[SQUEAKING]

[RUSTLING]

[CLICKING]

SIQI ZHENG: So today is our second lecture on how to finance sustainable real estate. A very quick recap-- Tuesday, on Tuesday, we talked about asset level. We talked about building level, basically. Then we talked about both, both the equity side, the private equity introduced-- his private equity, that's last year's best team in Charles' class final project-- and also the mortgage side. That's an asset level.

Today, we move on, and we talk about this portfolio level. So basically, that's the structure. Then next session on this topic will be global level. This global sustainable real estate market. So still, go back to our diagram, this big picture, as I always show.

We have the sandwich structure. We have these individual end users in this physical space market to choose whether to live, work, play in green buildings and green cities. Then we also have these individual investors put money in pension fund, insurance companies, and then they become big investors to invest in sustainable real estate. And then we have equity and debt.

So now, today, we are going to talk about these big guys. These are small guys, last class, individuals, and the private equity. Now we are here, rates and the big companies, now on the equity side. And then the mortgage-backed securities and the green bonds. So that's for today. They're both this public market.

So basically, we will talk about, first, still, equity level. That's basically rates. And then that will be green bond. So that's basically the vehicles, some investment vehicles on public market that target at sustainable real estate. Then we talk about the benchmarking and disclosure, some basic tools and what's going on, all the data.

So that's the 4 times 4-- 2 times 2 matrix of this. Then we are here. So basically, I'm not sure whether you are familiar with the concept of REITs. Who are-- don't know what REITs is? Could you raise your hand?

So everyone knows. So I think that's already being taught in the finance and other classes. So basically, this is real estate investment trust, so that's a special stock. It's a company.

A real estate investment trust is a company. It's a publicly traded listed company on stock market. So they are mainly investment in real estate. So that's called REITs. And REITs, since REITs is a company and mainly equity rates, and then they are here public, trading every day.

So one example is Boston Properties. So yes, so that's basically here, and we have 200, like 250 REITs right now in the United States. So they are big companies.

And since they are a company, they can do all kinds of things. That's why they can do-- so this is a public company trading. And then they can do their equity investment. So they reinvest their money, or they raise new capital by issuing new stocks.

So that's basically their equity money and invest in. And as a company, they can also go to the bank-- because it's a company, we can go to the bank-- to borrow a loan from the bank. So they can go to the bank.

And then they can also issue corporate bonds. So basically, although it is REITs, it itself is here. But it can do so many things because this is a company.

They can go to the bank. They can issue their own bonds. They can issue their new stocks. So that's the REITs. That's why we focus on this. Then you can understand the important role of REITs here.

For those who forgot what REITs is about or haven't touched on this topic, there are very quick basics of REITs. So REITs basically is here. It's a company, and then this company's main business, the main business, the core business to invest on, not other factories or manufacturing or IT or biotech, no. They invest in income-generating real estate properties.

So that's office-- commercial real estate, commercial real estate. So they invest in commercial real estate. And then because they are publicly traded-- so actually, there are so many investors. Maybe you are one of this, and I'm also one of this. All these investors, we buy the stocks of the REITs.

So we buy stocks of REITs. REITs have our own money and then invest in all the real estate, then real estate because they are income producing. They're commercial properties.

Then every year, every month, they have rents that become the revenue. And then you distribute. So that's basically the idea.

The key things is REITs, they enjoy some tax benefit in the United States. So then basically they saw there's no corporate tax-- income tax but just the personal individual income tax. So basically, the cash flow from those properties to this company can pass through directly to individuals. When we get our dividend and all the things, as individuals, we pay tax, pay income tax.

But at this level, they don't pay so that this is an advantage of REITs. Since you have this advantage, then there's also a rule. You cannot be so like-- has this advantage. But then you need to also follow this rule is 75% of the income generated by real estate-- and they also must invest all their assets mainly in real estate, 75%. You have a little bit more on other things, but the majority, 75%, need to be in real estate.

And another thing is you need to distribute because all the people on here, all our investors on here, so you need to-- you are obliged to distribute 90% of your income. So all the income from here, you cannot just stay here to do other things. Instead, 90% of the annual income need to be distributed.

So that's, if you follow this 90% and 75% rule so you can enjoy this tax benefit at this level, no income tax, at this level, income tax. So that's the basic idea of REITs. So then, of course, as a company, they become a publicly listed company. They invest in real estate.

Then we say, OK, then let's compare a little bit of this for me. You, as a investor, we directly go to buy real estate, a commercial real estate. Or I buy the stock of the REITs, and the REITs will go to invest in this real estate. So that's a direct real estate investing, to buy a building or buy a property. Or you buy stocks from REITs, a company, Boston Properties.

And then they will do-- use your money, pool all the money of the individuals together to buy real estate and invest in real estate. So these are two ways, direct way or indirect way from individual perspective. And someone can tell me the basics of the comparison advantage or disadvantage of each one? [? Derek. ?]

AUDIENCE: REITs allow you to have greater geographic diversification versus buying direct real estate, perhaps.

SIQI ZHENG: Why? But why you can have this geographic diversification?

AUDIENCE: Well, because the rates are larger scale. So like, for example, we could own properties in every geography in the United States, so you're able to diversify away some of the idiosyncratic risk that comes along with an individual city or municipality.

SIQI ZHENG: Yeah. I think the basic rationale, logic is, as individuals, we don't have so much money for ourselves. It's very hard for common people like us to invest in so many countries, to go there to buy buildings. Then since REITs are stocks, they are small pieces, then you can buy different stocks.

AUDIENCE: So REITs were conceived as a pre-tax vehicles, so that's their most important characteristic. So if you invested in direct real estate instead of a REIT, you will be taxed, for example, on your corporation level and then on your income level. And the REIT, whatever income comes out of the REIT is tax exempt--

SIQI ZHENG: Yes.

AUDIENCE: --in a way. And you're only taxed on the income you had of it.

SIQI ZHENG: Yes.

AUDIENCE: I think that's the main advantage of investing of REITs, direct real estate.

SIQI ZHENG: Tax advantage. Please.

AUDIENCE: I think it's also that in case of-- it's not a shared-- it's a shared loss or a shared risk because so many people are investing together as opposed to buying a direct property, you're alone, like sharing the risk.

SIQI ZHENG: You want this feeling of together. You mean here in the United States? You mentioned India or--

AUDIENCE: Yeah, it's--

SIQI ZHENG: Also in India.

AUDIENCE: They'll mutually find something like that.

SIQI ZHENG: OK. Please, and then you.

AUDIENCE: Already you don't need that much, that big amount capitals to invest in [INAUDIBLE] by a small amount compared to the direct investment that we need to have that large capital [INAUDIBLE].

SIQI ZHENG: Yeah.

AUDIENCE: [INAUDIBLE]

SIQI ZHENG: You don't have enough money. Not everyone can directly invest in real estate.

AUDIENCE: Investment is also more liquid.

SIQI ZHENG: Liquid, yes. You can buy and sell. Today, you'll buy. Tomorrow, you'll sell. But a building, you need a broker, and it takes so long.

So given this so good benefit and advantages, in this classroom, who has invested in REITs? Please raise your hand. In your own money. I invested.

OK, not so many. Since it's so good, you should consider. But I only bought a little bit of REITs.

So we already covered all this, basically REITs stock. They're stocks, so they are highly liquid. You can buy today, sell tomorrow, and you even don't need to know what are the real properties underlying. So you don't know.

Maybe they just put the money to invest in global, all kinds of cities, countries, and you don't need to go to there to see these buildings. And they're very transparent because the stock market and all these advantages. Especially for our small investors, we really cannot do this first one.

But then another thing is you have lower control. But you need to make the trade off because, if you really want to control-- you're some control freak-- then you really want to do private equity. You really want to hands on to change your property, or you really want to invest.

For this, you just invest so indirectly. You even don't know what are the buildings behind. So that's basically the idea.

As we said, REITs, basically the US is the birthplace of the modern REITs. But other countries and regions also followed and adopted the REITs approach. There's so many countries now have REITs because it's a very good way to make very, very illiquid-- real estate assets become a liquid thing that common people can invest in. So this is a very innovation of the financial investment vehicle.

I anyone to tell me some story of the REITs in your countries? So the US, we know. We all know, and we invest in. But other countries?

Just now, you already talked India. Do you want to say more, when India started the REITs?

AUDIENCE: I don't know much about it. For me, it's like a concept [INAUDIBLE].

SIQI ZHENG: OK, any other stories? Please.

AUDIENCE: So in Colombia, we have an adapted figure of a REIT. It's called the PEY. It was founded in 20-- it's not on the [? board. ?]

SIQI ZHENG: OK.

AUDIENCE: It was founded in 2008 by a former colleague of Sam Zell. So what he did was basically adapt the REIT model, the American REIT model, to adapt to our tax laws. And it works basically the same.

It's a pre-tax vehicle. It's open. It's priced in the BVC, which is the Bolsa de Valores de Colombiana. It's the Wall Street of Colombia. It's really small, so it's--

SIQI ZHENG: That was the first one, first REITs, the first one.

AUDIENCE: Three REITs.

SIQI ZHENG: Three weeks, OK.

AUDIENCE: That's the biggest one. That's 120 million square feet under management. And because our market is so small, it's not like in the States that you have REITs for each type of assets. You have a office street, like BXP. You have a--

SIQI ZHENG: Industrial, like a Prologis.

AUDIENCE: You have different [INAUDIBLE] they have from hospitality to retail to multifamily.

SIQI ZHENG: OK.

AUDIENCE: Every type of asset. It's rather new. People still don't-- are not very educated, so they don't really understand--

SIQI ZHENG: You should go back to do this REITs. Julio, your story.

AUDIENCE: Yeah, in Mexico, we started in 2011, if I'm not mistaken. And I think what's interesting is-- 2010, there it is. Since then, the commercial property prices have increased significantly until before the pandemic.

SIQI ZHENG: What other stories? Later, we will talk about China. Other besides China? South Korea?

AUDIENCE: South Korea. [INAUDIBLE] I believe that more [INAUDIBLE].

SIQI ZHENG: Infrastructure.

AUDIENCE: Macquarie-- Macquarie. I believe that was a Macquarie one.

SIQI ZHENG: OK.

AUDIENCE: But it does-- the control thing issue, control issue does become an issue because the valuations for REITs are maybe lower than market. And people try to-- there have been attempts to take over.

SIQI ZHENG: OK, good. So, yes, I can talk a little bit more about China's REITs, and China is an expert. So I want to tell a joke or a small story, not a real story.

So basically, 20 years ago, 20 years or more than 20 years ago, when I was a graduate student and my husband also a graduate. We were classmates in graduate school, and we were together in a kind of real estate center doing some research with our professors. We share one professor. That's why we got to know each other.

And then he was a Master's student, and I was a PhD student. So then the professor said, you, please do your thesis, master's thesis, on REITs. At that time, there was no REITs at all in China.

But there was a lot of discussions because they understood this so good. And they really want to do REITs. Then my professor asked my boyfriend at that time to do Master's thesis on REITs and to evaluate to forecast when is a good timing for China to launch REITs. That was 2002.

And then he did some research and analysis. And then he came up with a conclusion it's not ready. Next 20 years, no REITs for China. No need, no need to do REITs because there are other huge capital sources and no incentive and very difficult legal, things like that. I wrote the thesis to elaborate on why no REITs and to compare China and the US systems. And then so that was his Master's thesis about to prove that there's no need for China to have REITs in the next 10 or 20 years.

That became the reality. Although it's a lot of discussion, if you search, there's a lot of discussion back to early 2000, a lot of discussion about China's REITs. But it's just a dream, and nobody really launch. And the government did not launch until the recent recession.

The recent pandemic recession, that, at that time, the Chinese government really had the real incentive, not the tax advantage. It's not about taxing. It's just because they didn't have enough funds, especially all the cities. All the cities, they were losing a lot of money from land sale and all the things.

And first, the cities were very rich. They had enough money to build infrastructure, highway, high-speed rail and all the things. And then, suddenly, they lost a lot of money because of the COVID and all the other things, and they couldn't sell the land. The real estate market was declining.

Then they said, OK, REITs, good. REITs is a very good solution for the cities. And then they launched a very different animal. It's not like what we mentioned here in the United States model, like this model.

And the tax advantage is very important and how the disadvantage, advantage. They say, OK, REITs, good. They will use this concept, but they only apply to infrastructure field, infrastructure area. The transportation and the sewage and all the things infrastructure say, OK, now you are poor, right? No problem.

You use REITs to get money from individual people or the citizens. So that's the REITs. Then they extract the money from common people, become REITs, and then they have another alternative way to gather money. And then they invest in real estate-- not real estate, infrastructure.

So that's China's REITs. I don't think they have this tax advantage at all, no. And just another way for the city and state governments, especially state and provincial governments, to extract money from common people. And after this, now, I think it's two years old. It's a two years old, new baby.

Recently, I got this information from the news that they plan to-- these two years was so successful, they have several very huge infrastructure REITs, so successful, then they will considering to expand the rates to commercial real estate using retail as the first step, like malls and the department stores.

Not all-- the first cities became so poor they wanted to use REITs to save those cities to give them another way to gather money for cities to invest. Now, the real estate market was so bad they wanted to use this to stimulate the real estate market. So that's my understanding.

And we can listen to CNN. But first, your question.

AUDIENCE: Are these publicly owned REITs, you're saying cities issued REITs to pay for their infrastructure so this is an alternative to bond?

SIQI ZHENG: That's a very good question. I think the cities, they-- the cities, not the city government, not the mayor himself, but they establish quasi-company corporation. Then they make that a listed company with the main business of infrastructure investment. Then they use that as a special vehicle to issue REITs, not the government itself.

AUDIENCE: It's interesting that, actually, it's the same thing, same situation happened in Thailand. So the REIT concept was initially introduced during and after the Asian financial crisis to Thailand to help provide liquidity to disperse property--

SIQI ZHENG: To save that market.

AUDIENCE: Yeah. So before then in the '90s, we only had property fund for the poor or the real estate asset together. But now we have [INAUDIBLE]-- because of that event, we have almost 20 REITs [INAUDIBLE].

SIQI ZHENG: Yeah. So always there was a trigger.

AUDIENCE: Yeah.

SIQI ZHENG: Otherwise, why bother themselves to create a new thing, right? There's a trigger. Now we have two experts for China's REITs, but be brief. You first and then [? Marcos. ?] Go ahead. Because CNN came from Guangzhou.

That's a very big real estate company in China. They establish first REITs.

AUDIENCE: This problem, because the China government financial framework [INAUDIBLE] to the financial [INAUDIBLE] because in China, with real estate, then they're [INAUDIBLE].

SIQI ZHENG: Separated.

AUDIENCE: So [INAUDIBLE] very dangerously we can combine those two functions to mix. So also the public [INAUDIBLE], like the logistic, like some prefer this to REITs It's more stable than [INAUDIBLE].

SIQI ZHENG: Yeah.

AUDIENCE: A commercial, like [INAUDIBLE] now I'm a real REIT in China [INAUDIBLE] also from Singapore and Hong Kong.

SIQI ZHENG: Yes. OK, good. And Marcos?

AUDIENCE: Yeah, and before the property rates in [? 2010 ?] to [? 2021, ?] they are like crazy rates within some companies, like logistic levers. And so the topic is about infrastructure, and that's because the government wants to control the REITs, the financial REITs. They don't want some speculative trading for the commercial real estate market. But now, since the situation changed, they do--

SIQI ZHENG: Yeah, they really want to rescue the real estate market there.

AUDIENCE: [INAUDIBLE] open to affordable housing at first and then open to those kind of commercial lulls and [? property ?] [? scores. ?] So that's a gradual challenge of the government's intention. But at the same time, the situation there is still at very beginning, so comparing the overall volume is very, very few.

SIQI ZHENG: Very small.

AUDIENCE: Yeah a group [INAUDIBLE] very small compared to the overall real estate market. And at the same time, the major investors are not common people. Major investors do like the private equity firms.

SIQI ZHENG: OK, not us.

AUDIENCE: [INAUDIBLE] so will probably be limited because the kind of information asymmetry because [INAUDIBLE].

SIQI ZHENG: Very good. So that's why I'm thinking the following-- this is beyond our class. I'm going to organize a conference in the summer, July 31 and August 1, on Asia's real estate. So that will be an academic conference.

We have papers, but I'm thinking, to organize a industry event to talk about these risks in emerging markets, especially Asia, because you can see these totally different animals. If you are interested, we can later discuss. I know you are interested. And if you are interested, we can talk together and how to organize because we have so many like new market for REITs.

But this is not our focus of class. I need to quickly move on to green REITs because we are talking about sustainability. So basically, even if you look back to our MSRED thesis-- I think we have the database of the MSRED theses. And in the past several decades, you will see-- you can find some theses on the REITs topic to evaluate this emerging market.

So last year an MSRED student, Chenzhou, he worked with me and to interview institutional investors and then and also REITs and private equity to understand their preference and their perception of sustainable real estate, given that they are REITs or given that there are some institutional investors behind the REITs. Like big ones, they invest in REITs from the capital market.

And what are they thinking about this ESG investment? So that's from his thesis. So basically, now, more than 60% of the REITs by the equity market, this big size, they have-- they are very ambitious, these carbon targets, so net zero carbon targets. And it's a very sharp increase, year by year increase.

So now the ESG also very, very important for many, many REITs. They have their own net zero. When they talk about net zero, they mean their portfolio, all the property they are investing. And then it's a huge increase, this impact of investors. But the very, very important thing is, who are pushing them? Who are pushing them?

So that's now we are doing-- we want you to do some research. [? Chen's ?] thesis is kind of preparation of our in-depth-- understanding is like the following. REITs is here. We have 250 or 260 REITs. That's for the United States.

And you will see that they're very, very aggressive. They are saying they're going to do all those net zero and the ESG. But why? Whether are these managers of the REITs they really from the heart want to do so, or they have the underlying institutional investors, they are pushing them.

So these are the institutional investors, like Pension Fund and those insurance companies and the asset management, BlackRock, all those. So then he went to interview those investors, this underlying behind the scene the REITs.

And the key thing is most of the institutional investors behind the REITs they are pushing, so these managers, they need to get capital. This is capital allocation. So if those investors said, I want to invest in you. I will give you capital-- if you, your portfolio, have a higher share of the sustainable real estate, we will invest in you.

So they need to get capital from them. So that's the fundamental driving force. And from our interviews from them, the key things, the key patterns we found is that the leaders, these very, very-- the most pro-ESG investors-- those people-- are from Europe and Western and northern Europe. So I give you some examples of the Central Bank of Norway and also the Netherlands Dutch Pension Fund.

All those are very big guys, and they invest heavily in the US REITs. And they're really pro-ESG. They say, if you do this, I will give you money, capital. And then among all our-- and the Canadian Pension Fund, you can see all these Canadian real estate investment asset management and the global in Sydney and Australia, Germany. All those, they were the people behind this.

And then for the Middle East, Middle East, very, very big guys, the investors, they care the least. I'm not sure. Maybe we didn't really interview those who care a lot. But overall, they care least. And the US states in the middle. I think maybe Asia also in the middle.

So that's the basic pattern of this. So now the understanding is this is a principal agent. This is the principal. They have capital in their hands. This agent, they get money and manage the properties.

So maybe they are very aggressive, not because they really think that's important, but they need the capital. So that's our preliminary funding. But now we are going to do in-depth research. We have not started yet is to understand we will have survey of those people. We will have more survey of those people to understand.

So then I went back to literature. With any research, we need to look at what have been done. That's the literature. From the literature, we do see, for example, this paper, 2012 paper. They did observe that doing well by doing good, that also applies to green REITs, not just green buildings.

Remember, green buildings, we have this doing well by doing good. If you are green building, then you have a price on rent premium. But for REITs, similarly, but it's a portfolio-level aggregate. Each REIT may own hundreds of buildings, aggregate together. So they measure the sheer of the green properties in that portfolio, the entire portfolio.

And then you can see that, for this REIT, they are holding the portfolio. The share of LEED-Certified properties and the Energy Star also rose very fast in recent years. And then they did say-- they did, from the data, they have all-- the REIT research relatively easy. Why? Because you have all the data, because they're all stocks.

You just all-- get all the data, annual report, all the things, very public information. So they got all the data of the REITs. And they found that, for those greener REITs in terms of the higher share of the green buildings in their portfolio, they have higher return on equity and also higher return on asset. And then they also have better performance.

Then, of course, you can argue, when we do rigorous research-- remember, I mentioned this apple-to-apple comparison before the spring break. We also tested you on in the midterm of the apple to apple, not that we need to be very careful of the endogeneity.

So then this kind of argument really, really may have this problem is the reverse causality. For example, better perform the rates. They are doing very well. They have a lot of money. They make a lot of money. They have better performance.

So they are more cash rich. So if they are more cash rich, then they can spend more on green investment. If you struggle with your performance, you need to, first, keep your bottom line. You don't have time or you don't have the resource to think about these ESG things.

But the return rates, REITs, they are thinking about the image. They are thinking about their social image and the cooperation, social responsibility. So they invest. So that's the reverse causality. Bill.

AUDIENCE: Another concern I would have is that this is over 10 years old. And so now as LEED becomes more and more common in the market, I'd be interested to see this study more updated--

SIQI ZHENG: Yes.

AUDIENCE: [? --to see if ?] the results are the same now.

SIQI ZHENG: Yes. That's very good. Maybe another thesis can be done to update this because this is not that difficult to do. So there's so many channels, so then they use very advanced econometrics to address that potential other channels than they really, really pin down in their data set.

If you portfolio-- your portfolio of your all the properties, increase of 1% of the LEED buildings in your portfolio, you have this ROA increase by 3.5 percentage points and ROE increased by 8 percentage points. And you also have a lower beta, means your portfolio is-- have a lower risk.

So that's, really, supported by the building-level analysis. The building-level analysis said that, when there was recession like that, ups and downs, those energy-- more energy-efficient buildings, they perform relatively better. So that's why, if you have a portfolio of those greener assets, you can handle the up and downs of the recession much better.

So that's why-- OK, and this is all the research. We want to update this. So that's why we are doing this.

So now I have two related REITs projects. One is this. The other is this.

So now we are doing something like that. From the news, we saw all this applied to net zero, this, this, that, that, cities, and the states and also companies and all the REITs, so all the REITs they have. So I went to-- in the spring break, I went to San Francisco. I went to Prologis.

They are very, very progressive on this. They are logistics and supply chain. And we know BXP is very, very progressive, and we have other data center REITs and all the REITs. So we collect data of all the REITs. We have a long-time span, 2010 to 2019.

And then with all the information-- some are missing values-- altogether, we have now currently our database 178 REITs in our data set. Then we want to understand not just the, like in this way, to count how many green properties. That's one way.

And then now we are going to do two things, green talking and green doing. Maybe they are different. So because we observed so much talking, a lot of talking, and the news release and the conference and like that, and then green talking is one indicator because the investors, as us, we don't know really, where are the properties? What's going on?

We just read the news. So we are going to construct a green talking index by extracting their news conference or some senior c-suite leader's media report or their annual report, say, they are-- how ambitious they are. Then we create a green talking index.

And then we measure their green doing, whether they really invest in real green things or just a cheap talk. So then we have green talking. We have green doing.

Then we say how they really affect the performance on stock market. Thus, we have beta alpha and the asset return on equity, all the outcome variables. So that's our research. So we are not in this stage of construct, this green talking and green doing indexes. But we have our hypothesis.

So we say, for example, this is the stock price. This is the time. Then, suddenly, there's a green pledge, net zero, 2040. Then the stock market might respond because it's an information shock. Then it's going up if, if the investors, they really appreciate that. If we don't care, then maybe there's no response.

But if the investors, the individuals, they care, maybe they will see this as a information shock. But whether it can sustain or they will go back, then, of course, if you just talk, just talking, then, after some time, the investor noticed, I realized that there is no real action. So they go back.

But for the green doing for those REITs may continue to increase if-- will be sustained if the market really appreciates this ESG investment. So that's our hypothesis number one. Maybe it's the opposite direction because you talk about all those-- whether what's these two relationship, you have your core business. You cannot everyday do ESG.

If this may be costly and if there is no synergy as a substitution between these two things, you spend more money on ESG. You have less resource on other things. Maybe that will go down. We don't know. That's an open question.

So that's the-- give you a sense of what we are doing on this. And then let's move on to green bond. So green bond is that side. Equity side is a risk, the debt. So green bonds is quite easy to understand.

So if you understand the bond, what's the definition of bond? Bond, basically, fixed-income investment vehicle. Equity is not fixed, variable. Bond is fixed.

And who can issue? Government can issue. Just now we talk about this Treasury bond issued by Federal Government here in the United States. And, here, cities' municipal bonds, they can also issue. So this government cities and the government cities and the Federal Government and all this can issue. And big companies, they can also issue green bonds. So that's not just a government bonds, but also there's a corporate bonds.

So that's the of basic concept of bonds. So bond is a fixed income. So when we [? issue ?] this, it's kind of a paper, saying, if you buy this and, each month, if you just lend money to us, to the government or to the company, then each month you have a interest rate, then they will pay back. So you have a very secured income flow as determined as specified in this contract of the bond. So that's bond.

So they have different purposes. For example, municipal bond, the city is here. My understanding the city is here. They issue municipal bonds because they really need money to build the city infrastructure and school and all this public service. So they issue bonds, municipal bonds.

And then they issue municipal bonds. And then you need to pay back. You can issue bonds. Then you collect money, a lot of money. Then you build roads and all the infrastructure, schools, hospitals in your city. And then you need to pay back.

The main revenue that the cities can pay back can be the new money coming in, can pay back the property tax. Because you maintain your city public service, your housing price can be very stable and even increase. Then you collect property tax, which is a flow. Every year, you collect, collect. Then you use your property tax to pay back.

The basic logic behind is you borrow money, upfront money, because you need to, first, invest. And then your city becomes beautiful and better service. Then your housing price will be good. And then you collect property tax every year to pay back. So that's the idea.

But as far as I know, in many developing countries, the cities, they are not allowed to issue bonds. And especially when the institution is not that very well developed, then you have no property tax. If the city does not have a stable income flow stream, how can you issue bonds? You issue bonds, and you have no money to pay back.

So you have-- so you don't have any credibility, and you don't have guarantee for the future cash flow to pay back. So that's I think that's a very big problem. From my understanding, my research, in Chinese cities, they don't have property tax until now today.

They only have very little tiny pilot. It's not real property tax. If you don't have property tax, then-- but they still need money. The cities, they really need money to build, build, build.

And then they have a quasi-municipal bond then the city cannot issue because the city has no income flow inflow for future. They establish a special vehicle. A special vehicle is a quasi-company like a state-owned infrastructure investment company. And they issue bonds. They really issue bonds because they need money.

They issue bonds, and then they don't have property tax. But they sell the land. The government sells the land. And then they use the land sale revenue to pay back the bond.

So basically, this is a government, city government. They cannot issue. This is a city government bank, the company, they issue. They issue bonds then to all the citizens.

Then money come in. Then they transfer the money, not-- even don't transfer, just to build, build the infrastructure. And then there's no property tax, and the land, the government sells the land, land sale. Then the money, get the money to pay back.

But this is very dangerous and very risky. When you can sell the land, you can pay back. When you run out of the land sale revenue, then you are in trouble. You are in trouble because you cannot sell because the market is so bad, you cannot sell. All the city's is shrinking. Shrinking cities, how you can sell the land? No money.

And then they say, OK, especially in the recession, no money. Then the government all are quiet, oh, no money. How can we maintain? Even without building new, how can we maintain?

Then the central government say, OK, we will give you another thing, the REITs. So I linked to my REITs story of China because they have no money and they no land sale. But they already issued bonds, and they cannot pay back. Then they create a new thing of REITs. I talk too much about China because--

AUDIENCE: [INAUDIBLE]

SIQI ZHENG: No. You can still buy if you--

AUDIENCE: [INAUDIBLE]

SIQI ZHENG: Oh, we are so optimistic about China's economic recovery. So if you are interested, come to my China class this afternoon. But we will stop here. But the key thing is REITs.

The key thing is bonds, and then we want to understand bonds, green bonds. We are not talking about general bonds. We are talking about green bonds.

So now, it's a new huge trend. From the data you can see from 2017 to 2025, it's a fast, sharp increase of the green bond. What does green bonds mean? Green bonds are either governments or companies, they issue bonds. And they said, when they issue, they announce or they say that we issue the bonds. We collect the money we are going to use on green investment.

So that's a very simple concept to say, oh, we issue bonds. If you buy bonds, I can collect money. Then I will use renewable energy on wind farm, on solar farm, on climate resilience investment in coastal areas in the clean energy of the electricity, something like that. So that's the idea.

On this, both government-- if the city want to build, then they issue. If the company wants to do green building investment, they can issue. So they say that. Question [INAUDIBLE].

AUDIENCE: What makes a green bond green, is it only the project that it's going to be funded? Or are there special tax benefits of doing this? Are they tax exempt at the municipal level?

SIQI ZHENG: No, no, no. That-- no, I don't think they have tax advantage. But if they invest in those things, if those things, they have the incentive. For example, the Biden's Inflation Reduction Bill Act, if they invest in solar and in electric vehicles, they get this benefit.

AUDIENCE: Right. But the investor is not seeing any added benefit of--

SIQI ZHENG: Yeah, but they may have an actual premium return from this.

AUDIENCE: Is it based on performance? Is it kind of retrospectively analyzed? Or is it just you make the promise and then [INAUDIBLE].

SIQI ZHENG: You'll make the promise because that's for the future. But it's not like a very cheap talking. Later, you will see they have some way to validate.

So yes, so basically that's huge. And remember, REITs can also issue bonds because REITs are also companies, REITs can borrow money from the bank, or REITs can issue bonds. REITs can issue new stocks to raise fund.

AUDIENCE: Like US and other countries issue a bond from [INAUDIBLE] also use that model?

SIQI ZHENG: Now, which model?

AUDIENCE: By the government [INAUDIBLE].

SIQI ZHENG: Yes, yes. This is a general, general concept of bond. So government, and they must have-- people must have trust in those entities. that they will pay you back, that you can issue bond. For example, I cannot issue bonds. How can I issue? Nobody will think I can pay back.

So the REITs, they are issuing a lot of green bonds. So, for example, we always use Boston Properties because they are coming. Zhengzhen will have a case study of Boston Properties, and they are coming here. And they are across the river, so you can see.

And we are trying to-- we are now trying to arrange our final presentation in the Prudential Center building to give you a business environment to really pitch. So green bonds, they issued several rounds of the green bonds. For those companies, what's the incentive for this? What's the incentive for them to make the promise and to issue green bonds?

AUDIENCE: It's cheap for me.

SIQI ZHENG: Cheaper. The cost of capital will be cheap, cheaper. Why will be cheaper?

AUDIENCE: [INAUDIBLE], if you go back a slide, they're priced at like half a percent above the Treasury. It's really cheap money.

SIQI ZHENG: Yes, so they just need to pay very low interest rate to these investors. Yes, so basically, that's true. For example, this is research already done, 2019 paper. In this 2019 paper, they look at the asset level and also the portfolio level and show that the greenness of the REITs-- for example, they say, we are going to use this money to invest in green assets, green buildings, green infrastructure.

They can really lower the bond spread, the cost of capital of the bond. They just get cheap capital. So they show this. So that's very clear.

But this is, on average-- remember, all the statistics are on average. It's not, say, if you tomorrow issue, then you will definitely get. So that's a risk example that they issue bonds, and then they have a lower cost of capital, lower spread. And this Fannie Mae also issue green bonds. So this is a government-sponsored enterprise.

So then because, Fannie Mae, they just purchase a lot of mortgages from the small banks-- they purchase this mortgage from a small bank. They securitize them, and they sell to the public market. And all the mortgages, there are some green building mortgages. The energy-efficient buildings, the LEED-Certified buildings, and this.

And then Fannie Mae buy a lot of loans from banks. The banks lend money to the individual households and the buildings. And if those buildings, they are green buildings, they can identify in the pool of all the mortgages which are green mortgages, which are not green mortgages.

If your pool has a lot of green mortgages, then the Fannie Mae said, this pool is a green mortgage pool. Based on this pool, I'm going to issue green bonds. I got green bonds.

And then for the mortgage, the underlying green mortgage, the monthly payment to the bank, the bank pass through to Fannie Mae. Fannie Mae will pay back the investors of the bonds.

AUDIENCE: What's the percentage of the green project assets has to be in there in order to issue a green bond?

SIQI ZHENG: That's a good question. I don't know. We need to check. I think they have different types of the green bonds that Fannie Mae and Freddie Mac. They must have a very specific thing that now we can see that they have these ESG bonds.

Green bonds is one of the ESG bonds. Then they have this environmental criterion and the social and economic. For example, you need to really reduce the energy by 30% and 15% like that. So then you are a green mortgage. You can define that as a green mortgage.

But how much the share of the green mortgage in the pool that you can say this green bond? I think that's a practical question. We can check.

But you cannot just see. You cannot just announce-- Carlos.

AUDIENCE: So a question, have you seen [? except ?] of big financial institutions, like REITs or Fannie Mae, Freddie Mac, et cetera, committing-- like real estate development companies funding themselves through this type of financing green bonds?

SIQI ZHENG: Yes. Yes. No, these are become more and more important. Those rates, they issue green bonds. And because they saw the benefit of that, the lower capital, cost of capital.

AUDIENCE: But have you seen the real estate developers, not huge--

SIQI ZHENG: No.

AUDIENCE: Related companies.

SIQI ZHENG: I don't have-- I didn't say that. Maybe later, we can have Charles talk about this real world. But I think developers, it's very hard. You need to own the properties, and you need to be a very big stable company. Otherwise, who will buy?

AUDIENCE: I think I can contribute a little bit to this [INAUDIBLE]?

SIQI ZHENG: Yes.

AUDIENCE: So the company I was working for is heavily involved into the tax credit, affordable housing, or [INAUDIBLE].

SIQI ZHENG: United States.

AUDIENCE: In the United State with low carbon. And sometimes when there is a gap, when [INAUDIBLE] rent, you-- they do use something called a tax-exempt law, which is issued by the government agency authority, who is [INAUDIBLE] agency [INAUDIBLE]. And they issue bonds on behalf of the department. And then your asset [INAUDIBLE].

AUDIENCE: But is it green?

SIQI ZHENG: That's affordable. So that's a social, ESG, social.

AUDIENCE: I'm talking about green because that applies for the whole world, not just the United States. That's my actual [? deepen ?] question. This can be exploited in a very [INAUDIBLE] US--

AUDIENCE: My personal experience is that, yes [INAUDIBLE]. It's hard to market this [INAUDIBLE] the construction lender or the senior [INAUDIBLE] financier. But you do get additional equity investors, and you may have a lower cost of equity. So you may not see it so much on that side of things.

You might realize it on the equity side of things. The reason I think you see these spreads is either, in a bond, you have a lower interest rate, so to speak, on the bond for one of two reasons. Either the bond is perceived as less risky, which maybe there's an argument for that, or there's a lot of capital chasing fewer of these types of assets.

So it has real green credentials. There's a lot of people who want to buy that, which just drives down the cost of capital. That's what I experienced in the real estate market from an equity side. When you're dealing with smaller lending institutions, debt is priced--

SIQI ZHENG: Very expensive, right?

AUDIENCE: Well, these days, it's horrible.

SIQI ZHENG: Smaller. Yes. So I just want to clarify one thing. I think that's a basic concept of bond is, no matter which green bond or general bond, you have a contract like a paper. This is a bond. They say this is a $100.

And then, each year, we promise to pay you back because it's a fixed. Each year, you have some cash flow. You will receive a check of this.

Well, this is book value of this. Then each year, you will get $2. And then this is on the paper. But then, later, this bond will be traded on the market. If this is very popular, someone will be willing to pay $110 to buy this paper. So this paper is a contract to say future cash flow will be calculated based on the book value times this interest rate. Each year you will get $2.

But those individual investors, based on whether it's popular or not, will be willing to pay higher price to buy this. Or it's not popular, will pay lower price, will be, say, 90%-- $90 or $110. So that will totally be market because it's a public market.

So suppose this is a green building, green bond, and it's very popular. And we see this $100, but the investors are willing to pay-- all of us are willing to pay $110. Then that's so good for the issuer because you can still pay this little, but you'll get more money. That's why this is a cheap capital.

That's the idea. It's not like always fixed at this price, but this transaction price will vary according to the market condition. This is just, on the paper, this bond fixed income. So that's to you-- help us understand.

For example, when Boston Properties, they issue this, they have these papers. But later, how this will be valued in the market, that cannot be controlled by them. That will be controlled whether these are popular and whether the investors are willing to pay to buy those papers.

So then that's why you cannot just talk. You cannot just, oh, I promise you. When I collect the money, I will do this and do that. It's so good and so solar panels and all the carbon reduction things.

You need to stick to-- this is the climate transition finance handbook. And they have these green bond principles. I don't think this is a law. This is not from government. This is non-profit organization.

But they association of all these all these green bond issuers. They say, let's stick to this. Then, if you sell your green bond, you must follow all those principles like this and that, all the details.

So then you can sell your green bond. It's kind of a certificate of the bond. You need to meet this, this, this, your green bond. You cannot just argue. You cannot just greenwash.

So there, I'm going to just give you a basic, very basic flavor of the institution for the folio level, how to raise money from the public market to finance sustainable real estate. Equity, we talk about REITs. And then we have this, that we are talking about green bonds.

Now I'm going to do something about this final thing, and then I will pass on to Charles about final project. Now, today, we need to assign the final project. Then you will have something to do.

But before that, I'm going to talk about this. And, as you know, that all the things are measurement. If you have no data, if you have no measurement, and then if you have no benchmarking, then that's cheap talking. We just say, oh, green bond, green REITs. We are so green. So what?

And who will trust you? Because then your value will depreciate. Maybe just one day information shock and then you will depreciate. So that means data and measurement and benchmarking are so important to build the credibility of how green you are.

Then now this emerging field, maybe later you can find jobs in this area because there's a huge need for this data and the transparency information to solve this information asymmetry problem. So there are many, many companies are doing so. Many of them, they are start-ups. This data, data analytics, and this kind of companies, but then they become big.

So for example-- and some are government provided-- these are all examples and also from MSRED thesis. He did a very good summary of this. Data acquisition, so there's a software called Portfolio Manager provided by the EPA portfolio EPA. That's a government thing.

Then this is very fundamental to collect all the utility data from each building. From each building, they use this because then they can share, you need to have a standard format and the software to collect all the information. So for example, now we are working with REITs called the Varus. Varus uses residential rates, multifamily rates?

So we are now collecting data from Varus, and we are working with Christoph Reinhart, the professor in architecture, to do energy modeling for those multifamily REITs properties. Then they said, we want data. Then they say, you sign up for this, and we will transfer the data from this portfolio manager to you.

Then we create an account. Then they transfer data. So we have the data because we share this software.

Then you need to integrate the data and visualize the data. So something, it's measurabl-- no, it's very big. At first, maybe a startup, now a very good company. They are doing all this ESG and carbon accounting data and how to aggregate from different utility sources and their buildings and the different types.

So that's measurabl. And you cannot just do so. You need a third-party assurance. It's very similar to accounting. Accounting is about money, financial, now using carbon-- not accounting, audit. You need a carbon audit, third-party assurance.

This DNV is a very, very now-popular one to issue assurance opinion, just audit of whether you just make up numbers or these real numbers you cross-validate and, lastly, audit of your carbon. And then you calculate. As you as we all know, scope 1, 2, 3, you need to report. Especially if you are a listed company, you report scope 1, scope 2, scope 3.

Then they have those companies, those data analytics companies. They have algorithm that you just pull the data into this. Then they calculate for you 1, 2, 3 like that.

Of course, scope 3 is the most, most challenging one. 1 or 2, relatively, just formulas and all the parameters [INAUDIBLE] scope 3, that's emobdied carbon, is very difficult. So I think there are challenges of who can calculate the most, most reliable scope 3 embodied carbon.

Then you evaluate the benchmark, say, oh, this company is so much. This company is so much numbers, got audited, reliable, calculated. Then you need to evaluate. When your portfolio will be become a strength for the folio means under this regulation, saying, that you lose value. That's a model of the CRREM.

Then you talk-- you know your portfolio is in danger, is in risk, in the risk of later exceed this carbon cap. Or your benchmark with your peers, that's GRESB. So I will just quickly go through GRESB.

Very interestingly, I told you that my day started at 6:30 this morning. I went swimming again, and then I talked to-- I had a lunch with GRESB. GRESB is a company called Global Real Estate Sustainability Benchmark. This, you can-- think about this.

I think they already talked about this in the first session, GRESB. So this is a portfolio version of LEED. Think about. LEED is a building-level certificate, LEED silver, LEED gold, gold, LEED practicum. Then you know it's a certificate rating system.

That's on the building level. This building is LEED building. That building is not LEED building.

But when you go to portfolio, like REITs, like a big asset management company, they own a pension fund. They own hundreds of buildings in different cities, different countries, different types, maybe not just only buildings, but also other real assets like infrastructure, this and that. Then they also need a measure, a benchmarking tool as a certificate, to show how green your portfolio is. So that's a GRESB.

So GRESB, the founder of GRESB is a professor, Nils Kok. He founded this GRESB as a startup. Then he sold to become so big, and he has no time to manage.

He needs to write papers like me. He sold, but he's very entrepreneur. And he's a professor in the Maastricht University. And he's a PhD supervisor of Juan Palacios.

So Nils Kok, I think he will always come. He will later come. But already, he sold this company.

This morning, this company, as you can see, headquarters in Amsterdam, and they started this. Now, they have a US business, and the US business, a small office, a few people. They just reached out to me, say, can we talk? They want to collaborate with us.

And I say-- they want to talk today. I said, I have no time. I have so much teaching and all the things. No time.

Then we say, OK, breakfast. Then after my swim, I went to Flour. And we three, we talked, sat there for one hour before our class. I talk about GRESB.

And they really want you to work with us. They want to expand their US market, but they don't know how. They're just data provider. They have a lot of-- they have more than 10 years of data of all the portfolio.

They have portfolio, but they aggregate from buildings. They have building level. They have portfolio level, all the indicators that I talked about how we can do together.

I say we are scholars. We do research. But we can translate our research how to be useful to you. And I talked about our collaboration with Moody's.

Now, we have another collaboration with Moody's on the climate and commercial real estate. I think we can later establish another collaboration with GRESB. And then we can have all their data, and we can do whatever we want.

And another thing they really mentioned, they want to hire interns. So if you are interested in, so their US office is just a base in Boston. So they said they want interns. But first, you need to understand what they are doing so that you can say if you want to do internship in the Boston office.

So as I said, it's a portfolio-level LEED. So they are measuring ESG, and they have-- so basically, it's scores. They have the overall score. They have subscores of every aspects you can think about of ESG.

You have the leadership. And because it's ESG, not just the green, there's a leadership and the stakeholder engagement. And they also have energy materials, and they have this social aspect.

So basically, they have many, many subcategories. Whether this is very scientific, I'm not sure, but they are developing. They are developing this as a first step to have this subtopics, subscores.

Then they have their weights for if this-- already a very mature portfolio, that's management always have 30%. Your company leadership is governance, all the things. Then you have the performance of your properties. And this one is like a development, things like, if you are more like a developer or the development. So then you have this.

So the key thing is they have a report. The companies, the portfolio company, the portfolios, for example, those REITs, they need to sign up for this. For example, [INAUDIBLE] because they are not government. They are not government, say you must report data to me.

No. They are-- at first they were a start up. Now it's just a very popular rating company. Then they say, OK, if you want me to evaluate your portfolio and give you a score, you sign up. Your register. Then you give us all your data. Submit all the data to GRESB.

And then we will do all these ratings for you. So, for example, this is a Kilroy Realty Corporation. That's an example. Then you-- then because this is-- many, many portfolios, they sign up, these asset management companies, pension funds, and the REITs, they sign up. Then they have lots of data because they collect all the data.

Then you can compare with your groups, and you can make the trend this year that your score will increase or not. And then you have this asset strengths and opportunities, at which part you lag behind, which part you are the leader, and how to improve. So they will-- oh.

So then you'll say, OK, this part, waste, you need to improve. Water, you need to improve. And you are doing this data monitoring so well. So that's an analysis. They will give you a report.

This is a good example because, later, we will have guest from Boston Properties. You can see they are doing very well in terms of the GRESB. They say, OK, 90 out of 100, their score is 90. And the pr average is 79. So good, better, better than average.

Then each year, you will see the trend, basically. And this data, after they get the data from all the companies, they won't put them online. So this is, for example, for me, as a professor, I want to do research, use GRESB, I need to buy data from them. That's why, this morning, I was happy because they are coming to me and try to collaborate.

So I said, first step, give data to me. And I can get free data from them, which is good. Now, there are one, two, three papers already published by other scholars. They got data from GRESB.

And they started how you cannot have their rating, but you need to show whether for the portfolios with higher GRESB rating score, whether that will lead to better real estate return to justify why you want to go green, why you want to have ESG.

If you do ESG, then your stock market stock performance goes down. That doesn't make sense. So this paper, this very new paper, private equity, private equity, they collect all the private equity with GRESB scores. And they run regression. They show that, really, GRESB participation performance are both significant of the fund. Private equity, this is private equity fund returns.

And then this paper is about REITs.

Similarly, they started ROA, ROE, and all these indicators. They also show for those REITs with higher ESG and higher GRESB score, they have higher performance. So that's the other paper.

Finally, they also show that, for those rates, the higher GRESB, scores. they go to the bank. They can get cheap loans, lower the cost of capital. That's so good.

You have better performance. You have lower cost of capital. Then you make more money. So that's another paper.

But this still-- on average, still statistics. It's not say, this REITs, you get higher GRESB score, then you will guarantee you get this lower cost of capital or higher return. But on average, these three papers showed, if you have a higher GRESB, score, you have lower interest rate when you go to the bank to borrow money. Then you have better performance in term of the REITs or the private equity to justify the benefit of ESG.

And also then GRESB also become famous. Then all the companies want to get the GRESB score. So I'm going to skip this. And finally, I want to say one thing is I cannot only say good things.

Another, on the other hand, now, Professor Roberto Rigobon at MIT Sloan, they have a team, a research project called ESG Confusion, so confused. That's a ESG Confusion, which means now there are so many ratings-- GRESB is from the real estate sector. Then you have this and that. You have a lot of things, like I might see [INAUDIBLE] S&P Global and Moody's also. There's so many ESG ratings.

If you Google, so many because this is such a good area to make money for these rating companies. They publish their own ratings, and their own ratings are not consistent. So are not consistent at all, they are not correlated that much.

So it's very confused. They are noisy and messy and unreliable. So they created this ESG Confusion project to understand. You see, the correlation is so low, like 0.5 or something like that.

This company says it is green. That company says it's not green. It's so confused. And we even need to question whether they make up some data. Or is this really real data or not? Or what's the methodology's about, whether it's greenwashing or not?

So they are trying to develop a methodology-- not trying. They already published papers. And their already published papers, they have a very innovative methodology to collect this information and to make sure how to derive a reliable ESG measure from these noisy measures. This is, really, a way from econometric science to this very advanced methodology. So now we are small part of this ESG Confusion project. We are looking at the real estate side.