[SQUEAKING]

[RUSTLING]

[CLICKING]

GARY GENSLER: Welcome back to FinTech, Shaping the World of Finance. Today, we're going to review developments in finance and technology related to capital markets. And since there's so many pieces with capital markets, I've chosen to take the time to dig more deeply into two areas, online brokerage, or really mobile brokerage applications, and wealth advising through robo advising.

But we'll touch upon the broader capital markets as well as a little touch on cryptocurrencies because some of the most successful financial technology companies in the capital markets have actually been crypto exchanges and some of the endeavors around crypto markets. So if I just take a moment just to share my screen and share some slides, and we'll get going here.

Online brokerage, this is not a new tradition. It goes back actually several decades. And so then the question is, what's happened here in the last six or eight years? What's happened that this startup Robinhood and others have really just toppled over the last remaining bits of the commission structure that we've had?

Robo advising and then capital markets, FinTech startups more generally. We'll have to do a quick survey there and then a little discussion of what's happening in crypto exchanges and decentralized finance, because it's really the question, will that actually transform finance, or will it stay as it is right now, a more narrow niche, though, still a $200 billion asset class environment? But will some of those technologies come into mainstream finance?

So the readings again were mostly focused around those two areas, robo advising and online brokerage, and how Robinhood has transformed the industry, and how Charles Schwab and others entered into by the late part of 2019 what some call the New Broker Wars, in part because of this financial technology along the way. So just some lively questions but a way to get us going here. And hopefully somebody

wants to chime in.

How did online brokers emerge during an earlier FinTech development period, during the '80s, '90s, that sort of internet technology, FinTech technology area? And then how Robinhood's transformed maybe this more recent era. Romain, does anybody want to dive in at all?

ROMAIN: Let's see. Who will be the first volunteer today?

GARY GENSLER: I mean, everybody, we'll be talking about this for the whole class. But I just-- if anybody wants to offer their thoughts to start.

ROMAIN: And we have Michael.

AUDIENCE: Yeah. So when I think the earlier FinTech startups, I think just thinking of edge of the internet. I'm thinking like PayPal, just ways you can do online payments and online interfaces for-- or sorry, not online brokers. I'm thinking of E*TRADE, but ways to make it without having to call somebody on the phone.

I guess it was probably more inaccessible when you actually had to drive to the broker directly or in-person. Robinhood definitely was more starting to take the mobile-first approach, started tackling weaknesses of the larger platforms, such as user interface, make it more accessible for somebody to really just trade from anywhere. And then also the fee structure was a huge part of that, too, for trading.

GARY GENSLER: Yeah. But I'm glad-- I'm actually glad Michael raised PayPal, because there's analogies, and that's what this class is really about. It's finding what's happening from a strategic point of view. We're teaching finance, technology, the intersection but about the strategies. And there's a lot of parallel.

There we were in the 1990s. Some of it even started a little earlier. And online brokerage started-- E*TRADE, Ameritrade.

We'll dive into a number of these companies similar to PayPal starting in 1998. So I thank you, Michael, for pulling that together-- PayPal starting in 1998. That earlier wave, the internet, access rather than through bricks and mortar, or physical checks, or an old credit card system vis-a-vis the payment systems in PayPal, online brokerage starts, emerges.

Does it take off? Not entirely. But over time, it's a big story in the capital markets, especially retail investing.

And then we get to this other period, a new form of technology, largely about mobile phones, but not entirely about mobile phones also related to open API and access to the data. Robinhood comes along. And also in the payment area-- we've talked about this already a few classes ago-- a lot of these payment startups.

And Robinhood GEN really further transforms an industry. And by 2019, Robinhood had almost as many members online through their mobile app with just a handful of years as E*TRADE or many of the brokerage firms. So it's got that parallels, and we're going to dive into how Robinhood pressed further. And I'm wondering, Michael, do you have a Robinhood account?

AUDIENCE: Yeah, but I haven't really used it since I started paying loans.

GARY GENSLER: Oh, no. I understand why you might not be investing while you're in school and why you might not have the money to do it, but you actually have a Robinhood account. And while it's hard to do it by a show of hands, but I imagine that many other students in the class have downloaded the app.

So then a little bit different area that we're going to be chatting about is robo advising. How has that transformed the provision of retail investment management, and how is big finance reacting? And I'm wondering if, Romain, if anybody wants to just take a high level hit at that.

ROMAIN: I hope so. We had great papers on the topic. Any volunteers? Weiyi?

AUDIENCE: Sure. So I guess from the robot advisor perspective is sort of, I personally feel, is a how to transform people's behavior from like now going to some kind of financial advisors to actually you're now going through more electronic platforms, whereas traditionally, especially for maybe the younger generations were a lot more used to doing things online. I think robot advisors provide them a new way to construct their financial portfolios rather than going to a financial advisor.

So it's definitely feeling like it's going to take a bite out of the existing financial advisors, which are probably where we're talking about from the retail asset

manager perspective. Some of them are trying to, I feel like, emerge or creating new platforms, or either buying some of the existing platforms, or having some kind of interaction with them. So the existing-- the asset managers are definitely, I feel like, looking more into how to incorporate more tools to come to the [INAUDIBLE] on the [INAUDIBLE].

GARY GENSLER: Right. So robo advising, the ability to have an application on your laptop or on your phones, of course. Robo advising, having an application rather than having a human but having analytics embedded in a program give you advice about asset allocation, investing, in the like.

And then secondly, as you said, big finance. And big finance in this case is asset managers, generally, but also the brokerage firms reacting. What do they do?

There's one other thing that's similar to what we see on online brokerage and Robinhood. And that's about costs. It's not just about a delivery system. It's not just about mobile phones, but it's also about a cost point and a price point. And we'll dive into that a little bit, but robo advisors giving access to financial advice at lower costs, maybe in the range of 20 to 50 basis points a year.

Asset management, the whole field of asset management, the business of asset management is accumulating assets under management. And if you accumulate $100 million of assets under management and charge 1% fee, that's $1 million of revenue. If you only charge a quarter of a point, that's only $250,000 of revenues.

Now, of course, you can multiply because none of these firms really want to just be at $100 million of assets under management. And the biggest, BlackRocks of the world are at $5 trillion, $6 trillion, $7 trillion of assets under management. But the robo advisors have tucked in here at a lower cost point. And that is also true on the online brokerage side.

So it's delivery mechanisms. It's user interfaces. It's service, and it's also a cost and, thus, price points. In essence, can you do something better, quicker, cheaper? That's a very simplistic way to think about it.

But any other FinTech trends? There's a lot going on in the capital markets that-- Romain, you want to see if somebody wants-- they just want to capture a couple of

the other trends beyond these two on the retail side?

ROMAIN: Any volunteers? Come on, guys. Nikhil, go ahead. Thank you.

AUDIENCE: Sorry. I was muted. I thought something interesting was both Robinhood and Wealthfront are moving towards cash management. So they enter the market from the stock side of things and robo advisor side of things, but they seem to converge to cash management as a next product to roll out. So that's a big trend.

GARY GENSLER: Yeah. And look, even Betterment, which we'll talk about in the robo advising space, Betterment is starting to enter into the challenger bank area. They're not the only ones. You have TransferWise from the payment side entering into the challenger bank side. But absolutely, some of these platforms are then spreading out. So you could be robo advisor first and then move into something else.

Other trends, because of data, we'll see there's a lot of startups, dozens of startups in the FinTech space around data, around infrastructure, about what many investors think of as the back office side of things that are connecting exchanges with the public. There are many startups around asset management and trying to help asset management out. And this would be big, wholesale, institutional asset management and not just the retail side.

So let's dive into a little bit the history of online company landscape and think about this for a moment. Who really started out this whole thing? And I put some of the foundation dates and the number of customers. These are the figures I could get. From time to time, I wasn't able to online to find a figure.

But Charles Schwab and TD Ameritrade-- you might think of them as Ameritrade-- both started back in the early 1970s. Actually, free internet. The idea was a lower cost brokerage. But what was happening in the early 1970s, a really important part of this saga is, out of the 1960s, there was a movement that was ultimately captured in congressional action in the US. The US Congress got involved, the Securities and Exchange got involved to repeal fixed commission rates.

You see, for decades, the New York Stock Exchange had fixed commission rates set by the members of the New York Stock Exchange. And the institutional world, the larger investors, wanted discounts, wanted cheaper rates. And in the early 1970s,

there was this movement to free that up, not to have fixed set rates by the New York Stock Exchange.

And around this time, Schwab, Ameritrade started, later affiliated with Toronto Dominion Bank and thus the TD. Each 50-some years later, about 12 million users. E*TRADE starts in the '80s, Firstrade later. Interactive Brokers, a remarkable company, more on the institutional side, little less than a million and so forth.

Monex bought TradeStation, but Monex from the '90s and even TradeStation earlier. Each of these companies were chipping away a little bit of the old concept of brokers. And there were many challenges in the 1990s into the noughts between Schwab and Ameritrade, and E*TRADE and traditional firms like Merrill Lynch and the like.

The asset managers themselves, the big asset managers like Fidelity and Vanguard pre-date all of this. But Fidelity and Vanguard also were saying, how can we, in addition to wealth management, offer online brokerage? And as we all know, if you have an account with Fidelity or Vanguard, or for that matter with T. Rowe Price or other large asset managers in the US, at some point in time in the last 20-ish years, some starting in the mid '90s, some waiting all the way until the late noughts, they started to say they're going to compete with traditional Wall Street, the Merrill Lynches and so forth. And they were going to compete by offering an online ability to buy and sell stocks.

Both got into the business. It's not that the big banks didn't notice and everything. And some of them, even in the last few years, started discount retail packages.

Merrill Lynch, which I keep mentioning, Merrill Lynch Edge 2010 was a product after Merrill Lynch was bought by Bank of America. And Bank of America is thinking, OK, it's post-crisis. They buy Merrill Lynch. Merrill Lynch has this remarkable multiple 1,000-person organization of brokers, but they do Edge to be online. And even Ally Bank, Ally Finance, which started in the auto lending business, was that first challenger bank in 2009, by 2016 is saying, we can get into this, too, online-- 4 million members.

But where are we on the startups? The startups, Robinhood in 2013 and all this package of startups in the last few years really have transformed things. So what I

was saying is these FinTech startups, primarily we think of Robinhood, but there's a bunch of others within other markets. Like Freetrade, and Tastyworks, and Webull have come along partly because of mobile phones, partly because even the Schwabs and Ameritrades were still charging, whether it was a few pennies a share, but still charging $0.03 $0.04, $0.05 cents a share and so forth. User interface and cost provided some opportunity to move in.

So I'm going to just talk a little bit about the large companies, that E*TRADEs, and Ameritrades, and Fidelities and the like for a moment because part of it is about mobile trading. And they each-- and this chart that I was able to get from StockBrokers.com, a comparison was just like, what are the apps? What is that user interface? And this was one example.

But better believe that whether you're Merrill Lynch Edge or you're Robinhood, you're also thinking about, do I interface well with an iPhone, an Android, and so forth, and Apple Watch? I have to have that connectivity and that technology to be ready and used on all of these. And you can run your eye through, can I have trading on each of these products, mutual funds? And particularly electronic trading often is around ETFs but not only ETFs.

And as the cryptocurrency space came up, a number of them said, well, can we trade cryptocurrencies as well? Not the E*TRADES and Ameritrades, but the Robinhoods and the disruptors were into that space. So it's just a little bit of a comparison in how some folks think.

Recent developments are really important. And the biggest one was late in 2019, what's called the Broker Wars. What happened start was-- at the start was Robinhood was eating into this, 6 million, 7 million, 8 million members, now maybe 10 million members. And as we saw the earlier numbers, Schwab and Ameritrade are only at about 12 million.

And as that was happening, IBKR, which is that smaller but remarkable company, Institutional Brokers, in September of 2019 said they were going to go to free brokerage for some of their accounts. It wasn't 100%, but they were going to go. And within weeks, early in October 2019, Schwab finally said, zero commission.

Now, what's fascinating, I think, is this is the challenge that we're in. We're in the

challenge of, are there financial services that will move to zero top line pricing? And what we've found, whether it's in Facebook or in many, many online applications and outside of the financial world, it's a zero fee environment. And then the business model is earning money some other way. In Facebook's case, it's about marketing and advertising. 90-plus% of their revenue is really about advertising and marketing if you look at that business model, that remarkable business model.

But it may be on the data. It may be cross-selling and marketing. It may be on the data. It may be somewhere else. We're going to talk about the revenue model of Robinhood in a moment.

But Charles Schwab reacted. E*TRADE, TD Ameritrade all within one week went to zero commission. And in fact, it led to Schwab being able to do the next thing, which was announce the purchase of Ameritrade. With collapsing revenues in Ameritrade, Schwab could actually say, we're-- they made him an offer, purchase for $26 billion.

Morgan Stanley wasn't going to be outdone. And early in 2020, Morgan Stanley, one of the most venerable old-line investment banks dating all the way back to James-- to J.P. Morgan himself, the industrialist that though he's departed this world many decades ago has his name on Morgan Stanley and JP Morgan Chase, Morgan Stanley buys E*TRADE earlier this year.

If you would have told the Morgan Stanley executives when E*TRADE started 30 years ago that some time they would in their future buy E*TRADE, they would have scratched their head and said, really? We're going to be a retail online brokerage firm? So it's an interesting change in this world.

So what's the long road? What's the long road of commissions? This is the-- a much earlier chart, but if you look at this gray line, this commission rates from $0.25 a share down to about $0.03 cents a share in 2008 or 2009. I think this chart cuts off around 2008. This long march of competition in part is because of volumes as you can see on this, that volumes were going up and commissions were going down. So some of it is just efficiency, but it's also this competition that was coming in from E*TRADE and Ameritrade on the retail side.

But Robinhood entered a world that still had $0.03, $0.04, $0.05 cents commission.

Robinhood initially did an online app that was easy with a mobile phone to start an account. But what they also did is they said, we'll do it for free. Their business model from 2013 on, we'll do it for free.

And how did they do that? What's the revenue model behind that? Anybody want to take a moment of pause, Romain?

I will answer this question. I'm just saying, Romain, who amongst the class would think, how could you be so bold? As a startup venture capitalist, you start an entrepreneurial effort free online brokerage from day one.

ROMAIN: Any volunteers? Victor.

AUDIENCE: I guess you can either make a profit on lending money to traders so they can purchase stock. And you can also use some high-frequency trading, as some people said, that's probably what it's doing in order to before you sell, you actually go through a-- determine the area to make a profit out of.

GARY GENSLER: OK. So Victor's raised two things. I'm going to focus on the second, was the relationship of these mobile platforms, Robinhood in particularly, and high-frequency trading. What Robinhood knew was that a feature of the capital markets was that there were firms that would pay for order flow. They would pay a very modest amount, maybe a penny a share, but they would pay just to receive the order flow. And this is a feature of the competitive markets, the competitive exchange markets.

In the US, we have 50 to 70 individual exchanges. We think of the New York Stock Exchange. We think about NASDAQ and so forth, but there are many other electronic markets where transactions occur. And some people call them the dark markets.

But all of those markets might pay for order flow. And then individual trading shops, high-frequency trading shops, might pay for order flow. What that means is they want to have a first look. They want to have those orders and to route them through their algorithms and into their either exchange engines, if it's an exchange that's paying for order flow, or a high-frequency trading shop that's paying for order flow.

And the exchanges have different fee structures depending upon whether you

make a bid or offer or you take a bid or offer. You will sometimes hear this called maker and taker rates. Making a bid or offer, putting a resting bid or a resting offer into an exchange engine is more valuable for the exchange because it brings other orders into the exchange.

So what Robinhood figured out was they could offer the retail public something for free because they entered into two or three major contracts with hedge funds, with high-frequency trading shops saying, we will enter into something where we're selling you the order flow for a modest amount. I don't know the exact amount, but let's call it a penny a share inside the pricing of the $0.03 or so to $0.05 that the online brokers were charging, but still very valuable over time for Robinhood. And then bingo, 6 or 8 million members later, account holders later and a good user face, we get into the Broker Wars where others drop their rates as well.

And so then I go to this interesting zero commission model chart that talks about, well, how could you have the cost of financial advice be zero? Well, it's because of everything else. And the everything else model, whether it's for Morgan Stanley and E*TRADE, whether it's for Schwab, Charles Schwab, or whether it's for Robinhood, as Victor said, this is everything else that might be valuable for you.

Picking up payment for order flow is the third one on this list, but margin interest, maintenance fees, transaction fees, saying once you have a client, there's a lot of other revenues that can be garnered. So once Facebook has your information, there are other revenues that Facebook can garner. But in the brokerage space, this is very well known. This was known in the 1960s and 1970s when the large investment banks would think, if I have a relationship with this big insurance company, I can earn money in other ways.

It's what led in part in the early 1970s to break the old decades-old fixed commission rates because large investment banks wanted to discount and lower their rates for large institutions, not for the retail public but for large institutions. That was 50 years ago, but that was also because there's all this revenue potential, as this little graphic says, beneath the surface. Romain, questions if I can pause a little bit, because it's about the business models of brokerage and the business models of investment banking.

ROMAIN: Let's wait a few seconds so people have the time.

GARY GENSLER: [INAUDIBLE] lived at Goldman Sachs for 18 years, even though that feels like another era.

ROMAIN: So we have a few questions. Let's take Luke and then Hassan.

AUDIENCE: So I have one quick question when it comes to traders or trading platforms. Banks usually make money by holding deposits in daily basis because that's a revenue to the firm. It's especially hard to do so in US when interest rate is near zero.

But in emerging markets, such as Korea, China, or India, they basically make the revenue if you have somebody's money. And you can lend it out in a net interest margin of positive. How do platforms like these, E*TRADE or Robinhood, make money when they transfer the money from deposit to their account and takes two, three days, and they can make money out of it besides these hedge fund deals that you have explained?

GARY GENSLER: So a great question. So the classic what I would call commercial bank model is exactly what Luke said. To pot-- there's a net interest spread between the depositors' money and what you lended out. And whether you're a $1 trillion bank or a $100 million bank, it's basically that spread between the depositors' money and what you're lending out. That model has been around for centuries. And as Luke said, it's a little bit more challenging in different interest rate environments, but that's been there.

The brokerage business traditionally was making money on commissions, and commissions was a big part of that revenue model all the way through the 1960s and '70s. But there's other pieces of it as well beyond just the commission of, as we saw on that chart, $0.25 a share long ago or $0.03 or $0.05 a share more recently.

Beyond that, it's also, when you buy and sell securities, you-- there is what's known as a bid-offer spread, the difference between the bid side and where somebody is offering. And a market maker can be in the middle and provide liquidity to the market, get paid for taking risks. It's a risk-return business. But first, Luke, is the bid-offer spread, just being in the flow.

In Robinhood's case, Robinhood said, we don't have a balance sheet. We're not

going to pay for the bid-ask spread. But we will enter into transactions with high-frequency trading shops and effectively give them access to this flow of transactions. And so that's payment for order flow. And the high-frequency trading shops are, in essence, trying to tap into that bid-offer spread. So that's a dominant part of it.

In addition, just to name one other, but there are many others-- in addition, Charles Schwab and others-- Merrill Lynch figured this out decades ago. Once you have that customer relationship, that customer relationship will come to you for other things, and they will come to you to do margin lending, which is a form of borrowing. And so you have maybe then that customer there who you can actually use your balance sheet and lend them money, usually what's called margin lending.

So I'm just mentioning two of them. Bid-ask spread, Robinhood was not taking that themselves. They were selling that access. And then the relationship that you can have when using your balance sheet and lending money.

AUDIENCE: Can you tell us a little bit about the kickbacks in the presentation?

GARY GENSLER: What's that?

AUDIENCE: Can you tell us a little bit about the kickbacks in the presentation you have here in the small letters?

GARY GENSLER: Well, these are not my words. These are Jason Wenk of Altruist. But in essence, there's so many different ways that you might take a customer's order flow and sell access to that, or you might be the front end model.

You could be-- I'm not saying Robinhood or Schwab are doing this, but you can be that front end model. And then somebody else will pay you, pay the Schwab, pay the Robinhood. And so I think what Jason Wenk, who wrote this, is calling that a kickback. But it's a contractual arrangement to be-- have access to that customer and that order flow.

AUDIENCE: Can I safely assume that they're selling our data as well as Google is doing?

GARY So data is really important, and data is really important for multiple reasons. One,

GENSLER: the better data you have, the better trading algorithms you can create. So part of the payment for order flow is to capture bid-ask spread.

Part of the payment for order flow is the data so that you can build your algorithms. You have more data for your machine learning, absolutely. There's also other relevant data, but fundamentally the data is to be a better market maker and a better investor. I think Romain, there was somebody else that still had a question before I go on.

ROMAIN: Yes, Hassan.

AUDIENCE: Hi, Professor. Yeah. My question is about the bid-ask margin. And I'm just wondering, I mean, so for instance like Robinhood, they-- so because they had many customers, they could get better deals, and they could benefit from the flow of customers that they have. Is this how they make money? I'm just wondering.

GARY GENSLER: Well, so actually, the way they made money is they were getting paid for that flow because their business model early on, and others like them now, said we will go to the investing public and zero commission. And somebody else will pay us. A fraction of a penny at this point in time would be enough, but a fraction of a penny. That other party would pay us to, in essence, route those transactions to the stock exchanges.

And so one company that does pay for order flow is a large hedge fund high-frequency shop from Chicago called Citadel, which I don't know its current size, but it used to be about a $20 billion hedge fund asset management shop and very active in high-frequency trading. It's very public that it is. And so Citadel is one of those vendors on the other side of the Robinhood app. And then they find a way, as we were talking with Luke. They find the Citadels of the world, not just Citadel. They find that order flow is then valuable for them.

They're routing some of it to the Stock Exchange, and that could still be worth something. They're putting it into their analytics. They then get better sophisticated machine learning on the analytics. And that order flow is also something that can be very valuable to an operator of a dark market, one of these small electronic markets, because you're all competing.

If there's 60 or 70 of these small dark markets, they're all competing for volume and market share. And then all of the sudden, Robinhood has not just a few 100,000 customers, but they have 5 million or 10 million customers. Then they can provide a lot of order flow and a lot of market coverage for somebody on the other side.

Now, as it relates to Schwab, Schwab and some of the earlier online brokers, they got into the business of collecting assets under management. They got into the asset under management custodial side of the business as well. There's a lot of other revenue streams, transaction fees, account maintenance fees, and even advisory fees in those shops.

I want to move on now to wealth management. I think you'll see merging between the wealth management fees and the brokerage fees, which is exactly what we've seen over time in the traditional brokerage field. In the traditional brokerage field for decades, a broker earned commissions. And then they started by the late 1990s, with some support from the regulators, to change their revenue models.

The traditional Merrill Lynch broker from the 1930s to the 1980s was a commission-based broker. But by the 1990s, they started to charge advisory fees, meaning for instance, maybe 1% of the assets that you left with them. And if you leave $1 million, if you're wealthy enough to have that $1 million, that means that they're earning $10,000 a year on your account.

If you obviously had more, that would even be better for Merrill Lynch and worse for you because you'd be leaving them a lot of money to just be a custodian for your account largely and to give you advice from time to time. And that's the set up for the next discussion. Romain, any questions?

ROMAIN: No. All good.

GARY GENSLER: So robo advisory-- and Hassan sort of helped me set this up. I'm going to do the same sort of landscape. We have the same groups, retail brokers, asset managers, and the banks.

Advisory work, brokerage advisory was largely, for many decades, the domain of investment banks and broker dealers, Merrill Lynch, Smith Barney, Paine Webber, many, many companies across the land, small and large. And they were a

commission-based business. By the 1990s, as I mentioned, they started to move to a financial advisory commission number. And I can't remember exactly what year it was in the 1990s. Even the Securities and Exchange Commission changed some rules to facilitate some of that.

Coming from the other side, the big asset managers managing pension money and managing big pools of money through mutual funds also started to get into the retail advisory space. And thirdly, you had the brokers, the Schwabs and so forth.

Now, I've put some names here like Charles Schwab Intelligent Portfolios, which is a more recent rollout, that branding, Intelligent Portfolios or TD America's Ameritrade's Essential Portfolios, more recent roll out for them. And they've been reacting to this crowd, this remarkable, entrepreneurial, mobile app robo advisors. And these companies span the globe in Europe, US, and Asia. But what Betterment, or Nutmeg, and others are doing is they're saying, we can give more financial inclusion, and we can do it in a better user interface and a lower cost structure.

By and large, the asset management fees for an account in the traditional brokerage environment was hovering close to 1%. There was some price compression. Some of it was coming down into the 3/4 of 1% to 1% area.

That means, again, if you were fortunate enough to have-- let's just say that you had $500,000, and you were able to have somebody invest it for you or advise you. 1% of $500,000 is $5,000. That's $400 a month that you were paying, in essence, for somebody to give you occasional advice and be your custodian for your electronic securities, because everything was digital by this point in time. It was no longer those earlier days where you had physical certificates.

This group came along and said, maybe we could do it at a different price point, a better user interface, maybe better analytics and service, generally somewhere between 30 to 50 basis points or a quarter to a half a percent. That same $500,000, if you were to have that $500,000, all of the sudden doesn't cost you $5,000 or $4,000 a year, but it's costing maybe $1,500 a year or $100 a month.

Now, you don't get a bill for the $100 a month. It just comes out each month out of your account, and it's charged as a fee per se. But there's generally a different price point. We haven't gone all the way that we went with online brokerage, to

mobile brokerage, to zero accounts, zero fees. But one of the great pressures that have happened here as well, which is off this page, is asset management fees have been coming down as well and particularly around a product called exchange traded funds.

And to understand the field of robo advisors, I just want to mention something about exchange traded funds, which is an invention of the late 1990s. That was a FinTech of its time that somebody came up with the idea, I can have a mutual fund. I can have a mutual fund that invests in the entire market, and I can do it at a low cost. And I can package it through a security.

So let me unpack that. The first innovation was an innovation of the early 1970s. Jack Bogle, who was the key innovator behind Vanguard, said, wouldn't it be great if we gave America at the time a product they can invest in the whole stock market a little bit of each company? And we're not going to manage it for them. We're just going to algorithmically, arithmetically pick a little bit of every stock. And it was called an index fund.

We take it for granted, but that was an innovation, a remarkable innovation of the 1970s. Everybody could have a piece of the stock market at a low cost. And to this day, Vanguard is still not a publicly traded for-profit company. It's a mutual company. Vanguard is held and owned by its mutual funds that are held and owned by us if we're a part of Vanguard.

That innovation then led to an innovation in the 1990s that said, what can we do to make this even more efficient? What if we take an index mutual fund and take the interest in the mutual funds and make those securities? Took a little change in some regulations, but all of the sudden, we had this thing called exchange traded funds, these low-cost ways to participate in the stock market, the bond market, some in the gold and silver markets-- exchange traded funds. All of these robo advisors in their packaging have said, we can get you into this and get you out of this, into this market or out of this market, and use exchange traded funds.

The second big innovation for robo advisors, of course, is everything we talked about out of artificial intelligence and natural language programming, processing, the ability to take voice or take digital and transfer that into machine language,

computer language, and the reverse. So robo advisors came along at a point in time where you could basically automate us humans a bit, not entirely, but we could step back. Humans step back, and robo advice goes in. And you could do it a lower price point.

And the third innovation was basically some simple analytics-- not machine learning, but simple analytics on portfolio and asset allocation. Some of it's related to, if you're in your 20s and you're saving for retirement, you could take more risk. You could have a higher equity share versus a bond share. If you're in your 60s, and you're about to retire, you should be more stable, a little less risk, maybe more bonds and less equities. Some of it's that simple, but they were able to basically take that.

And so the Betterment started, and they could find really readily available software for asset allocation. They could use products like exchange traded funds. Mobile phones were around already. So they had a good platform.

And they say, all right, we'll go to a lower fee point. And all of the sudden, we start to see a real change of things. Questions, Romain?

ROMAIN: While we wait for questions on this topic, we have a question in the chat about Robinhood's business model from George. Do you see Robinhood and other startups starting their own high-frequency trading operations instead of selling the order flows? And then Devin asks whether maybe Citadel or any other hedge fund should just buy Robinhood outright.

GARY GENSLER: These are two really great questions about the future. I think that in both ways will the front end platform-- and that's really, in a sense, Robinhood and, even in this robo advisor space, the Betterments of the world-- is a front end user interface platform that tend not to have balance sheets. And they tend to let somebody else handle that capital markets risk behind it.

But the question here is, do I see the front end building balance sheet and moving into the capital market side? And do I see the capital market side, the balance sheet risk taking, moving into the front end side? And we don't know, but history tells us that tends to happen at some point, that there's some sort of what you might call vertical integration. And if you really think about these slices on this page, the JP

Morgan building you invest in 2018 or Merrill Edge in an earlier time-- and if I go back to the brokerage side, they're named products there, too-- that's balance sheet coupled with front end. That's the fully integrated model.

But then if you look at the asset managers, the asset managers, the BlackRocks of the world are not actually acting as a principal. They're acting as an advisor, a pure advisor, a pure agency business. So one of the things is, do you just want to stay as an agent, or do you actually want to invest your capital in the markets? And that big business decision separates some of the asset managers and then, as you mentioned, the high-frequency traders.

I think that if Robinhood is going to be bought, it could be bought by high-frequency trading shop. But the challenge there is, will they still get as big a customer base, I mean 10 million customers? Or is Robinhood more valuable for one of the large banks to buy or one of the large asset managers? I think if you look out three to five years, it's quite likely that Robinhood gets merged up into something, as you saw Morgan Stanley buying E*TRADE as well. Another question?

ROMAIN: Yes. Let's go with Camillo.

GARY GENSLER: And then I'm going to do a few more slides here on robo advisors.

AUDIENCE: Hi, Gary. I wonder why platforms such as Acorns and Betterment that you were just talking about have a mixed business model, because in one way, they are a robo advisor business model. But then they have savings and checking accounts.

GARY GENSLER: Correct.

AUDIENCE: They're stepping a foot into a banking model. What's the reason to merge the two spaces into one?

GARY GENSLER: I think because they have the front end customer relationship, and they have some trust. And this helps set something up. This is a chart on users. And it's got some predictions here. We don't know if these predictions will hold. But if you see the use of robo advisors, it's just getting much more comfortable that folks are being-- and

this, I believe, also includes the robo advisors at the big shops as well as the startups.

But just as if you have that user interface-- and remember we talked about challenger banks as well, Camillo, the challenger banks last session, a lot of it's about trust as well. Once you have that user interface, there's a certain trust and, frankly, stickiness to it. So if Betterment, which is looking to become a challenger bank, can use that customer relationship, then you can build the platform.

And back to the economics of platforms, the economics of platforms is as you layer activities on top of a platform, and if you can grow your user base, you get more data, you get more centrality. There's not going to be 10 years from now this many advisory platforms. And in fact, in the blue, the advisory platforms, I picked the ones that are large. There's 50 to 100 others that I haven't listed.

So there is going to be consolidation. As sure as we're here at this moment, there's going to be consolidation in this space. And so they're trying to build classic platform economics, build activities, build user bases.

And this is assets under management, the same website behind this. But as of a few days ago, just a sense of, what are the assets? This is in billions. So in 2020, $1.2 trillion of assets under management somehow associated with robo advisors. So even a 1/4% fee on this starts to be a real revenue model.

Possible evolution, I like thinking about, where could this go in the future? Where did robo advising start, all the way on the left? It's just an online questionnaire about asset allocation largely, and an online questionnaire, a mobile questionnaire about products and risk and how-- and then usually a list of exchange traded funds, some bonds. So simple but very accessible, broadening financial inclusion for lower rates.

And it helps a lot of people, a lot of investors sleep well at night. It lowers their uncertainty. I'm getting some good advice about asset allocation, some risks, some life events.

But could move it move further? That's the question. Can it move further? And exactly like Camillo said and Luke's earlier question about other revenues, can robo advisors-- like Betterment say, well, we'll actually be the fund manager. We'll start to

actually manage the funds rather than just doing these low-cost ETFs.

And maybe we'll start to actually do something more with regard to risk based portfolio allocation. Maybe we'll start in this third column, do a little bit of algorithms. Maybe, in fact, we'll start to do trading and be principals rather than just an agent and an advisor and the like.

So there's going to be more sophisticated algorithmic AI or machine learning. But I don't think it's going to be highly sophisticated machine learning because there's a certain commoditization about the advice. But it is quite possible as we move forward that somebody will figure out what risk I should take versus somebody else.

Andrew Lo, a faculty member at MIT, thinks that you can take machine learning and embed it in even an index fund, that you could have inside of an index fund-- what Andy talks about is called "the freakout factor," that we all have different risk profiles. When the stock market goes out, down, how likely are we to, quote, as he says, "freak out" and want to sell? And that we could, based upon other aspects of our lives, put that into a machine learning model and have it automatically adjust up and down. Questions before I think I'm going to go to the-- broadly the capital markets piece?

ROMAIN: We have a question.

GARY GENSLER: So we've sort of covered-- I'm pausing here for a second, but we've sort of covered the online brokerage, robo advisor, those two big pieces as captured by Robinhood and Betterment, might be the two companies that are the leads of the pack, but they're not alone. And in the wealth management side, it's much more evenly split, whereas in the mobile side, in the mobile brokerage side, Robinhood seemed to really sort of punched high and done well.

ROMAIN: The only question we have here is from the chat from Luke. What kind of US regulation is [INAUDIBLE] the likes of Robinhood to expand globally or to attract capital from abroad?

GARY GENSLER: Well, this is a highly regulated space in both the advisory side and the brokerage side. And Robinhood would certainly need to be aware of that and register appropriately as a broker dealer here in the US. And then on the asset management

side, there's a little bit different regulation but also regulated here. Attracting capital from overseas, if the capital is just investing in Robinhood, in one of their venture rounds, BCD rounds, because these are probably private placements largely speaking, other than the usual regulations around sanctions and anti-money laundering, it'd be straightforward.

If it's actually customers using the platform, then a Robinhood would have to be aware of the regulations in that jurisdiction, whether it's the regulations in Europe or in your home country, Luke,-- in Korea, that they'd-- those customer-facing applications, Robinhood Korea would have to think, do they register as a broker dealer in Korea or Japan and the like, as they are, in fact, just a mobile application for a traditional investment brokerage firm?

So again trying to capture capital markets. Capital markets is a vast array of activities from accessing capital to trading platforms and the like. And this slide from McKinsey just captures an earlier stage of, where is FinTech in each of these? And I'm not going to go through each of these buckets, but part of why I have this is it's so many little buckets. We talked about two on the retail side.

There are crowdfunding platforms, literally platforms that help companies raise money. There's trade execution, and I'm going to talk about a couple in a minute, decentralized trading platforms like cryptocurrencies, but also centralized trading platforms and cryptocurrencies.

But even in the last few years, a firm called IEX is a startup in trade execution. It's a new trading platform. There's post-trade services. There's a lot of infrastructure and operations.

The capital markets are a vast multi-trillion dollar business globally in terms of revenues. So I'm just going to quickly touch upon some in these next couple of slides. You can see, I picked some dozen or so firms that were just ones I kind of like to watch and follow.

We can take any questions about each of these, but there are a number of them in the wealth management space. And one of the things in wealth management we talked about, like Betterment, is facing the retail public. But there are startups that are in the wealth management space facing financial advisors. These tens of

thousands of financial advisors want better software. And Addepar and a number of others are actually platforms for the financial advisors, that financial advisor that's trying to build a business wants software and access to the capital market. So it's an interface between the two.

There's a bunch that are in the area of collateral management and infrastructure, CloudMargin. Literally, collateral management means the collateral that you're moving on derivatives in the institutional market or collateral that you're moving even as it relates to loans. And why not start a platform that might be a little better for collateral management and take some of the back office cost out of it? And not to be outdone, you could have digital fixed-income brokers as well as equity brokers.

What we were talking about earlier was the stock market and this company called Elephant. I mentioned IEX started in 2012. It's to be a competitive stock market to NASDAQ, New York Stock Exchange started by a bunch of buy side institutions, for instance. And sometimes, it's just research. PitchBook and others like PitchBook put together a remarkable data base on the financial business of venture capital, for instance. So it could be a lot of different spaces.

Back to thinking about the different aspects of capital markets, crowdfunding platforms, trade execution, the post-trade side of it. I don't do this to be like a full course on capital markets, but it's to open your thinking to it's not just the retail interface. It's not just using a mobile phone, good data, good user delivery, and lower cost. And that's really the Robinhood, Betterment side. It's also a lot of taking the paper flows out of it, old processes out of the back office, and trying to provide a service to the capital markets in a better way. Romain, any--

ROMAIN: Any hands raised? Anyone has a question on this topic? No. I think we can move on.

GARY GENSLER: Let me just close out crypto markets a bit. And some of you take the crypto finance course, so it may be a little bit repetitive. But let me just say, one thing that's interesting is this crypto market came along. Is there a question here?

ROMAIN: Luke has his hand raised.

GARY Let me hold Luke because he's had a lot here. So let me just say something on

GENSLER: crypto markets, and then we'll definitely take Luke's question.

But the crypto markets came along about a dozen years ago. And by an early stage of these markets, somebody said, how can you buy and sell Bitcoin? And they created exchanges, a new form of exchange, not for equities, not for bonds, not for foreign currencies or Fiat currencies, but cryptocurrencies. And these exchanges act as agents matching buyers and sellers like traditional exchanges, but they also act as market makers. We talked earlier about capturing bid-ask spread.

These exchanges could also buy and sell from customers. Not all of them do, but they could. Traditional exchanges did not.

And they also acted as a custody and held your funds. And even to this day, if you trade on a crypto exchange, you're moving your asset through the use of what's called a private key. But you're moving your asset to the crypto exchange, and they're the custody. They're the custodian.

The public has direct access. And this is a very different model than traditional exchanges. And the question will be, will this come to traditional markets? And that's why I wanted to focus on this minute.

In traditional markets built upon a business model that's multiple centuries old, you and I are not members directly of the New York Stock Exchange. We have to go through somebody to get to the New York Stock Exchange. That's called a broker. It's called a member of the New York Stock Exchange, or the London Stock Exchange, or the Shanghai Stock Exchange.

But in these markets, in these crypto markets everybody can access directly the markets. The markets actually, interestingly, have to have a much more robust API for the retail public. The New York Stock Exchange and London Stock Exchange have to have a robust API, application program interface, for institutions. And it has to be very high volume, very resilient. But it can be limited to hundreds or, at most, a couple thousands of users even if the volumes are high.

These exchanges have to be open to millions of people from their home laptops and mobile phones-- a very different architecture where it's disintermediated the broker dealers. And the question I have, which is unanswerable right now, will this

be something moving forward? Will we see a direct access model at any exchange around the globe, or will we stay in the intermediated access?

There's a lot of regulatory reasons we'd stay in the intermediated access. There's some competitive reasons brokers wouldn't want to have folks going directly. But on the other hand, the technology now exists that you could go directly.

And so these markets, by the way, are not well regulated. And they're rife with fraud, and scams, and manipulation. So I just want to mention that. I see a few hands in addition to Luke's hand. So maybe we should pause.

ROMAIN: Yes, Carlos?

GARY GENSLER: And we have to get Luke's, too. But, Carlos, all right.

AUDIENCE: So what do you think would happen if the big banks started holding more crypto on their balance sheets, right? If they start acting as market makers in crypto markets, then would it-- for example, under current regulation, would this asset go under Dodd-Frank as well and therefore limit proprietary trading, or do you think it would be different?

GARY GENSLER: So there's a lot of questions in there. The large banks around the globe today have not been active in this asset class. The asset class is about $225 billion as of this morning, which is small. The worldwide capital markets are between $300 trillion and $400 trillion when you add equities and bonds worldwide and debt. So this is quite small in comparison.

But for regulatory reasons and for customer interest reasons, the large banks haven't really gone in. If they were to get in, to answer answer your question on the regulatory side, yes, it would be just like any other asset they have, any commodity. So if you hold Bitcoin, you might think if you're JP Morgan, I'm now holding it. I'm Barclays bank. I'm now holding it.

What regulations? If it's Bitcoin, it would be very similar to the regulations around holding gold or silver. Maybe you would hold gold or silver futures or contracts, but holding gold, silver. And to the extent that there was a-- you mentioned Dodd-Frank. If there were any rules and regulations out of Dodd-Frank that were generally

applicable to trading accounts, it would be applicable to these trading accounts.

The one big challenge for big institutions is custody. Custody has been a challenge. And what's interesting is Fidelity, one of the largest asset managers in the world, started something called Fidelity Digital Asset holding-- I believe that's the name-- where they are providing a custody solution.

Coinbase, which is a large crypto exchange, has a custody solution. The owner of the New York Stock Exchange Intercontinental Exchange started Bakkt, B-A-K-K-T. Bakkt is trading crypto markets but also providing a custody solution.

And why I'm focusing on custody is one of the challenges in this small asset class is how to hold the digital asset. In the traditional markets, there are centralized organizations that operate as clearinghouses but also as the ultimate digital custodian. In the US, it's called DTCC. And other countries have different names.

But how do you make sure that, in essence, the cryptocurrency isn't stolen? These crypto exchanges have had lots of stolen cryptocurrency because once you steal what's called the private key, effectively the password, you have the digital asset. What was Luke's question earlier?

AUDIENCE: Speaking of cryptocurrency, I know you teach in H4, the cryptocurrency class, which I don't have the luxury of taking but [INAUDIBLE] have the opportunity to take next semester or next year. My question is then, is that because of the security that Robinhood does not implement customers the option to buy US equity with Bitcoin overseas, because they would allow them to jump over its respective nations ethics regulations, i.e. Chinese customers or Korean customers who want to invest in ONG--

GARY GENSLER: I--

AUDIENCE: --buy low, sell high with Bitcoin?

GARY GENSLER: Yes, Luke. I'm going to answer briefly. I think the regulation for any one platform like Robinhood around cryptocurrencies is a bit challenging because in many jurisdictions, we have not gotten to a place where you can feel confident we have a

robust investor protection regime on cryptocurrency. And in fact, in most jurisdictions, it's pretty shaky. It's pretty still undeveloped.

I'm talking about investor protection. So Robinhood may have made a choice, look, if you're going to trade, you're going to trade Fiat currency versus buying and selling stocks. And that would be an appropriate business decision that they made until there is a much more robust and satisfactory both investor protection and also guarding against illicit activity.

Cryptocurrency started and emanated out of a little bit of an off the grid cypherpunk movement. And I use the word accurately. Cypherpunk was a mailing list that Satoshi Nakamoto uploaded that eight-page paper on 12 years ago. And though you can track Bitcoin transactions, a lot of use of Bitcoin and other cryptocurrencies has been to avoid the censorship and the watchful eyes of the official sector. And so I would imagine-- I've not talked to Robinhood-- that they would be aware of that. And they would just feel as both a legal matter and for reputational reasons, better not to go there unless there is a more robust support for that system.

ROMAIN: And Nadia had her hand up for a while.

GARY GENSLER: [INAUDIBLE]

ROMAIN: Nadia?

AUDIENCE: Yeah. I actually have two questions on wealth management FinTech. So the first question, what do you think more important for wealth management FinTech to grow? Is it the inclusion part, meaning like low minimum deposit, or the user experience part? That is for the first questions. And for the second question, given the growth of past management feature like Wealthfront, do you think now customers prefer a simpler product rather than more complicated product?

GARY GENSLER: So there's a lot there, Nadia. I'm not sure what-- but I think that the Betterments and the robo advisors, I can't separate the two. When you're saying, is it more about user interface, is it more about pricing, maybe somebody better than I could, but I think it's about both. I really do think that.

I think that they have provided a lower price point, which is really important. But if it were only that, if somebody had just put out an advertisement, I'm going to give you wealth advice for a quarter of a point, I don't think you could have gotten adoption. I think you had to have that user interface. And I think the two of them together are really important.

So it's not just doing something cheaper, because a lot of people could say, listen, I'll give you wealth advice for a quarter of a point. I think the user experience-- these are very private matters. Sometimes it's just frankly a little easier.

It's interesting to just go to a drop down menu, answer some questions, feel that I'm getting the advice, feel that I'm, yes, getting low-cost ETFs and low-cost advisory fees. But I think the user experience goes hand in hand. And I can't easily separate them.

Let me just try to wrap up. And then, Nadia, remind me the second half of your question as I wrap up, because I want to make a-- we only have about 3 minutes. So I want to just make a point beyond these crypto exchanges.

There's a bunch of crypto lending and borrowing. And why I raise this is this market, just like the capital markets, is starting to say, can I lend to crypto? Can I borrow crypto?

And why would you do that? Same reason in the capital markets. You lend and borrow stock sometimes because you want to buy the stocks on margin. Or sometimes you lend it because you need to borrow against your assets to do something else.

So these markets are developing that way, but the thing that I wanted to mention was this question of decentralized finance versus centralized finance. Centralized traditional finance-- this is a slide that I created in the last eight months-- has proprietary software, central clearing, all the attributes that I list here. The question is, is there a market just like we talked about in lending for peer to peer decentralized finance?

And what we found in LendingClub and other companies, they really haven't stayed decentralized. They started with this concept that we'll be peers lending to peers.

And then what we found is they've become more marketplace platforms. And platform economics have taken over. But there's been this question, can there be an open source software built on blockchain technology that's truly peer to peer? And you will hear this time and again.

It's a business concept that I just want to prepare you for, decentralized finance versus traditional finance, usually used in the context of blockchain technology. And the advocates say blockchain technology facilitates-- we can get rid of the big banks. That is what they might say. That's what Satoshi Nakamoto wrote in some of the early emails and so forth, that we can disintermediate both banks and central banks around cryptocurrency and the like. That's the dream.

But the question is whether network economics-- whether there's a reason in capital markets and finance that you have a hub and spoke approach rather than a decentralized approach. When I say "hub and spoke," the New York Stock Exchange or London Stock Exchange is in the middle of the market, that the banks, back to Luke's earlier question, are sitting there collecting a net interest margin and why LendingClub is moved into a marketplace platform rather than that peer to peer. And so this debate and this business concept is a relatively important one, and it basically goes well beyond cryptocurrencies. And I wanted to mention it.

But in cryptocurrencies-- and this is my last little bit-- is that there are DeFi platforms, decentralized finance where you can peer to peer use a crypto exchange. Binance, IDEX, Uniswap, others basically say, we're not going to have a central exchange or, more technically, a central limit order book. But Nadia and I could trade. And later Nadia could trade with Luke, and Camillo could trade with somebody else, but it's not all centralized.

And similarly, there's platforms-- Maker DAO, and Compound, and Synthetix are the three big ones-- that are trying to do that on crypto lending and borrowing. There is even prediction marking markets that are trying to say Nadia can trade with Luke and make a bet. Now, the regulatory environment for these prediction markets is highly challenged, and they might be doing things that are not strictly within the law. But these decentralized markets are very small.

None of these projects are really big. But some of these projects have a few billion

dollars in their crypto lending and. Borrowing some of these exchanges have a few hundred thousand dollars a day of trading. They're not big.

But back-- it raises this central question of traditional finance versus decentralized finance. And I just wanted to capture that before we signed off today.