

## California Debt and Investment Advisory Commission

### Webinar Transcript The Public Investment Portfolio: Demystifying the World of Agencies June 17, 2015

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*Local governments in California may invest in a range of securities issued by U.S. agencies and international institutions. Agency bonds are issued by two types of entities – government-sponsored enterprises (GSEs), which are usually federally-chartered, but privately-owned corporations; and federal government agencies, which may issue or guarantee these bonds to finance activities related to public purposes. Supranational and international institutions, such as the World Bank, issue debt securities that may also be considered as an investment option by some public agencies. This webinar will discuss GSEs and other types of U.S. agencies that are investment options for state or local governments. Investment options in supranational and international institutions will also be covered.*

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#### **Title Slide – The Public Investment Portfolio: Demystifying the World of U.S. Federal Agencies and Supranationals**

**Robert Berry:** Good morning, everyone, and welcome to the California Debt and Investment Advisory Commission's webinar, The Public Investment Portfolio: Demystifying the World of Agencies. My name is Robert Berry and I am the deputy director here at CDIAC. Before proceeding further, if you're experiencing any technical problems, please contact GoToMeeting. The website is on the screen, but the number you can call is 1-800-263-6317. Or you can try the website to go through some technical fixes. The address is on the screen. Demystifying the World of Agencies is the second of a nine webinar series on public investments that CDIAC has scheduled to run through the summer. Each webinar will focus on a category of statutorily authorized investments in a way that will help you understand many of the features and risks and how you might go about assessing whether or not a particular investment meets your agency's investment policy objectives. We hope you'll be able to participate in each webinar in the series.

We also understand that schedules may not permit participation in the whole series, so to help you fill in the gaps for perhaps a missed webinar or just to broaden your knowledge of other investment management topics, CDIAC has a number of different resources available to you on our website. First, the presentation slides for today's webinar, and all the webinars in fact, are available on CDIAC's website at the address on the screen. And next, a replay of this webinar and all the future webinars will be posted to the CDIAC website about two to three weeks following each of the broadcasts. Also, the 2015 edition of CDIAC's *Local Agency Investment Guidelines* and our *California Public Fund Investment Primer* are currently linked to CDIAC's main web page and also at the address listed on your screen. It is also important to mention we have a number of other investment publications from CDIAC and our allied organizations that are under our recommended readings section on the bottom of the CDIAC web page describing the investment webinar series. If you have any problems finding any of these publications or links, please go ahead and give us a call and we will guide you to them.

A few more notes before we move into the program. If you would like captioning during the program, you may paste the address on the screen under the captioning area into your browser or click on the link in the chat section at the bottom of your control panel. Also, if you would like a certificate of attendance for CPE credit, you must be registered and logged into the webinar under your own name and then a certificate will be emailed to you in about a week. You'll have the ability to submit questions using the box marked "Questions" near the bottom of your control panel. The speakers will address your questions during the presentation. Some we may need to hold until the Q&A session at the end, and if we run out of time, we will post responses to questions that we don't get to during the presentation on the CDIAC website.

## **Slide 2 – Disclaimer**

**(03:21)**

**Robert Berry:** Before I introduce our speakers, I would ask you to take note of the important notice on the screen. The presentation today is informational it does not constitute investment advice or recommendation. There are many risk, policy, portfolio and suitability factors that must be considered by an agency prior to making an investment decision. The webinar material is presented as of June 17, 2015, and in a current context. A replay of the webinar will not reflect any changes in investment authority or market conditions that occur after today and that may affect the suitability of an investment. So with those formalities behind us, I would like to introduce our presenters for today.

## **Slide 3 – The Public Investment Portfolio: Demystifying the World of U.S. Federal Agencies and Supranationals**

**(03:56)**

**Robert Berry:** First to present is Hank Stern. Hank has been the treasurer for the City of Anaheim since his appointment in January 2007. He is responsible for the City's cash management program, including investment of City funds, collection and receipt of revenues, and he serves as the investment advisor for the City's outstanding debt issues. Prior to his current appointment, Hank spent 27 years in the public sector in several key public investment positions, including chief investment officer for Los Angeles and the City of Long Beach. Hank is an active member of numerous public finance organizations and holds a Certified Treasury Professional designation.

Next to present today will be Rick Phillips. Rick is the president and chief investment officer at FTN Financial Main Street Advisors. Prior to starting FTN Main Street, Rick managed Clark County, Nevada's portfolio for six years and was the investment office for the City of Las Vegas for nine years. He has over 25 years of experience in cash and investment management. He is a frequent speaker at public finance conferences. He is the founder of the Government Investment Officers Association and holds the Certified Cash Management designation.

And then our final presenter for today will be Kevin Webb. Kevin is a director with Cantor Fitzgerald in the firm's Houston office. Kevin joined the firm in 2009 and has been a guest lecturer and speaker at numerous fixed income workshops and conferences and was our speaker on our Treasuries webinar just a few weeks ago. He is a Chartered Financial Analyst and a member of the Houston Society of Financial Analysts, the CFA Institute, and the Global Association of Risk Professionals. So with that, gentlemen, I will turn it over to Hank.

#### Slide 4 – California State Code

(05:40)

**Hank Stern:** Thank you very much. And it's a pleasure to have an opportunity to share some information this morning. I also should add that for Kevin, at least for today, he is a very good boater in down there in Houston with all the rain. When we get to government agencies, there is a litany of these. They start with discount notes right through your bonds. They are probably the most frequently invested security that public investors in California use. With that in mind, we always go back to the government code when we have any questions and government code 53601(f) defines federal agencies and gives you the authorization under California code to do the investment for your public funds. I wanted to use that as a reference point. That is always your default to go back to if your agency has any questions about your authorization or the ability to purchase any of these securities. Note that in this section, there is no reference to a credit rating for the federal agencies. With that in mind, you'll find out later on, the Big Four – which is Fannie Mae [*Federal National Mortgage Association*], Home Loan [*Federal Home Loan Banks*], Federal Farm Credit [*Federal Farm Credit Banks Funding Corporation*], and Freddie Mac [*Federal Home Loan Mortgage Corporation*] – usually have credit ratings from one of the three major NRSROs [*nationally recognized statistical rating organization*]. However, there a couple of other federal agencies, such as Farmer Mac [*Federal Agricultural Mortgage Corporation*], which are not possessed of any credit ratings, and they are still under the definition of 53601(f) an authorized investment. So keep in mind that this section does not have any type of criteria for a credit rating.

#### Slide 5 – California State Code (cont'd)

(07:24)

**Hank Stern:** With that in mind, we will go to the next one, which is 53601(q). This is a new one – became effective January 1, 2015, and introduces several other items which are now authorized for you to invest your public funds in. The bullet points simply show International Bank, International Finance Corporation, and the Inter-American Development Bank. With these criteria, there is a requirement of a AA or better by a recognized NRSRO, and the NRSRO is the nationally recognized grading agencies. The big ones would be Moody's, Standard & Poor's, Fitch, and I believe that there are two others that are out there, but those three are the ones that you are really focused on. The other criteria [*are*] you cannot invest more than 30% of your agency's money in these authorized investments. Going back to the Big Four and the other

government agencies we talked about in 53601, the prior section – there is no limitation. You can invest up to a 100% of your funds in those items. Whether that is prudent or not would be up to you [and] what is appropriate for your agency.

#### Slide 6 – Investment Policy Considerations

(08:41)

**Hank Stern:** Other things to consider under the federal agency debt is: have you clearly defined and listed the federal agency issues as authorized by your investment policy? This webinar is not about investment policies; however, it behooves you – since there are changes like the new issues for January 1, 2015 – that you go back and review your investment policy. That is your authorization by your legislative body, and if you haven't updated it, you may want to update the policy to include those items if you chose to participate in those types of purchases. Within that, have you set any maximum limits to invest in federal agencies, such as total federal agency investments, total percentage per issuer, total percentage per issue? You can be more restrictive than the government code. You cannot be more lenient. So you can actually define your criteria in a more conservative manner than what the government code allows.

#### Slide 7 – Investment Policy Considerations (cont'd)

(09:42)

**Hank Stern:** Why would you do that? The first one would be diversification. You would want to make sure you don't put all your eggs in one basket. You don't probably want to have 100% of your funds in federal agencies. You want some percentage of that. And your policy should be tailored to what is appropriate for you. I'll give you an example for the City of Anaheim. Our restrictions are 100% of agencies, but we only allow 40% by a single issuer. That means that 40% of my funds is the max amount I can invest in Fannie Mae or Home Loan or Federal Farm Credit. We also drill down one more level and we only allow 10% of our portfolio to be invested in a single issue. For example, if Fannie Mae issued a \$50 million bond, the max amount I could buy for that particular bond for that issuer would be \$5 million. Again, we are focusing and circling back to the aspect of diversification to protect ourselves, basically, from the market risk. Also, protect ourselves from the investment officer that gets a little too carried away and maybe tries to punch up his percentages to look for yield. And again it goes back to: what we are looking for? Safety, liquidity and yield. One other point I think Rick is going to cover later is that for liquidity purposes, most of you are going to be buy and hold, but for those of you who need liquidity, you may want to look at the benchmark qualifiable issues – those are larger issues – or global issues, \$250 million or more in size by a single issue. That would preclude a larger percentage of active participants owning that issue which provides a higher level of liquidity if, in fact, you had to sell prior to maturity. You get a more competitive bid or ask spread on those securities.

#### Slide 8 – U.S. Fixed Income Market

(11:46)

**Hank Stern:** With that in mind, I think I am going to turn the ....Well, do you have any questions at this point? If there aren't any, I would turn this over to Rick Phillips.

**Robert Berry:** We don't have any questions at this point, Hank.

**Hank Stern:** All right.

**Rick Phillips:** Thank you, Hank, and good morning, everyone. I am going to discuss the different agencies and supranationals, some information about them, talk about the types of securities they issue and then where to find more information, in-depth information. So we will start out with an overview of the fixed income market in the U.S. We see on the left hand side the marketable debt outstanding, U.S. Treasury being the biggest market, a little over \$12 trillion now. This is at the end of December last year. The mortgage-backed market about \$9 trillion. That is primarily comprised of agencies, which we will talk about in a few minutes. And the corporate market about the same. We see agencies about \$2 trillion, so much smaller than the other components. Looking at the right hand graph – the daily trading volume. Treasuries, again, being the most liquid market, about \$500 billion dollars trading each day last year, where we see agencies about 1/100 of that, only \$5 billion. As Hank mentioned, it is important to have some securities that in your portfolio – even if you are buy and hold – that have some liquidity. We suggest maybe looking at some Treasuries and those big benchmark deals that Hank mentioned.

**Slide 9 – The “Big Four” Federal Agencies (13:15)**

**Rick Phillips:** Next slide. The Big Four federal agencies that we primarily invest in – municipalities do – Fannie Mae, Freddie [Mac], Federal Home Loan Banks, and Federal Farm Credit. And there is the website for each of them that you can go get much more in-depth information.

**Slide 10 – “Big Four” Agency Debt Outstanding (13:32)**

**Rick Phillips:** Looking at the agency debt outstanding, kind of drilling down on each of the Big Four, we can see during the height of the financial crisis, these are year-end amounts. It was about \$3 trillion outstanding in 2008. We can see over the last few years that has shrunk by about a third, down to a little over \$2 trillion outstanding right now. If you look down at the table, in 2008, the year-end, that was the peak of the Big Three – Home Loan, Fannie Mae and Freddie Mac – their issuance. And if you looked at 2014, they are all smaller now, particularly Fannie and Freddie. What is interesting to see is that Federal Farm Credit has actually increased and is larger now due to need in the agricultural sector in the United States.

**Slide 11 – Supervision (14:22)**

**Rick Phillips:** So supervision. Back in 2008, during the financial crisis the Federal Housing Finance Agency was created to supervise Fannie, Freddie and the Home Loan Banks. And so it is their mission to oversee those three agencies so the agencies provide a source of liquidity and funding for housing finance and the community investment.

**Slide 12 – Supervision (cont’d) (14:43)**

**Rick Phillips:** Looking at the Farm Credit Administration, they oversee Farm Credit and also its smaller cousin Farmer Mac. And these agencies provide a source of credit and related services for the agriculture and rural America.

**Slide 13 – The “Lesser Known” Agencies (14:58)**

**Rick Phillips:** Some of the lesser known agencies that are allowable per code but just don't issue in the volume as the Big Four – the TVA [*Tennessee Valley Authority*], OPIC [*Overseas Private Investment Corporation*], PEFCO [*Private Export Funding Corporation*]. And all three of these agencies presented at the GIOA conference in March. Also, then, there is the Small Business Administration. Most municipalities – actually I haven't found any in California that invest in SBA securities. They are little more complicated from an investment accounting standpoint, usually picking out principal and interest every month. Just recently this week, TVA, OPIC, and PEFCO were issuing bonds, but certainly not to the volume of the Big Four.

**Slide 14 – Additional Agency Information (15:42)**

**Rick Phillips:** There's additional agency information that you can find. Lehman Brothers – back in 1992, I attended a conference that they put on – has a great book and I have a hardcopy of it, and I actually found it in preparing this presentation out on the Internet at [investingbonds.com](http://investingbonds.com). And so it is a great resource. It gives a lot more information about all the different agencies you can see on the right that are generally available per State code to invest in.

**Slide 15 – Organizational Information (16:10)**

**Rick Phillips:** Looking at organizational information about the Big Four. So Federal Home Loan Bank was created in 1932 to restore confidence in the thrift industry. It is not guaranteed by the U.S. Treasury. It is guaranteed by the Federal Home Loan Banks and it is owned by the member banks – about 7,300 banks and credit unions throughout the country. Just a few years later during the Great Depression, Fannie Mae was created to provide that liquidity to the mortgage market, and up until a few years ago, they were similar to Federal Home Loan Bank, where it was just the guarantee of Fannie Mae, but they are essentially guaranteed by the U.S. Treasury now because, as you see, the owner put into conservatorship up to the U.S. Treasury. Freddie Mac was created in 1970 to provide competition to Fannie Mae and is essentially the same as Fannie Mae. And Farm Credit provides that funding to farmers and ranchers throughout the United States, and similar to Federal Home Loan Bank, it is a cooperative of borrowers who are the owners, the ranchers and the farmers and such.

**Slide 16 – Ratings Information (17:17)**

**Rick Phillips:** Looking at ratings information that Hank touched upon. So if we look on the right-hand side, all the short-term debt by the Big Four are rated A-1, P-1 or F-1 by all the ratings agencies the same. As we see, and most of you know, I am sure, that Moody's and Fitch have AAA ratings on the long-term debt but S&P has a AA+. You can see down below in August 2011, S&P lowered the credit rating on the U.S. Treasury debt, and since agencies are lesser credit quality than Treasuries, they lowered them as well. And so it was interesting in the statement, S&P said the reason they did that was they felt that the fiscal situation in the United States was not that great and the capacity of Congress and the administration to deal with the debt had become less stable, effective and predictable.

**Slide 17 – U.S. Federal Debt Information (18:11)**

**Rick Phillips:** So on page 17, you can see when the downgrade happened. The federal debt outstanding, including marketable and unmarketable debt, was a little over \$14 trillion and that has gone up by about \$4 trillion since then, so you could argue that has been – it is still less stable. But what is interesting is you can see the average interest rate on the debt actually has remained right around 2% for about the last three and a half years. So the credit rating really didn't impact what was going on with the interest rates.

**Slide 18 – FNMA/FHLMC Conservatorship (18:45)**

**Rick Phillips:** So just touching on Fannie Mae and Freddie Mac when they were put in conservatorship back in September 2008, the Treasury at the time did what is called the senior preferred stock purchase agreement, where they at the first could invest \$100 billion dollars in each of the agencies, and they upped that because they saw what was going on with the housing market. Fannie and Freddie needed more funding so it went to \$200 billion each. And so then later on, a few years later, there was a bipartisan bill in the House that looked to change Fannie and Freddie, and obviously, nothing has happened since then and we see the downgrade of the GSEs in August 2011.

**Slide 19 –FHLMC (and FNMA) Caps (19:29)**

**Rick Phillips:** Part of that conservatorship mandate was for Fannie and Freddie to shrink their balance sheets, and so this is a snip from Freddie's website. And you can see this row is to their mortgage-related investment portfolio was to go down from approximately \$755 billion down to around \$400 billion. And so there has been less supply certainly for Fannie and Freddie as that mandate has been given during conservatorship.

**Slide 20 – FNMA/FHLMC Conservatorship (19:59)**

**Rick Phillips:** Probably many of you know that they were – most of these agencies had publicly-traded stock during the time and actually it's still outstanding so you can see when conservatorship happened and when the housing market started to show cracks. In 2007, we see their stocks go down.

**Slide 21 – U.S. Treasury Support for FNMA/FHLMC (20:21)**

**Rick Phillips:** So here is the Treasury support that was issued back a few years ago that both the senior debt and the subordinated debt was essentially guaranteed by the U.S. Treasury for Fannie and Freddie.

**Slide 22 – Tax Payers Paid Back by FNMA/FHLMC (20:40)**

**Rick Phillips:** So the taxpayers – I thought this was kind of funny from the newspaper a few years ago – that we, the taxpayers, had that burden as the Treasury had to invest or loan those two agencies approximately \$187 billion. But what's been a nice end of the story is these companies have paid back \$228 billion in dividends to the Treasury. And that is been a nice source for the federal government in revenue. And so why the stocks actually have gone up as

you saw on the previous pages is, there is the thought that eventually some of those profits will be given to the shareholders, the stockholders, down the road.

**Slide 23 – FNMA/FHLMC Possible Reform Scenarios (21:19)**

**Rick Phillips:** So possible reform scenarios. It was talked about a few years ago that we could just nationalize the GSEs, Fannie and Freddie, and they would be like Ginnie Mae [*Government National Mortgage Association*], fully-guaranteed. That is probably not going to happen. A privatization where there is no backing at all, no implicit backing for the GSEs. Now, studies have shown that that would probably raise mortgage rates by 1-2%, so Congress wants to help the housing market. That is probably not going to be the case, so the most likely scenario would be a hybrid model where there is a combination of private capital with some form of government support. This snip is from Bloomberg in 2012, so a little over three years ago, where then-Treasury Secretary Geithner said that they could release within the coming weeks a plan to wind down or change the agencies. Obviously, that hasn't happened and with us heading into an election season, that probably anything wouldn't take place most likely until a new administration takes over.

**Slide 24 – How FHLMC (and FNMA) Work (22:19)**

**Rick Phillips:** So just looking how Fannie and Freddie work. So I have put a star on the next few slides where you and I as investors in agencies buy their debt securities. So at the top we see the residential mortgage market where you and I would go to the bank and get a mortgage loan. The bank would package those up, all those loans, and sell them to Fannie Mae or Freddie Mac. And how that is funded by the two agencies is the debt securities that you and I buy to help fund that.

**Slide 25 – FHLB System Overview (22:52)**

**Rick Phillips:** The Federal Home Loan system is different, where there are twelve regional federal home loan banks that comprise the Federal Home Loan Bank system and so there, like I mentioned earlier, there are 7300 banks and credit unions around the country that own the Federal Home Loan system, and that has helped participate in the funding, getting funding from the Federal Home Loan Bank.

**Slide 26 – How the FHLB System Works (23:16)**

**Rick Phillips:** And so how does the Federal Home Loan system work? So again, we, as investors over here – you and I go to one of the banks to get a loan. And banks can get money from deposits, but they can also get what is called an advance from the Federal Home Loan system. And so that is just money, cash that is given to the bank to help fund those mortgages. What the banks do in return is, they provide collateral back to the Federal Home Loan Bank system. So it is essentially like a repurchase agreement where the collateral would be in the form of securities, the advance is in the form of cash. And so we, as investors, buy those securities from the dealers. The proceeds of those securities go to the opposite finance and flow to the Federal Home Loan system to help provide funding for the mortgages or other related lending.

**Slide 27 – How the FFEB System Works (24:04)**

**Rick Phillips:** So the Farm Credit system is similar to Federal Home Loan, where the members are ranchers and farmers and other agriculture-related entities throughout the country. They go to their banks, retail associations, to borrow to help fund those needs. Those loans are packaged up, sold to the Federal Farm Credit system, and then again, we, as investors, buy those securities from Federal Farm Credit to help fund those operations.

**Slide 28 – Types of Securities Issued (24:33)**

**Rick Phillips:** So now let's talk about the different types of securities. Hank mentioned these a little bit earlier. So there is discount notes; bullets, or non-callables; floating rates; fixed to floating rates; callables; mortgage-backed securities; and subordinated notes.

**Slide 29 – Discount Note Offerings – ADN Page (24:48)**

**Rick Phillips:** So here is a discount note offering page from Bloomberg, and so we can see at the top the different entities that issue the Big Four, Farmer Mac, as well as the World Bank, one of the supranationals. And so this is the window offering rates where they are saying – so here are the different maturity dates that the agency is looking for, the rates – and so we can see overnight on the day I printed this was zero all the way out to six basis points in September. We see the amount needed, and so that would be \$50 million right there. And so that is how the dealers can go to the windows when we do an inquiry and say, hey I need a specific maturity date, I need to buy \$2 million of a discount note. They can go to the window and buy that security for you.

**Slide 30 – Discount Note Offerings – BOOM Page (25:37)**

**Rick Phillips:** Another page on Bloomberg. This is the BOOM page. You can actually execute electronically using this page. And so again, it is similar, where the different amounts outstanding. And so the offerings in white are the window offerings, and you can see kind of a date range there. The different yields and then what dealers are offering those. The ones in blue are inventory offerings. So that would be Bank of America Merrill Lynch has that bond at 19 basis points as compared to the same maturity range at 17 basis points. And so there is a concession given to the dealers that go to the window to buy these bonds, a concession given by the agencies to pay them to help fund operations. And so inventory bonds are generally cheaper if you can find those from your dealers.

**Slide 31 – Discount Note Details (26:29)**

**Rick Phillips:** Here is the discount note detail. So we can see Federal Home Loan discount note. There is no coupon payment – zero coupon. Here is the maturity date. And then we can see the day count. It is how it is calculated to show that the actual days over a 360-day year.

**Slide 32 – Discount Note Trade Ticket (26:49)**

**Rick Phillips:** Looking at a ticket. So we buy this discount note October 16, 2015. We see that we buy it at a discount. There's the discount rate and the yield is slightly higher using that day count convention I mentioned. But as I also mentioned, no accrued interest, that this changes in its price. So if interest rates don't change, this would gradually accrete up to par.

**Slide 33 – Bullets, Callables, FRN Offerings – NIM Page (27:16)**

**Rick Phillips:** Looking at bullets and callables. So here is the NIM, new issue monitor page on Bloomberg. Again, we see the different issuers; the different types of coupons, including fixed coupons; step-ups and floating rate notes; maturity date. The amount outstanding would be \$125 million. The dealers doing the bond as well as the structure of the bonds.

**Slide 34 – Bullets Details (27:42)**

**Rick Phillips:** Looking at the bullet details. Here is the Fannie Mae with a 7/8, or 0.875, coupon. Maturity in February 2018 and has a day count that is slightly different. It is 30-day months over 360-day years. This is one of those big benchmark deals that Hank mentioned with \$5 billion outstanding.

**Slide 35 – Bullet Trade Ticket (28:03)**

**Rick Phillips:** Trade ticket, you are probably familiar with. Interest rates have gone up, and so this bond actually is trading at a discount. So instead of the yield being 0.875, or 7/8, it is at 1.04 because interest rates have gone up and bonds have gone down in price. We see that price reflected over here and of course, the accrued interest.

**Slide 36 – Floating Rate Note (FRN) Details (28:24)**

**Rick Phillips:** Floating Rate Notes. And so here is one issue by Federal Home Loan Bank. How the coupon resets. It is monthly, London Interbank Offering Rate, or Libor, plus eight basis points.

**Slide 37 – Floating Rate Indices (28:42)**

**Rick Phillips:** The different floating rate indices used by the agencies could be a T-bill. This would be buying a Federal Home Loan Bank and the coupon resets weekly, so a lot to keep track of. So weekly plus six basis points. Here is one with a monthly Libor, when you have monthly Libor minus four basis points. And then quarterly Libor minus 11 basis points. And one that floats off of prime rate minus 303 basis points.

**Slide 38 – Floating Rate Indices History (29:14)**

**Rick Phillips:** Looking at the different indices history. So prime rate is very stable. It is 300 basis points over the target fed funds rate, and so that has been at 3.25% for many years. We see the 3-month Libor rate as well as the 1-month Libor rate. Back in 2011 with the European debt crisis going on, both of those rates went up much more than T-bills did. And so if you had a floating rate note based upon Libor, you actually really benefited from that because your coupons went up, and you weren't taking any risk of Libor or European debt because you had an agency. We see if you had a Treasury bill floater, that pretty much remained between zero and ten basis points for the last five years.

**Slide 39 – California Code – “Zero Interest” (30:01)**

**Rick Phillips:** One interesting thing in the code is regarding zero interest. So local agencies “shall not invest...in any security that could result in zero interest accrual if held to maturity.” So those floaters could, if there weren't a floor, they could actually have a negative interest accrual. And so all the agencies that issue floaters in their offering circulars – this is one from Federal Farm Credit Bank – so there is a limitation of floor of zero. And so it is a little bit gray in the code where you could have – it says zero interest accrual if held to maturity. And so you probably shouldn't buy a floater – I should say you should not buy a floater if it has a zero interest accrual from the start. It should have some interest accruing, a positive spread to zero. And so in talking with a lot of other participants and investment officers in California, our feeling is that floaters are fine with this floor because you are going to have some interest accrual when you buy the bond, even though it may go to zero with low interest rates. For example, we had negative T-bill rates and so that could be the case. And that is the case in Europe for their short-term debt. So we hope we'll get further insight in about an hour from now from the Fed that hopefully rates will start going up later this year or next year. And so floaters would not have that problem.

**Slide 40 – Callable Bond Details (31:25)**

**Rick Phillips:** Okay, shifting gears to callable bonds. When you purchase a callable you are selling a call option to the issuer. And so you should be paid for selling that call option by means of receiving a higher coupon than a bullet that does not have any optionality. The issuer has the right to call the bond from you and as the purchaser, you have the obligation to relinquish the bond. The agency will refinance a bond or call a bond when it is economically in their best interest when interest rates have dropped.

**Slide 41 – Callables – What's Up with the Names (31:55)**

**Rick Phillips:** So what's up with the different names? So you have probably heard these different names when looking at callable bonds. So American callables have – they will have a lock out period, let's say a year, and then they are callable any day thereafter. European calls have just one time, and those are based upon where they originated from stock options and how the call features work on them. And so a few years back, the financial engineers on Wall Street and the agencies said, let's kind of do a blend between an American call that is continuous and a European one-time call. Let's do something in the middle so they named it Bermuda, from the Bermuda Islands in the middle. And so to continue on, they said, let's kind of do a blend between a Bermuda call that has a call that, let's say, has a lock out of one year and then is callable every three months. So they created the Canary call that is a blend between a one-time and a Bermuda call. And then one that is not as prevalent is a Verde call. It is from the Cape Verde Islands in the middle of Bermuda and Canary, so to speak. It is a blend between those two, kind of.

**Slide 42 – Callables – American (33:02)**

**Rick Phillips:** So let's look at American calls. This is a Farm Credit and almost all of their callable bonds are American calls. And so we see that schedule that it will have a lock out for –

this was issued in last month and has a lock out for three months and then is callable any day thereafter. You get a five business day notice.

**Slide 43 – Callables – European (33:34)**

**Rick Phillips:** Next, looking at European calls. So this, again, was issued last month and has only one call date.

**Slide 44 – Callables – Bermudan (33:46)**

**Rick Phillips:** A Bermuda call where it has a lock out – this was issued, again, last month with it settling – actually the first coupon of June 29<sup>th</sup>, and so its first call is in six months on December 29<sup>th</sup>, but then will have quarterly calls thereafter as you see on the schedule down below.

**Slide 45 – Bullets vs. Callables (34:14)**

**Rick Phillips:** So just comparing bullets versus callables. This is from Monday, looking at different rates. So here is Treasury notes. So a two-year at 73 basis points. You get a little bit more on an agency bullet at 79 basis points. So if you do a European or one-time call, you are selling that call option, so you are picking up to the bullet about 11 basis points for a three-month lock out. And then if you have the lock out at one year, you are picking up a little less than nine basis points. So when you are selling more callable options – more options I should say – the Bermuda, where it is a lock out after three months and callable every three months thereafter, you get a little more interest rate, more coupon because you're selling more options. And then again, looking at the American, you are selling many more options and so you are being compensated two more basis points. So what you have to decide as an investor – these are the number of call dates that you have on these bonds. So again, European calls, just one call date on those. Look at the discrete calls. So the most would be a five-year, non-call three month. So it is not callable for three months and then callable every quarter thereafter. So it has nineteen call dates. So to look at that in comparison, you have a five-year, non-call three month American call, so again, that three-month lock out, but then 1730 call dates thereafter. And you are only being paid five basis points more for offering those call options. So much more flexibility to the issuer, to the agency, so you have to decide if that is worth it. Kevin is going to talk a little more about that in the analysis part later on.

**Slide 46 – Callables – Canary (36:03)**

**Rick Phillips:** So here is a Canary call, that blend between the Bermuda and the European one-time call where it has quarterly calls but then has a one-time call on June 8, 2016. Here you can see it is a five-year bond – actually, sorry, a three-year bond in June of 2018. And so you should get a little more than a one-time call and a higher interest rate because you are selling three more call options.

**Slide 47 – Callables – Step-Up (36:39)**

**Rick Phillips:** Step-up bonds. These are very popular when an investor thinks interest rates are going up because your coupon will step higher. And so we see again that they are callable every

quarter starting in November of this year, and here are the coupons that start at 1.25 and then step clear up to 5%. So the average coupon is 2.175. Now, just one caveat. Some accounting systems, what they will do to show a yield to maturity on your portfolio is they will show just the average yield for the whole time in your portfolio, even though this is a five-year bond and it only has a 1.25% coupon for two and a half years, it will show a 2.175. So just be aware of that if your accounting system does that.

**Slide 48 – Step-Up vs. Fixed Coupon (37:31)**

**Rick Phillips:** Just one way to look at a step-up. So here is that same bond starting out at 1.25 for two and a half years and then stepping up all the way to 5%. So what I did is just, the cumulative average step-up yield, what you would earn if this bond never gets called, there is your average yield, 2.175. Then, I compared it to a fixed coupon callable. When this was issued back on April 30th of this year, you could have bought a five-year callable bond that has a fixed coupon at 1.8%. So, we can see that here is the step-up bond over here on the graph – that is the light blue. And so the coupons stay at 1.25 for two and half years and then step higher. And so the green line is the average coupon. And so you see you have to hold that bond where it does not – you have to hold it so it doesn't get called four and a half years before you would break even. Now granted, later on you would have a much higher coupon, so there are different ways to look at that, and Kevin is going, again, to do further analysis later on.

**Slide 49 – Callables – Verde (38:39)**

**Rick Phillips:** So Verde calls. Again, I am not going to spend much time on this one, but this is a blend where it is a blend of a step-up and also those Canary calls where they are just for a while and then a one-time call.

**Slide 50 – Callables – Step-Down (39:00)**

**Rick Phillips:** Step downs. These aren't issued very often. They are more – an investor would buy those if they think interest rates are stable or actually going down. Like the name implies, they are just the reciprocal of a step-up bond. And so this bond was issued earlier this year in February. It starts with the bottom right. Sometimes my mouse will show and sometimes it doesn't. Sorry. That is why I am pausing. The bottom right you see the coupon, 7.75. Incredibly high coupon for where we are with interest rates. And then you only get that for three months, from March of this year until, well actually, tomorrow. And so this bond would then step down to 2% out to March of next year, and then it would step to 1.25. So the average coupon is 1.69, and these are quite comparable to a five-year bullet when they have been issued. And so a five-year bullet is 1.61. So the challenge with this is if interest rates go up, it would not be called and you would be stuck with a lower coupon, so definitely an offensive bond compared to a step-up being a defensive bond.

**Slide 51 – Fixed to Floating Rate Details (40:19)**

**Rick Phillips:** Fixed to floating rate. And so here is a bond that will have a fixed coupon, so 1% coupon for two years up to 2017, and then it will float three-month Libor plus 1%, or 100 basis points. It does have a 3% cap and a zero floor, so something to be aware of if you are looking at

those types of securities. Again, allowable per code. You have to decide again that zero floor we talked about earlier, but if interest rates are going up, that floor would not come into play.

**Slide 52 – Callables – Notices of Calls (40:57)**

**Rick Phillips:** So I know most municipalities do not have a Bloomberg because of the cost. So one way you can go out and monitor your callable bonds to see if they are going to be called is to go to the Federal Reserve's website. And each of the agencies will post each day their call notices. It is a very good resource to have.

**Slide 53 – Callables – Partial Call (41:19)**

**Rick Phillips:** So looking at another little nuance of callables is they are all partially callable. And so here is a Home Loan Bank that was issued a few years ago, and it had a partial call in 2015 where half of the bond was called. And so we can see it was \$50 million outstanding in the red box and then with 25 million outstanding now. And so the factor, or the pay down, is a 0.5. Now usually, the economics are there that agencies would just call the whole issue, but for example, Federal Home Loan Bank has twelve different banks, and so this \$50 million issue could have been \$25 million from the Seattle Federal Home Loan branch and then \$25 million from New York. And so the liability on the other side might have a slight difference, and so that is one reason you might have a partial call.

**Slide 54 – Agency MBS Pass-Through Details (42:17)**

**Rick Phillips:** Looking at agency pass-through the mortgage-backed securities. So again, the agencies will – the homeowner goes to the bank, gets a mortgage. The bank will sell those to Fannie and Freddie, and the cash flows go to the trust of Fannie and Freddie. And then all those mortgage payments of principal and interest just flow through or pass through to the investor.

**Slide 55 – Agency MBS CMO Details (42:45)**

**Rick Phillips:** Another type of mortgage-backed security issued by the agencies is a collateralized mortgage obligation or CMO – the same thing. But what happens to the cash flow is, the agency will tranche the cash flow or put them in different buckets, and so therefore, you could have just interest for a year and then you start receiving principal. So there is different interest rate risk characteristics that can be given with a CMO mortgage-backed security.

**Slide 56 – MBS Investors (43:09)**

**Rick Phillips:** Now, just to look at mortgage-backed investors, we see the New York Fed, with the Fed owning so many agency mortgage-backed securities, is the biggest buyer and owner of those, and then banks and mutual funds. We go clear over to the right. We see state and local governments, not big buyers of MBS – I am not going to spend a lot of time on them – just again probably because of the complications of the pay downs of principal and interest. Most municipalities do not like to own them.

**Slide 57 – Agency Subordinated Debt Details (43:37)**

**Rick Phillips:** The agencies also issue subordinated debt. And so we see the ratings are a little different. They are AA- by S&P and Fitch. And so, again, you can buy those but many municipalities would put those into a corporate bucket and so that as an allocation, but they could technically, I think, by code – we will have Hank maybe weigh in on this – but I think there is just no preclusion on a rating as he mentioned earlier, that you could buy those and not have to look at the rating. But again, an investment policy – that is something you might want to address.

**Hank Stern:** Along with that, Rick, usually you can tell by the pricing and the yield. If they are AA-, they should have a higher yield than a standard bond of the same maturity that is rated AA+. And if your broker-dealer is showing you the same price for both, then he is overpricing the AA- subordinated bond, and that is something an investor should be aware of when they are buying any type of bond as far as the characteristics.

**Rick Phillips:** Absolutely. Thank you.

**Slide 58 – Agency Issuance – FHLB (44:47)**

**Rick Phillips:** So just looking at the different agencies how they issue. I just used Federal Home Loan Bank as an example. And so they issue those discount notes at the window where you can go in for specific dates where they actually auction twice weekly with specific maturity dates. Medium-term notes – the smaller ones that Hank mentioned under \$250 million issue size – you can do a reverse inquiry. Say you have \$15 million, you could go to your broker-dealer and say, “Hey could you see if Federal Farm Credit would do this type of bullet or callable for me?” And also they do auctions. The big deals – they call them global or benchmarks by Fannie and Freddie – and those are usually \$2 billion and up sizes.

**Slide 59 – Agency Issuance – FHLB (cont’d) (45:38)**

**Rick Phillips:** Just looking at the callable bond issuance from Federal Home Loan, you can see that the majority – well, not the majority – but 45% have less than three months of a lock out. And then a big percentage over here on the graph – if I can get my mouse to catch here – three to six months has 29% of the callables. Then, you can see a majority down below are Bermuda calls at 58%. So they like that flexibility of being able to call usually every three months. And that is similar to Fannie and Freddie as well.

**Slide 60 – Agency Issuance – FHLB (cont’d) (46:16)**

**Rick Phillips:** So looking at the distribution of agencies, the left-hand graph shows the ... by region. So again, U.S. buyers buy U.S. agencies. But then on the right-hand side, we see central banks, a big buyer more recently of the QE [*quantitative easing*] programs. But again, state and local, an important segment for us that have municipal portfolios but a small segment of the agency market.

**Slide 61 – Supranationals (46:44)**

**Rick Phillips:** All right, turning attention to supranationals. So the three that were approved by code have red stars over on the left-hand side. They are based out of Washington. But there are five other ones throughout the world that issue that aren't approved by code.

**Slide 62 – Supranationals (cont'd) (47:02)**

**Rick Phillips:** So the Washington supras – the World Bank, IFC [*International Finance Corporation*], IADB [*Inter-American Development Bank*] – they were established in the 1940s and 1950s. The largest shareholders are the U.S. government, and they were established by an act of Congress. And so that is why many, many states actually have approved those in their state codes and laws more recently.

**Slide 63 – Supranationals (cont'd) (47:25)**

**Rick Phillips:** This is a presentation from the World Bank, and so they say their instrumentality to the U.S. because it was established by the U.S., and also the U.S. Secretary of Treasury sits on the Board of Governors.

**Slide 64 – Supranationals (cont'd) (47:40)**

**Rick Phillips:** They have a AAA rating from both Moody's and S&P showing that even greater financial strength, and S&P feels that the U.S. Treasury and agencies have somewhat interesting.

**Slide 65 – Supranationals – Issuance (47:57)**

**Rick Phillips:** Their issuance – again, they have big benchmark or global bonds, typical size \$1-4 billion, maturities range from two to ten years.

**Slide 66 – Supranationals – Issuance (cont'd) (48:09)**

**Rick Phillips:** They also issue smaller medium-term notes, fixed- and floating rate notes, and they have structured notes. And their pricing is comparable to the GSEs. In fact, we saw yesterday that World Bank discount notes were actually slightly lower yields, but then World Bank is issuing a bullet – two and a half year bullet – that has a slightly higher yield than the GSEs, the agencies.

**Slide 67 – Supranationals – Issuance (cont'd) (48:37)**

**Rick Phillips:** They also issue discount notes very similar to the agencies. A little smaller program for sure. And you can see the dealers down below that participate.

**Slide 68 – Supranationals – Contact Information (48:49)**

**Rick Phillips:** And if you need more information, the folks that presented at GIOA from the organizations here are happy to take your call if you're looking to put that in to your investment policy and need to explain that to your city council and such.

**Slide 69 – Suitable Agency/Supra Allocations (49:07)**

**Rick Phillips:** So what are suitable agency or supra allocations? So as Hank mentioned, most policies do not have a sector limit. You can go up to 100% per state code. We do see some policies with 40-50% issuer limits similar to Hank's, but many have no issuer limits. And then some policies have limited callables – no greater than 50%, for example. We've seen few policies that have a floating rate limit. On the supras, as we know, code is 30% and we do see some policies that have limited those, the issuers, to 5-10%. But the few that we've seen, probably the majority, have no issuer limit and would just be able to go up to 30%. We think that would be wise, even though they are AAA rated – higher rated than the agencies, too, at the start – if it is a new class for you, to be more conservative.

**Slide 70 – TRACE Trading Information (50:06)**

**Rick Phillips:** Now, information that you – if you wanted to find information on how agencies are trading, you can go to TRACE because, again, most people don't have Bloomberg that has this TRACE information. Dealers, within fifteen minutes of a transaction, have to report to TRACE the information about the trade. And so you can go to that website and look up the different Treasuries, corporates, and agencies particularly today.

**Slide 71 – TRACE Trading Information (cont'd) (50:32)**

**Rick Phillips:** And just to drill down a little bit more, here is a Federal Home Loan Bank. And you can see down below on the graph, if you just wanted to graph the price over a certain time period.

**Slide 72 – TRACE Trading Information (cont'd) (50:44)**

**Rick Phillips:** And you can drill down and see all the different transactions that took place in the middle of the screen. The quantity, that 50,000, is 50,000 bonds. And then you see down at the very bottom 5MM+, that is a trade greater than five million. Over on the right hand side, we see the reporting party side. So this is from the dealer's perspective. So the "S" is a dealer selling to an investor, you and I, and then "B" [is] buying from an investor. And then "D" [is] dealer transactions as well. So with that, I am going to turn it over to Kevin to talk about the analysis part.

**Slide 73 – The Treasury Yield Curve Framework (51:17)**

**Kevin Webb:** Good morning, everyone. As Hank may have alluded to, if you caught it the beginning of the presentation, I am in Houston, Texas, and while it is true, I often, in social circumstances, lapse into an awkward, contemplative silence. If I suddenly go silent today, it will be a more mundane explanation. In Houston, we have the remnants of tropical storm Bill and if power goes out, Rick Phillips will jump in and take over the presentation. With that said, given everything that Hank and Rick just went over, all these various options from the Treasury webinar that CDIAC put on and I was a part of last month, and all the different flavors of agencies from bullets, callables, and within callables, step-ups. What I am going to go over with you for the remainder of this presentation is two common methods for evaluating and comparing

these different securities. And it all begins back with a quick refresher from the Treasury webinar, the Treasury yield curve framework.

And so just as a reminder, the Treasury curve – any yield curve – is composed of two parts. It is a risk-reward framework where the vertical axis is yield and the horizontal will be final maturity. Now, this is true for this slide and for the remainder of my slides and my part in the presentation. The numbers and actual values are not as important as the relationships that the graphs will demonstrate. And so a Treasury yield curve is normally upward sloping. We always require a higher rate of return when we loaning money for longer periods of time. And the Treasury yield curve is the default yield curve for benchmark interest rates around the world.

#### **Slide 74 – Primary Risks Associated with Bonds (53:22)**

**Kevin Webb:** And that primarily has to do with the fact that Treasuries really only have U.S. Treasuries interest rate risk. Now, the risks that exist in fixed income securities can be sliced and diced into different tables and different lists, but for the most part, they are comprised of these four main elements: interest rate risk, reinvestment risk, call risk, and default credit risk. I briefly want to go over interest rate risk and we'll cover all these, but as you change any one of these up, you would expect – and Hank alluded to this when he talked about why you would want to see on a subordinated AA agency paper – a higher yield than a senior piece of agency paper of the same maturity because you are taking more credit risk so you would expect to see a higher rate of return.

#### **Slide 75 – Price & Yield Relationship (54:23)**

**Kevin Webb:** So as a quick reminder, the three core concepts – and we went into greater detail on this in the Treasury webinar last month – are price, yield and duration. As a quick reminder, price is just the present value of all the future cash flows of that security, discounted by the yield on the bond. And yield goes by many different names – internal rate of return, required rate of return. We will use yield and internal rate of return interchangeably. But if we discount all the future cash flows of our security, of any security, by the yield to maturity, bring them all back in time, and then divide them by the face amount, we get a price. So price and yield have that relationship in that price is what all those future cash flows are discounted by. And you take that amount, divide it by the par amount, and you get the price of the bond.

#### **Slide 76 – The Price-Yield-Duration Connection (55:32)**

**Kevin Webb:** Price and yield themselves are related to a concept called duration. You can tell that it is a curvilinear relationship. So just as a quick reminder, duration describes how the price of the bond will change, how the present value of all those future cash flows will change, as we change the yield. And it is curvilinear but the number we use to describe that relationship, duration, describes a straight line as a slope. And so as a reminder, for example, here we had a 4.814. That just means that a 1% rise in interest rates will lower the price of our bond by 4.814%, and conversely a 1% decline in rates will raise the price of our bond 4.814%. But you can tell that this blue line moves away from the actual relationship for larger and larger changes in price and yield. The other concept that describes that difference is called convexity. And so price and

yield are related to each other through duration. And duration is the primary risk existing in U.S. Treasuries.

**Slide 77 – Yield Spread****(56:53)**

**Kevin Webb:** So when we try to think about how we would analyze and compare, for example, the Treasuries versus the agency bullets and all the many flavors of agency callables and step-ups that Rick just spent the last hour going over, there are two primary methods. There are many. I am going to discuss the two most common, and the first one is called yield spread. And what yield spread means is you take the yield – Hank did this intuitively when he talked about the subordinated debt versus the senior debt – but what yield spread is, is you take the yield on the bond you are interested in and you would subtract from it the yield on a Treasury security of the same maturity. So what does that look like?

**Slide 78 – Yield Curve/Spread Analysis: Agency Bullet Bonds****(57:45)**

**Kevin Webb:** So what I am going to do is, I am going to go back to our yield curve framework, and I am going to plot a yield curve. This lower yield curve, this solid line with the red arrows pointing to it, is our Treasury yield curve as of May 29, 2015. Above it, I have plotted an agency bullet curve. And just as a reminder, when Rick was talking about the different agency structures, bullet means that it cannot be redeemed early prior to maturity. A callable can be redeemed early or prior to maturity. Since agencies have credit risk that is more in the Treasury curve, we would expect – as Hank had alluded to when discussing the subordinate versus the senior agencies – we would expect the agency bullet, for every point along the maturity spectrum, to yield higher. And so one of the common ways is to take the yield spread. Again, referring to the previous slide, that is the yield on our agency bullet bond and subtract from it the yield on our Treasury bond. So taking the 5-year here, I have the table. The yield for this example, a 5-year agency bullet piece of paper, would on average have been a 1.58. On the Treasury, it would have been 1.48, and that gives you a 9.8, or 10 basis point difference.

Now, whether that is high or low or appropriate or inappropriate on its own, you won't really know until you do a comparison. And so you can do that comparison historically and see how it fits into your own risk-reward framework. One of the common ways is you would expect it to be higher because you are taking on more credit risk. Now, the bulk of the agency issuance, as Rick discussed, in market value are bullets. But most of the bonds that you see issued, and Rick showed a screen from Bloomberg called NIM 2, New Issue Monitor, where the agencies issued callable debt almost on a daily basis. And there are more of those bonds by number, maybe not necessarily by market value.

**Slide 79 – Yield Curve/Spread Analysis: Agency Callable Bonds****(1:00:07)**

**Kevin Webb:** You would expect if we plotted an agency yield curve – and this is what I have done here on slide 79 – so I have removed the agency bullet curve, I have plotted a derived agency yield curve just showing what you would expect for each maturity along the spectrum, an average callable to yield, and you can tell that it is a little bit higher than the agency bullet curve. And using our same analysis, if we had an agency callable 5-year, we would expect a yield somewhere around a 1.82, Treasuries around 1.48. That spread is around 34 basis points. Again,

the numbers aren't important, more so than the relationship that is demonstrated in the graphs. We would expect to earn more on a bond the more risk we take whether that is credit risk or in this case, as an agency bullet. We have the same credit risk as an agency bullet, but now we have the early call risk or redemption risk in the sense that the issuer – whether it is Fannie Mae, Freddie Mac, Home Loan Bank, or one of the supranationals – can call away the bond at a time that is advantageous to us.

**Slide 80 – Yield Curve/Spread Analysis: Tsy vs. Bullet vs. Callable (1:01:25)**

**Kevin Webb:** On slide 80, what I have done is I have plotted all three. So the bottom is the Treasury yield curve, here is our agency bullet curve, and here is our agency callable curve. And again, it is not the numbers so much that are important. As Robert said, this is on June 17, 2015, and they are most certainly likely to change, and the relationships and the magnitude of those numbers will change. But I would expect to see, just like I would always expect to see, a Treasury yield curve that is upward sloping, even though it can be flat or inverted. I usually expect to see agency bullets yielding more than Treasuries, and agency callables of the same maturity yielding more than the same agency bullet, and of course, by virtue of that fact, yielding more than the Treasury. And that is usually done by looking at the yield spread analysis. So looking back at our 5-year, we can see the bullet's spread above the 5-year Treasury is at 9.8, roughly, and the callable spread over that Treasury is around 33.5, or 34 basis points.

**Slide 81 – Yield, Duration, Spread Problem/Solution (1:02:35)**

**Kevin Webb:** So one of our dilemmas in looking and using yield spread analysis is that callable bonds have more than one possible redemption date. They have their call date and their maturity date, and therefore, the collection of future cash flows that contributes to their overall return is not clearly defined. And when we have a return measure that is flawed in the sense that it does not allow us to adjust for the possibility of early redemptions, we run into a problem. So one of the solutions and the second most common method behind yield spread analysis would have to solve a couple of problems. It should account for the risk posed by an uncertain redemption date – in other words, those possible future call dates. And it should provide a means for assessing the incremental return for that security relative to a riskless benchmark – in other words, Treasuries. So we end up with a distinction in the two most common methods of analyzing and comparing these securities.

**Slide 82 – Spread Analysis: Two Approaches (1:03:45)**

**Kevin Webb:** And that is yield spread analysis and option-adjusted spread analysis. Now, these are dense definitions and they are here for your reference. So I am going to read them to you shortly. Yield spread analysis is what I mentioned earlier. You take the yield on your bond and subtract the maturity-matched U.S. Treasury, and the spread that you get represents the incremental return over the benchmark the investor earns for taking on that interest rate risk, reinvestment, call and credit risk that I mentioned. However, this incremental return is to a specific date. It is to the maturity. So we looked at the 5-year bullet and 5-year callable versus the 5-year Treasury. That spread difference was to a particular maturity date, which was five years. A callable, as Rick mentioned in all its many flavors, can be redeemed at many points prior to maturity depending on the structure.

And so the most common method for handling this problem is something called option-adjusted spread analysis. It is a method that analyzes the impact of any options embedded in the bond structure. It is quoted in basis points. The OAS represents the constant spread applied to the benchmark rates in a fixed-income option model that allow us to recover the price of the bond being analyzed. The measure is called OAS because (1) it is a spread and (2) it adjusts the cash flows for the option when computing the spread to the benchmark interest rates. Now, that is a dense definition and not easily understood at a first pass. What it means is that it is not a spread to a particular Treasury. It is a spread to the Treasury curve because the callable has many possible earlier redemption dates than its maturity date. And so that is what it means when it says that it is applied to benchmark rates, not a particular benchmark rate. And it's an option model, in a sense it employs a methodology. Much like you would use a map to guide you from point A to point B, an option model is just like a map. It extracts a lot of unnecessary details and allows you to guide yourself from point A to point B. An option model tries to do the same thing when you move from the bond today to its final, to its maturity date and all the potential points in between. But what I want to do is, the next couple of screens, I want to look at an option-adjusted spread analysis on a 5-year agency bullet and a 5-year agency callable. I chose these out for the demonstration purposes, not to suggest that callables are either better or worse than agency bullets either now or in the past or in the future, but more to demonstrate the difference between yield spread and option-adjusted spread analysis.

### Slide 83 – Yield Spread vs. OAS: Agency 5-Year Bullet

(1:06:45)

**Kevin Webb:** So let's look at our 5-year agency bullet first. Now, this screen has many, many parts to it. This is a 30,000 foot overview, our introduction to agencies in this webinar. Now, I am going to focus on a few key points, but I would like to mention that changing any of these assumptions, from the volatility to the curve used or to the model, will change your results. I have used standard, reasonable assumptions as of the time of this analysis. If you change these or the model, you could end up with different results.

So what do we have here? I am taking a Fannie Mae, 1 ½ year, June 2020 agency bullet and I have a price that it is offered out at. And I have a Treasury benchmark. This is our 5-year Treasury. The Treasury – 1.875, June 2020. And here is their yield. So the Treasury yield is here. The Treasury curve is here, and the yield spread, which you may remember from the previous slides with the agency bullet curve versus the Treasury curve back on slide 78, was around the same 9.7 basis points. And this describes the yield spread. What OAS does is it comes in and analyzes and adjusts the spread for any possible early redemptions across this curve. Since this is an agency bullet and it has no embedded options as is mentioned here, the OAS we would usually expect to be right on top of the yield spread. As you can tell, it is just one more decimal place but if you rounded up, it would be 9.7. And this is 9.7. This is what we normally expect to see. It has a yield of 1.77. That 1.77, if you subtract from it this 1.674, you would end up with about 9.7 basis points for the yield spread and the OAS. So what about our callable?

### Slide 84 – Yield Spread vs. OAS: Agency Callable (5YrNcaYr-Dq)

(1:08:53)

**Kevin Webb:** Briefly, let's talk about nomenclature. This is a callable agency. It is a 5-year final maturity. It is non-callable for the first year, and after that, it is discretely callable quarterly.

There are many ways of shortening the description of these bonds, their nomenclature to describe them. This is one that I prefer to use. You may encounter others. But what this bond means is that it has a 5-year final. When you buy it, it cannot be called away for the first year – in other words, the non-call part – but after that, after the first year, beginning on June 30th, 2016, you will be able to be called away by the agency – in this case, Fannie Mae – every quarter – so June, September, December, then March 2017, and so forth all the way to March of 2020 – every three months, you could be called away at a time that would likely be disadvantageous to you, that is, [if] rates fall. And this bond has a 2% coupon. It was issued at par. And so looking at our yield spread analysis, taking our same 5-year Treasury that we compared the bullet to – that 5-year Treasury yielding a 1.674 – we subtract that from our 2% yield that we are earning on this callable, we end up with a yield spread of 32.6 basis points. So that is how much additional yield we are earning in this callable over this Treasury. And remember the agency bullet was earning 9. And so using a standard yield spread analysis, we would conclude that the 32, of course, is much better on an income basis than the 9 basis points.

But wait a minute. It is possible that given this call schedule here that the agency could redeem this bond at any of these points beginning a year from now, all the way up to three months before the final maturity, at a time that is not to our advantage. So what OAS does is it goes and looks at all those potential redemption dates using an option model – the standard option model here is log normal; there are many other options – and looks at the Treasury curve, in this case, not much past five years since it has a 5-year final – and does an analysis and computes a spread to every one of those possible redemption dates over many interest rate scenarios until it figures out what that constant spread is that it would have to add to all those Treasury rates under all those different Treasury rate scenarios to make those future cash flows equal the price that we were being offered the bond at. And that OAS is a positive 5.44. So it does earn 5.44 basis points of option-adjusted spread over the benchmark rates. Again, not a particular rate but the rate the Treasury curve itself. But that 5.44, as you can see, is nowhere near the 32.6.

Now I chose this bond specifically because I found one that had an OAS lower than the comparable maturity agency bullet. There are others on the same day that were higher. And I did this to demonstrate that the initial analysis of using a standard yield spread analysis which compares the yield to maturity on the bond you are looking to purchase – its additional incremental yield over the comparable Treasury can lead you to perhaps a drastically different conclusion than using a method like option-adjusted spread analysis that tries to adjust for those potential early redemptions and give you a clearer picture of how much you are being paid, not so much over a particular Treasury, but over the Treasury curve and trying to account for or adjust for all those possible early redemption dates. Now, one of the byproducts of an option-adjusted spread model – and I started off the Treasury presentation and revisited it here describing that the relationship between price and yield are duration. Duration describes how price and yield change – is one of the things you notice about a callable agency is that its duration in the OAS method, modified duration for this bond, is a 3.33 but its duration to maturity would be a 4.74.

**Return to Slide 83 – Yield Spread vs. OAS: Agency 5-Year Bullet**

**(1:13:46)**

**Kevin Webb:** If we go back to the agency bullet slide, we will see that its OAS method duration is the same as its duration to maturity because there are no early potentials for redemption. So I

would expect the agency bullet 5-year bond, if rates moved up 100 basis points or down 100 basis points, to change by about 4.89%.

**Return to Slide 84 – Yield Spread vs. OAS: Agency Callable (5YrNcYr-Dq) (1:14:11)**

**Kevin Webb:** However, on the callable, because there is the possibility for early redemption, one of the byproducts of an option-adjusted spread model where it tries to model for all these possible early redemptions, for different interest rate scenarios – and those scenarios and their severity are controlled by this volatility assumption, and if you change that, you get different results as I mentioned earlier – but one of the byproducts of an option model is that we would expect to see in a callable whose price is close to par, an option-adjusted duration that is different than the duration we would expect to see if it had no call options, and that would be this. So if there were no call options and this is a bullet, we would expect the duration to be 4.74. But it does have call options. It is possible for this bond to be redeemed early. The future path of interest rates is unknown in the option model. Modeling for those concludes that its interest rate risk is something less, and it is 3.33. This is a common statistic that you would expect to see on callable agencies, step-ups as well, that their initial duration, option-adjusted duration is less than the maturity-matched bullet.

**Slide 85 – Yield Spread vs. OAS: Duration Differences (1:15:36)**

**Kevin Webb:** Now, what I have done here is I have taken a hypothetical portfolio. Again, this is not a recommendation on sizes. This is for demonstration and pedagogical purposes only. And I have taken four bonds that are representative of the bonds that we have discussed so far in this webinar series. So last month, we did Treasuries. Today, we are doing agencies. I wanted to give you a sense of what you would expect to see and how these relationships work with each other. So notice I have an agency bullet here, an agency step-up – what we call a quarterly step-up bond – a Treasury bond and then our 5-year, non-call 1 [year], callable agency bond. Four bonds representing the various structures that we've seen so far in this webinar series. I want to point out that the modified duration, which is much like the yield spread analysis and only looks at each of the bonds to maturity, ignoring any possibility of early redemption in the cash flows, have them all pretty close to each other. But when we look at their effective durations, and effective is a good term – it means in a sense their effective change in price when interest rates change [and] it takes into account the possibility for early redemptions – it is very, very different. And so are the option-adjusted spreads. And we will get to that in a second.

Now, I want you to notice not so much the numbers, but the fact that these can differ, and differ greatly, even though the bonds all have the same maturity. So duration, broadly speaking, is just that concept that describes the percentage price change in a bond for a given change in yield. Modified duration just assumes that yield changes do not change the expected cash flows of the bond, and so for our agency bullet and our Treasury, when yields change in the market, the cash flows of the bonds do not change. Their value changes but there will not be any possibility of them being redeemed early. What effective duration does is it recognizes that yield changes may change the expected cash flows and adjusts the interest rate sensitivity of the bond accordingly. And that is the case for this step-up and for this callable.

**Slide 86 – Visual Analysis: Modified Duration vs. Effective Duration (1:18:05)**

**Kevin Webb:** So using a general principle for the visualization of quantitative data, we use a table and when we know a value, we use a graph when we want to describe a relationship. I would like to use a series of graphs as we round out this section of the presentation to demonstrate the relationships. So you just saw the table showing the relationship between the modified duration on our four example bonds and their effective duration. That relationship becomes more prominent when you graph it out. So what do we have here? We have effective duration versus modified duration. And in this portfolio, again, which is just a sample portfolio not a recommendation at all, I made them each equally weighted, \$1 million market value. So I have a portfolio of four bonds, four with \$1 million in market value each. The horizontal axis is effective duration, that interest rate sensitivity number that takes into account that changes in interest rate can change the future expected cash flows, versus modified duration, which has all the cash flows go to maturity. And then the bubble size represents their market value. So the bubble size for each of them is the same. And as you can see here the step-up, which not only is callable but as the name implies and Rick demonstrated in his portion of the presentation, has coupons that move up as you move through time.

This bond we would expect to see always have a much lower effective duration than the maturity-matched callable or agency bullet or Treasury. The agency callable, or five non-call one [year] – remember that it has a 5-year final and is not callable for the first year then callable quarterly after that – has a slightly lower duration than our agency bullet and our Treasury. And our agency bullet and our Treasury have roughly the same effective duration and roughly the same modified duration. The difference in the modified duration numbers has to do with the fact that the agency bullet, because it is a lower credit than the Treasury, has cash flows that are slightly higher, and when you increase the coupon, everything else being equal by a bond and you leave the maturity the same, you are going to lower the duration and so I would expect the durations to be about on top of each other. So that is modified duration versus effective duration.

**Slide 87 – Visual Analysis: Effective Duration vs. OAS vs. Yield, Take 1 (1:20:36)**

**Kevin Webb:** Now, OAS, our measure that helps us understand and compensate and adjust for the shortfalls of the standard yield spread analysis – if we take our effective duration in this visual graph, let effective duration be the horizontal axis, and then we plot their OASs, we see something entirely different. In general, for bonds you would not want a negative OAS. But this is something we see very regularly on step-up bonds, especially new issues, and that is that their OAS is negative. So is that good or bad? Well, that would depend on your risk-reward profile and preferences, but the reason that we expect it to be negative – and Rick discussed this implicitly – is that step-ups have, as implied, a step schedule. And the further they get to closer to maturity, their coupons rise, and so actually as their maturity shortens, the coupons rise and so what the option model is telling you is that there are many scenarios in the option model under which the bond is called away. And when the bond is called away, as Rick discussed, these callable bonds – both the step-ups and the agencies – are usually called away at par, meaning you receive 100 cents on the dollar back on your bond when it is called. The price of the bond, the spread you would have to add to each of those benchmark rates under all of those different scenarios on average was negative. This is another way of saying that you are paying a premium for this.

Why would people do that? Well, the reason that they would do that is that this effective duration on this bond and interest rate risk is lower than the maturity-matched callables or agency bullets or Treasury bullets. And they provide a hedge against rising rates. Whether that is good or bad is for each individual institution to make the decision based off the numbers, but more importantly, as I mentioned earlier, it is the nature of the relationship not so much the magnitude of the numbers that are important here. So if we take this same relationship – and here in this graph, we have effective duration versus OAS and in the bubble size, the market-weighted purchase yield – you can tell that the agency step-ups bubble – hopefully you can tell – is slightly smaller than the others in the sense that its purchase yield is a little bit less.

**Slide 88 – Visual Analysis: Effective Duration vs. OAS, Take 2** (1:23:18)

**Kevin Webb:** And we adjust this graph where the size of the bubbles represents this particular structure's, each structure's contribution to the overall purchase yield of the portfolio – I mean the effective duration of the portfolio, you can see that the step-up's contribution to the overall interest rate risk of the portfolio is much less than of course the agency bullet's and less than the callable, which is less than the bullet and the Treasury. This is something, again, a relationship you would expect to see.

**Slide 89 – Visual Analysis: Change in Rates and Time** (1:23:50)

**Kevin Webb:** But with that said, the callable and the step-up – callables and step-ups in general – as the option-adjusted spread and effective duration definitions demonstrate and say explicitly, their cash flows can change as interest rates change. And so as interest rates fall, as we allow this graph to represent changes in interest rates – so we have -100 basis points, -50, rates remain unchanged, and rates up 50, up 100 and up 200 – and we age all these bonds by twelve months – in other words, we move them from 5-year finals, now they are 4-year finals, we move a year in the future – what would their durations look like under these different interest rate scenarios? Well, the Treasury and agency bullets will have durations close to their final maturities, not quite 4.00 but something less than that, and they are right on top of each other. And regardless of the interest rate scenario, their interest rate risk does not change because the potential cash flows won't change as interest rates change. But for our agency callable and the step-up, that is not the case. As interest rates rise, the callable and the step-up, the option model is telling us by these longer duration numbers, we would expect them to live longer and not be called sooner. So if rates rise 200 basis points over the next year, the step-up's effective duration would have moved from something of 0.27 a year from now, all the way to a 3.0.

And the callable – again, it is not so much the magnitude of these numbers but this type of duration drift analysis is something you can get from your advisor or money manager or your brokers on Bloomberg – Bloomberg has a function called Bloomberg scenario analysis, and that is where these numbers have come from – you can do what they call a scenario shock analysis and shock the bonds in the portfolio and end up with what our middle line shows here. And this is what you would expect to see from a portfolio that has callable agencies or step-ups in it, that its duration extends as the interest rate shock environment rises. And that weighted average of this overall portfolio duration is composed of the Treasury and agency bullet, the callable, and the step-up. If we take this line, this line, and these two lines on top of each other and just divide them, which is why I made them all equal market value, divide each of them by four, we would

end up with this line here representing the weighted average effective duration for this portfolio a year from now under these various interest rate scenarios.

And this type of duration drift analysis, especially this extension for the callable and the step-up, much like an upward sloping yield curve is what we would expect to see for the duration extension on these bonds when there are embedded options in the sense they can be redeemed earlier than their maturity date at a time that is not to the owner's advantage. So using this type of analysis, option-adjusted spread analysis and its byproduct, effective duration – in looking at it on an individual security basis as we have done here, you may be asking yourself a question, well, this helps me on an individual bond basis, but what I can say about callables, for example, versus agency bullets in general? And this is in a sense where having access to indices can help. So for example, when you watch the evening news and they talk about how the stock market did – they will talk about the Dow Jones Industrial Average or the S&P 500, and the Dow Jones is just an index of 30 equities and of course the S&P, as the name implies, is an index of 500 equities – and they allow those stocks to be representative of the overall equity market. Well, not as commonly reported in the news but known to people that deal with fixed income portfolios, there are fixed income indices.

#### **Slide 90 – Visual Analysis: Big Picture View, Take 1**

**(1:28:36)**

**Kevin Webb:** And this is for demonstration purposes only. We produced this. What this is, this is a graph of the effective duration of a 1- to 5-year agency bullet index, meaning it comprises only agency securities that are \$250 million in size or greater with maturities between one and up to five years. And then it is a callable agency index that contains callable bonds from agencies – Fannie, Freddie, Home Loan Bank, Federal Farm Credit Bank – that have \$250 million in size issued up and then their effective durations. Now, this effective duration is a byproduct, and these indices are Bank of America Merrill Lynch indices and so it uses their option model. And again, if you change the option model and the assumptions, you will get different results. So when you are comparing option-adjusted spreads and effective durations, it is important to be using the same model or comparable models when making the comparisons. In this case, what this graph shows is what we would expect, and what we saw in that duration drift graph is that regardless how interest rates change, and they have changed drastically from 2001 to 2015, the duration on 1- to 5-year agency bullets has on average been about a 2.28. Now, this graph, which looks more like an EKG, is the effective duration of the 1- to 5-year callables through the same time period. It is much more volatile as you can tell. Its annualized standard deviation is much higher than the annualized standard deviation of the bullet. But you can draw a couple conclusions. Only under extreme scenarios does the duration of the callables index approach the interest rate risk of the bullet index. But what you may be expecting can change drastically, and that is something to take into consideration when looking at callables versus bullets. So average durations here.

#### **Slide 91 – Visual Analysis: Big Picture View, Take 2**

**(1:30:59)**

**Kevin Webb:** The last slide that I have for you takes the OAS – now, this is not as easily discernable because they are right on top of each other – and as you can tell from the graph, you don't have to look very far to find where the financial crisis is at. This is option-adjusted spread for the 1- to 5-year bullet which is averaged over this time period, 9.00, versus the option-

adjusted spread, the average spread for the 1- to 5-year callables over the same time period, which is 10.00. And whether that is good or bad would depend on your own risk-reward preferences. You may look and it and go, well, I have only earned on average one basis points more on an OAS basis than I did on the callables, that is not worth it to me.

**Return to Slide 90 – Visual Analysis: Big Picture View, Take 1** (1:31:47)

**Kevin Webb:** Or you may conclude I earned one basis point more and on average, I had about half, a little less than half of the interest rate risk of the bullets. It is entirely up to your own risk reward profile preferences.

**Return to Slide 91 – Visual Analysis: Big Picture View, Take 2** (1:31:59)

**Kevin Webb:** And so I would leave you with this: when looking at all these different flavors of securities, from the Treasuries to the agency bullets to the many flavors of callables and the step-ups and all their various combinations, the yield spread analysis is useful in the sense that you would always expect to be paid more, as Hank pointed out, when looking at the subordinate agency debt versus the senior debt on a yield spread basis when you are giving away more things. If you are extending the maturity, if you are giving the right to be called away, you would expect to be paid more on a yield spread basis. Whether that additional spread as demonstrated in the yield spread calculation is fair or not, you may get a better representation and a better understanding of what exactly you are giving up if you move to an option-adjusted spread analysis in looking at that comparison. Are there any questions?

**Robert Berry:** Kevin, this is Robert. We do have a question that came in here. How do you predict the likelihood of a bond being called by looking at OAS?

**Kevin Webb:** That is an excellent question.

**Return to Slide 84 – Yield Spread vs. OAS: Agency Callable (5YrNcYr-Dq)** (1:33:19)

**Kevin Webb:** So I am going to go back – and this is a common misunderstanding - to this slide here. So let me answer that by saying this: so effective duration – many people look at effective duration and this is a screen from Bloomberg. So if you are trying to get an option-adjusted spread analysis and get an effective duration, this maybe a screen that your broker or your advisor or money manager is most likely to have, although there are other models using another analytical system like BondEdge or Axiom or Wall Street Analytics. There are many, many of them. But the effective duration, no matter which one you are using, is not a predicted call date. It is the model's representation of what it expects the market value change and the price of the bond to change by for small changes up and down in interest rates. What you can do, and you can do it in this screen here, is you could – and the way that most of these option models would go about predicting a call is they would first compute the option-adjusted spread, and so they would leave this at 5. They would change the model here to say, okay now given that I have an option-adjusted spread of 5, I am going to change this to “P” and I want to calculate the price. And then they would change the settlement date. Let's say we wanted to see our settlement date out to 2016. They would change the settlement date somewhere close to when it is callable or when the future date is when they want to analyze it. And they would either shift the curve or not

shift the curve, and they would tell the OAS to solve. So what happens in these predicted calls is if we left this at a +5 OAS and aged our callable bond a year, we would want to look at the price of the bond and see if it was above par, and if it was above par, the model might predict it to be called. In a sense, that is what is happening here.

### Return to Slide 89 – Visual Analysis: Change in Rates and Time

(1:35:27)

**Kevin Webb:** So I am going to go to my duration drift graph and on our agency callable, if I took it and I am on our callable or step-up, and I said let interest rates stay the same, move the time period forward one year and give them the OAS we had at the start, we solve for a year out given that constant OAS spread, what would not only the price of my bond be but when I compute the price, I will also get as a byproduct of the option model, effective duration. So you can tell on the step-up here, it is saying the effective duration is 0.27. It is saying that this bond is going to act, if interest rate changes, it is going to act more like a 0.27. That is not a predicted call date, but I know from that, that the option model is going to have that bond priced such that it is likely to be much shorter. And one of the byproducts you get from the Bloomberg scenario analysis is it literally will give you an output table showing what it calls a horizon event, an “M” for maturity, a “C” for call, or a dash that the bond is still alive at five in the model’s estimation. And so that is one way that the option-adjusted spread gets used in predicting the likely call of these bonds that have options in it, both callables and step-ups. Just to summarize it, it takes that initial OAS that you get when you solve. You put in the price of the bond you are being offered at currently right now. You get the OAS. You hold that OAS constant and then you put in your scenario, whether it is rates changing or three months, six months, one year, or two years forward. And the model re-solves given that OAS and then backs into the price, and given that price, determines whether it is called or not.

**Robert Berry:** Kevin, another question. Can you use the OAS comparison with certificates of deposit?

**Kevin Webb:** You can. It is not – the OAS can be used with anything. If you have on Bloomberg, if the CD is modeled, you can put it in Bloomberg, and you can do it. It may not be as helpful. If it is a callable CD, it certainly will be helpful in that regard. And you see many of those, and I have used the OAS on callable certificates of deposit to gauge their sensitivity to changes in interest rates in the passage of time as is demonstrated here in this graph, duration drift graph. I look at another table, that it is a horizon event table to see if they are called or matured, but yes, you can do that. OAS is a very good method for – it doesn't work well in the next webinar, I believe, which is corporates. It doesn't work particularly well. It is something we will be discussing in the corporates [webinar], I believe, called “make-whole call.” But there are callable corporates and you can use OAS for that as well. It adjusts everything and puts everything on the same basis. That “A” in OAS – it is a spread and it is an adjusted spread. It tries to put everything on the same playing field, which is what makes it much more useful than a standard yield spread analysis.

**Robert Berry:** There don't seem to be any other questions. Hank or Rick, did you have any closing comments? Kevin?

**Hank Stern:** No. This is Hank. From my point, let's just let the buyer be aware and make sure you do your due diligence. One thing, if you are pricing these items, that I have found is you need to compare the pricing mechanism or benchmarks that every dealer uses to make it standard. I have caught some dealers when they price out a spread and they have basically said, "Well, I am three basis points over your competition." They are using a different benchmark. They are not using the on-the-run benchmark, but the off-the-run benchmark sometimes. And that will change the spread.

**Return to Slide 83 – Yield Spread vs. OAS: Agency 5-Year Bullet (1:39:45)**

**Hank Stern:** So on this one slide here, 83, when you get down to the Treasury that is right in there, you have to make sure you are using that same benchmark for all your dealers when they are giving you a quote. Otherwise, it will skew the entire thing.

**Return to Slide 84 – Yield Spread vs. OAS: Agency Callable (5YrNcYr-Dq) (1:40:07)**

**Hank Stern:** As Kevin mentioned, you change any of the parameters on that page and you are going to change obviously the price as well as the yield. So you have just got to make sure you are comparing apples to apples, not apples to bananas, when you are looking to either price the security to purchase or even to price a security to sell if you have to liquidate early. The only other comment I would make is, at least on the examples Rick showed on the step-ups and step-downs and stuff, the example he showed was a very small issue, \$15 million or \$20 million. If you are going to do that, you are really going to shrink the field of liquidity if you had to sell that security early. If you are buy and hold and your cash flows are wired and super tight, then you don't have anything to worry about. You can hold your securities to maturity. Those are the only comments and caveats I would give is – make sure you know what you are doing and you do your due diligence. Don't assume anything and there are no dumb questions. Ask them if you don't know.

**Kevin Webb:** We have, Robert, just a couple minutes here. One of the points I would mention and Hank and Rick and I discussed this and weren't sure whether we should mention it. Hank pointed out that, of course, I use the same Treasury benchmark, but if I used a different Treasury here than in the previous one, it would change it.

**Return to Slide 83 – Yield Spread vs. OAS: Agency 5-Year Bullet (1:41:45)**

**Kevin Webb:** But one of the likely changes that you would see is – if you notice on the agency bullet, volatility here is zero because the volatility parameter is irrelevant on the bullet because volatility describes, like it says, how volatile interest rates will be, and if interest rates change as you move through the option model and there is the possibility of early redemption, then the cash flows will change, but this doesn't have the possibility of early redemption, so how volatile interest rates are won't change.

**Return to Slide 84 – Yield Spread vs. OAS: Agency Callable (5YrNcYr-Dq) (1:42:13)**

**Kevin Webb:** That is not the case for the callable. It is standard. Many of the dealers would use a 14 VOL [*volatility*] here, and that describes a much lower volatility environment than this

default 41.24. Now, what happens on an OAS, and this is important – Hank just mentioned this – you want to make sure you are comparing apples and apples, and not apples and bananas. And that is, if you take every callable bond and have a 14 VOL – which by the way, there is no point on the curve right now and it has not been for a good number of... probably a decade, or any point on the yield curve that is at a 14% volatility – you will change the result. And in general, if you lower this volatility, it will increase the OAS and increase the duration. And you can derive some incorrect conclusions, in my opinion. So what I do, and I have my Bloomberg terminal set up this way, if you use the default volatility parameter appropriate for the structure – this is the recommendation of Fannie and Freddie for their AOAS [*agency option-adjusted spread*] model, which is an OAS model for a one-time [*call*] – I would just point out that this is probably the one assumption that would most likely differ. If you were to take the same bond and ask some dealers to send it to you, they may get back to you with a 14 [*volatility*] there. And if they did – everything else being equal, you use the same yield curve over here and the same price – you would end up with a higher OAS and a higher duration on average.

**Hank Stern:** Just to dovetail on Kevin's explanation, the 14 [*volatility*] historically, before everything got into volatility, was pretty normal on an average basis. If you really want to see what the VOLs are, you can go if you have a Bloomberg, to the USSW page and it will show you the VOLs from one to five years. And that is where Kevin's slide on 84 showing a 41 – industry standard. In all fairness to the brokers so everyone is speaking apples, the standard seems to be 14 that all of them use. Just be aware as a buyer that that is not the true volatility out there right now in the market. But the markets do change.

**Robert Berry:** All right. Well, we don't have any other questions.

**Slide 93 – Public Investment Webinar Series: The Public Investment Portfolio (1:44:59)**

**Robert Berry:** Before we close, I would like to draw your attention to the remaining slate of webinars in the investment series. We hope that you will be able to join us for a few if not all of them if your summer schedule allows. The agendas and the registration instructions for each of these upcoming webinars are posted to the CDIAC website. In closing, on behalf of CDIAC, I would like to thank Hank Stern, Rick Phillips and Kevin Webb for the dedication of their time and expertise to making this program a great success. And a big thank you to our CDIAC education team, Linda Louie, Susan Mills and Sandra Kent, for their hard work in producing this webinar. So with that, thank you to everyone for participating and we look forward to hearing and working with you next week for our third in the series on municipals next Wednesday. Thank you.