EPISODE 994

[INTRODUCTION]

[00:00:00] JM: Stock trading takes place across a variety of software platforms E*TRADE and Schwab have allowed individual traders to buy securities for decades. Robinhood built a business around a similar model, but also removed the commission. Wealthfront and Betterment provide Robo advisor services that abstract away the underlying securities and focus on managing a risk profile. Each of these different financial services has a programmatic execution system for managing assets. In order for a developer to build a product like Robinhood or Wealthfront, that developer needs access to an API that can execute trades.

Alpaca is an API for stock trading. Alpaca can be used to build financial products, apps and algorithmic trading programs. Yoshi Yokokawa is the founder of Alpaca and he joins the show to talk about why he built an API for trading and the potential applications of Alpaca. Yoshi's background includes work in finance at Lehman Brothers, a period spent as an individual day trader, and a previous company that he started selling custom trading algorithms to enterprises.

Yoshi was an awesome guest and he has such an interesting background. It makes a lot of sense that he would end up building Alpaca, and it's fascinating to hear about the potential of an API for stock trading.

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[00:01:31] MB: Being on-call is hard, but having the right tools for the job can make it easier. When you wake up in the middle of the night to troubleshoot the database, you should be able to have the database monitoring information right in front of you. When you're out to dinner and your phone buzzes because your entire application is down, you should be able to easily find out who pushed code most recently so that you can contact them and find out how to troubleshoot the issue.

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[INTERVIEW]

[00:03:22] JM: Yoshi Yokokawa, welcome to Software Engineering Daily.

[00:03:25] YY: Thank you. I'm happy to be here.

[00:03:26] JM: You worked at Lehman Brothers for 4-1/2 years before the firm fell apart, and you are working with some mortgage risk assets. Did you anticipate any of the problems that led to the 2008 collapse?

[00:03:40] YY: We've been seeing a lot of default rates going up and all those interest team metrics getting worse and worse. We kind of knew what was happening, but nobody really though that I was going to be happening, because the data that any professionals have is like in 70, 80 years. You don't know what happened before that. Nobody thinks that in our lifetime that's going to happen. We're like, “It's happening,” but there's money and people are still buying it. So we're just pushing it even though you understand there's something wrong that's happening.

[00:04:11] JM: Did that experience change your perspective on risk or perhaps tail risk?

[00:04:17] YY: Definitely. From the point I realized that I really don't trust anything anymore, which means like I always think about the risk when I do anything at all. That may not be actually a good thing to be a CEO of a startup because I think about the risks too much. But, yes, it did change my perspective about the long tail risk. Of course, that exists.

[00:04:41] JM: I hear what you're saying. I used to be a poker player. I played poker back in the day, online poker. Then the online poker market completely crashed and it scared me at a really, really deep level, because one minute I had this career that was great, really fun, good money, complete flexibility and then the market evaporated overnight, and it scared me. I've never gotten over that. It fills you with the kind of paranoia that is in some ways unproductive, but probably does protect you from certain things that other people might set themselves up for.

[00:05:19] YY: Yeah. I think it does definitely affect how we are building Alpaca. A lot of problems that we want to solve is extremely technical and extremely like software-side, but at the same time that's very much connected to the financial services and that is extremely regulated, which we need to really protect it in very many ways, like having doing the boring things. Yeah, that affected even what we are doing right now.

[00:05:46] JM: When the market fell apart, did you think about leaving finance completely at that point?

[00:05:52] YY: Definitely, I did. Maybe like you felt the same thing, but I felt extremely empty. What was I doing with this, like all the billions of dollars that I was doing?

[00:06:02] JM: All that core competency of knowing how to manage credit defaults swaps and derivatives. You're like, "Well, this is useless now."

[00:06:08] YY: Yeah, exactly, exactly. Yeah, I actually felt like lost confidence about this financial services in general. I actually became more interested in naturally, like more physical stuff. I study a lot to be personal gym trainer after that because I wanted to be extremely genuine to what it is a human instead of dealing with the numbers and the finance. I did go through that kind of phase. I continued like one more year because my boss was really a great guy and I wanted kind of pay back to him in a way for his trust. But right after the one year, I left the industry.

[00:06:47] JM: You eventually became a full-time trader at some point after that.

[00:06:52] YY: Yeah.

[00:06:52] JM: You went from, I guess, more of a spreadsheet managing risk kind of person to an actual in-the-weeds setting up trades, like managing your portfolio trades. What was that transition like? What were the best and worst parts of being a trader?

[00:07:13] YY: Starting from best and the worst thing in trader, best is like you're like a poker player. You feel like you are in control of what you do 110%. Worse thing is that it's extremely stressful and very, very scary. The reason why I went there is because that is the only thing that I was able to do by myself. After working in finance for 4-1/2 years, I was backed by big names of the investment bank, but without that I was nothing. No one.

I felt FX, foreign-exchange day trading is the place that every single person on the earth can participate. Not much of the regulation. No pattern day trading role. It's like a street fight. I wanted to see how I can fight, industry fight without those names. That was the reason why. Also, I had to take care of my grandma at home. That was basically the only thing that I was able to do at that time.

[00:08:08] JM: Were you working from home? Were you totally on your own or were you working for a firm?

[00:08:10] YY: I was doing it totally at home, living only with my grandma. Cooking three meals a day, because she's getting – What is that? Like losing her memories and everything.

[00:08:18] JM: Alzheimer's, dementia.

[00:08:19] YY: Yeah.

[00:08:22] JM: You were doing Forex trading by yourself. What's the biggest – We'll get to software eventually, but Forex, that's always something that's intrigued me, because I know the swings can be huge in Forex and you really have to – I mean, it's like no limit. You can really bust yourself out or have huge upswings. What is the biggest downswing or upswing percentage of your portfolio that you can have on a given day?

[00:08:52] YY: I mean, you could lose a lot, right? Because I'm taking the leverage of like 25 or 30 times of my actual assets. Even a few percent really doesn't happen in the FX world. But if you have the position there, like you almost lose – You could almost lose like more than 100% obviously. It's like you can think of it like more of the crypto trading. But crypto now has like lower leverage, but FX always allows me to trade more higher, higher leverage.

[00:09:23] JM: When you saw the crypto trading take off, was there any temptation? Did you start to get the itch? You're like, "Oh God! I know this game."

[00:09:30] YY: Oh yeah, definitely. I actually did. I didn't sit down and do the day trading, but like even – Because I am so used to day trading, and crypto movement is so simple compared to FX. I was just doing it even on my phone. It was enough to make money. Yeah, I was doing that a little bit when there was enough volatility. Of course, eventually, I completely stopped because I got too busy.

[00:09:55] JM: Did you recognize the same like behavioral patterns, or like I'm guessing Forex had more programmatic infrastructure, more big players. There's more liquidity. Probably the crypto was a lot softer because a lot of it was actual humans that had just had no idea what they're doing.

[00:10:15] YY: Yeah, because there is less sophisticated investors and players in the crypto space, the movement actually became much simpler, because the movement of the price is extremely correlated to the human behavior being scared and being tempted and the institutional investors basically take advantage of that human behavior and make money. If there is less of those, the movement of the price becomes simpler.

[00:10:40] JM: What was your path from being a trader to building software?

[00:10:44] YY: After doing the day trading by myself three years, I eventually kind of burnt out in a way that I wanted to work with someone. Being day trading is extremely solo stuff, and I miss working with the people that I can fully trust. That was the way for me to really go into the software side since a lot of my friends were in the computer science. Also at the point, like because I was doing the repetitive task in the day trading. I was using things called MQL, which is a meta trader software, kind of automation software language specifically for the FX trading. I was writing those things. Automation definitely is the key. I should not be here if the automation is there. That's when I realized that I really have to 120% focus on this.

[00:11:34] JM: You started out cofounding something called Alpaca Japan. Is at right?

[00:11:40] YY: Correct.

[00:11:40] JM: And then later you founded Alpaca in the U.S., which is the company you're building now.

[00:11:45] YY: Yeah.

[00:11:46] JM: Can you tell me about Alpaca Japan? What is that?

[00:11:50] YY: Actually, we started it only one Alpaca in 2015, and we started a building like basically a basic technology in order to automate things. You needed to build specific database and the processing engine for that. we were doing that and we got a lot of inquiries from the big banks and trading firms if they can use those technology that involve like deep neural nets prediction and stuff like that.

We actually started making money from that business, which something that we were not originally expecting the business to go. We started that and we pushed a little bit because it was profitable. But then we always had this problem that we want to solve, which was the things that I personally felt paying for is this brokerage space and trading, investing space for individuals and small guys. That was just not there yet.

In order to move there, we had to split the companies in two and basically we spun off the enterprise business into the different group of operators and we named that as Alpaca Japan. Now what we do is like just Alpaca and it's being Alpaca, but like it just took us some time to actually get to the problem that we originally wanted to solve.

[00:13:09] JM: The products around Alpaca that you're building now, that is API infrastructure for executing trades. The really boilerplate, I think overly reductive description will like a Twilio for trading or Stripe for trading. I want to get into that a little bit later, but Alpaca Japan, that was more about, as you said, like data collection and finding trends using machine learning.

[00:13:38] YY: Correct. We still do Alpaca Japan. I wouldn't say we, because I'm not really a part of it. But they use a lot of deep neural nets prediction model to basically detect the trends and predict the prices, and lot of dealer desk at the banks or commodity trading firms use the prediction models to enhance their P&L.

[00:14:01] JM: How durable were those prediction models? Did they just change all the time and you constantly had to have engineers like reworking the models?

[00:14:07] YY: Yeah, definitely. They use a lot of new data. Not only the market data that's publicly available, but the data also from the firm specifically that see the flow on their desks. They use extremely priority data for each of their clients so that it's all different. But it's all based on this specific platform of the prediction model that we built and like it's customized.

[00:14:32] JM: The training process, the training algorithms were pretty durable. You just had to rebuild the models on new data all the time?

[00:14:38] YY: Correct.

[00:14:39] JM: Wow! That's great.

[00:14:41] YY: Yeah, it is a cool technology.

[00:14:43] JM: How were you able to do that successfully? Because I would just imagine that business would just get destroyed in the limit by whatever, Goldman Sachs, Citadel, these other players who have so many more engineers devoted Jane Street to like destroying the market in terms of programmatic trading. How were you as a smaller shop able to create learning algorithms that were good enough to compete with the bigger players?

[00:15:13] YY: I think not all of the big financial institutions have that understanding of utilizing technology in the right way, fortunately or unfortunately, and there are very many different asset classes around the globe where very niche players are actually doing very well.

For example, one of the asset classes that we really did really well is like specifically like foreign exchange, but specifically like dollar-yen pair, U.S, dollar, Japanese yen pair. Goldman Sachs obviously is not the biggest liquidity provider in that currency pair, and one of the Japanese banks is. Which means they have much more data, and we specifically built our model for that based only using or appropriately – It's actually open source, a database called Market Store, processing that data as fast as possible using different type of the data, using the proprietary data they only have. That creates a very different type of the model.

Also, the duration of the profit that they want to make is also very diverse based on the financial institutions for dealer desks that deal with a lot of flow coming in. Their duration is extremely, extremely short. Most of the hedge funds, like a lot of Quonset's funds, the long-short equities. Obviously, it's much longer horizon. It's a very many different types of data utilization.

[00:16:42] JM: Right. I guess you're saying this is why this is an enterprise business. It doesn't really like scale super well, because if you're selling a training algorithm for trading yen-dollar pair specifically to a Bank of Japan, that's like a very customized integration that you're building just for them. That's great. They're going to give you a big bucket of money and you will never be able to sell that algorithm to anybody else.

[00:17:07] YY: Correct. Correct. We need to think about like how much of it can be generalized and how much of it needs to be always customized to actually create good prediction. That is balancing of the actual true technology and balancing out the business, because everything is customized, "I want to be able to make business."

[00:17:30] JM: Eventually you realized, “Oops! We’re in a consultancy.”

[00:17:33] YY: Yup.

[00:17:34] JM: And you started to think about what are the more generalizable products that we can build that don't look like a consultancy.

[00:17:41] YY: Yeah.

[00:17:42] JM: How do you arrive at Alpaca?

[00:17:45] YY: At the time, originally, we started Alpaca. I had my personal pain way. I knew how it was like to be an individual investor, a trader to seriously use some kind of trading, investor platform that's out there through my day trading –

[00:17:56] JM: What were you using, interactive brokers?

[00:17:58] YY: I was using – Because like was using FX, I was mainly using this platform called Metatrader and using multiple number of the brokerages interacting including interactive brokers. That I knew there was an extreme pain there and problem there. At the same time while doing that, the business, enterprise business that we were doing, we tried to make them more generalized so that it can be applicable to the individual use cases.

We built this web application based on those know-how that we built. Simultaneously, we are executing those enterprise businesses. In order to provide out to the retail customers, in order to create the value for that new application, we needed to integrate into some kind of broker-dealers. Because as a web application, prediction doesn't connect directly to your actual execution of the trade.

I've talked with a lot of broker-dealers out there, “Okay, can we connect this application to your system so that your end users can use this automatically?” We had extremely difficult time even getting an access to API documents and even getting approval over using that is another like three months to even see the documentation and another six months or something to get approval to actually connect into the API dock.

That's what we see, “Okay, this is a true pain here.” Not as only individual users trying to use this thing, but even below that is application providers or something who want to build something even cannot build something, and that is a big barrier for the application developers to create some innovation.

[00:19:35] JM: Back in the day when you were an FX trader, you were using a tool called Metatrader.

[00:19:40] YY: Yes.

[00:19:40] JM: Metatrader had API hooks into like interactive brokers and other programmatic brokerages?

[00:19:49] YY: They sold their whole package of the system to each of the brokers instead of like connecting that with the API. They sold the software license business instead of like it’s connected over cloud, so that broker-dealers buys Metatrader’s system on the broker-dealer server.

[00:20:13] JM: They’re basically saying, “You as a broker, we’re going to give you access to the customer base that uses our UI,” basically.

[00:20:23] YY: Yeah, exactly, exactly.

[00:20:25] JM: There are a bunch of broker-dealers, they were plugged in to Metatrader. That's a really weird –

[00:20:28] YY: Yeah. I don’t want to say plugged into. There are a lot of broker-dealers the vote Metatrader system in their broker-dealer servers.

[00:20:36] JM: Okay. I'm having trouble understanding, because you as the individual trader sitting at home, you're working with Metatrader.

[00:20:43] YY: Yeah, it’s a Metatrader interface that’s been provided by broker-dealers.

[00:20:47] JM: Oh! Okay. I see. There’s a different interface for each of the broker-dealers that you work with?

[00:20:55] YY: They all have the same interface, different Metatrader.

[00:20:59] JM: But a different website or like a different program.

[00:21:01] YY: Exactly. It can be Metatrader, broker-dealername.com. Metatrader.brokerdealerbname.com, but it’s exactly same functions.

[00:21:11] JM: Oh my God! So you have like six different tabs open in Chrome and you tab between them to execute your different trades across different broker-dealers.

[00:21:18] YY: Yeah.

[00:21:19] JM: Wow! I guess eventually when you were searching for the product to build, you came across the understanding or you had the insight that something weird going on here, what is the relationship between the broker-dealer and the UI and that led you to the conclusion that this infrastructure is brittle, monolithic, has not been turned into open APIs.

[00:21:52] YY: Correct.

[00:21:55] JM: Just to ask the naïve question, why does that matter? What would be different in the world if there were more open API infrastructure between, for example, broker-dealers and the UI that interfaces with the broker-dealer?

[00:22:11] YY: Right. This is a great question. While I was doing day trading, obviously I saw the big success of the Robinhood, and I think how Robinhood did so well is that they proved by changing the user experience and target a specific group of the people who needed that, there was a strong demand, and there are so many types of the different groups that are not served yet.

Because financial services touches every single person, 7 billion people on the earth, there is no way one type of the interface satisfies every single group that lives on this earth. Therefore, if you are able to personalize, if you are able to create some kind of right experience for each of the targeted groups, that can be always like 100X better than what it is right now, and that's been proved by Robinhood.

We thought, "Okay, this is something that can be done for the U.S. millennials who is mobile first. That can be done – For example, Japan, it's an easing population, targeted specifically 7-years-old, 8-years-old interface or experience. That may not involve even mobile, but there has to be some kind of customization that has been specifically targeted that audience. Same thing as the U.S., like there are many types of the groups and developers are one of them, and millennials are one of them. Just so many different group in buckets that needs to be targeted in a more personalized way.

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[00:23:47] JM: Looking for a job is painful, and if you are in software and you have the skillset needed to get a job in technology, it can sometimes seem very strange that it takes so long to find a job that's a good fit for you.

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[INTERVIEW CONTINUED]

[00:25:36] JM: Alpaca is an API for trading stocks. Describe the different use cases for stock trading API.

[00:25:43] YY: Sure. The biggest use case that we're seeing, the fastest one, is directly trading through API so that people just like me used to be manual day trader, if you're going to automate that with some kind of bots or algorithms, you need to use API. You automate things by the language or whatever that you use, and you trade directly through that. That is of course the one use case as an individual.

Another is building some kind of applications on top of that. If you see like specifically even like algorithmic trading, you need to do like back testing. You need to do some kind of analysis. You need to suck into bunch of the data into the platform, but they're not many good applications around that. One developer wants to build that kind of application, he needs to be connected directly to the broker-dealer API so that his or her end users can use it automatically. If it's not connected to the broker-dealer, okay, all analysis and everything, data analysis is automated. But, okay.

Now, I'm going to click this thing based on the output that it gave me automatically. It just is ridiculous, right? Of course, it should be connected. So that is another use case. Like bunch of the investing application, trading applications need to rely on broker-dealers automatic integration to actually provide the normal experience to their end-users.

The third, what we are seeing even existing financial institutions outside United States wanted to pull in the U.S. stock trading to their end-users. That needs to be connected somehow through their API. Now, those financial institutions don't have to be traditional like you know brokers, but also any super apps that's trying to bundle bunch of the financial services into one app. They tend to be a lot of software developers and who look for modern API to do that.

[00:27:43] JM: Let's take the first use case. I am a random developer. I like Python. I want to just write my own algorithms to trade in Python. Alpaca would be a good API that I could use for that situation.

[00:27:59] YY: That is correct.

[00:28:00] JM: There must be a company that has offered that kind of product before, right?

[00:28:06] YY: Of course, and you know this better. API is a big word. You provide something. You provide some application and you just open your API interface, but it doesn't mean that you're building API product. There a lot of components around, "Okay, do you have SDKs? Do you have a community that's supporting that?" That documentation is updated. Is it easy really taking care as, A, your main core product? Is it very different value product?

[00:28:35] JM: When you're looking at the market, if we're just talking out one specific use case, like I'm a random developer. I want programmatic APIs for trading. If you look at the market, what was the best product? When you look at document – If you take the aggregate of the documentation, community all the things that go into a good API, was there anything out there that was satisfactory?

[00:29:01] YY: Before us, it's probably interactive brokers, and they do offer API with a lot of complexity.

[00:29:07] JM: I've been to their website. It looks like it's from like 2004 or something. It's an old looking website.

[00:29:13] YY: Yes. I think they started it early 90s, one of those online brokers that started around at that time, including E*TRADE and TD Ameritrade and those guys.

[00:29:22] JM: Wow! Okay. That seems like a good opportunity. But in order to actually provide that API, you need to establish relationships with these other broker-dealers, right?

[00:29:38] YY: Or –

[00:29:39] JM: Or you paper over their API infrastructure.

[00:29:41] YY: Or you become the broker-dealer.

[00:29:43] JM: Oh, okay.

[00:29:45] YY: Yourself.

[00:29:46] JM: I see. That's what Robinhood did, right?

[00:29:46] YY: And that's what we did too.

[00:29:51] JM: Got it. Another way of looking at the business is you are like Robinhood, but the good UX that you're providing is an API infrastructure UX, not a beautiful looking mobile app.

[00:30:05] YY: Correct.

[00:30:08] JM: Very cool. Then you've also like built your own products on top of that API, which almost like kind of proves, or that's a good way of dog fooding it, right? You've built your own trading interface on top of your broker-dealer API infrastructure.

[00:30:25] YY: We actually tried to do that including like mobile app to just – Yeah, exactly showcase and make the sample code so that people can start off from something that's already there.

[00:30:37] JM: So it's open source.

[00:30:38] YY: Yeah.

[00:30:38] JM: We should actually define this term, because I'm not sure I even fully understand it, broker-dealer. What does that mean?

[00:30:44] YY: Broker-dealer is the financial entity that is being regulated by the FINRA, which controls and basically monitors all of the trade activity and protects the U.S. securities market. Making sure that there is no insider-trading. There is no like criminal money going in. So you have to be a member of the FINRA to be a broker-dealer.

[00:31:08] JM: Okay. Aside from regulatory constraints, what does it actually mean? Let's say I am using the Alpaca API to write my Python script to buy Apple. I want to buy Apple every time Apple stock is – Like let's just say a very simple example. I've got a Python script that's running all the time and every time Apple stock drops 5%, I want to buy 10 shares, okay? That's something I can do with Alpaca, right?

[00:31:38] YY: Of course.

[00:31:39] JM: Okay. If I've got that script running on my computer and let's say Apple stock drops 5%, I execute that programmatic trade. It hits your API server. What happens next?

[00:31:53] YY: I think going back to the question before, what is a broker-dealer? I guess the simplest way is the people or institutions that can sell stocks. That's a broker-dealer. We have a license to sell you stocks. If you don't have a license, you cannot sell stocks, and we have a license because we are broker-dealer. How we sell it can be anything, right? Anyway. Robinhood decided to do it through mobile to sell you stocks. We decided to use API to sell you stocks.

[00:32:27] JM: The fulfillment process is basically like you can look out at the market from other people that you could buy the stock from and/or look at your own portfolio and you just have to make sure that the bookkeeping lines up, and voilà! You can execute trades.

[00:32:47] YY: Yeah. There are so many things that we're doing. It’s pretty boring though.

[00:32:54] JM: Indulge me. Give me a little bit of the boring part.

[00:32:56] JM: Okay. Okay. Okay. Yeah, like including what you just said, like those accounting stuff and also what’s called anti-money laundering or customer policies. We need to define who you are. We need to get all the Social Security number and everything so that you actually exist and you need to receive the money from your bank account. We need to make sure that all the monies are custody and there’s a regulations to protect your money as well. So we need to make sure that it's complying to that and that we have to be connected to basically exchanges where the trays are filled, right?

There is something called clearing, which is clearing trade is that if why you said you bought Apple stocks is actually admitted and authorized by this central corporation that actually says that yes it is approved. You have to connect to that. In order to be all compliant, we have to be sending the reports all the time to those regulators and we get to audit it almost like every month, basically sending those reports every month. Extremely hard work to even maintain this license to just sell you stocks.

[00:34:06] JM: What are the actions that I can take through the API?

[00:34:10] YY: You can buy stocks, sell stocks and you can basically get the real-time market data and you can of course pull in the information where your position is, like how much money you have in your account. What is the total equity balance? Yeah, all sorts of things that you would see on the trading applications that you use with a graphical user interface.

[00:34:32] JM: When I think about the API companies out there, Twilio for example, API for telephony. The number of use cases that they actually solve is not that big. I mean, there's like two-factor authentication. There are your text message infrastructure if you want to text with your Uber driver. There are your phone call infrastructure feed to call your Uber driver. That's about it. I mean, they do like video stuff too. I know they can build you like a call center and things like that, but like the core API infrastructure. I understand, I mean, it's very hard to do well, but like the actual use cases are kind of narrow and just by being the best in those narrow set of use cases, they've really built a very powerful business.

I'm wondering if you see Alpaca, the stock trading API, do you see this kind of like two-factor – The Twilio business where it's like mostly two-factor authentication, like you're mostly going to be doing stock trading for people who want to build stock trading APIs? They want to build the next Robinhood, or do you see like some wider array of use cases? Is there people that are going to build really strange things that you're going to do with stock trading? Every time I drive near McDonald's, execute a McDonald's, buy order or something like that. Every time I come near business of a certain type, I want to execute a small order for that business just it's like programmatic behavioral bond. Weird things like that.

[00:36:07] YY: Yeah. By the way, yeah, you can do that through IFTTT. We're connected to IFTTT.

[00:36:13] JM: Okay. There you go.

[00:36:13] YY: Yeah. But I think how I think about what we do is not really stock trading API. How we see this is really API to move financial assets from point A to point B. It's not only even about trading or investing. If you think about it's a stock trading API, all you think about is, "Okay. I'll go trading or like let's build [inaudible 00:36:37] Robinhood." But when you think about moving assets from one to A is like you can think of those things, right? Like, okay, if you go to McDonald's and every time you do, maybe McDonald's give you some kind of a stock rewards of McDonald's or something, or it doesn't have to be actually stocks.

What we are thinking, like our vision is to be really middleware for investing in general. Eventually, it would look like at Zapier in a way. There's a bunch of supplies of different type of the assets or investment assets, and that can be connected to a bunch of the services in the app that they can do the checkboxes, "Okay. I will do U.S. stock investing. I'll also do fractional offerings of their things, music royalty or something and this seed fund investing security or something." It can be anything, but like our really – What we want to do is connect those things in a programmatic way so that it can be distributed to more people as possible.

[00:37:34] JM: One of the painful things about financial infrastructures is I understand right now is the transactions costs are just so high. That's one thing that was potentially interesting about crypto from the very early days is like this idea of micropayments, right? You can make potentially – You can transfer a nickel to somebody in Africa to do some micro task for you without a seriously high-transaction cost.

The use case of let's say every time I go to McDonald's or let's say I go to McDonald's 10 times a month and McDonald's transfers me a little bit of stock to reward me, that's kind of a cool idea. I think it's too expensive to do today, because the execution infrastructure costs too much money. Is that correct or are the transaction costs going down?

[00:38:28] YY: Actually, transaction cost is not expensive. It's doable. But what would be very difficult to do if the McDonald's try to do it by themselves is even to make it achieve that thing by holding all the compliance and regulation, because like holding securities means you have to move the money from point A to B and actually convert that with stocks and that has to be stored somewhere. Maintaining that whole thing is a lot of money, and that's basically being a broker-dealer in a part. Us, basically, want to be the background behind the seed player if that kind of thing is happening and we don't have to be front-face of that, but we take care of all those boring stuff on your end.

[00:39:14] JM: Right. If we were to push this terrible app idea even further, I mean, Starbucks actually has a pretty good mobile app. If you go to Starbucks 25 times a month, maybe they transfer you a little bit of stock. Since you actually have a mobile app in the Starbucks case, maybe they can just add something, the terms and conditions, "By the way, Starbucks is also an investment firm and you are opening essentially a brokerage account by downloading the Starbucks app." Is that possibility?

[00:39:46] YY: Yes, definitely possible. By the way, I think Starbucks in terms of assets under management on the money, it's like 10th or something in the U.S. in terms of the money that users have as a Starbucks point or money. It's a humongous amount of money.

[00:40:00] JM: Whoa!

[00:40:01] YY: Yeah. It's definitely something that probably lot of players including Starbucks will probably go into becoming a fintech. Utilizing that, even try to archive the money in their ecosystem. They can start providing maybe some kind of an interest payment. I guess maybe they already do it by themselves, but they can start sharing a little bit. They can provide some kind of stocks investing on that, like robo devising on that. Those kind of things would be definitely possible.

[00:40:29] JM: Whoa! Okay. Let's push this a little bit further. Let's talk a little bit about the future of fintech stuff. That idea that you're talking about, Starbucks being in the top 10 of holding assets, is that like literally like people saying reload my Starbucks app with $25? Because that's the freaking – That's the default. I know, because I've gotten a lot of Starbucks with the app, you go to reload, it's like default is $25. Do I really need $25 in my Starbucks account? All right. Whatever. It's the default. Fine. Like, fingerprint idea. I approve. Whatever. I'll get enough coffee to justify it. It's kind of devious. That's way more money that you need.

[00:41:09] YY: Yeah. You're basically transferring the money from bank A to bank B, and the bank B happens to be a Starbucks, and they're holding your money there. Because they're holding your money, maybe they can sell you other financial products, and that's what's happening in any financial services, right? Uber started driving and Uber started Uber cash and started Uber cars. In order to maintain the customers create the ecosystem, they can definitely do Uber invest, uber insurance, selling some insurance products. Then anything that touches you in terms of the money can stay in the lifestyle app that you use the most. It can be Starbucks. It can be Airbnb. It can be Lyft or Uber, whatever it is.

[00:41:55] JM: Do I as a consumer need financial products from all these different companies?

[00:41:59] YY: That's a very good question, and I also question that too. I think there are two ways of the answers that I can answer that. One is as a corporation, you want to do that, because that enhances the stickiness of your product, because you're providing money related products. If you have money somewhere in your app, you don't want to delete the app. If the money stays there and if you convert that thing into some kind of a mutual funds in the app, probably you don't want to delete the app. That's very much the intention of the corporation side of the thing.

As a user perspective, I'm not sure if it's a right future. I think it’s going to be a lot of consolidation and people start realizing that, “Okay, if it's really worth doing that kind of thing by the corporation side of the thing.” But as of right now, I think the logic of the corporations pushing this trend to be every life sell applications becoming a fintech.

[00:42:54] JM: It makes sense for QuickBooks, for example. I log into QuickBooks and it’s like, “Do you want a loan?” I’m like, “Not really. Not today, but thanks for asking.” If the business goes belly-up, like maybe I will come to QuickBooks a loan. It would make sense that QuickBooks would have a lot of data on me and would be able to give me a good loan.

I think in the case of QuickBooks, actually they use like a white label, right? There's some provider of loan underwriting or something. That infrastructure already exists through that.

[00:43:24] YY: Yeah. You can connect to the banking API and the data goes directly to those regional banks that's connected through the API and the regional bank can issue you a loan that way.

[00:43:36] JM: So shifting back to Alpaca, what are the use cases that you’ve seen most frequency? From your user base, what are people doing with Alpaca?

[00:43:49] YY: Definitely the algorithmic trading that they do, directly trading automatically, and two is building trading application, like building like actual manual user interface or back testing interface of your algorithm. The third is, okay, wanting to build Robinhood in country A, country B, country C type of a use case.

[00:44:10] JM: Right. Let’s go through some of those. The algorithmic trading example, what kinds of algorithmic trading are we talking about? Are we talking about literally like the example I gave, like Apple drops 5%. I want to buy some.

[00:44:24] YY: That would be pretty rare. I think more people is like looking at how the prices moves, like what I used to do in the FX trading and do that automatically using stocks. Stocks, there’s like 7,600 stocks instead of 20 currency pairs that you can trade. There are many things that you can do. Automation makes more sense that way.

[00:44:44] JM: Don’t most of the algorithmic trading strategies involve options?

[00:44:48] YY: Actually, no, for probably individual levels. Automating option trading becomes even more sophisticated and difficult considering what metrics that you need to see because of the type of the options that you need to trade, like expiration. It's not only the two axis of the thought process that you do price movement in time. Option becomes much more complicated. Automating that is very, very hard actually.

[00:45:15] JM: Automating that as a backend? Automating that from your point of view? That will be difficult to provide.

[00:45:22] YY: No. No. As a user standpoint.

[00:45:23] JM: From a user standpoint.

[00:45:24] YY: Yeah. I think like, of course, hedge funds do that because they have enough resource to really sucking all those data and actually make that into the algorithms. But if you’re an individual, that's very, very high bar. Of course, we want to be providing options in the near future. But the persons who can actually utilize that will not be very many.

[00:45:46] JM: Just because the strategies are too complex?

[00:45:48] YY: Exactly.

[00:45:51] JM: The people who are doing programmatic trading with Alpaca, their strategies are literally like, “I've got this algorithm,” they could be using those – What are those? Candlestick charts, right? They could say, “If you see these 10 candlestick patterns or this pattern of 10 candlesticks, that's an indication that the stock is about to pop, and in that moment, I want to buy.”

[00:46:24] YY: That’s definitely the one use case that you can think about in terms of when we said algorithmic trading. But algorithmic trading or automation of a trade is also is like a robot visor thing. Weekly rebalancing, monthly rebalancing based off your base profile. That's also part of the use case for that specific trade automations.

[00:46:43] JM: I want to build my own robo advisor.

[00:46:44] YY: Correct. Without using those ETFs and just specifically use your own process.

[00:46:52] JM: Ooh! That’s cool. Yeah. Because most of those like wealth front, they’re mostly buying Vanguard funds, right? Just like the Vanguards done really well over time. Let's just be a better interface for how we buy Vanguard. That seems fairly coarse-grained.

The back testing example, why do you need a trading API for back testing? Isn't back testing just basically all you need is historical data, right?

[00:47:19] YY: Historical data, and doing the back testing means that you don't do that for fun, right? You do back testing so that you can now do live testing. You know what I mean? Doing the back testing itself is not the solution. It’s the beginning of the solution to actually solve the problem. Test why you’ve built. You check with the back testing and you have to of course to do the live testing to make sure it's working regardless of the candlestick example or rebalancing example. If it's not connected to the live brokerage account or like brokers API, how can you actually test it in a live environment, in a simultaneous like smoother way?

[00:47:59] JM: I see. If my main trading workflow was through an interactive brokers and maybe I just want to write some scripts to test what I'm doing, I could use Alpaca to just test with like some small one-off trades. That’s the workflow you’re describing?

[00:48:15] YY: Yeah. You write scripts and like let's say how it works in the – I don’t know, 5 years, 10 years of the – Whatever that data that you have, and you want to directly copy and paste and like start running with the live testing and to see if it's not like over optimize based on some kind of back test historical data. You never like do back testing, and okay, this is working.

You do back testing and see like – It's the same thing as like data science problem, because you optimize create your algorithms based on certain set of the data group A and you test that with this unknown data B to make sure that it's actually working. That's how it works in this, I think, investing and trading, is the simple check is to test the previous historical data, which is data A and you want to test with unknown data, which is a future data, which is a live environment.

[00:49:06] JM: The example of building a Robinhood for a different geo, like if I want to build Robinhood for Ireland, Alpaca – First of all, why doesn't Robinhood do that already? What's new about somebody being able to build a new Robinhood for X?

[00:49:24] YY: I think even though people say it's a Robinhood for X, it should not look like literary Robinhood, right? Because Robinhood was designed that way because that was specifically targeted for the specific person in the United States. If you think about it, if you go outside United States, the money related thing is extremely cultural thing. I think like 40%, 50% of the deposits or like the money that's being held by individuals actually invested in something. In Japan, it's only 10%. If you go to Europe, probably like 20% or something.

The mindset for the money and investing is very different, which means in order to target that kind of of different people, you can provide similar exact same app to push you to trade something. You cannot just copy and paste and become successful. You need to understand like really who's actually using that from that country from that culture. In order to do that, Vlad and Baiju, obviously both of them came from different countries, but like that's their playground.

[00:50:25] JM: I'm sorry. What did you just say?

[00:50:27] YY: Vlad and Baiju, the founders of the Robinhood.

[00:50:30] JM: Oh, okay.

[00:50:31] YY: They mainly locate in the United States, understand mainly about the people in the United States and millennials. Not in the peopling in Ireland. Probably the person in Ireland understands much better about what's going on in the millennial's population in Ireland.

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[00:50:55] JM: When I’m building a new product, G2i is the company that I call on to help me find a developer who can build the first version of my product. G2i is a hiring platform run by engineers that matches you with React, React Native, GraphQL and mobile engineers who you can trust. Whether you are a new company building your first product, like me, or an established company that wants additional engineering help, G2i has the talent that you need to accomplish your goals.

Go to softwareengineeringdaily.com/g2i to learn more about what G2i has to offer. We’ve also done several shows with the people who run G2i, Gabe Greenberg, and the rest of his team. These are engineers who know about the React ecosystem, about the mobile ecosystem, about GraphQL, React Native. They know their stuff and they run a great organization.

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[INTERVIEW CONTINUED]

[00:52:44] JM: Now, the critique of Robinhood was sort of that, “Oh my goodness! Robinhood is actually executing trades on their backend in a way that clears them much more margin than E*TRADE or one of these other UIs that is not so millennial friendly.” Now, that's kind of a critique we all saw coming, like, “Of course.” You’re giving naïve millennial's mobile interface for buying and selling stocks. Obviously, you’re going to get ripped off on the transactions cost. But presumably, you’re a millennial. You should be buying and holding. You're not a day trader. The story a little bit different for you. You probably have to be comfortable with a little bit lower margins, right? Because you're dealing with a more savvy customer.

[00:53:38] YY: I'm glad that you asked me that, because that's what so-called I think conversation around payment for order flow. I see a lot of conspiracy articles coming from journalists, which are not necessarily true.

[00:53:54] JM: About Robinhood.

[00:53:56] YY: No. About what those joiners said as the conspiracy theory.

[00:54:00] JM: Conspiracy theory about Robinhood.

[00:54:02] YY: Yeah. I have a huge respect to Baiju and Vlad building Robinhood and – We of course know what they do, because that's our industry. How the micromarket structure works behind-the-scene is pretty complex and it's pretty unique in the U.S. stock markets. There's same thing as crypto market. There is a maker fee, taker fee. There're 50 exchanges in the United States.

They're fighting each other to get the liquidity from the users. They use different type of the incentives called maker fee take her feet posting the liquidity. You basically give the money back and if the user take the liquidity, you charge fees. There is a middleman called market makers, wholesale market makers. They collect all those flows and try new make money from the different incentives coming from different exchanges.

For those wholesale market makers, if they have more flows of trades, they can have more opportunities to make money by utilizing the exchange rebate structure. That where us, Alpaca, or Robinhood, or even E*TRADE, TD Ameritrade, the send trades to wholesome marketmakers and we receive some kind of basically introducing fee. That is called as payment for order flow, and it's all disclosed in a regular reports called 606 report. How much we are receiving from those wholesome market makers and who we are receiving from. This is nothing different from Robinhood or E*TRADE or Alpaca or TD Ameritrade or any other broker-dealers that's out there.

I think people talk about zero commission and like Robinhood is doing some weird thing, but it's not necessarily true, because they're doing the exact same thing. But the Robinhood went zero commissions. I think like a lot of joiners wanted to pick on what the – All the broker-dealer, like I won't say all, but like most broker-dealers do on the backend, and Robinhood just unfortunately got picked on because they went zero commission. But now everyone's went zero commission trade including all those other existing broker-dealers and they do the exact same thing is what the Robinhood does.

[00:56:15] JM: Because commission is your sugar on top. There making a margin regardless.

[00:56:19] YY: Exactly. That is the weird part, right? Facebook makes money on the backend by selling ads. Existing broker-dealers use – What you should do is like they also charge you to use Facebook. What is this?

[00:56:33] JM: Right. Right. Robinhood did have an innovation with the zero commission and then they changed the market essentially.

[00:56:40] YY: Yeah. As Alpaca, like I just said, because we deal with more sophisticated audience, we are very transparent. We explain, this is how we make money and this is how it works on the backend.

[00:56:52] JM: As you build up more volume, do you get better margins? Because you're selling to market makers in higher volume and you have economies of scale.

[00:57:01] YY: Yeah. Economy of the scale is more – Comes with the internalization of what we do as a company. Basically, I think same thing – I think of this more of the clouds business, right? Box or Dropbox, I think like they used to use Amazon AWS. But eventually they change that to their own server internally, because it's a better margins, better control, more control. It's a similar thing. Some stack, like we don't own it. If you really internalize that, yes, there is a better profit margin. Why you want to do that? Because there are more volume and it makes sense economically.

[00:57:35] JM: Right. What does that look like? If Alpaca becomes gigantic, do you eventually want to build a market maker business?

[00:57:43] YY: Not necessarily. Again, our vision is really middleware for investing in general. U.S. stocks is not the only thing that we want to do. What we want to do is connect as many different time of the niche asset classes into one. That's more priority for us. Not necessarily going super deep into one thing may not be our focus.

[00:58:04] JM: Is the equivalent business to this in crypto, is that market already saturated? My sense is that there's already a lot of APIs for doing crypto trading.

[00:58:16] YY: I agree, and I think the reason why for that is crypto industry in nature is built by software developers, and traditional assets were built by finance guys. I think that is why the thing like Alpaca really did not exist until Alpaca in the stock side.

[00:58:35] JM: Does your backend look in any way like what Vlad had to do in the early days where basically it was a really duct tape and chicken wire, like very janky. The programmatic interface, the user interface is fantastic. You're like, "Wow! It's a magical API for connecting me to banks." But what they were actually doing, like I think spinning up a VM and like literally logging in to your bank and like scraping the screen, really weird stuff. Are there any parts of integrating with the financial landscape that feel like that like really, really old janky stuff you have to do that makes you a little bit sick inside?

[00:59:17] YY: Oh, yeah. Every single day. Every single moment.

[00:59:20] JM: Like what?

[00:59:20] YY: Well, even like syncing, like those accounting, like who has how much money and all those things, reporting, end of day, start of day with CSV's and some FTP server, like file conversion. We have some notification through emails, because there's no API connection. Yeah, it's countless amount of the things that we have to do manually which we automate a heck out of it on our side. But connecting to those people is always a pain.

[00:59:53] JM: Do those automations break?

[00:59:54] YY: It's a system, so there is a risk that may break. That's why we had to be extremely careful. Our system is a very mission-critical system. We really care about that.

[01:00:03] YY: Totally.

[01:00:04] YY: Yeah.

[01:00:04] JM: Yeah. I mean, do you remember that company – What was it? Night Trading or –

[01:00:11] YY: Night Capital.

[01:00:12] JM: Night Capital. I mean, that is like the ultimate example of like exactly I guess unit test or I don't know what's the lesson from that, like Night Capital. It was literally like they had some algorithm that they thought was trading in one direction. It was actually trading in the other direction. They're like buying tons and tons of securities and just the company went underwater. Thanks to an algorithm misconfigured.

[01:00:35] YY: That's actually a human error of not updating one of the eight servers that they missed they supposed to upgrade. The guy who was supposed to be monitoring that thing, he seems to be out for like a few hours or a few days, because he was traveling on vacation and didn't have a network or something. It's extremely human error.

[01:00:59] JM: Don't do that.

[01:01:01] YY: Exactly. We introduced those cases to all our employees and staffs, because we deal with this mission-critical system and the human error actually creates that kind of things that – Disaster. We need to have a culture that we understand this could have happen. Every single thing that we do has to be extremely careful. At the same time as a tech company we have to move fast. Creating the value as a company ourselves has been basically has to come from both sides, tech side and having understanding of there's an extremely long tail risks that this one thing could blow up everything.

[01:01:41] JM: What do think about the potential of the crypto ecosystem? There's this term defi, decentralized finance. I think it's the idea that you have a permission list crypto ecosystem where you're unlocking the potential for anybody that have access to – First of all, obviously crypto assets, but then the idea of defi I think is that you put synthetic assets that track Coca-Cola stock, or McDonald's stock, or whatever. You put those synthetic assets into the crypto ecosystem and allow anybody in India or wherever to buy these things essentially in an unregulated fashion. I mean, synthetics –

[01:02:25] YY: I think [inaudible 01:02:25] does that.

[01:02:27] JM: Yeah. I guess more broadly, like what do you think of the potential of crypto to make trading infrastructure more seamless or permissionless? Does that matter? I mean, can we get everything – You're talking about Alpaca unlocking the potential to bring U.S. products, U.S. financial products or just better financial products to the rest of the world. Do we even need the crypto ecosystem to "decentralize" this kind of stuff, or is it naturally getting liberated by APIs and infrastructure?

[01:02:59] YY: That's a very good question, and I'm a big fan of decentralization. [inaudible 01:03:03] and I'm a big fan of it. At the same time, I also saw the strength of having very strong regulation as well, because what happened in the last couple years in basically ICO or IEO or crypto trading, it's really the history repeats it itself, rhymes itself looking at what the U.S. existing securities market experience since 1933.

If you read the history, all those thing that happened in the ICO or those scam in the crypto happened in the past. Eventually, that has to be stopped and that's why like there's the government moving to figure things out. I think any ways of doing that kind of thing, I think it will be coming into one anyway. The concept of synthetic is not new. Using synthetic a credit default swap, that has been there before Lehman that's why risk cost is so huge.

[01:04:09] JM: And after.

[01:04:09] YY: Yeah. I don't see there is anything new, but it just have to be streamlined in a right way and combined into the one process so that there is more efficiency. I think just using that kind of – I won't say it's a crypto. It's more of the blockchain and I guess some of the digital way to do that is just one of the methods that we can use, but the problem that we are trying to tackle is to make this whole thing accessible as possible to anywhere in the world. I think whatever works, we have to try it.

[01:04:45] JM: Is there even anything practical about it tough? I mean, crypto, like I get the decentralization. I like the decentralized gold use case. I like to decentralize store of value case.

[01:04:54] YY: Yeah. Hence, Bitcoin only.

[01:04:57] JM: Hence, Bitcoin only. Is the rest of it complete madness? Do we need decentralized computation? Do we need decentralize smart contracts? Do we need any of this stuff? It's cool. Don't get me wrong, but a lot of it, what's cool about it is the permissionless factor and you could build 99% of the permissionless use cases with APIs, if the right API providers were there. That's one reason I think Alpaca is pretty cool. That's one reason I think Stripe is really cool. The other 1% is illegal. It's getting a crackdown on anyway even if it's crypto. Do we need any of this stuff? Does it matter?

[01:05:40] YY: Yeah. I think making the fractional is possible has been probably, like I just said, like fractional money transfer or like owning something fractional, it's something that like you're talking about, like this blockchain and the crypto has been pretty good because it becomes like really cheap cost. Yeah, you're right. A lot of players are trying to solve the problem without using crypto or blockchain nowadays. So let's see how it goes.

[01:06:09] JM: And it's probably doable. I mean, it's fun to watch. It's so fun to watch. I mean, if all of this stuff, if in 10 years, 15 years we look back like, "What were we thinking? Blockchain?" I mean, we're all going to have some Bitcoin. It's have gone up like 15% in 10 years and we'll be like, "I'm glad it retained its value. That was great." Man! That was a fever dream. We all went crazy for a little while and just didn't realize we don't need decentralization for almost anything.

[01:06:43] YY: I mean, that concept itself has been there. FX is always decentralized. There is centralized FX stock market, right? There is no exchange. It's always like multiple liquidity providers like doing that thing. The concept, that's been always there. Same thing as the U.S. stock market. There's 50 exchanges there and there's a regulation, but like there's a regulation to make sure that price regardless of where it comes from has to be kept at certain level. That's called an NBBO or best execution policy, National Best Bid and Offer. People actually build the technology to sync. It's a big data problem. Probably distributed problem. There're multiple things, but it has to work simultaneously.

Yeah, there's technology happening to make the thing work. That concept and the problem is always there. Yeah, decentralization, it's core and it's already happening even before crypto maybe.

[01:07:43] JM: Right. Hilarious. Okay we got to wrap up. It's really cool what you're building, and the trajectory is also really cool. It's one of those things where your career has really taken a lot of twists and turns to get to where you are and the twists and turns are hilarious. What's the biggest risk to Alpaca? What is the thing that keeps you up at night? What is the tail risk that could cause this business to fail? Because it seems like – I mean, I don't know if another business that does this. Maybe somebody is listening and they know of another stock trading API or maybe you know of another one, but it's the first time I've seen this. It seems pretty cool. But what's the biggest risk to this business not working out?

[01:08:20] YY: I always think about people doing this thing, because if you are extremely tech side of the person's only, then you wouldn't probably think too much about the tail risk that you see in the financial services, financial market side of the thing. If you are coming from extremely just financial services side of the thing, you don't understand how open-source this has to be, how developer friendly this has to be and how liberated this has to be.

I think in order to – What scares me at night is probably are we leading this whole thing with the right values to make sure that everyone understands the risk but at the same time we are pushing in the right direction while understanding the risk. I think that that is something that I worry about all the time.

[01:09:16] JM: Yoshi, thanks for coming on the show. Great talking.

[01:09:17] YY: Thank you very much, Jeff.

[END OF INTERVIEW]

[01:09:28] JM: As a programmer, you think an object. With MongoDB, so does your database. MongoDB is the most popular document-based database built for modern application developers and the cloud area. Millions of developers use MongoDB to power the world's most innovative products and services, from crypto currency, to online gaming, IoT and more. Try Mongo DB today with Atlas, the global cloud database service that runs on AWS, Azure and Google Cloud. Configure, deploy and connect to your database in just a few minutes. Check it out at mongodb.com/atlas. That's mongodb.com/atlas.

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