there's something very unusual about his definition of news days and non news days in this case that seems to really matter.

Q. Okay. And did it occur to you that maybe you should just combine all of the events that you selected for Exhibits 1A, 1B, and 1C into a single test and just call -- uses high information flow days all the earnings and guidance releases, and all the 8-Ks and 6-Ks and all the press releases?

A. I don't believe so. Because the way I'm thinking about what I'm doing is I find in sight previously publicly available expert reports, Dr. Werner, and I'm trying to replicate that definition with the data at hand. So it's a replication.

So to the extent I was trying to replicate some sort of agglomeration of those previous tests, that might have occurred to me. But I'm trying to replicate what he

did in previous reports, which is exactly what I did in these three exhibits.

Q. What he did in previous reports isn't relevant to this case. It's what he did in previous reports relevant to different cases with different facts and circumstances; right?

MR. RYAN: Objection to form.

THE WITNESS: So that -- that sounds like your opinion. What I'm trying to say is, number one, as I make very clear, I do not agree at all with his definition of what news is and not news. Because it ignores any conception of value relevance.

So if, for example, on a given day many reports come upon GameStop's unusual short interest and the stock price jumps, or just ignoring the stock price jumping, if they're commenting on unusual short interest, that's clearly not value relevant by my definition. He doesn't seem to care either way what they're saying as long as they're saying something.

So he's not in his approach even what the news is. He's literally only counting mentions.

So I don't know of a finance or economics textbook that says what should drive the value of a stock is a number of mentions it gets in the press, regardless of what they're saying. Whether they're saying good

things, bad things, important things, or irrelevant things.

He includes mentions of such things as reporting on what happened to the stock price the day before. Why in an efficient market does he even consider that important news to buttress the opinion of a market efficiency? He's literally not looking at the information. He's ignoring it.

He's just counting cites. And counting cites, just mentions, is orthogonal to any measure of what is value relevant. It takes some work to notice whether it's value relevant or not. But just counting tickers or names in a headline is not looking at whether that information is value relevant or not.

So in that context, that's my critique. What he does in previous reports is different, but at least it has some nexus between information flow and value relevance.

So, for example, earnings announcements. We could all say that that's at least broadly related to something that's value relevant. I do not know why he would not look at earnings announcements in this case.

If in other cases he looked at company revelations through SEC documents, why is that not relevant in this case? What is it -- in your question,

what is special about this case that would make him not care about earnings announcements but now interested in just mentions in the popular press.

I don't see any reason, any sort of scientific reason for doing so.

Q. BY MR. ROSEN: So you think that he was bound to do the same type of study in every single case he gets hired to work on?

MR. RYAN: Objection to form.

THE WITNESS: Of course not. I do think it's fair to wonder when someone changes their technique for a particular case, why? Is there -- is there a reason why you changed it? And I -- I have not asked him that question and I don't know the answer to it.

What I'm pointing out is I don't know why he changed it. It's not obvious to me what is it about this case, though in previous cases would make him focus on earnings announcements but not here.

And what I wanted to show is for that unexplained reason, what I do note is it matters. That is, if he had used his previous approach, his results would have been significantly weakened.

And I'm not insinuating whether -- what his reason was, whether it was data scooping or not. I'm not saying anything like that. I'm saying he changed his

approach here from the publicly available ones that I've seen. He doesn't say in his report why he does that, and it matters. That's all I'm saying.

Q. BY MR. ROSEN: Okay. Now if you had done one single news/no news test for -- and combined all of the events in Exhibits 1A, 1B, 1C, and that unitary or combined test had shown the nine stocks or -- to be -- to have a statistically significant difference between high-information flow days and low-information flow days, would that change your opinion about this?

MR. RYAN: Objection to the hypothetical.

THE WITNESS: So my opinion wouldn't change because what I'm trying to show is if I look at his techniques in the previous reports, and I've identified three, and my opinion is if you do the techniques that he did in those -- those three techniques in previous reports, you get strongly different results.

That opinion doesn't change based on the hypothetical you gave me. Because I'm unaware of a previous report that he did what you're insinuating.

I'm simply saying if he did the techniques that he did in previous reports to the data -- applied it to the data in this case, his results would be dramatically different.

Q. BY MR. ROSEN: Let's go to your Opinion

Number 2.

A. What page? This is the rebuttal report two?

Q. No.

A. Okay.

Q. Let's see. It's page -- it begins on page 75 or 78 of the PDF, your first report.

So in Opinion 2, paragraph 149, it says that: "If plaintiffs' allegations were true and Robinhood's restrictions impacted the prices of the at-issue stocks 'artificially' throughout the proposed class period, that would be inconsistent with market efficiency."

A. I'm sorry, where --

Q. Why is that?

A. Where are you -- is this paragraph 149?

Q. Yeah. It's -- I don't know. It's the last sentence --

A. Yep. Give me just one second just to make sure I just read that full sentence.

Okay. Feel free to ask it again, please.

Q. So what is the basis for that sentence?

A. Sure.

What I'm trying to say is the notion of market efficiency and the notion that a restriction on demand of a subset of retail investors impacting the stock price are fundamentally inconsistent. It's the combination.

I want to be clear on this because in Dr. Werner's rebuttal report, he quotes this, like with quotation marks, but leaves out the part about "under the assumption of market efficiency."

He would say, for example, if you look at the -- the -- he says -- let me find a good example. If you look at the heading right above 149, he puts in quotes, I believe, something to the effect of one would not expect Robinhood's trading restrictions to have allegedly 'artificially distorted' prices. And he mentions that a lot in his report. And it's -- I'm trying to explain why that's an important misquote.

I am saying if the stocks traded in an efficient market, then the allegation that these restrictions on demand of a substantive retail investor would impact the stock price are inconsistent.

I'm making a very simple point. But to take off the part about if one assumes that they trade in an efficient market is a really strong mischaracterization.

And he goes on to say that Grenadier contends that -- that some sort of causality, that these restrictions could not have impacted stock price. And I never said that. I just wanted to point out here because this is literally -- your question here is about that sentence, and you fairly asked me to explain it. I'm

just saying that I was surprised that he put quotation marks around a fraction of my sentence over and over again, which gives a very misleading inference for my statement. And I was very surprised by that.

I don't know if I've ever seen that in a report, someone putting quotations around half of my sentence.

Q. Well, so when you say -- you preface that sentence with "assuming the stock is trading in an efficient market," but is it possible that the stock was trading in an efficient market and then the restrictions come into place, and as a result of the restrictions, the market is no longer efficient?

MR. RYAN: Objection to form.

THE WITNESS: If the market is not efficient -- so I'm just simply saying that if the market is efficient, you would not find that a restriction on a subset of retail investors would impact the stock price. If you're saying if the market is not efficient, could other things happen, yes.

If markets are not efficient, lots of things can happen that are very difficult to explain. In particular, causality, and in particular, what a but-for stock price would be.

So that's -- that's exactly my point is I'm very limited here in this expression here. I'm just saying

that you can't say two things at the same time: One, that these stocks traded in an efficient market; and two, a restriction on a subset of retail investors would impact the stock price. You could say other things, but not that.

It's a very sort of I think relatively non-controversial point that I would think almost everybody would agree with. But if you cut off half of my sentence, then it becomes controversial.

Q. BY MR. ROSEN: All right. Don't -- you're getting so sensitive about that quotation. I -- you know, you can ask Mr. Ryan to grill Dr. Werner about that, plans for that if you like next week or the week after. But I'm just trying to understand your opinion here.

And is it possible -- I mean, is it possible for someone to manipulate an efficient market?

MR. RYAN: Objection to form.

THE WITNESS: So "manipulate" sounds like a legal term. So I don't know what that is. I've certainly said in my report examples from the academic literature about friction. I'm not -- I'm not attributing any motives on that, but there are frictions that can make arbitrageurs have an inability to create efficient markets.

So if, for example, arbitrageurs of very large transaction costs and risks their capital, they are not able to perform their duty to enforce an efficient market. So that can happen here.

But all I'm saying is that, one, that these markets are not efficient during -- before and during the class period, and two, if you want to assume that they are efficient during the class period, you can't have at the same time the belief that the restriction on demand of a subset of retail investors would impact the stock price.

Q. BY MR. ROSEN: All right. So let me ask you another hypothetical question.

So instead of Robinhood being the only firm that was PCO only for the entire day on the 28th, I think there was one firm that was PCO only for a couple of -- for a few stocks later in the date, like at 2 p.m.

But let's say 90 percent of the stockbrokers in America went PCO only that day for these nine stocks. Could that reduction in ability of people to purchase the stock cause the prices -- cause the prices of the stocks to be distorted or -- and decline?

MR. RYAN: Objection to form.

THE WITNESS: So I don't know. Obviously, as you change the facts, you get -- you have to think about

it. That's why, of course, when I mentioned this here, there's two things that I think are important.

One is these restrictions. As far as I know, do not impinge on institutional investors. And two, the Robinhood segment of the market, for example, during the one week prior to the PCO restrictions was a relatively small part of the market. I think I show their net buy behavior was like a couple percent of the market.

So I'm saying that I don't know the answer to your question because it depends on magnitude. But I certainly took into account magnitude in my answer. As I said, one is that Robinhood seemed to be relatively -- its investors seemed to be relatively small part of the buy side of the market just prior to the restriction, and two, institutional investors, as we talked about earlier, have other ways of trading than through Robinhood.

So in the facts of the case as I understand it, it would not be the case in an efficient market that the restrictions on Robinhood would impact the market.

If you ask me to add on other types of restrictions, I would have to look at it.

Q. BY MR. ROSEN: Well, but then you're admitting it is a matter of degree. At some point if you put enough restrictions on purchasing, it's going to affect the price; right?

A. If you restrict, for example, all retail and all institutional investors, yes. But not if you restrict a subset of just retail investors. I don't know how to answer your question without some empirical --

Q. Where do you draw the line? What -- what how much demand do you have to cut off before it will have an effect in an efficient market? Do you have any idea?

A. There is no one number for that one. What I was trying to say is: It's important in your hypothetical to also tell me what the restriction is on demand for institutional investors.

So -- and also, what fraction of -- if there's any way -- so if there's any way of getting around those restrictions.

So one of the articles that's mentioned by Dr. Werner is this Jones paper, which says there was lots of activity trading of options. You got at that earlier.

So it's a simple answer to your question about the facts matter. But in this case, the facts, as I understand that, is that these restrictions were not placed at all on institutional investors.

AQR, for example, did not trade through Robinhood. That would be my best guess. And AQR could buy if it wanted to. AQR could sell if it wanted to.

And also, Robinhood investors, by the data that

I've shown in my report, was a very small fraction of the market in terms of the buy side the week before for these traded stocks.

So that is just used to provide a grounding of my statement about a -- when I say a subset of retail investors, I put some data behind it and show that Robinhood was a subset of investors. It was relatively small subset of investors.

Q. Did it come up with percentage points of the net buy?

A. I'm sorry, I didn't quite hear you.

Q. You said Robinhood investors represented about 2 percent of the net buy, something like that?

A. Yeah. It's on the next page.

So the net buy, what I have is this 1 percent of the total volume across all the at-issue stocks. And during the class period, it was 2.2 percent of the net sell.

Oh, sorry. Of the net sell, it was .6 of 1 percent. Those are very tiny numbers.

I'm not opining --

Q. Right. But if you look at the change, the change is 1.6 percent; right? So there's a 1.6 percent reduction in demand for the stocks; right?

MR. RYAN: Objection to form.

THE WITNESS: So I don't see it that way. Let's look at why I do the net buy just prior to it, which is the most important number.

So the net buy -- and you could look at the week before or the 27th itself. This is the demand. When I look at the net demand of Robinhood investors, that's relevant because under my understanding of this case, the issue is the restriction on demand for those investors, the Robinhood investors.

So just moments prior to the restrictions, roughly speaking, the net buy of Robinhood customers was about 1 percent. And then the restrictions come into play. And if they were totally successful, we're talking about stopping something that was accounting for, just before they came on, 1 percent of the net buy.

That's the most important number here. Not how it changed after the restrictions, but what they were restricting. And in principle, that strikes me as a very low number.

I'm not saying that's a good or bad thing. I'm not opining on that at all. I'm putting that in context. Because in the first question you asked me about this section, which is the relevant concept, is I mention a subset of retail investors. And I didn't want to be accused of saying a subset of retail investors when it

maybe accounted for 99 percent of retail investors. That would be -- that would be a mischaracterization.

And so when I put it in context, when I say a restriction on a subset -- a demand restriction on a subset of retail investors, I bring these numbers into context. And I think the most relevant one is this 1 percent of net buy of these stocks in the week prior to the restrictions.

Q. BY MR. ROSEN: Do you have any support in the academic literature for what the effect would be if you reduced the demand for a stock by 1 percent, what effect it would have on its price?

A. So if that reduce in demand was driven by non-value-relevant information, as my understanding here, then the academic literature would probably be quite universal in saying it would have a de minimus effect on the price.

1 percent would not -- would be very easily overcome by an institutional investor.

Q. Do you know what caused these nine affected stock prices to decline dramatically on January 28th when the restrictions were in place?

A. Just to be sure, you said that these nine affected stocks?

Q. Yes.

A. I don't have an opinion on causality.

MR. ROSEN: I'll go to your third opinion.

MR. RYAN: I'm sorry, I didn't catch that, Larry.

MR. ROSEN: Let's go to your third opinion.

MR. RYAN: Thank you.

Q. BY MR. ROSEN: What do you believe is the plaintiffs' theory of liability here?

A. So what I'm addressing in paragraph 161 of the report is that in terms of my commenting on a methodology for calculating damages, that's consistent with the theory and applicable on a class-wide basis.

I am looking at this. One is: What is the but-for price -- prices of these securities? And as I put here as the but-for price would be all else constant, but-for the restrictions of Robinhood.

That means it includes the price run-up prior to it and the restrictions on other firms such as E*TRADE would continue.

So they would normally try to find the damages by the difference in actual price versus the but-for price. And I've explained what my assumption was for the but-for price.

Q. BY MR. ROSEN: And why is the price rise prior to the class period relevant to the but-for price during

the class period?

A. Sure.

So when I did my report, it was to try to explain that the fact that I find it not efficient for the class period is obviously also consistent with how I found it prior to the class period.

It would be odd to find differences, and I don't find -- I find just as much justification for claiming it's a non-efficient market before the one week prior and the class period itself.

So to the extent chaud in many of my cases when I look at these and I try to opine on market efficiency, it's usually focused on the class period.

In this case for various reasons, Dr. Werner doesn't do any analysis during the class period. I assume he is just assuming that it's not efficient and focuses on the prior class period. I'm not 100 percent sure why, then. But I show it's not efficient during the class period, and for extra measure, that it's not efficient for the one week prior to the class period.

In addition, to the extent it appears to me that Dr. Werner is saying that the price as of the end of the 27th of January, 2021, was what I think he called a fair price, my analysis during the prior period puts that in context.

What he seems to be deeming a fair price is that price that I've mentioned many times today, for example, Koss was a thousand percent run up without any sort of reasonable value-related news, he calls that the fair price.

He's saying that GameStop without any value-relevant news, in my opinion, during that previous period, went up something like 700 percent. And he starts there and he says that's a fair price.

And so when you put that in context with this -- this is right at the end of that extreme period that I've talked about many times today. He looks at that extreme run-up and says that's the fair price.

Why? I don't see how you can say that Koss going up a thousand percent leads to a fair price. Why? You have to have at least some story as to why a stock had an unprecedented week's movement, and he doesn't, he just accepts it.

And so that's another reason why it's relevant here. To the extent he wants to use the price at the end of the week prior to the class period as a fair price, I think it's worth pointing out that I've already shown that it's far from efficient, and that price is nowhere grounded in value-relevant information.

Q. Now let's assume we have an expert. Plaintiffs

hire an expert. That expert does a regression analysis and shows that the but-for price at each point during the class period is a certain price that's, let's say, 10 percent higher than it was on January 27th, that if had there been no restrictions by Robinhood, that the prices would have stayed somewhat above -- somewhat above where they were on the 27th and stayed there during the class period based on a regression analysis. And it's able to disaggregate the restrictions that other firms may have implemented during this class period.

Why couldn't that serve as a model for a but-for price in damages in this case?

MR. RYAN: Objection to form.

THE WITNESS: So the point of a good segment of this section of mine is a difficulty of doing such an analysis in a market that's not efficient. So when you do a typical event study, information that's under the presumption of an efficient market.

If you can't do that inference, I'm not sure how that regression study would tell me anything.

Remember, in an inefficient market, as we said earlier, the best predictor of tomorrow's price is not the market price. It's what's in the minds and hearts of all the individual investors, and I don't know what it is.

But the kind of analysis that you're insinuating doesn't work in a market that's not efficient. You're trying to look at the data and figure out how the market price would respond to that. But doing that has some presumption of rationality on the prices that's tethered to value-relevant information.

You can do stuff like that sometimes if you believe in an efficient market. But that's why in your very standard cases, like you called the stock drop cases, why people first want to show that the market during the class period is efficient so that they can do that sort of event study. That's why they do that so it's meaningful.

But if you don't have market efficiency, those sort of standard techniques don't work. You don't see in the literature about using event studies that this is a great technique, markets are not efficient. The whole premise of an event study is to infer from the impact of value-relevant information on the market price. But if markets are not efficient, there is no connection between those two.

So that's my main point of the first section of this section is that when you don't have an efficient market, the standard techniques like one person's net present value analysis or an event study, they just don't

work.

And I'm not saying it's impossible, but he doesn't offer me any idea -- Dr. Werner doesn't offer any idea of what is he even thinking of? What is the technique you use to get but-for values in an inefficient market?

Q. BY MR. ROSEN: Well, let's assume the Court disagrees with you and determines the market in the pre-class -- the one-year period is efficient and that's enough to permit a regression analysis that's reliable enough for damages, and the regression analysis is able -- shows the -- the but-for price of the stocks, and it's 10 percent above the January 27th price during the class period.

Why isn't that sufficient to infer the but-for price to calculate damages?

MR. RYAN: Objection.

THE WITNESS: So for the same reason I said earlier, that in most typical cases I'm involved in, the expert trying to set up a methodology for damages first tries to prove that during the class period, the market was efficient. So they can do that.

Q. BY MR. ROSEN: But we just took that off the table; right?

A. No, no.

Q. I just said assume the Judge accepts that it is efficient.

A. Unless I misheard you, your assumption hypothetical was that a Judge determined that the market was efficient in the pre-class period. You did not say during the class period. So that's what I'm speaking of now, and you can change your hypothetical, obviously. But let me just first respond.

If you're doing an analysis of an event study or regression for damages during the class period, you have to have the presumption of market efficiency to do that. It doesn't change. That's, again, why I say in most cases that I'm involved in as an expert witness, the side asserting damages and explaining how they calculate them first tries to assert that during the class period when damages are calculated, that the market is efficient, and then they run things akin to your regression/event study.

But if you don't presume that the market is efficient during the period you're running that event study, you're violating the same attribute of causality between value-relevant information and prices. They're unable to do that unless you have a market -- an efficient market.

Q. So in that scenario, it would be impossible to compute damages if someone manipulates the market to the

point where it's not efficient during the class period?

MR. RYAN: Objection to form to the extent it calls for a legal conclusion.

THE WITNESS: So I never said in my report that it's impossible to calculate damages in an inefficient market.

What I'm saying is: It's a difficult problem. I haven't been tasked with doing that. But to the extent that Dr. Werner is asserting that this is something he can do, I am saying it's a difficult task. I am not as I sit here aware of a model that accomplishes that.

Because as you just mentioned, the standard models that you normally see done, such as net present value and event studies, will not work in a market that's not efficient.

So I'm not saying it's impossible. Of course not. I'm saying it's difficult, and I don't believe he has explained what model he's going to use to accomplish this difficult task.

Q. BY MR. ROSEN: So you say in your report that plaintiffs would need to propose a methodology that could identify whether and how market participants, both Robinhood investors and others, would have traded, taking into account that the restrictions imposed by other brokers.

I'm just -- are you suggesting that as part of their damages analysis, plaintiffs have to show how market participants would have acted, what trades they would have made, had there been no restrictions imposed?

A. I might have lost you a bit because I thought you mentioned Robinhood, and then I thought for a moment you said something about other like investment platforms. I just heard the later.

Q. Other brokers.

A. So I'm confused by the question. I see that as two different things. Can you try that again on me, please?

Q. All right. So this is paragraph 162, page 82 of the PDF of your initial report. At -- it says, "As discussed in Section 8 below, plaintiffs would need to propose a methodology that could identify whether and how market participants (both Robinhood investors and others) would have traded and the evolution of trading and prices in the counterfactual scenario, taking into account that the restrictions imposed by other brokers would have still existed."

And so what I'm trying to understand from that is: Do you believe that in their damage analysis plaintiffs must show how market participants would have traded? In other words, whether -- whether certain

people would have traded or not have traded or would have traded different days or bought more, sold less, sold more, bought less, in order to show damages?

MR. RYAN: Objection to form.

THE WITNESS: So what I'm trying to say here is in a world during this damage period, where there is not --

(Interruption in proceedings.)

THE WITNESS: Sorry about that. I don't know what that is.

So what I'm trying to say is that in a world without efficient markets during this class period, which my understanding is Dr. Werner is agreeing that it's not efficient -- he can answer that himself, but it sounds like he's also saying it's not efficient -- I'm mentioning in those sentences the difficulty of coming up with a but-for price.

So you can't do a simple statistical relationship that relies on market efficiency to do this. What you need to look at is in a but-for world, where people are making individual decisions without focusing on just the market price, you introduce lots of complexity.

So if we have a change in behavior that says without the restrictions of Robinhood, but with the

restrictions of other brokers such as E*TRADE, what would have been the prices in that inefficient market in that state of the world.

And I'm pointing out that that's difficult. Because if it's an inefficient market and you change the parameters, such as take out restrictions of investors, there is no simple way of say ah-ha, here's what the prices would have been.

Because when you take out those restrictions in an inefficient market, you have to look at individual calculus -- calculi.

So what would an individual investor have done in that but-for world where Robinhood got rid of the restrictions but E*TRADE did not.

So in an efficient market, that could be an story, but in an inefficient market, that's very difficult. Because you'd have to get into that -- what was the model in that but-for world that that investor would have used. We know the model is not reliant on the market price in an economic sense because it's not an efficient market. They'd have to use some model to do that, and I don't know what it is.

I'm not saying it's impossible to come up with, but I haven't been told or even hinted at that what that model might be.

Q. BY MR. ROSEN: Dr. Grenadier, I think that the thing that I'm not understanding is I understand why you believe that in creating a damages model, plaintiffs should -- should attempt to show what the but-for price would -- what the price would have been; right?

But what I'm -- what I don't understand and what I'd like you to explain better is why you think a plaintiff has to explain on an individual level whether they would have traded the same amount had there been no alleged manipulation by Robinhood.

A. Yes. And I'll repeat what I said, but hopefully in a way that conveys it to you better.

That what I'm speaking about here is how you would come up with but-for prices. As you just acknowledged, you agree we have to come up with but-for prices or Dr. Werner would need to come up with but-for prices, but in a market that's not efficient.

And so usually in these matters, we come up with but-for prices in an efficient market, and we've seen the kind of techniques that are often used.

Now we're in different territory here. So I haven't been involved in the case where a but-for price was to be calculated in an inefficient market. You may have -- obviously you've been involved in many more cases than I have. I'm just saying as an expert, I've never

seen an other expert contemplate but-for prices in a market where seemingly they admit it's not subject to market efficiency.

And so what would be a value in a market where you changed something such as a restriction on demand for Robinhood investors? How would that -- what would that translate into an actual price in that world when markets are not efficient?

So that's the problem I'm defining. And I think I am confident that that's the problem that he would need to solve if the market was deemed, as I say it is, not efficient during that period.

So he's tasked with calculating a market price in an inefficient market where you changed some variables such as a demand restriction on some investors but not other investors.

So where would you -- what model would you use? So if you think about yourself in a Ph.D. program, and they say find the value of a stock in a world without efficiency, and you change some assumption.

That's a fair question. I don't know what -- I don't know what paper you would do. It would be a very complicated analysis.

And all I'm saying is that since there's no simple way of doing that, where in an efficient market we

take prices as a fair reflection of the best guess of tomorrow's price. When you throw that out, you're in the world of complicated models.

And it's possible that Dr. Werner could find some complicated models. I mean, complicated doesn't mean bad. It's possible he could find a model. I just -- I don't know. I don't teach a class where I have such a complicated model to do that. But it's very difficult because when you have an inefficient market, it's driven by what motivates those investors to buy and sell when it's not an efficient market. And that is very, very difficult to come up with.

Q. Why are the investor's motivations to buy and sell relevant to their damages in the seller class?

A. So the main reason is because not just the people involved here, but all of the investors, what would their -- what would determine the price in the market when it's not efficient.

So it's not just these investors; it's the agglomeration of all investors. How would all investors interact in a market, determine a price, in a market that's not efficient.

So it's not just these investors. It's all investors would -- would face a different world if you changed the but-for assumption. But for these investors

in particular, you would have to ask questions, all right, if these investors can now trade in -- with Robinhood, well, what fraction of them were trading, anyway, by going to E*Trade or using, as you said, call options.

So that's the problem. We have to ask these complicated questions. When you change a but-for, such as you opened up the spigots and allow Robinhood investors to buy, to come up with the difference in some non-efficient market stock price, you have to ask the question: How does that change things for them? Were they still buying by going to E*TRADE? Were they what you called, investors who were buying and hold? All these questions are relevant to know the impact on the market price in an inefficient market.

Q. Did you make any effort to come up with a methodology for determining damages in this case?

A. No. I wasn't asked to do that in this case.

Q. Did you make any efforts to disentangle potential non-fraud-related or allegedly fraud-related impact on Robinhood's stock price?

Sorry. Let me rephrase that. I'll withdraw that question.

Did you make any effort to disentangle the potential other factors that could have caused the

non-affected stock prices to decline during the class period?

A. As I said earlier, I determined that, in my opinion, the class period these nine stocks did not trade in efficient markets. But I didn't look at causality of the prices. I didn't look at what caused them to fall, just that whatever happened, it was not an efficient market.

Q. Now the Jones paper you mentioned earlier found that the PCO restrictions caused large and negative return effects on these nine affected stocks.

Do you have any reason to believe that the Jones paper is inaccurate or in that respect?

MR. RYAN: Objection to the characterization of the Jones paper.

THE WITNESS: So I don't agree with how you characterize it.

Q. BY MR. ROSEN: Okay. I'll ask you again.

Do you -- do you have any criticisms of the Jones paper?

A. So I have comments on it in the relevance to this case. So first of all, the paper certainly doesn't ascribe causality. It ascribes association.

Secondly, there's a footnote in Dr. Werner's rebuttal report which cites some statistics that I

believe you may have in mind in your question. Those are statistics when you pool all of the stocks together, in a table or exhibit farther back in their paper, they show that -- unless I'm missing one of them, for none of the individual stocks were the PCO restrictions statistically significant.

So from a -- you know, obviously in academic papers, you don't just look at directionality and signs; you look at statistical significance. And my recollection is not for a single one of the stocks at issue in this case were the PCO restrictions statistically significant.

And then another issue with that paper is that some of the discussions are very hard to understand just from a technical standpoint. How they did their regressions and statistical analysis? It's missing lots of information, and I don't know why that is.

I think you may not know that one of the main authors has passed away from that paper. So that could explain some of this. So it may have been work in progress. I literally don't know, but it's a sad thing that a relatively young guy died.

There's also a discussion about the meme stock effect that they talk about, which is an alternative hypothesis to the PCO restrictions. And the results

there literally make no sense. They are talking that the stocks that they list in their paper, which are a big overlap with the nine at-issue stocks in this case, they're basically saying those stocks are rarely discussed on social media.

So what they said is that only two of the stocks that they're looking at, AMC and GameStop, are in the top 20 most mentioned stocks in the internet like Reddit.

I have no idea what -- that makes no sense that Bed Bath & Beyond and Tootsie Roll and all other stocks here, Blackberry, they're not even mentioned in the top 20 of most talked about stocks during this period.

So there's something wrong. They did a mistake there. And we all make mistakes. It's a working paper. But I don't know how to rely on that paper at all.

So those are the sort of off the top of my head problems I have with that paper in terms of relevance to this case. One, as I said, they were not causality. Two, it didn't show statistical significance for any of the stocks in terms of the PCO effects, and three, when they tried to investigate whether there was a meme stock effect, there seemed to be some technical mistake that made them miss all the important stuff going on in the real world.

Q. Are you offering any opinion as to whether a

presumption of reliance is available to --

A. You know, I didn't hear you.

Q. All right. Are you offering any opinion as to whether the class is entitled to a presumption of reliance under the affiliated Ute case?

A. That sounds squarely in the realm of legal opinions, and obviously, I'm not going to render any legal opinion.

MR. RYAN: It's so clearly a legal opinion, I didn't even object on that basis.

(Discussion off the record.)

MR. ROSEN: Okay. I don't have any other questions, Professor. Thank you very much for your time.

THE WITNESS: Thank you.

MR. RYAN: I have no questions at this time. Thank you.

(Time noted: 4:10 p.m. Pacific Daylight Time.)

--oOo--

STATE OF CALIFORNIA) ss:
COUNTY OF MARIN)

I, LESLIE ROCKWOOD ROSAS, RPR, CSR NO. 3452, do hereby certify:

That the foregoing deposition testimony was taken before me at the time and place therein set forth and at which time the witness was administered the oath;

That testimony of the witness and all objections made by counsel at the time of the examination were recorded stenographically by me, and were thereafter transcribed under my direction and supervision, and that the foregoing pages contain a full, true and accurate record of all proceedings and testimony to the best of my skill and ability.

I further certify that I am neither counsel for any party to said action, nor am I related to any party to said action, nor am I in any way interested in the outcome thereof.

IN WITNESS WHEREOF, I have subscribed my name this 20th day of April, 2023.



LESLIE ROCKWOOD ROSAS, RPR, CSR NO. 3462

ANTONY L. RYAN, ESQ.
aryan@cravath.com

April 20, 2023

RE: IN RE JANUARY 2021 SHORT SQUEEZE TRADING LITIGATION
4/19/2023, Steven Grenadier, Ph.D. (#5868343)

The above-referenced transcript is available for review.

Within the applicable timeframe, the witness should read the testimony to verify its accuracy. If there are any changes, the witness should note those with the reason, on the attached Errata Sheet.

The witness should sign the Acknowledgment of Deponent and Errata and return to the deposing attorney. Copies should be sent to all counsel, and to Veritext at cs-ny@veritext.com.

Return completed errata within 30 days from receipt of testimony.

If the witness fails to do so within the time allotted, the transcript may be used as if signed.

Yours,
Veritext Legal Solutions

IN RE JANUARY 2021 SHORT SQUEEZE TRADING LITIGATION

4/19/2023 - Steven Grenadier, Ph.D. (#5868343)

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Steven Grenadier, Ph.D. Date

IN RE JANUARY 2021 SHORT SQUEEZE TRADING LITIGATION

4/19/2023 - Steven Grenadier, Ph.D. (#5868343)

ACKNOWLEDGEMENT OF DEPONENT

I, Steven Grenadier, do hereby declare that I have read the foregoing transcript, I have made any corrections, additions, or changes I deemed necessary as noted above to be appended hereto, and that the same is a true, correct and complete transcript of the testimony given by me.

_____ _____

Steven Grenadier, Ph.D. Date

*If notary is required

SUBSCRIBED AND SWORN TO BEFORE ME THIS

_____ DAY OF _____, 20___.

_____

NOTARY PUBLIC

ERRATA SHEET

NAME OF CASE: In re January 2021 Short Squeeze Trading Litigation
No. 21-MDL-2989 (S.D. Fla.)
DATE OF DEPOSITION: 04/19/2023
NAME OF DEPONENT: Steven Grenadier

I have read the transcript of my deposition taken on April 19, 2023. The contents thereof are an accurate transcription of the deposition, subject to the following corrections or changes:

Page	Line(s)	Original	Correction	Reason
9	10	valuated	value-weighted	Transcription Error
10	5	valuated indices are generally quite easy o	value-weighted indices are generally quite easy to	Transcription Error
49	22	is the stock price's value	is the stock price	Misspoke
49	25	is a stock value	is the current stock price	Misspoke
51	20	MPV	NPV	Transcription Error
52	2	MPV	NPV	Transcription Error
52	17	in inefficient	in an inefficient	Transcription Error
56	2-3	in efficient market and some investors don't believe in efficient market	in efficient markets and some investors don't believe in efficient markets	Transcription Error
57	22-23	be an efficient market	occur in an efficient market	Transcription Error
59	9	costs	Koss	Transcription Error
61	24	costs	Koss	Transcription Error
62	10	in, I-N, an efficient market	in, I-N, inefficient market	Transcription Error
67	16	it's going to go back to ten	it's going to go back up ten	Transcription Error
72	17	that only change those beliefs under	that only change under	Misspoke
74	14	could proper up	could prop up	Transcription Error
80	5	didn't say markets	didn't say which markets	Transcription Error
80	25	close	closer	Transcription Error

ERRATA SHEET

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No. 21-MDL-2989 (S.D. Fla.)
DATE OF DEPOSITION: 04/19/2023
NAME OF DEPONENT: Steven Grenadier

Page	Line(s)	Original	Correction	Reason
89	7	arbitraged	arbitrage	Transcription Error
106	10	value-relative	value-relevant	Transcription Error
113	19	mean a version	mean reversion	Transcription Error
114	15	version	reversion	Transcription Error
118	12	an important	important	Transcription Error
118	25	to a Court – curtail	to curtail	Transcription Error
122	25	rationale	rational	Transcription Error
164	13-14	Why would an analyst saying that the stock doesn't trade in an efficient market?	Why wouldn't an analyst saying that the stock doesn't trade in an efficient market be value relevant?	Transcription Error
166	21	with some fair price	was some fair price	Transcription Error
168	14	why costs went up	why Koss went up	Transcription Error
172	19	use that public	use public	Transcription Error
173	3	Feinstein	Werner	Misspoke
174	9	use it -- the	use the	Transcription Error
175	7	what includes	what to include	Transcription Error
175	19-20	I find in sight previously publicly available expert reports, Dr. Werner	I find previously publicly available expert reports by Dr. Werner	Transcription Error
176	20	even what the news	even considering what the news	Transcription Error
184	1	of	have	Transcription Error
185	3	these restrictions. As far	these restrictions, as far	Transcription Error

ERRATA SHEET

NAME OF CASE: In re January 2021 Short Squeeze Trading Litigation
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Page	Line(s)	Original	Correction	Reason
189	13	reduce	reduction	Transcription Error
191	11	to the extent chaud in many	to the extent that in many	Transcription Error
200	15-16	that could be an story	that could be a story	Transcription Error

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Steven Grenadier

Steven Grenadier