NEW YORK CITY TEACHERS' RETIREMENT SYSTEM
INVESTMENT MEETING

Held on Thursday, January 6, 2020, at 55 Water Street, New York, New York

ATTENDEES:
DEBRA PENNY, Chairperson, Trustee
DAVID KAZANSKY, Trustee
THOMAS BROWN, Trustee
JOHN ADLER, Trustee, Mayor's Office
NATALIE GREEN-GILES, Trustee
SUSANNAH VICKERS, Trustee, Comptroller's Office
RUSS BUCKLEY, Trustee

REPORTED BY:
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ATTENDEES (Continued):
PATRICIA REILLY, Teachers' Retirement System
THAD McTIGUE, Teachers' Retirement System
SUSAN STANG, Teachers' Retirement System
RONALD SWINGLE, Teachers' Retirement System
ROBIN PELLISH, Rocaton
MICHAEL FULVIO, Rocaton
MATTHEW MALERI, Rocaton
VALERIE BUDZIK, Teachers' Retirement System
LIZ SANCHEZ, Teachers' Retirement System
SHERRY CHAN, Office of the Actuary
DAVID LEVINE, Groom Law Group
SUMANTE RAY, Mayor's Office
ALEX DONE, Comptroller's Office
MICHAEL HADDAD, Comptroller's Office
JOHN DORSA, Comptroller's Office
KOMIL ATAEV, Teachers' Retirement System
ISAAC GLOVINSKY, Teachers' Retirement System
PAUL RAUCCI, Teachers' Retirement System
STEVEN YUAN, Mayor's Office
SANFORD RICH, BERS

MS. REILLY: Good morning. Welcome to the January 6, 2020 Teachers' Retirement investment meeting. I will start by calling the roll. John Adler.
MR. ADLER: Here.
MS. REILLY: Thomas Brown?
MR. BROWN: Here.
MS. REILLY: Natalie Green-Giles?
MS. GREEN-GILES: Here.
MS. REILLY: David Kazansky?
MR. KAZANSKY: Present.
MS. REILLY: Russell Buckley?
MR. BUCKLEY: Here.
MS. REILLY: Debra Penny?
MS. PENNY: Here.
MS. REILLY: Susannah Vickers?
MS. VICKERS: Here.
MS. REILLY: We have a quorum. I will turn it over to Debra Penny, our chair.
MS. PENNY: Good morning. Thank you. We will start with the Passport Funds. Robin is here. Michael?
MS. PELLISH: Good morning.
MR. FULVIO: Good morning, everyone.

Happy New Year. So we will start off the year talking about November, which you might recall was a pretty strong month across the board for markets both in the US and abroad.
Russell 3000 index for the month was up almost 4 percent at about 3.8, and abroad we saw really strong returns there as well with the EAFE index up about 1.1 percent in emerging markets. Emerging markets roughly flat to slightly negative for the month, but in general it was a good month for the Passport Funds.
The Diversified Equity Fund in November with assets of about 16 billion dollars were up about 3.1 percent. What drove the absolute returns for the fund during that month, again really strong US markets with the active composite up about 3 and a half percent slightly lagging the Russell 3.
The Defensive Composite up about 2 and a quarter percent and the International component up about 1.3 percent. That brought the year-to-date return for the fund, calendar year-to-date return for the fund to about 24

percent. So really big numbers. Huge some might say.

If you look at the Russell 3000 through November was up 27 percent with the strong month we saw in December up over 31 percent for the calendar year 2019. The Balanced Fund also had a positive month, up just shy of about 1 percent, about three-quarters of a percent. The year-to-date return for that fund was approximately 9.5 percent. The International Equity Fund up 1 and a quarter percent for the month of November. Calendar year to date up just shy of 18 percent. The Inflation Protection Fund did have a negative month in November, down about 6/10 of a percent. Year to date that fund is up over 8 and a half percent and the Sustainable Equity Fund up 3.9 percent for the month of November. Calendar year to date, that fund was up 21.1 percent.

So if there is no questions on November, again I already hinted at December, but I can spend a little bit more time on December. So I already commented on the US, again up about

almost 3 percent during the month of December. For the fourth quarter alone, up about 9 percent in the US. So again, really strong numbers in 2019. The calendar year return for the Russell 3 was 31 percent. The Defensive Composite again, you know, beta of below .7, around .7 or so. That part of the program was up about 25 percent for 2019.

And you can see the Diversified Equity Fund hybrid benchmark also up about 3 percent for December, but the calendar year return of about 28.6 percent. The Balanced Fund benchmark up over 1 percent during December. The calendar year-to-date return about 11.4 percent, and then when we look abroad, we can see developed markets up over 3 percent for December with calendar year return of about 22 percent. Small cap a little bit better there. A little bit better for both of the proxies we are showing here. For the month of December, up nearly 5 percent and calendar year to date up over 22, 23 percent.

The emerging markets, they had a really strong fourth quarter last year. In December

alone the emerging market benchmark was up about 7 and a half percent, calendar year up about 19 percent. With the International Composite benchmark up nearly 3 and a half percent for December and calendar year return of 22 percent. You can see below that the underlying strategy for the Inflation Protection Fund also had a strong month during December, up nearly 2 percent. Calendar year to date we expect that fund to be up about 10 and a half percent, and below that the underlying strategy for the sustainable equity fund, again that strategy was incepted back in October within this fund. But you can see up 2 and a half percent for December, and for that fund, which doesn't necessarily reflect the entirety of the history that was in the Sustainable Fund that you can see the Sustainable Fund composite benchmark which is the linked history there up over 33 percent for the calendar year to date.

So I will pause there but obviously we have talked about what was a really strong period for 2019 alone was a strong period for

equity markets. Starting to see a little bit more volatility for many reasons as we move into the new year. But obviously when we look at what markets have done, all of that again is part of a discussion we have been having about strategic asset allocation and thinking through about how much, you know, market performance over the last ten years factors into our view over the next ten years. So see if there is no questions.

MR. KAZANSKY: Can you do this again next year?

MR. FULVIO: We will try our best.

MS. PELLISH: We would like to take responsibility for 2019. Not so sure about 2020.

MS. PENNY: So are we ready for our discussion about asset allocation?

MS. PELLISH: Sure. So this is in the context of a continuing discussion. Given the importance of this context, as well as the complexity of the questions we are trying to address, we wanted to continue the dialogue. We have been continuing it behind the scenes

with the Bureau of Asset Management, and Mike Haddad has been part of leading these discussions here.

And so we are prepared to address some of the issues that have been raised, but given the holidays and the timing of this particular meeting, we are certainly not prepared to address every question. However, we brought along Matt Maleri who I think you have met before. He works with Joe Nankoff as part of our asset allocation team. He is a partner at Rocaton, is now very engaged in asset allocation and capital market research.

So we -- I am going to ask Matt to take you through the deck that has been distributed or was distributed in advance of this meeting, but again I want to highlight the fact that what we are trying to address is one central question that was raised at the last investment meeting which was what if -- what would happen if we modified the US equity return expectation that was part of our analysis that had been previously presented to the Board. Our US equity assumptions in terms

of returns particularly over the next ten years is significantly lower than that of the other consultants who serve the New York City Retirement System.

So that is an important question that we wanted to address, and so we went back and said what if we just isolated this one factor and we also adjusted real estate because less significant but what if we isolated this return expectation to US equities and ran a similar analysis? What would be the result of that? And I think that is a really important topic for discussion and consideration because the Board needs to evaluate all of the recommendations but the most important and most significant change that's being proposed is a change to US equity allocation, and our US equity assumption also has implications for private equity assumptions, for other assumptions, other asset classes that are linked to equity markets.

So that's the context of what we would like to bring to the Board's attention and use as the basis for discussion today. Any other

thoughts before Matt launches? Anything you would like him to highlight as he goes through this deck? No? Okay, well, we will certainly have time for discussion.

MR. MALERI: Great. Good morning. Happy New Year. Good to see everyone again. I think Robin laid out the high level context of why we did this. I won't rehash much of that, but I will put a few numbers around what Robin outlined and also just provide a bit more background methodology for how we arrived at what we are about to look at.

So as Robin said, our US equity assumption for the next decade is much lower than that of what the other consultant systems look like, consultant providers look like. Just for context, our US equity return assumption for the next ten years is 3 and a half percent. That's an annualized number so 3 and a half percent for a year for the next ten years. The average of the other consultants of the other providers is about 6 and a half, 6.4 to be exact. So what we did is we made adjustments to our methodology to

get back to that 6.4 percent expected return for ten years.

MR. ADLER: Can I just stop you one second? It's really a question for BAM. 6.4, that seems high. As I looked at it, it was 6.0.

MR. HADDAD: I didn't bring my spreadsheet with me, but I just looked in my backpack for it. It's the arithematical average of the other four. So excluding Rocaton.

MR. ADLER: So I don't have a mark-up but Wilshire is 6, NPC is 6, Callan is 7.

MR. HADDAD: It's important to note that number excludes Rocaton.

MS. STANG: It's arithmetic and not weighted by the system, so Fire and Police get the same weight in that average that NYCERS --

MR. MALERI: Also important to point out if it was 6 or 6.4, we wouldn't come to too different results, so I wouldn't want to get too stuck on 6 versus of 6.4. So one of the things to point out -- Robin alluded to this earlier, but rather than just changing US

equity, which is certainly at the center of the conversation but we know if we adjusted our US equity assumption to be fair, and you know, as we go through this, we have to think about what other asset classes are influenced, should we have a more improved outlook for US equity markets. Robin again alluded to this, but we are going to look at this in just a moment.

Private equity has obviously a heavy

component of US equity valuation embedded into it. The same is true is convertibles, another asset class that's heavily linked to the US equity market. And then Robin also mentioned this earlier but we also adjusted our real estate assumptions. There are reasons we can get into, but essentially what we did is brought our real estate assumption back to what Rocaton would consider its standard assumption. What we were using previously was a bit more inflated and there is probably some back history that we can rehash, but I think the point is when we look at the numbers, the real estate numbers look more like Rocaton's

typical real estate assumption.

So with that, maybe it's helpful to look at page 3 and actually look at what the numbers were. Then again, this is the impact on the assumptions. We will get into in a moment what does this actually mean when you are building portfolios when you are thinking about two allocations, two different asset classes but even just the numbers on paper we made it pretty easy here to highlight the asset classes that change, so you see that US equity in the top row there, 3 and a half, which is again the Rocaton -- call it standard or original assumption and then modifying that to 6.4 percent for the next ten years. So up about 3 percent over the ten-year period. And you can follow that through down to all the asset classes shaded in green.

Some of the private equity you can see the impact there and then convertibles as well further down at the bottom of the page, and I mentioned already real estate, which also has a corresponding impact for private infrastructure and assets. You can see that

coming down about 1 percent again more in line with the Rocaton call it standard assumption for those asset classes. So any questions on how we got here or how we ended up with these assumptions? Okay.

So if you flip ahead with me to page 4, this is kind of the high level. We have numbers behind these. These are a series of efficient frontiers, and what we did is there is four sets of frontiers. It will become clear in a moment kind of which is which, but we ran efficient frontiers using those ten-year assumptions that you just saw in the prior page and then the 30-year assumptions that were also on the prior page, and what we did again if you flip back to the prior page, there was an original set of assumptions and then what we are calling adjusted. So four sets of assumptions on the prior page, four sets of efficient frontiers which are here on page 4. It should hopefully be obvious, but if you look at -- given that we now have higher return expectations for US equity private equity, real estate being a little bit

of an outlier with a lower assumption, but the frontiers for all the adjusted, so you see ten years constrained adjusted, which is that sort of yellow gold line there, much higher than the ten-year constrained original frontier. Then the same is true for the 30-year frontier as well where again naturally if you have higher expected returns for certain asset classes, your efficient frontier should look much higher than it otherwise would.

MS. PELLISH: Can I jump in? So I would focus on the ten-year curves because that's where they have really significant impact, and so you see what we would be doing then would be comparing the two bottom curves. The blue curve which is based on the assumptions we developed at Rocaton and then the gold which are the assumptions more closely aligned with the other consultants' equity assumptions, and not only are the returns higher at every level of risk, but importantly the yellow line with the adjusted assumptions has a much greater slope to it, which tells you that you are getting paid for taking incremental risk.

So at the heart of Rocaton's assumptions is the belief that taking on incremental risk over the next five, seven, ten years will yield less incremental return, and that's really the heart of the argument and risk in your portfolio and virtually every institutional portfolio is dominated by US equities. Even if they are not the majority of capital, they are the majority of risk because they are a relatively risky asset class and they influence so many other asset classes and so that's the debate that's going on. Not what number is correct because none of these numbers are absolutely correct, but the real question is do we believe we will get paid for taking incremental risk particularly in US equities over the next ten years.

MR. KAZANSKY: When you put your revised projection together using the other consultants' numbers, did you just basically look at their numbers and say okay and just throw them in or did you try to -- did you dig into the weeds of it, or were you able to dig into the weeds of it to find out the rationale

behind those assumptions whether or not they are reasonable in their logic?

MR. MALERI: We didn't have that level of granularity. We simply -- so we kept the same Rocaton framework, process engine, model, whatever you want to call it and just backed into getting that 6.4 percent number. So we didn't try to figure out how do they get from today to 6.4. We just said okay, if we had to get to that number and using the Rocaton engine, here is how we would do it.

MS. PELLISH: But that raises an interesting question: Why do they believe that number is correct? And we don't have that.

MS. GREEN-GILES: That's exactly -- just follow up on what David asked. So my presumption is when you are presenting this, I am not hearing that you are 100 percent convinced that the revised assumption -- I am not hearing that you are changing your original model, and you are just showing us what it would look like if we adopted everybody else.

MS. PELLISH: Yes. That's exactly right.

MR. MALERI: We have a couple of additional slides which we will cover which bascially say what do you need to believe to get to 6.4. We don't believe in it, but if you want to say I think 6.4 is reasonable, okay, let's look a little bit deeper, and what do you have to believe to get there. So we can cover that in a moment. I think that will be quite helpful.

MS. VICKERS: In terms of providing context to the other consultants' thinking, I don't know if Mike or Alex have any thoughts that they want to share if you have been engaging with the other consultants.

MR. HADDAD: No, I don't think we have dug in deeply into the building blocks. We respect the independence of each of the consultants and their process, and it's -- you know, I don't think BAM weighs in on challenging the building blocks so to speak. We kind of take them as it's their expertise. They have the economic group, the modelling

group resources that we don't have.

MS. VICKERS: Just going back to the numbers that John raised previously, it seems that there is sort of more similarities between all of the other consultants, and Rocaton was kind of an outlier in terms of your assumptions.

MS. PELLISH: An outlier, yes, that's exactly right. We have a process that led us to these numbers, and there is nothing about the other -- you know, there is nothing about what we are doing that leads us to believe that our process is erroneous. But I think because we are an outlier it should be discussed, and the most important decision the Board will make is what should be the equity allocation within this portfolio, so it deserves a lot of time and discussion.

MR. MALERI: So maybe let's jump ahead to page 5 and you can actually see what do the tangible numbers look like, and there is a lot of columns here on page 5 so we will try to step through each of these carefully.

But first, we have all the asset classes

in the far left-hand column. Under the title there "Original assumptions", we have not only the current policy target, but this initial recommended policy target. So this is all under the framework of the original set of assumptions, 3 and a half percent US equity return, and you can see there where we have landed. So again, focus on -- I think there is a few line items to focus on, but obviously US equity being the one that's really at the center of this conversation. So 29 percent today, policy target down to 22 and a half, and then you can see kind of the change across all the other asset classes, investment grade, fixed income, probably the corresponding offset there going from 17 percent today to 25 percent. There is obviously some minor differences in some of the underlying sub asset classes, but if you are going to hone in where the biggest change is, it would be that US equity line item and the investment grade fixed income line item.

MS. VICKERS: I don't see the change.

MR. MALERI: So 29 percent under policy

target going to 22 and a half percent. These are all under the original set of assumptions.

MS. PELLISH: You have seen all these numbers.

MS. VICKERS: But it's exactly the same for the adjusted. So there is no change.

MR. MALERI: So that's the same target. The one you want to focus there on the far right is that next ten-year optimization.

MS. PELLISH: So let me -- because I had a little trouble with this. So the numbers, first two columns, original assumptions, you have seen this data already. None of this changes. So then what we did is we said for the next three columns -- Matt walked me through this previously - the next three columns we said what if we adjusted the return assumptions for the policy targets? So you can see we have an expected compound return of the current policy of 5.2 percent over the next five years based on the original assumptions, and that rises to 6.5 percent.

MS. VICKERS: Oh, that's where the change is.

MS. PELLISH: Then if you look in the middle column under adjustment assumptions at the initial policy targets, these are the same allocations that we had originally recommended, but you see the returns rise because we have raised the US equity assumption. Then if you look at the final column, the next ten-year optimization, this says what would the model have come up with as an optimized portfolio using the adjusted return assumptions. And you can see that for ten years we kept it at approximately the same level of return of the current policy target for the next ten years and slightly lower risk. So what we are trying to say what the current policy would look like, what does the original assumption look like, and what would an optimization look like based on the adjusted US equity return.

MS. VICKERS: But the optimization is

almost the same, 28.5 as the current policy.

MS. PELLISH: Yes, which says if you raise US equity return expectations -- no surprise -- you will end up reducing US equity

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significantly. So I think that's intuitive. Is that --

MS. VICKERS: It's not intuitive to me. I mean, the raising, yes, that makes sense. But basically nothing is changing. If our current policy target is 29 percent currently before this exercise, then basically what the optimizer is saying, it stays about the same.

MS. PELLISH: If you believe that your return is going to be north of 6 percent.

MS. STANG: If Rocaton believed what the other four consultants believed, you wouldn't really move. You are exactly right. That's if they --

MS. PELLISH: The model says you are not going to change anything. You are at a good place.

MS. VICKERS: Okay.

MS. PELLISH: So what we are saying is this assumption is the heart of the decision.

MS. PELLISH: What else is worth noting?

MR. MALERI: The other thing worth noting is just if -- forget about US equities for a second, but what about the portfolio

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level. If you go to those rows down at the bottom as far as expected return and risk across the different time periods, five, ten, and 30 years. So if we think we can get 6.2 percent over ten years, those -- again, using our current assumptions under the policy targets, if we adjust that US equity assumption, what would your expectation be? It would be about 100 basis points higher at 7.1. So again, trying to isolate if we did have a higher US equity return assumption, how might the conversation change and then as Robin just walked through, how might the allocations differ. So really trying to isolate both factors is again, you know, what allocations might you want but also what might your return expectations be. And then again, the influence is clearly on the shorter term, five- and ten-year type numbers where if you look at the 30-year numbers, whether you use our old set of assumptions or these revised adjusted set of assumptions, return expectations look pretty similar.

MS. PELLISH: So it might be worthwhile

to hand out material that was sent to you on Friday. So we presume you haven't had much of a chance to look at it, which provides some data about US equity market return expectations.

MR. HADDAD: One of the questions on your adjusted assumption under the next ten years, did you use all the same constraints that were used on the original? So basket clause, all the same?

MR. MALERI: We did, yes. There was one or two kind of tweaks there, but mostly related to private asset. But by and large the same constraints.

So I know people are still getting the handout. There is a couple of pages here. The first page I will say it's related but I think the other pages, pages 2 through 4, 2 through 5 cover some of the questions that folks had about okay, how do you get to 6.4, and if you are going to believe in 6.4 versus 3 and a half, what do you have to do to get there.

So if you have the handout and you are

on page 2, this is a pretty -- hopefully pretty simplistic type chart, but I think it puts some context where would you end up if you got 6 and a half or 6.4 in the next decade versus what would you get, where would you end up if you got 3 and a half percent for the next decade.

So what we are showing here, the left-hand side of the chart, the dark blue is the S & P 500 index level. So what have we achieved or what has the index looked like over the last -- call it three decades. You can see obviously the '08 period stands out and then post '08 through this year the rapid rise we have. We are estimating the S & P 500 goes up 340 percent cumulatively over the last time period, call it the last decade plus. So starting from today, starting from January 1, 2020, if you tacked on 6.4 percent a year for the next decade as the kind of average consultant expectation versus the Rocaton expectation of 3 and a half, what would it look like? And what we show, to be fair, is kind of a straight line. We know there is likely volatility along the way, but I think hopefully it puts it in context. If you were to get 6 and a half a year for the next ten years, you would end up another 90 percent cumulatively. You can see that the orange dotted line, that's the one that's a bit higher, and what would you expect if you were to get the Rocaton 3 and a half percent for the next decade. That's up about 40 percent cumulatively over the next ten years.

So we -- again, we know it's not a straight line but give you a sense 6 and a half a year for ten years, it almost doubles the index from today's levels. And don't forget we have come off a return of about 340 percent over the last ten years. So I think it just puts it in context.

What's on the next few pages, 3 has just has some background pages. Four and 5 are probably the ones that are a little bit better to look at, but without getting sort of too granular here, I think it's helpful to say if I thought 6.4 was reasonable for ten years, how do I get there. And really in our mind

there is two ways you get more return from US equities. One is that valuations. So equity market multiples, price earnings ratios continue to go higher. That is one way that we know equity markets can go up or the other way, and there is lots of ways for equities to do better, but one of the other ways is we get actual earnings growth. So you get compensated for companies' growing earnings. So we tried to isolate those two factors, and say to ourselves if you are going to rely on valuations to go up or you are going to rely on earnings to be spectacular over the next ten years to get back to the 6.4 percent return, what would that look like? So maybe put some numbers and some initials around it.

So page 4 has -- again all S & P 500 here to keep it simple -- valuations for the equity market. So we use the Shiller CAPE methodology. So PE ratios again using the Shiller methodology, which tries to smooth out for earnings. Today the equity market using that metric is trading at about 30 times and you can see the history there and what happened in '08 as well as importantly what it looked like back in sort of the late '90s, early 2000s, the tech bubble. You can see it climbs up over 40, close to 45.

So again, what happens if we play it out? So if we want to get 6.4 a year for the next ten years and all we are going to rely on is valuations, so keep earnings where they are today in real terms but we just want valuations to get us there, so that PE, that multiple would have to rise to about 36 over the next decade. So certainly not nosebleed territory, not going back to the late '90s, 2000s, but at a level you can see we think is above -- above normal and you can see we have put there what we think the Rocaton equilibrium. That's kind of what our fair value is. That's what we think is reasonable for the S & P 500, so again, not heroic by any stretch of the imagination, but again, you are talking about you need equity market multiples to rise for a decade essentially. So that's one part of it.

I think the other part of it is the

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earning story, a bit more powerful, which is on slide 5 there. So again, similar concept. If we thought we were getting to get 6 and a half out of US equities over the next ten years and the only way to get there was through earnings, so actual real tangible earnings from companies -- forget about valuations, keep those where they are today -- we would have to generate 3 percent earnings. So add that to inflation, so 5 and a half percent nominal earnings growth. Let's just use the 3 percent number because I think it's a little bit easier to focus on. Three percent real earnings. It doesn't sound that outrageous, but what we typically think of when companies grow earnings, it's typically linked to how well the economy is growing. Not always. There could be periods where the economy does better or worse than companies can grow earnings, but by and large for companies to grow earnings, the economy needs to do well, and so what we are saying is again sort of making a few assumptions here that the economy has to grow at 3 percent a year for a

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decade. We haven't achieved 3 percent real growth, real GDP growth for much of the last decade, but in order to get back to the 6 and a half percent, you have to assume we get 3 percent growth, real growth for the next decade.

So those are the bookends. We can either get 3 percent growth for ten years or we can get valuations to go from where they are at 30 up to 36 and there are obviously endless combinations in between, but that's what you have to believe, that's what you have to subscribe to to believe we get to 6 and a half percent for the next ten years as far as US equities are concerned. So again, they are not heroic but you have to have some strong belief in those two set of assumptions.

MS. VICKERS: Just in terms of the assumption, do you overlay on the blue line the experience of the S & P?

MS. PELLISH: Which page?

MS. VICKERS: Either of these, 4 or 5. I am just curious as to over the past period if these assumptions sort of held true. So if

you put a line that was the S & P, would it match the way it would have been?

MR. MALERI: Very tightly. Again, some of the cases are -- obviously '08, the correction there and whether you are talking about earnings or valuations looks like quite similar, the rise we have had over the last decade looks quite similar. As far as valuations look, the longer your time horizon, the more likely it will look like the S & P 500. So what we have done -- we have done this chart before. We show what valuations look like and what does the S & P 500 look like, and they almost sit on top of each other. So over short periods of time, yes, there are definitely divergences and earnings and valuations can look a lot different than your experience as an investor, but if you stretch that out over five, ten years what earnings do and valuations do will look a lot like what the S & P 500 does.

MS. PELLISH: And you may recall this chart which we didn't include here, which is my favorite chart, which is like a histogram

which shows what the next ten years look like when the starting point is higher or lower PE ratios and there is this very linear relationship. The higher the PE ratio is at the start of time frame along the next ten years, which makes sense there is a cyclicality. There is some reasonable level of valuation. When you earn 30 percent in one year and you have earned an average of 13 percent over ten years, one would expect there's going to be some adjusting because those returns are higher than anyone thinks the US equity market can generate over a long period of time.

MR. FULVIO: Debbie, did you have a question?

MS. PENNY: Yes. I just want to get it straight because this kind of feels awkward. So it's your belief on what you think is going to happen versus the other consultants? I mean, that's what we are comparing?

MS. PELLISH: What we are trying to do is get it away from idealogy or beliefs. What we are trying to say to the Board is that the

way we came up with different assumptions is that we think that US equity market has done very well. Has done much better than anyone expected and is fairly highly priced in terms of PE and that our return assumption primarily rests on this understanding that to assume even a 6 percent return over the next ten years requires us to believe that PE valuations will go significantly higher over the next decade and that there is a higher level of earnings growth than we think the economy will support.

So we are not going to fall on our swords for the 3 and a half percent because that's just a reflection of our estimate of the richness of the US equity market, but we are saying that 6 percent seems to us to be a fairly heroic number. Even though that's the consensus.

MS. PENNY: Is there like a middle ground?

MS. PELLISH: So that's a great question. Because if you -- the point I think that it's most important to get across here is

that there is -- we initially recommended reduction of something like 6 and a half percent in US equity allocations, and the Bureau of Asset Management is supportive of a reduction of some level of some degree in US equity allocations. I think the most important fact is that we think we should take some of the risk that we have in US equity markets off the table within the policy target. If you said 6 and a half percent seems outside, we would like to be more mainstream, we would like to do 4 percent. There is no magic to the 6 and a half percent. It's much more important to get the direction right than to get precise number right.

MR. HADDAD: I was going to weigh in on the PE ratio because that's a big component of their analysis. So it's PE ratio and earnings. I think you tied together earnings really well to the economy. I 100 percent agree on that.

So then the question is what drives PE ratios and I think and agree to disagree is a market psychology type of thing. The more

exuberant investors are, the higher PE ratios are and the opposite. So I wouldn't characterize the last decade as one of exuberance. So what drove PE ratios higher? I would argue the drop in interest rates and I try to spend a lot of time on my time in front of the Board to talk about the unusual state the interest rates are in. It wasn't by coincidence I showed you the chart for the history of the country. This is the lowest interest rates we have had in the country. It doesn't mean we can't go lower, but a lot of things have happened in the 280 years, whatever the number is.

Secondly, over the last decade what really drove interest rates was quantitative easing across four major sectors. There is not supposed to do that level of quantitative easing again. There is not enough bonds for them to buy, so that cannot be repeated.

So in my mind, the expansion of the PE ratio shows a very low probability of that, and the second part I want to bring in which I think is the next part of the discussion, why

we do want to derisk the portfolio and that gets into both the high valuations as well as the consequence of not derisking and that gets into -- that's page 1 but it gets into a drawdown, and what we are charged with in this room is returns over a long period of time and if you limit your drawdown versus what you would not have done otherwise and you start

with a higher level going forward, then you compound with a higher number, and to me that's the critical -- I think we have done a reasonable job trying to explain why markets are expensive. I don't think we have done a reasonable job explaining the consequence of a drawdown. So that's something Rocaton spent some time on, and I will turn it back over to you guys to walk through that part.
MR. MALERI: Should we cover that page now?
MS. PELLISH: Did you have additional questions before we move on?
MR. KAZANSKY: So what I am about to say makes sense here. I don't know if it will make sense when it comes out of my face. Is

there any benefit, any usefulness in a model that would show a hypothetical portfolio where, okay, we decide that we agree with the heroic version but Rocaton's assumption becomes reality and what happens to the portfolio in that scenario and then the opposite of that whereas we pick your assumption but the more heroic assumption turns out to be correct. And what the difference would be in actual dollars that we are seeing in the portfolio over a period of time. Is that --
MS. PELLISH: We can do that and we thought about doing that.
MR. KAZANSKY: So I don't want to give you extra work that's pointless, but if there is a value to that information for us to see that.
MS. PELLISH: Let me jump in for one second because we thought when we were talking about the slides that we were to bring to the Board, what would happen if 3.4 was right or 3.6 was right, and the reason I argued against doing that is you have to predict how

everything else is going to react. So I think it gives a false sense of certainty to say this is what happens if 3.4 results because then tell me why that happened and what happens to the fixed income markets and you can't tell me that and then I am just making up a lot of numbers. So I am reluctant to do that because then I am giving you information you are using to make a decision, and I think that there are too many variables and too much uncertainty for me to say if I am right and and you derisk, you save 2 billion dollars because then I would have to predict everything else in the portfolio and I can't do that. So this analysis of drawdowns is much simpler, and it says why bother reducing risk because the reality is we are investors with an 80-year time horizon. Maybe longer than that.

MR. ADLER: Perpetual.

MS. PELLISH: Yes. So perpetual and we for that reason avoid making many tactical decisions and we recognize that we are steering a huge ship and we don't want to

pretend that we can avoid all the losses because we are taking risk to generate returns and along the way we are going to absolutely experience losses. We can't avoid that, but nonetheless we do look at this every three years for a reason and we look at this for every three years to see if there are any opportunities that we have overlooked in the past or have emerged and whether there are any new and significant risks that have emerged that we want to pay attention to. So having a perpetual time frame isn't the same as saying stay the course and never deviate, but it does say we only want to make deviations when there are significant opportunities of risk.

So the question at hand is is this a significant enough risk to make a deviation recognizing that we will want to rerisk at some point. We doesn't want to permanently lower risk. We don't want to permanently lower the allocation to US equities necessarily. What we are saying is for the next three years until we reconsider this analysis again or until some huge event causes

us to reconsider the analysis because we could do it any time the Board would like us to, is there a significant enough risk to take action relative to the current policy.

MR. HADDAD: Let me take a crack at it as well. Directionally you know the answer to what you are saying, so it's all the variables that are going to drive that answer. If you keep the same portfolio and 3 and a half comes, you will have a bigger drawdown. If you reduce it and the market earns 6, you are going to earn less. So that gets into the risk/reward probability and we don't know what's going to happen. I think we all acknowledge that but given where we are, the probability seems skewed to not repeat what happened in the last decade.

MS. PELLISH: And I think all the consultants would agree with that, but they still think okay, we are not going to repeat the 13 percent but we might have 6 percent. To give them their due, it's not they are assuming anything fantastical. They are just assuming a more benign environment and higher

earnings growth and higher PE multiple than worse.

MR. MALERI: You have to sort of piece the two decades together. So we got 13 for the last decade. If we get 6 for the next decade, that's roughly a 10 percent for two decades. Are you supposed to earn 10 percent for two decades? Probably not. You are probably supposed to earn something closer to 7 or 8. We don't have a crystal ball, but 10 for 20 years seems to be on the high side.

Back to Mike's point about probabilities, is it part of the distribution of outcomes? Sure. Is it the more likely outcome? Probably not.

MR. HADDAD: And think back to the Bridgewater chart that I shared with you. All that shows the last 70 years each decade's return for the index 65/35 portfolio. The last ten years and then the next ten years after that, those were all-time highs. It's history. Doesn't necessarily repeat. But something to keep in mind when you are trying to formulate that probability.

MR. ADLER: Let me just ask this question. So what's your inflation assumption?

MR. MALERI: Two and a quarter.

MR. ADLER: So your real return is 1.25?

MR. MALERI: That's right.

MR. ADLER: Has it ever been that low over a ten-year period?

MS. PELLISH: Probably in the 70s.

MR. ADLER: But that's when inflation was in the double digits.

MR. MALERI: If we went back and reran our assumptions in the late '90s, early 2000s, you would get an assumption just as draconian when valuations were much higher than they are today. Back to the CAPE chart that was on slide 4, right, if you look at valuations in the late '90s, 40, 45 times. If you were to go back and strike a set of assumptions at that time, you would come up with a real return estimate that was quite low.

MS. PELLISH: But his question is realized.

MR. MALERI: I mean, we have had the

decade ending '08 was zero nominal.

MR. ADLER: Two major drops. It's interesting to me on the CAPE chart that the 2002 drop was really in CAPE or in PE. It's much more severe than the 2008. So the 2008 drop in terms of actual stock market valuations is much more significant. Am I wrong about that?

MR. MALERI: I think maybe the difference being that the '08 correction was very severe in the short space of time. The 2000 kind of burst. That bubble did last over really three years, so if you look kind of point to point, the drawdowns is actually not all that different, but maybe the tech bubble felt less bad given that it happened over such an extended period of time.

MR. ADLER: The earning chart is almost the opposite where the earning chart is almost as severe than the 2000 tech bubble drop.

MR. HADDAD: That wasn't just the tech bubble. That was also Worldcom, Enron, and 9/11.

MR. ADLER: I am just saying it would be

interesting -- I guess you put these on top of each other and say that's where you get the total stock market.

MR. MALERI: On page 2 you have the index level. You can see that gradual 2000 slow grind down to 2003, and then you can see what happened in '08. There were very sharp kind of severe correction.

MR. ADLER: I can just ask another question about the chart. On page 4 the PE was higher in 2016 and 2017 than it is today. I mean, maybe that's not until today. December 31st, but it went down even though returns have --

MR. MALERI: So what you are pointing out sort of the methodology I don't want to say issue because that's overstating it, but what CAPE does is looks back ten years on earnings, so what you are doing as you are getting out sort of '17, '18, '19 rolling off some of the very bad earnings at the beginning of that time period. So that either artificially -- "artificially" might be too strong a word but lowers the PE even when the

price doesn't change, so PE can actually stay the same. If the earnings piece goes up, which it is by virtue of rolling off some of those bad periods, it actually pushes down --
MR. ADLER: -- the denominator.
MR. MALERI: Exactly.
MR. HADDAD: I would say the other factor, the corporate tax cut so that boosted PE a lot. So that brought PE back so prices went --
MR. MALERI: Rolling off bad Es and adding good Es on the front end.
MR. ADLER: One other thing that I am interested -- like I agree with the point that if you lower your drawdown, you are starting from a higher place. On the other hand, there is the question of what do you give up if you reduce your equity exposure and equities go up and you guys -- had you talked about you guys had 3.5 earning expectation in 2016 too?
MS. PELLISH: Yes, we did.
MR. ADLER: Which obviously --
MS. PELLISH: -- has not yet materialized.

MR. MALERI: We got seven more years to be right.
MR. ADLER: Part of me is very uncomfortable with the size of the equity that you guys are proposing, but I do agree with taking some approach to derisking and one of the questions that I had is that last time as I recall we left the equity exposure more or less the same, but we went to the long-term treasury fixed income as a way of hedging and part of what I need more understanding of is is the only way that we can derisk the portfolio through equity reduction, or are there other things we can do with fixed income allocation to derisk the portfolio?
You guys are proposing increasing investment grade. Basically there is some tweaks in there, but more taking the amount of

US equity and taking it to investment grade, is that the only way to derisk the portfolio? What are the alternatives to keep equity exposure at a higher level but use the fixed income perhaps other assets, I don't know, to reduce our risk?

MR. HADDAD: I will take a crack at it. The suggestion you made is based upon correlation. So you are dependent upon that correlation holding to derisk your portfolio. So one has to be comfortable that that correlation is going to hold, which then makes you examine why did that? What happened over the past three years? They both rallied. Both rallied like crazy. Should we expect that to happen again or not? I think you know my view on that. If you really want to derisk, you sell the stuff you own. Otherwise you are dependent upon a model working on correlation benefits.

MS. PELLISH: There is no way to reliably derisk because of this whole correlation thing. So you just don't know whether the other asset classes will behave as you want them to as a hedge. The only guaranteed way to derisk is to hold cash. And I am not trying to be humorous but --

MR. ADLER: Holding cash is also a large risk.

MS. PELLISH: There's an opportunity

cost. So that's right. Reducing US equity would have created realized opportunity costs if we did that in 2016, and the question you are raising is are we facing the same issue in 2019, and you know, the argument we made in 2016 is the same argument we are making in 2019. But we believe it even more firmly in 2019 because we said things are expensive then.

I mean, you would have to question us if we changed our view because if things were expensive then, they have to be really expensive now in the US equity market and we think they are and the simplest way to view this is we have made a lot of money in the US equity market. Let's take some profits off the table, invest it elsewhere in our diversified portfolio, and reexamine this in 36 months.

MR. ADLER: I'm sorry. Reexamine it

when?

MS. PELLISH: Thirty-six months.

MR. ADLER: I thought you said six months.

MS. VICKERS: Can I throw something else out there because I think maybe this discussion came out of a previous meeting's discussion where I questioned the total expected return and I asked BAM and told them kind of give us some feedback on how we could meet our 7 percent bogey.

So is there any other tweaking that, you know, you would recommend us looking into that may be a slight difference on this? How we get to a more comfortable place because I think the goal is derisking but also trying to be more close to the 7 percent hurdle.

MS. PELLISH: So we have spent some time on this question, and BAM has provided us with some data. So there are a couple of factors. One is we have assumed in this analysis, as we do in all of these kinds of analyses, broad market returns, which works in the case of US stocks and works generally in bonds. Doesn't work very well in private equity. And the reality is -- and private markets in general. And the reality is that over the past particularly five years and maybe even a

little longer, BAM has done a much better job in private market investing than the broad private markets. That's particularly true in equity and really true in infrastructure. And also true in real estate. And so we are -- we think that we could with intellectual honesty tweak the total fund return to reflect the allocations to private markets and the above meeting returns that you have experienced and that you can reasonably be expected to experience going forward because of skill and manager selection but add as well as the scale of the investments being able to to yield much lower than typical fees. So that can tweak -- that should be added to the total portfolio bottom line. We don't want to change any of the assumptions because that gets a little messy, but we can change the bottom line and there is certainly room for the Board to consider intermediate allocations.

So one of the things we could do is come back to the Board with a set of portfolio mixes that are bookended by our original recommendation, the current policy target, and

what are reasonable intermediate steps between those two bookends and what would that mean for total portfolio expected return/total portfolio risk both before the incremental returns are added to them as well as after that. I think that might be --

MS. PENNY: Yes.

MR. ADLER: Good idea.

MS. PENNY: We appreciate that.

MR. ADLER: Can I just ask one other question? One of the ways to read the change from the initial policy recommendation to the new one with the adjusted assumptions is that essentially what you do is you take the high yield and take it -- it's currently 5. You take it up to 8 and the new one is zero, and so essentially what you are doing is taking the high yield or most of it and putting it into equity.

MS. PELLISH: A little bit into OFI.

MR. ADLER: A little bit into OFI and I don't know what OFI's correlation. High yield is fairly highly correlated with equity, so it struck me as kind of weird that you would have

this.

MR. MALERI: I think it's actually hopefully intuitive. Once you sort of peel back the layers a little bit which is high yield, if you think of the companies -- they are US companies that are in the US equity markets. Hence the high correlation. So if you now have an asset US equity which is higher returns, the optimizer will say I would rather own this higher return asset which looks and feels a lot like this high yield asset class that I currently own.

So it actually makes sense if we have the numbers, you go back to page 3, you can see that we have high yield at 3.7, and we have US equity at 3 and a half in the original assumptions. So the optimizer prefers high yield. If you look at the adjusted set, high yield stays at 3.7 but US equity goes to 6.4. So the optimizer says I would rather own more US equity.

MR. ADLER: I get that mechanically. Just intuitively the gyrations on high yield just to go from.

MS. PELLISH: A lot of it is basket clause so let me put that in.
MR. ADLER: But US equity and high yield. High yield is mostly nonbasket and 20 percent basket.
MS. PELLISH: Right but we have limitations on international, so we have limitations on other places where we can put the money. That's a very simplistic way of viewing the basket clause, but the basket clause has a huge impact on how you can reallocate those US equity dollars.
MR. HADDAD: I think if we pushed you, Robin, if you were going to change your equity assumption, you would probably change -- high yield would probably be the next thing. And that's a direct link with private equity and converts. It's not a direct link with high yield but probably the one that should go --
MS. PELLIH: Absolutely. There is a higher correlation, so if we were going to really to go through every asset class, that is one that would be adjusted.
MR. ADLER: Are you guys going to do new

capital market asssumptions for December 31st?
MR. MALERI: Yes.
MR. ADLER: When will those be?
MR. MALERI: We have a draft of them. They should be ready in the next week or so.
MR. ADLER: So then we would presumably fold those into this analysis as we --
MS. PELLISH: Yes. You know, what's the change?
MR. MALERI: Pretty modest. If anything, US equity probably went down a bit.
MS. PELLISH: We will show you them. I would like to stick with these assumptions. There are so many moving variables that I think to introduce another set of assumptions, then we will have to reconcile that. We will be happy to share those with you.
MR. MALERI: I don't think it's going to be any outliers relative to what's here.
MS. PELLISH: So just to restate next steps, we will come back to the Board and if there are obviously -- this is a -- you know, a big download of stuff, so if you have additional questions that you want us to

address, we will more than delighted to address them, but we will go back, rerun the model, and provide you with some -- with a range of portfolio mixes for your consideration.

MR. ADLER: I just have one more question I would like you to address publicly in this, but you know, we talk about capital market assumptions projections. What we don't talk about is interest rate projections which clearly will have a dramatic impact.

MS. PELLISH: Yes.

MR. ADLER: So I would be interested in what your projections is of what is going to happen to interest rates and how that's going to have an effect on the asset allocation.

MS. PELLISH: Absolutely. That is an important building block in all the assumptions.

MR. ADLER: I haven't seen it anywhere.

MS. PELLISH: No, we probably haven't provided it, but it's embedded in all of this. We will make it explicit.

MR. ADLER: Okay. Thank you.

MS. PENNY: Okay. Great. Thank you. We have a resolution.

MS. REILLY: We have a resolution in support of modernizing New York State Retirement and Social Security Law, Section 177.

"Whereas the permissible type of investments as well as --

MR. KAZANSKY: Please skip to the resolved.

MS. REILLY: "Resolved, that the Board supports an amendment to RSSL Section 177 to increase the permissible allocation of foreign equity securities and agrees to convey said support to the appropriate legislative bodies and executive agencies; and be it further resolved, that the Chair, or in their absence the Executive Director, or in their absence the Deputy Executive Director is hereby authorized and directed to issue instructions and take any other action as may be necessary to implement this resolution."

MS. PENNY: Thank you. Do I hear a motion to consider this resolution?

MR. BROWN: So moved.

MS. PENNY: Thank you, Mr. Brown. Do I

hear a second?
MS. VICKERS: Second.
MS. PENNY: Thank you, Ms. Vickers. Does anyone want to discuss it? Any discussion about the resolution?
MS. CHAN: So this is a resolution that the Board is adopting, and then we are going to go through the legislative process to implement it?
MS. PENNY: Yes. Right.
MS. CHAN: And I guess for the backgrounder information, this went through -- unless it's a variation of this but this went through a legislative session last year?
MS. PENNY: Yes.
MS. CHAN: Was this done last year too before the legislative session?
MS. VICKERS: Yes. Teachers passed a resolution supporting the change last year. You know, we will try again as we go through the asset allocation process. Obviously it's a very important issue.

MS. CHAN: I just didn't recall this last year.
MS. PENNY: Anything else? Great. All those in favor? Aye.
MS. VICKERS: Aye.
MS. GREEN-GILES: Aye.
MR KAZANSKY: Aye.
MR. BROWN: Aye.
MR. ADLER: Aye.
MR. BUCKLEY: Aye.
MS. PENNY: Any opposed? Any abstentions? Okay. Motion carries.
Now normally we go into executive session, but am I correct there is no executive session today?
MS. PELLISH: I don't think Susan and I have any manager updates.
MS. PENNY: Okay. Then I guess we are done. Is there anything else before the Board? Anybody else have anything to discuss?
MS. REILLY: I just want to let you know on the way out for the trustees we have the CAFR that we give to you. It's in the box.
MS. CHAN: Was that sent to the OA hard

copies?
MR. McTIGUE: Hard copies I will give you one.
MS. CHAN: Was it already sent?

MR. McTIGUE: Now no because today is the first time we have the hard copy but --

MS. CHAN: You usually send it.

MR. McTIGUE: We do but this is the first day we have it.

MS. PENNY: Do I hear a motion to adjourn?

MR. KAZANSKY: So moved.

MS. PENNY: Thank you, Mr. Kazansky. Do I hear a second?

MS. VICKERS: Second.

MS. PENNY: Thank you, Ms. Vickers. All in favor of adjourning? Aye.

MS. VICKERS: Aye.

MS. GREEN-GILES: Aye.

MR KAZANSKY: Aye.

MR. BROWN: Aye.

MR. ADLER: Aye.

MR. BUCKLEY: Aye.

MS. PENNY: Any opposed? Happy New

Year, everyone.

(Time noted: 11:24 a.m.)

C E R T I F I C A T E

STATE OF NEW YORK)
: ss.
COUNTY OF QUEENS)

I, YAFFA KAPLAN, a Notary Public

within and for the State of New York, do hereby certify that the foregoing record of proceedings is a full and correct transcript of the stenographic notes taken by me therein.

IN WITNESS WHEREOF, I have hereunto set my hand this 16th day of January, 2020.

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YAFFA KAPLAN