TRANSCRIPT

Understanding options pricing

Edward Modla: Welcome everyone, thank you for joining us. These are certainly stressful times for a lot of people in different ways, whether that's personal or professional, but we're trying to manage our way through the health risks, and certainly the financial impact that the current environment has thrown upon us. In this session here, going to try and push things a little bit further with respect to core concepts of options and discuss pricing factors. And once you have that foundation of knowledge and the absolute core concepts, digging in a little deeper into pricing is very important.

And when you buy or sell an option, just like any other investment, there's a price attached to that, the buyer's paying something, the seller is receiving something of value, and understanding where those prices come from and what the different factors are that determine that price is very important, it helps you understand the price you're seeing today that you're either paying or receiving, and it also, just as importantly, helps you understand and feel comfortable with changes in the price of an options contract over time, as different market forces will evolve, and the variables change that affect pricing. And having a full grasp of that is going to help investors feel comfortable with

the decision they're making and feel much more at ease with what they see in their account as they have open positions.

Here's our disclaimer, options are a complex tool, you do have to review the options disclosure document, which is called the characteristics and risks of standardized options. You have to verify that you've reviewed that before getting approval to trade options in a live account. You can contact your Fidelity broker to get a copy of that document.

Here's our outline, starting with what makes the price of an option and where does it come from before moving into some of the details, definitions regarding theta and time decay, also implied volatility, I'll compare that to historic volatility, and then a concept that I like to describe and refer to as historic implied volatility, I'll define what that is.

And then I'll wrap up walking through once again the four outright positions, for those of you who were with us in session one, this will be refreshing the concepts discussed there with the four outright positions, a little bit redundant, but that's a good thing, and that's by design. I consider myself still a student of options in 23 years plus in the business, I'm always learning something new, but also as a teacher and as an instructor, repetition is a good

thing. As someone who's learning the product, if you understand the explanations and the presentation that you are given, just understand the way it's being explained, that's the first step. Once you reach that point, you know, certainly being able to remember the concepts or repeat them is a different story. But getting to that further, more advanced level, is a function of repetition, hearing, and seeing, and studying, over and over again, hearing it presented to you in different ways, that redundancy is going to lead to your inherent and instinctual knowledge of the product.

So, let's start with what makes prices and where do they come from? Ultimately, this is a tradeable product on an exchange, and the prices come from supply and demand. Every market participant, no matter who you are, you, me, an advisor, a trading group, an institution, a bank, whoever it is, anybody putting in bids and offers constantly drive the price of options up and down, just the same way stocks trade. If there are more buyers than sellers, prices go up, if there are more sellers than buyers, prices go down. The market is constantly fluctuating, trying to find that level of equilibrium where there is no trading, market's moving up and down to find that level where the buyers and sellers are comfortable and there is not an executed trade. And that's ultimately what the option is worth, it comes from the marketplace. There are pricing models, that can help forecast what you think an option

should be worth, given certain inputs. You can forecast future values of what an option might be worth. Again, given changes in the variables that we're going to walk through today. But ultimately, no matter what forecast you come up with, or what results the option pricing models give you, the worth of an option is what buyers are willing to pay, and where sellers are willing to sell. And that is ultimately what it is worth.

So let's now take that concept, now we know prices come from the marketplace, and they're driven by buyers and sellers, supply and demand, the basic concept, first of all, option buyers pay premium and that is a nonrefundable cost upfront, option sellers receive premium upfront, that's a cash credit to their account, nonrefundable. Now most often option buyers and sellers trade back the contracts to close and let me explain that. It's an option myth that exists that many instructors, or maybe even some investors have come to me and said well look, I've heard that most options expire worthless, that 80 percent, 85 percent of all options that are traded expire worthless. It's not the case, it's a myth. You buy an option contract to open a new position, you of course can then sell that contract to close the position prior to expiration. Similarly, if you sell a contract to open, you can buy it back to close the position prior to reaching expiration, and in fact, that closing transaction occurs, the vast majority of the time, about 70 percent of all open

contracts are closed before ever reaching expiration. The profitability of those contracts is impossible to determine, because the industry does not know the price points of the opening and closing transactions. The industry also doesn't know what was the motivation of the opening transaction in the first place. Was it speculative, was it hedging another position? So, profitability is impossible to determine in that case. The point is about 70 percent of contracts are closed before ever reaching expiration. Of the remaining 30 percent, the vast majority expire worthless. That's where the myth comes from. The myth ignores all of the closing transactions and just focused on the options that are actually held through expiration, to close out those numbers, out of all contracts that are open, about 70 percent are closed before they reach expiration. Another 20 percent or so expire worthless, and another 10 percent roughly are exercised, and that's how the numbers break down.

Premium amounts are quoted on a per share basis, and I will break this apart as we go through examples, and discuss concepts, it's an options trading for $3, and it's quoted at a $3 price point. That's on a per share basis, each standard contract is written on 100 shares, so $3 would actually equate to 300 total dollars, excluding commission. And I want to break apart $3 and look at it in its most simple format, which is in two different pieces.

Here you have intrinsic value and time value. This the most simple formula you can use to analyze the options premium amount, it consists of these two pieces. So, what is intrinsic value? Well it's really simple arithmetic, intrinsic value is the in the money amount. Here's the definition for that. An option is in the money if the buyer of the contract owns the right to execute a stock transaction at a better price than the current open market is currently providing. An example will clear that up, if the stock is trading at $75 a share, and the investor is looking at a call option with a strike price of 70. The buyer of the call option has the right to purchase stock at 70, it's already trading at 75, you would expect to at least pay $5 for this options contract, because it's in the money, and it's in the money by $5. Conversely, if the strike price was 80, the buyer of the call option has the right to buy shares at 80. Well that's a worse price than they can get in the open market, so the intrinsic value is zero, there is no in the money amount. You can do this calculation rather quickly, and as you see, as I walk through it, it's important to be able to make that quick arithmetic computation when you're looking at option premium amounts. So that's intrinsic value.

Time value is anything in excess of intrinsic value, back to my example, stock at 75, if the 70 strike call is trading for $6, you know right away $5 of that amount is intrinsic value, and the remaining $1 is time value. The time value's purpose

is to account for future stock prices looking forward. Options are not a backward-looking tool, options look forward into the future to try and evaluate a range, or a possibility for future stock prices, and then the price of the option is derived from there. Now once you reach expiration date, there is no more time remaining, and the option will only have its intrinsic value.

Putting these two pieces together into more of a symbolic visual, here you have option premium represented by the full triangle, just focusing on the left side, the intrinsic value, you can see there's two pieces here. The stock price and the strike price. Now what you'll notice is the strike price, of course that's constantly know what option we're looking at, and that's not going to change. The stock price does. So intrinsic value is influenced by changes in the stock price. Over on the right side of this graph, time value is influenced by a number of different factors. The days to expiration is constantly changing, so that will change and adjust from one day to the next.

Volatility's also changing. This is the guarded or considered to be the great unknown, nobody knows what volatility is or should be in the future, that's an hour from now, a day from now, a week from now, and that is constantly changing, the market, as micro or macroeconomic factors come into play, the market is constantly looking for the appropriate level of volatility, and it's

certainly a considerable variable in the time value. Now we have interest rates and dividends, but we'll speak to the future value of the dollar amount of the current stock price. Interest rates moving forward will have an effect on future value of -- the future value of today's money, and so do dividends, you know, when a company pays a dividend, their stock price will be reduced by the dividend amount, and that can change, or expectations of that can also change in our current environment. This is a little more magnified as the market is pricing in the expectation or the possibility of reduced dividends moving forward. So here you have intrinsic and time, you have stock price influencing intrinsic, and then you have a number of variables affecting time value.

Let's not confuse time value with time decay, and that's what I want to get to now. Time value is also known as the extrinsic value of an option, and that is the portion of option premium that decays over time. So, let's define this in terms of theta. Theta is the Greek which will indicate, in numeric terms, how much the expected decrease in option premium is from one day to the next. It's expressed in decimal form, and it's very simple, most theta numbers represent the cash amount from one day to the next, and that's a calendar day, not trading day. So it is true that over weekends and holidays, several days of decay that does come out of an options price, but it's not so easy, or

it's not, as some investors might say, sell options on Friday, and get three days of decay, it's not quite that simple, and I'll explain that.

The industry forecasts the possibility of three days of decay coming out of an options contract, going into a weekend. So professional traders will look at that and adjust their prices accordingly. From personal experience, I used to, on the trading floors, and as a professional market maker, look forward to, or look ahead, I should say, to Monday while I was trading on Friday afternoon, and use prices that were more reflective with Monday's days till expiration. Also, it's worth saying, if you sell options on Friday, you really are taking an extra added risk over the weekend, because a lot more can happen around the world over a weekend than just over a day. We do see Monday morning sometimes markets open up with big changes.

Let's look at time decay a little bit differently on the next slide. And here you see the graph of the expected decay of an option, specifically at the money options, and when that decay starts to accelerate. Now that arrow is pointing roughly at the 35 to 40 days out until expiration mark, if you're buying or selling options, you would want to be aware of that, and be familiar with what that timeframe is. Then you can make a decision for yourself what's the appropriate time or length until expiration to buy or sell your options contract?

But I want to move forward into volatility, because it's so important to define and understand what volatility is as you trade options. So, let's look at a few definitions.

First, historic volatility, this is backwards looking. Price movements of the stock in the past, factual, measurable, quantifiable, and you can choose what range of dates or timeframe you're looking at with respect to historic volatility. A 30-day historic, maybe a 90-day historic, you can choose for yourself what range you want to evaluate. Implied volatility looks forward, and is the volatility used to justify the open market price of an options contract. Now I said in the outline that there is a such thing, or a concept, as historic implied. Let me explain that.

If you put these two together, historic is looking back, implied is looking forward, but you can also extract an analysis looking backwards at the historic levels of implied volatility and comparing them to today's level. And when you do that, you might be able to get a sense for where today's levels are compared to where they had been in the past. This is how investors who use volatility as a measure to get market analysis and to form an opinion will use implied volatility. Most investors are not going to move towards that level of complexity, and will just simply understand what implied volatility is, and what

it means to the price of their contract. It is important when you buy or sell an option to at least know what that level is. And you can find it on your trading platform, make a note of it, and know when you buy or sell, where is it, and then track it over time, it will help you understand changes in the option price.

Here's a graph looking back again, just representing what we just did, historic volatility, implied volatility, they're looking backwards at factual information with historic volatility, that's what the stock has already done, looking forward with implied volatility is the option market's expectation for future movements in the stock, and that helps derive what the option price is. Now again, we're going to do a little redundancy from session one, and that's just walk through the four outright positions, buying and selling calls and puts, first with call buying, this is a bullish position, you can see that from the blue solid line, if the market moves higher and stock prices move higher, this position should increase in value. See the stock at 60? If we bought shares there, profit and loss is right there at the 60 level, but buying the option is a little bit different. If we pay $3 for the options contract, we need movement in our favor. Now this is a negative when comparing buying stock to buying a call, certainly we have more risk control here with buying a call, less capital expense, less risk, but we do need a movement in our favor, not just the direction of the move, but the

magnitude and the timeliness of the move needs to be favorable in order to be profitable.

So that's buying a call option, let's also review buying a put. And here you have stock at 36, if you're bearish here, now most investors are not going to be shorting shares of stock, they may not even have approval for that. An alternative to shorting stock, and having a short delta position, is to buy a put option and potentially capitalize on moves lower in the stock price by buying a put. Remember, we own the put option, we own the right to sell shares at the strike, in this case that's 35, so as the stock drops, we should have a positive influence on our position as the stock price moves lower. So, there's buying calls and buying puts, let's look at selling calls. Now this is selling calls outright. This is likely, arguably the most risky trade in the options space that an investor can do, it's likely a trade that most investors will not make, because of its unlimited loss exposure. However, it's important just to understand that, as you look at the four outright positions, understanding what it means to sell a call, you receive premium upfront, that's $3 in this case, and now you're under the obligation to sell shares at 60, if the stock moves up, your loss is unlimited. But you see the underlying statement on the bottom, selling calls is very popular. It's a very common strategy, but not as an outright position, instead it is frequently used in conjunction with having a long stock position, the risk-

reward with the covered call is substantially different, and shifts the risk profile from a high-risk to a relatively low-risk position, and that would mean owning the shares, selling a call option, receiving premium, lowering your cost basis, and now being under the obligation to deliver shares of stock at the strike price.

That's selling calls, and then selling puts, most often used in the cash-secured variety. Here stock's trading 50, you might be interested in going long this stock, because you're long-term bullish, but 50 is not the level that you want to get in at. So, in our example here, if you're looking to get into this trade in the mid to low forties, you can sell the 45 put for $2, receive that $2 immediately. Now if the stock rallies, looking at the graph on the blue solid line, if the stock rallies and stays above 45, well you just simply profited your $2 as the option expired worthless. You don't get to capitalize on the upside move, but you at least made something, and of course in that case, your analysis was wrong, the stock did not retreat down into the forties. If that does happen, and the stock sells off, then you are under the obligation to buy shares at 45, it's assigned, you will be doing so, you'll own shares, you were paid $2 upfront, so your break even now is 43, and now you have a long stock position to manage.

There's the four outrights, along with some description of pricing, of time decay, of volatility, and some insight into each. Now John, I know you want to pull up the platform and take a look at some of these concepts with respect to what investors will see, how they can get this information, and then how they can utilize it from there. So, take it away, John.

John Deyeso: Thanks a lot Ed, appreciate it. Excellent, so what we want to do is build upon the topics that Ed was talking about and show you where you can see some of these metrics in real-time for stocks or indices that you're following. So what I'd like to do is take you folks through our implied volatility and historical volatility charts, and then additionally I will show you how to use our profit and loss calculator to model changes, how does time decay affect an option, changes in volatility, changes in price. So, let's first start with the implied volatility and historical volatility grids.

So, I'm back on Active Trader Pro, it's Fidelity's trading software, it can be downloaded to a Mac or a PC. You can see the numbers changing in real-time, great to see some green numbers today. And what it allows you to do is customize the view of your accounts in the markets and allow you to interact with your portfolio. We do have a tab dedicated to options here, so what I'm going to do is go from options down to option research, and then IV Index.

And what I'll be doing is I'll be pulling up the implied volatility index on a particular stock, in this case I'll use Tesla Motors. A little-known company, I think they make cars that don't require gas or something like that. And so, what we're going to do here is we're going to take a look at where is implied volatility and historical volatility now compared to where it's been in the past? So, if we scroll down on the page, what we'll see is an implied volatility index grid showing different timeframes and current IV index for calls and for puts, where it was one week ago, where it was one month ago. Continuing down, we see the same information for historical volatility. Where it was one week ago, one month ago, 52-week high and low, things like that.

I think one of the more useful items on here though is this volatility chart. And what we have here, forgive me I'm colorblind, so I'm just going to say the lighter shaded line and the darker shaded line. The lighter shaded line here, I believe it's yellow, is showing you implied volatility. And Ed brought up a good point. It's nice to know where implied volatility is now, but where is it now compared to where it's been? And the darker shaded line here, I believe it's blue, is showing you historical volatility. I like to think of volatility, implied and historical, like the weather. Historical volatility would be like me saying -- I'm here in Philadelphia today, I'm sorry to report it's not sunny in Philadelphia today. Historical volatility, from a weather perspective, would be saying

historically, on March 25th, the weather is somewhere between 30 and 35 degrees Fahrenheit.

Implied volatility was when I looked at the weather report last evening for today, and it told me it's likely to be 45 degrees out with overcast today. That's your difference between historical and implied volatility. This chart's showing you, and you probably guessed what the chart was going to show before we pull it up, that the implied volatility has moved up quite a bit here, hasn't it, from February to March. And what you'll see over time, even before we had this strong period of volatility, is that there -- it's never constant, okay? So, it's rising, it's falling, it's rising, it's falling.

There are a lot of different events that can change the implied volatility on these options, things like a binary event like earnings announcements is a common one, right? It's an uncertain, unknown element to the markets, and the earnings announcement comes out, now there's a known element, now the volatility may back off from there. Might have big news announcements, mergers and acquisitions, things like that, that spike volatility. So, this is where you can go to chart that out and understand if it's a volatility rich environment that you're buying or selling into, or a low volatility environment. And that

might dictate what type of strategies you lean on. Some do better in low volatility environments, some do better in high volatility environments.

Next up, I'm going to go back to the trading software here, I want to show everybody how to use the profit and loss calculator and go through an example of an option contract changing value over time, based upon different elements. So, if you went to the options menu again, and this time we went to profit and loss calculator, I actually already have it pulled up here on Tesla. So, we'll stick with Tesla. Tesla reports earnings in the middle of April, I believe it's April 22nd. Given what we know now, and we think about the options strategies that Ed's outlined so far, we could maybe go through an example here. Let's say we wanted to model a position, and let's just hypothetically say that we were, had a bullish outlook on the underlying security, and to express that, given the foundational strategies we talked about so far, we wanted to buy a call contract.

Let's simulate that. In the bottom right here, you can see you could add simulated position, I'm going to go ahead and do that. The action is buy to open, okay? Because we're buying a call contract, and it is our opening transaction. I'll just do a quantity of one, so we're going to buy one contract. I said the announcement was in the middle of April, so maybe I'll go to, you

know, the early part of May as an expiration, just so that kind of encompasses that timeframe. You can see in the top right, it's kind of shaded out now, but it's giving me the quote on Tesla now. It's $546.27 in the market.

So, I'm going to select my strike price from the dropdown menu. Maybe I think it's going to reach $580 by that timeframe. And I select call or put, I'll select call. Now the eval price is filling in for me automatically. You could change that if you'd like, but it's just moving in the current market what's the pricing on it and giving you an evaluation price to go off of. So, I'll just apply. And you can see, we get one of these fancy diagrams, and in real-time now, that has been showing on the slide so far today, on the different strategies. What you have on the bottom is price changes, so 275 all the way to 775, you have the theoretical change in the price of that option contract, the different dates with these lines in the middle of the chart. And then theoretical profit and loss on your top to bottom axis there.

Now at the bottom, you can see here the strategy, it's a May 15, 2020 580 call. We simulated a quantity of one, here's the current bid and ask, here's the evaluation price. Theo price, theoretical price, I want everybody to keep their eyes on this field right here. I'm going to do some magic tricks here for you. So, it's currently at 75.85, okay? Let's do this. In the top left, you can change

price evaluation, or the date you're evaluating. Right now, it's evaluating today's date. Watch what happens to that theoretical price as I change the date, I'm not going to change any other components, I'm not going to change the price, I'm not going to change volatility. I'm just going to change the time component. And I'm going to go out a few weeks into April. Look what happened to the theoretical price, it dropped. Why on Earth would the price drop when we go from March to April, and nothing else changed? Well, Ed walked us through that. Time decay, theta. If I buy an option contract, think of it this way. I'm swimming against the current, every day I've got to outswim the current, because it's going to whittle away and decay the premium value. That's not to say the contract can't profit, it needs to move though. So that time decay is a big element to watch as we buy option contracts. I'm going to hit the reset button.

Now, we're back to that theoretical price being around $74. Well let's not touch anything, I always like to say all things being equal, because it never is the case, but I can say that when we're going through examples like this. So, all things being equal, let me go ahead and just make a slight adjustment to implied volatility. Let's say that implied volatility increased 20 percent. Keep an eye on that theoretical price again. All of the sudden now, it's moved to 92. Well wait a minute, time didn't move, price didn't move, all you did was

increase a little volatility, and your option contract changed in value? Of course, it did. There's an element called vega which is going to change the options price based upon changes in implied volatility. So that pricing component has to reflect the changes in implied volatility taking place in the marketplace.

Let's go the other direction. I'm going to hit reset. Give it a moment to reset. And I'm going to put in negative 15 percent. Watch what happens to the theoretical price again. Down to 62. If I buy an option contract, I'm long volatility. If volatility goes down after I buy, all else being equal, that's going to hurt the position, the premium's going to go down. We'll reset one more time, and what I want to do is model a few different things. I want to model the price going from 548 to $625, let's say, theoretically. And let's say that happens by the second week in April. What happens to the price? You could see the price has gone from the low 70s to 104. So, the price movement has outswam that current of that time decay. And let's say during that period that we're moving closer to earnings, maybe the volatility increased 10 percent, okay? So now it even increased further for my position. That's how you could use this tool to add a theoretical position on, map the changes based upon price, time, and volatility, and see how it would affect a real-world example here.

END OF AUDIO FILE

Options trading entails significant risk and is not appropriate for all investors. Certain complex options strategies carry additional risk. Before trading options, contact Fidelity Investments by calling 800-544-5115 to receive a copy of *Characteristics and Risks of Standardized Options*. Supporting documentation for any claims, if applicable, will be furnished upon request.

Greeks are mathematical calculations used to determine the effect of various factors on options.

There are additional costs associated with option strategies that call for multiple purchases and sales of options, such as spreads, straddles, and collars, as compared with a single option trade.

Any screenshots, charts, or company trading symbols mentioned are provided for illustrative purposes only and should not be considered an offer to sell, a solicitation of an offer to buy, or a recommendation for the security.

924685.1.0