



TERMS

- **2s10s spread:** The 2s10s spread is the difference between the 10-year yield and the 2-year yield. This spread is commonly used in the market as the main indicator of the steepness of the yield curve.
- **Yield Curve:** The yield curve is a visual representation of yields across a variety of different maturities. Under normal circumstances, the shape is upward, meaning that short-term rates are often lower than long-term rates.
- **Spot rate:** A rate or yield on a transaction that will start today. For example, the 10y USD swap rate is the fixed rate that one can pay fixed in exchange for a floating rate for ten years.
- **Forward rate:** A forward rate is the rate that can be locked in today for a transaction that will only start in the future. Additionally, the forward is the market's implied estimate of where interest rates are expected to be in the future. For example, a 1y10y rate is the rate that can be locked in today for a 10y swap that will only start to exchange cashflows in one year time, for ten years.
- **Backwardation:** Market environment where the price for a certain asset is downward sloping over time. Meaning that the current price of the asset in the spot market is higher than if we buy the same asset for delivery in the future. Generally, means that the demand for the asset is expected to be lower in the future.
- **Contango:** It is opposite of backwardation. It is the market environment where the price for a certain asset is upward sloping over time. That means that the price of the asset today is lower than buying it today for delivery in the future.
- **Repo and reverse repo:** are essentially short-dated loans with collateral as a guarantee for the loan. It requires one party needing cash and the other willing to lend cash.
 - **Repo:** A repo is short for repurchase agreement. A repo used when an investor has an asset but needs cash or need to borrow cash. This investor will sell its asset with a promise to buy it back the following day (week or month, depending on the term of the repo contract) at a pre-determined price. A repo is used when an investor's goal to raise cash without losing the performance of the underlying asset. It is commonly used as a form of leverage as the investor can buy an asset with money borrowed using the repo contract giving the asset as a guarantee.
 - **Reverse Repo:** In a reverse repo, market participants lend cash to the Fed at the current rate of 2.3%, in exchange for Treasuries or other government securities, with a promise to buy them back.
- **IORB:** The Federal Reserve pays interest on balances maintained by eligible institutions at Federal Reserve Banks. The rate paid is the IORB rate, or interest on reserve balances rate.



- **SOMA:** The Federal Reserve's System Open Market Account (SOMA) contains dollar-denominated assets acquired through open market operations. <https://www.newyorkfed.org/markets/soma-holdings>
- **QE:** Quantitative Easing: During the financial crisis, the Fed bought treasury bonds in the market. The goal was to take assets away from investors and to put more cash into the economy. QE ended from the perspective of buying new securities to increase their balance sheet.
- **QT:** Quantitative tightening: During the financial crisis, the Fed bought treasury bonds in the market. The goal was to take assets away from investors and to put more cash into the economy. QE ended from the perspective of buying new securities to increase their balance sheet. However, as mortgages and treasuries mature, the Fed is still buying to keep the level of balance sheet. Note that their QT reduction of balance sheet has caps. A cap is the dollar amount that the balance sheet will be reduced per month on both treasuries and mortgages. They only let the amount of the caps go down per month. If more than the cap matures / gets prepaid on a month, the NY Fed goes to the market and buy more. So, they will technically be buying for a long time in a way that the balance sheet is reduced in a predictable fashion.
<https://www.newyorkfed.org/markets/desk-operations/ambbs>
<https://www.newyorkfed.org/markets/desk-operations/treasury-securities>
- **Duration:** Duration is a measurement of the sensitivity of the price of a bond or any fixed income instrument to changes in interest rates. In general, the higher the duration, the more a bond's price will drop as interest rates rise. Any bond is long duration. It's the bond's sensitivity to a 1bps move in interest rates. Even short duration is long. It's potentially a misnamed strategy... it should be called less long, all bonds are long duration.
- **Convexity:** As interest rates drop, bond prices will rise and vice versa. The extent of the move is typically larger for bonds with a longer time to maturity. That relationship is known as duration. The change in the price and interest rate, or yield, of a bond isn't linear.

If you chart it with prices on one axis and interest rates on the other, you end up with a line showing the curvature in the relationship -- convexity. The higher the convexity, the quicker prices will rise as interest rates fall, and the opposite is true.

The Greeks & Derivative Terms

Derivatives: Warren Buffet made a famous quip that derivatives are financial weapons of mass destruction. Certainly, they can be, and they have been so on more than one occasion. He made this comment back in 2002, so he was right about that, as he has been right about many other things over many decades. But his statement was too broad, grouping together both the risks of derivatives as well as the beneficial ones. The word "derivative" covers a tremendous range of products. So-called Delta 1 derivatives have linear payoffs that are symmetrical. Examples of these products include futures, forwards, swaps, and credit default swaps.



There are two main types of derivatives:

- Linear Derivatives (aka “Delta-One” derivatives)
- Non-Linear Derivatives, or Options
 - **Linear Derivatives** (aka “Delta-One” derivatives) which include all swaps such as Total Return Swaps (equities/indices), Credit Default Swaps (credit); and any type of Futures Contracts or Forwards. A linear derivative (Delta-One) is one whose payoff is a linear function. The upside and downside are unlimited and symmetric returns (make \$1, lose \$1 for example). Linear derivatives could expose investors to future unknown liability given funding needs.

Delta 1 derivatives are very similar to buying an asset, such as a bond, outright. If the asset rises one dollar, an investor in a delta 1 derivative makes one dollar, and if the asset falls one dollar, the investor loses a dollar.

Though seemingly innocuous and simple sounding, the danger of delta 1 derivatives is that they facilitate leverage, sometimes in tremendous amounts. Owning a delta 1 derivative may have the same payoff as owning the underlying asset, but unlike actually buying the asset, the buyer of a derivative does not have to pay for it up front.

Take as an example someone who has \$100 to invest and buys a share of a non-dividend-paying stock for \$100. The buyer pays someone \$100 and receives her stock. Since the buyer has fully paid for the stock, if the stock rises, falls, or bounces around, she neither owes nor receives any cash. Only when she decides to sell the stock does money change hands again.

A delta 1 derivative is entirely different. A buyer of a delta 1 derivative may not have to pay any money at all when she trades it initially. But, each day, if the stock rises, she receives money from her counterparty, and if the stock falls, she must pay his counterparty. Additionally, since she did not have to pay anything up front, she is not limited by the \$100 she has to invest. Even though the stock trades for \$100, nothing stops her from buying two delta 1 derivatives. Or five. Or twenty! If she buys twenty, then if the stock rises by just \$5 to \$105, she makes twenty times that amount and doubles her money. But if the stock falls by the same amount, to \$95, she loses twenty times that amount and has her entire \$100 investment wiped out and she could be forced to sell the derivative. Even if the stock later rises back above \$95, she does not have the opportunity to recoup her losses.

Clearly, these seemingly simplistic types of derivatives can be very destructive to people who don't understand their full risks. Which leads us back to Mr. Buffet's original quote. Are derivatives really the infamous "financial weapons of mass destruction?"

- **Non-Linear Derivatives** (aka “Less than Delta-One” derivatives) which include all options. With vanilla options, a premium is paid by the option purchaser to acquire a right, but not an obligation, to buy or sell a specified item at a specified price at some specified point in the future. It's the right to buy or sell an underlying for a fixed price, or strike price, at or up to a fixed point in time. The maximum that the buyer of an option



can lose is limited by the premium paid at inception. And there is typically no funding risk beyond the premium that is paid initially. Buyers of options pay a fixed, up front amount for this right, which they do not get back irrespective of whether they exercise the option or not.

- Call options are the right to buy the underlying instrument at the strike price
- Put options are the right to sell the underlying instrument at the strike price

Unlike delta 1 derivatives, non-linear derivatives—namely, options—can also be instruments that have convex payouts and provide locked in leverage, locked in borrow costs, volatility exposure, and downside limited to up front premiums. Although options, too, can be misused, when used correctly, options can lower—not raise—the risk in a portfolio. The owner of an option has the right—but not the obligation—to buy or sell an asset at a prespecified time and a prespecified price. An option that gives its owner the right to buy is called a call option, while an option that gives its holder the right to sell is called a put option. In exchange for this right, a person who buys an option pays a small up front premium to the option seller. The seller of the option gets to keep this money no matter what else happens.

A long option position can only lose the premium paid while the profit is potentially unlimited. The maximum gain from being short an option position is the premium collected, while the maximum loss is potentially unlimited.

- **Volatility:** VIX is a common metric used to measure the level of volatility in US equities. There are many types of volatilities across asset classes. VIX is just one type. Any market with an options market has to have a volatility market because volatility goes into pricing options. IVOL and BNDD access the US Interest Rate Volatility markets with the use of options on rates.
- **Skew and Term Structure:** Options on the same underlying and of the same tenor with different strikes will typically trade with different implied volatilities. Usually for most asset classes, out of the money puts and calls have higher implied volatilities than at the money calls and puts. This is known as the “smile,” due to the way an implied volatility vs. strike graph looks. Puts and calls on the same underlying with the same tenor and strike must trade at the same implied volatility (or there’s an arbitrage opportunity).
- **Delta:** Delta describes how much the current value of an option changes if the underlying rises \$1.
- **Gamma:** Gamma is an important measure of the convexity of a derivative or a bond. For options, gamma measures the rate of change in an option's delta per 1-point move in the underlying asset. For bonds, gamma measures the rate of change in the duration as interest rates move. Gamma defines the degree of asymmetry that an option will experiences at under the prevailing market condition. In the case of a vanilla call, for example, it answers the question of “How much more will this option rise if the underlying increases by \$1 than the option will fall in value if the underlying declines by \$1?” In general,



the closer to “at -the-money” an option is, the more gamma it has In general, the longer dated an option is, the less gamma.

Gamma describes the expected asymmetry of an option or a portfolio of options. Gamma is therefore important, as it indicates how quickly our position exposure will change as the market price of the underlying asset changes. When a portfolio is “long gamma” (as ours is) its exposure will become “longer” as the price of the underlying asset moves in the portfolio’s favor, and “shorter” as the underlying price moves against the portfolio, thereby intrinsically limiting losses.

- **Theta:** Theta defines the amount of time decay an option is experiencing. It is a similar concept to carry, but more complicated to calculate for options. It answers the question, “If ‘nothing happens’ in the market for the next 24 hours, what will be the change in the value of this option?” Theta is always negative when one purchases vanilla options, but typically a “higher theta” refers to a “more negative” number, meaning more decay. In general, the closer to the money an option is, the higher (i.e., more negative) is its theta. In general, the longer dated an option is, the lower (i.e., less negative) is its theta.
- **Vega:** Vega defines how much the value of an option will change if implied volatility increases by 1 percent (or by “1 vol”). When one says that they are “long vol,” that means vega is positive In general, the closer to “at-the-money” an option is, the more vega it has In general, the longer dated an option is, the more vega it has.
- **Long Volatility:** Whenever you buy an option, you are long volatility.
- **Short Volatility:** Whenever you sell an option, you are short volatility.

Options-Related Risks

The following summarizes certain options-related strategies and the risks associated therewith:

- **Buying Call:** If at expiration the underlying asset finishes below the strike price, the risk to the investor is losing the entire premium paid. The call is profitable if at expiration the underlying finishes above the strike price plus the premium paid for the call.
- **Buying Call Spread:** Buying a call spread is buying a call and selling a call with a higher strike that has the same underlying and expiration. If at expiration the underlying finishes below the lower strike price, the risk to the investor is losing the entire premium paid for the spread. The call spread is profitable if at expiration the underlying finishes above the lower strike price plus the premium paid for the call spread. The call spread’s maximum payout occurs when the underlying finishes at the higher struck call at expiration.



- **Buying Put:** If at expiration the underlying finishes above the strike price, the risk to the investor is losing the entire premium paid. The put is profitable if at expiration the underlying finishes below the strike price minus the premium paid for the put.
- **Buying Put Spread:** Buying a put spread is buying a put and selling a put with a lower strike that has the same underlying and expiration. If at expiration the underlying finishes above the higher strike priced put, the risk to the investor is losing the entire premium paid for the spread. The put spread is profitable if at expiration the underlying finishes below the higher strike price minus the premium paid for the put spread. The put spread's maximum payout occurs when the underlying finishes at the lower struck put at expiration.
- **Buying Straddle:** Buying a straddle is buying a call and buying a put with the same underlying, strike and expiration. If at expiration the underlying finishes at the strike price, the maximum loss occurs of the total premium paid. The straddle is profitable if at expiration the underlying finishes above the strike plus the total premium paid or below the strike price minus the total premium paid.
- **Selling Call (Naked):** The short call is profitable if at expiration the underlying finishes below the strike price plus the premium collected for the call. Investors who sell uncovered call options have exposure on the upside that is theoretically unlimited.
- **Selling Call (Covered):** If at expiration the underlying asset finishes below the strike price, the investor profits on the premium collected from the call sale which may help enhance returns or offset losses on the underlying asset. If at expiration the underlying finishes above the strike price, the risk to the investor is limiting their upside profit on long underlying to strike price plus premium collected for the call. The investor remains exposed to the downside of the underlying asset in the return.
- **Selling Call Spread:** Selling a call spread is selling a call and buying a call with a higher strike that has the same underlying and expiration. If at expiration the underlying finishes above the lower strike price, the risk to the investor is losing the entire premium collected for the sale, with a maximum loss of the difference between the strikes minus the premium collected. The call spread is profitable if at expiration the underlying finishes below the lower strike price plus the premium collected for the call spread. The call spread sale's maximum payout occurs when the underlying finishes at the lower struck call at expiration. By selling a covered call spread, the investor remains exposed to the downside of the underlying asset and gives up the spread between the two call strikes should the underlying asset rally.
- **Selling Put:** Investors who sell put options will own the underlying asset if the asset's price falls below the strike price of the put option. Investors, therefore, will be exposed to any decline in the underlying asset's price below the strike potentially to zero, and they will not participate in any price appreciation in the underlying asset if the option expires unexercised.
- **Selling Put Spread:** Selling a put spread is selling a put and buying a put with a lower strike that has the same underlying and expiration. If at expiration the underlying finishes below the higher strike priced put, the risk to the investor is losing the entire premium collected for the sale of the spread, with a



maximum loss of the difference between the strikes minus the premium collected. The put spread is profitable if at expiration the underlying finishes above the higher strike price minus the premium collected for the put spread. The put spread's maximum payout occurs when the underlying finishes at the higher struck put at expiration. The seller remains exposed to the downside of the underlying asset.

- **Selling Straddle:** Selling a straddle is selling a call and selling a put with the same underlying, strike and expiration. If at expiration the underlying finishes above the strike price plus the total premium collected or below the strike price minus the total premium collected, the maximum loss is unlimited. The straddle is most profitable if at expiration the underlying finishes at the strike price.
- **Butterfly Spread.** A butterfly spread consists of two spreads established simultaneously – one a bull spread and the other a bear spread. The resulting position is neutral, that is, the investor will profit if the underlying is stable. Butterfly spreads are established at a net debit. The maximum profit will occur at the middle strike price; the maximum loss is the net debit.

INDEX Definitions

The Agg: Bloomberg US Aggregate Bond Index ("Agg") is a broad-based benchmark that measures the investment grade, US dollar-denominated, fixed-rate taxable bond market. The index includes Treasuries, government-related and corporate securities, MBS (agency fixed-rate pass-throughs), ABS and CMBS (agency and non-agency). The Bloomberg Aggregate is widely regarded as the most common gauge for core fixed income and serves as the foundation for a wide range of investment products. Many investors utilize products tied to the Bloomberg US Aggregate Bond Index ("the AGG") for passive fixed income exposure. Important issues with the "AGG" investors should keep in mind:

- Roughly 30% of the AGG's holdings could be "short" volatility due to its large mortgage exposure¹. Homeowners are long the option to prepay, leaving mortgage investors short options/short vol.
- The AGG does not contain any inflation protected bonds (TIPS).
- As a result, Investors who rely on the Agg for the totality of their bond exposure have two significant gaps in their exposure.
- **Negative Convexity:** Most fixed income investors are only short convexity and short volatility from their exposure to US mortgages. For instance, roughly 1/3 of the Bloomberg Aggregate index ("the Agg") is made up of mortgage-backed bonds. Mortgages are inherently short volatility because of the US homeowners' ability to pre-pay their mortgages without penalty. Put another way, mortgages and MBS can be thought of as a bond coupled with a short position in an American option - meaning it can be exercised at any time
- **S&P 500:** The S&P 500® is widely regarded as the best single gauge of large-cap U.S. equities and serves as the foundation for a wide range of investment products. The index includes 500 leading companies and captures approximately 80% coverage of available market capitalization.



- **DOW Industrial Average:** The Dow Jones Industrial Average is a price-weighted average of 30 blue-chip stocks that are generally the leaders in their industry. It has been a widely followed indicator of the stock market since October 1, 1928.
- **STOXX Europe 600:** The STOXX Europe 600 Index is derived from the STOXX Europe Total Market Index (TMI) and is a subset of the STOXX Global 1800 Index. With a fixed number of 600 components, the STOXX Europe 600 Index represents large, mid and small capitalization companies across 17 countries of the European region.
- **FTSE 100:** The FTSE 100 Index is a capitalization-weighted index of the 100 most highly capitalized companies traded on the London Stock Exchange. The equities use an investable weighting in the index calculation. The index was developed with a base level of 1000 as of December 30, 1983.
- **MSCI Emerging Markets Index:** The MSCI EM (Emerging Markets) Index is a free-float weighted equity index that captures large and mid cap representation across Emerging Markets (EM) countries. The index covers approximately 85% of the free float-adjusted market capitalization in each country.