

FEATURE ARTICLE III



THE CASE OF THE UNLOVED THETA AND THE FAKE GREEK

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ALGORITHMS AND THE FIVE GREEKS

Investors and professional money managers need to be great sleuths in detecting potential investment thieves before they strike. The obscure concept and the unquestioned definition stand out as leading culprits behind some of the greatest financial heists. Algorithms and the Five Greeks are excellent examples of terms bandied about in finance but many do not understand the concepts embodied in the words. They are also fine examples of the dangers inherent in multiple meanings that, if not precisely defined, can cause costly confusion.

Defining algorithms and the Five Greeks (including what they are and how they work) will illuminate one's understanding of these terms, which should obliterate their obscurity. To do so, however, means starting at the beginning, which is agreeing on the best investment definition of an asset.

Question #1: What is an asset?

- a) An undercover human spy recruited by an intelligence or espionage agency.
- b) A freely exchangeable instrument representing a financial value.
- c) Aerothermodynamic elastic structural systems environmental tests.
- d) A useful or valuable quality.
- e) A British trade union for transport industry bosses.
- f) All of the above.
- g) None of the above.

All of the definitions given as the answer to this first question are correct. In fact, there are over thirty very different definitions of the word “asset” listed in a Google search of that term. The best investment definition is (b): A freely exchangeable instrument representing a financial value. Groups of these financial instruments (also called securities) that have similar characteristics are labeled an asset class.

CLUE #1 HOW TO APPREHEND AN INVESTMENT THIEF

Confirm the definitions of even the most basic phrases as investment words have many different meanings. Hesitations with the response are red flags showing that the person(s) is unclear themselves, has institutional rules limiting such dialogue, or that possible chicanery exists. The red flag might turn out to be a red herring (i.e., nothing of note) but it's always worth the look.

Everyone agrees that two of the primary asset classes are equities (the stocks of companies) and fixed income (the bonds or debts issued by firms or governments). Here—even at this basic level—definitional differences commence with some including real estate, commodities, cash equivalents, money markets, guarantees, intangibles such as patents and trademarks, and/or volatility as other major asset classes. Most of these asset classes are sold and bought globally, 24/7, and most have other products derived from their value—i.e., derivatives—also being sold and bought globally, 24/7. All of this buying and selling, all of this trading, is done on computers, which use algorithms to do their work.

ALGORITHMS: THEIR STRENGTHS AND WEAKNESSES

There is no “formal” definition of “algorithm” because not all parties can agree on one description. However, a plausible investment meaning is: an algorithm is a precise set of instructions understood by a computer that delivers a fast efficient high-quality process that specifies the moves—and the order of those moves—of the computer to find, decode, and handle supplied data reliably and correctly to effectively produce in a reasonable time an answer or solution at a specified place and in the requested format.

The basic strengths and weaknesses of algorithms shine forth clearly in this definition, namely:

Strengths:

- Speed.
- Constant reiteration of the same process without unexpected changes.
- Ability to solve complex equations with many factors and situational choices (i.e., if “x”, then do “y”; if “z”, then do “f”).

Weaknesses:

- Stupidity: computers perform algorithms exactly as programmed. All possible circumstances that may arise must be accounted for within the algorithm with clear computable instructions given as to the process to be followed. Any conditional steps must be listed in the correct order. The data provided must be accurate, applicable, and comprehensive.
- Human error: any decision making mistakes, lack of understanding of human nature or the relevant asset(s), process goofs, and/or varying degrees of common sense and intelligence will affect the efficacy of the answers algorithms provide.
- Inability to change: in stable environments algorithms perform better than in fast changing times because if the new variables are not in the algorithm along with the correct process to deal with the new situation, the answer the algorithm gives is not likely to be effective.

ALGORITHMIC TRADING

Algorithms employed on computers to decide the various aspects of trading orders such as the timing, pricing, and/or quantity size and release method when entering the trading order is called algorithmic trading. Algorithmic trading is used by almost all money management firms—both traditional and alternatives—in three ways:

- To divide up a large trade to enhance invisibility.
- To initiate orders based on information as it’s received even before a human trader reviews that data.
- To make and/or implement investment decisions in any investment strategy or asset class automatically.

Estimates exist that as high as 80% of all trades entered in 2008 were via algorithmic trading in some markets

and countries. In addition to the general strengths and weaknesses of algorithms already mentioned, there is concern that because these systems are so complex and since many firms use outside sources for their algorithmic trading platforms, that a system breakdown of one or more of those platforms could impact the overall market. The other topics of concern revolve around transparency and latency.

There are over fifteen different definitions on Google for the word transparency, which includes that it is a political party in Guatemala. The economic definition of transparency fits the algorithmic trading situation best, which is: a market or some asset in that market that much is known by many about. It’s quite similar to the physical sciences’ definition that says transparency is the state where an object can be seen through. Transparency of outside sources offering algorithmic trading platforms is where divergent perspectives occur.

Different traders have dissimilar uses for algorithmic trading and poles apart stances regarding transparency. One view is Rob Piton’s, who is the managing partner for Resonance Wave Absolute Return Fund, LLC, which is a long/short hedge fund using fundamentally based research with a private equity type approach. Piton computes his own entry and exit prices for each security he invests in/trades. He does not display those entry/exit prices until it’s time to execute. Piton avoids outside sources of algorithmic trading platforms (also known as “algo shops”) because of his concerns regarding their transparency.



“Think of trading as a game of poker,” says Piton. “When you send your order to an algo shop, you’ve potentially disowned your strategy, style, and models because all that information can be backed out of your data. The algo shop could be counting your hand along with every other client’s hand that places orders through them, extrapolating the market’s consensus. The algo shop’s goal might be to decipher which cards are being played (investment strategy) by which “chip stack” (investment fund/mutual fund/hedge fund) in order to use that information elsewhere.”

Because algorithmic trading moves faster (no human involved before action in many cases), companies are having to react to market events quicker and quicker in order to beat their competition capturing the profit before they respond. The amounts of money lost for every millisecond delay from when the data is received until the order is placed may be huge.

Question #2: What is “latency”?

- a) The average number of days between visits for visitors over their lifetime.
- b) The time or delay in a network that must be accommodated in the jitter buffers.
- c) The period when a virus has invaded a host but has not actively multiplied yet.
- d) A period between the initiation of something and the occurrence.
- e) The time it takes a data Packet to travel from source to destination.
- f) All of the above.
- g) None of the above.

Although (f) is the correct answer, in algorithmic trading the definition for latency that’s best is (d): A period between the initiation of something and the occurrence. Low latency—i.e., less delay—is the preferred state. Latency is a two-edged sword: to make more money, investment firms need to move faster and faster yet human beings tend to make more errors and systems tend to break down more often the faster they go. To make more money, investment firms are using more complex systems yet the more complexities exist the more humans are likely to err and systems to break down or not work as anticipated.



In contrast to Piton’s concern with transparency, Joan Rockey, CEO and Founder of Hadelrock Capital Management LLC, is more concerned with speed. Hadelrock is a hedge fund focusing on event-driven, special situation, and relative value absolute return strategies. Rockey uses fundamental analysis to determine short term equity and option arbitrage opportunities caused by corporate event, economic environment, or market mispricing.

Rockey says that she needs the speed of the lowest latency for her trades. “I use algorithmic programs in every aspect of trading—from supplementing idea generation using fundamental analysis to executing the

trades. Algorithms allow traders to utilize dark pools, upstairs trading, ECNs, and exchange floors to find liquidity and minimize market impact. In addition, algorithms allow event-driven hedge funds such as myself to successfully trade hard to implement or highly volatile spreads. **In the brisk world of trading, you need every edge you can get to generate alpha for your investors. Therefore, algorithmic trading is a must.**”

THE FIVE GREEKS

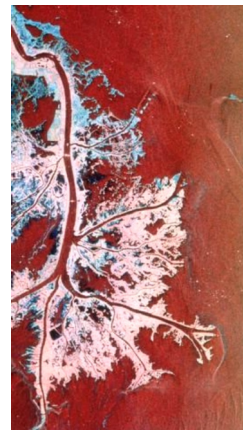
Rockey also uses the Five Greeks, which are:

- Delta
- Gamma
- Vega
- Theta
- Rho.

These Greeks provide her with important information regarding her position’s risks and potential rewards. Rob Piton uses them, too: “The Five Greeks are my dashboard. I use them for informational purposes to see where the market is and to gauge the sustainability of a rally. They can save you a lot of money even if you never trade an option or derivative.”

Because the Greeks are so important, each one of them will be explored next while also covering:

- why Theta is unloved
- who is the Fake Greek.



DELTA

Even though Google is correct that Delta is both “the fourth letter of the Greek alphabet” and “a low triangular area of alluvial deposits where a river divides before entering a larger body of water,” like the radar image of the Mississippi River Delta above, the best investment definition for “Delta” is not even mentioned on Google. InvestorWords.com has that one, namely that Delta is “the change in the price of a call option for

every one-point move in the price of the underlying security.” Now, what does that definition mean?

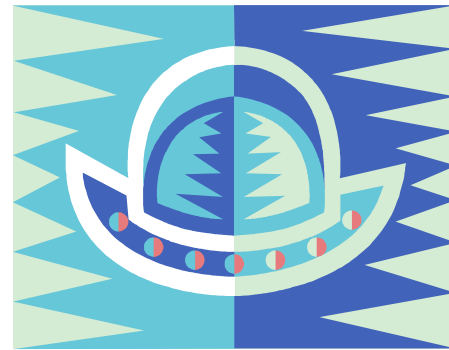
Options are derivatives. Google has five different definitions for the word “derivatives”: the best one for investment purposes is “a financial instrument whose value is based on (i.e., derived from) another security.” A security is a member of a group of financial instruments that have enough similar characteristics to label the group an asset class, like equities or fixed income. So one equity or stock would be a security or asset in the asset class named equities.

In most trading, to make a profit you have to correctly choose whether the security price will go up or down, by how much, and in what time frame. Then you have to add in the cost of commissions and margins to see if there will be any money left after making the trade. If you’re off on any one of these factors, you could lose...and by a large amount. The deck of cards is stacked against you.

To even those odds, rather than buying the actual security or asset, a trader is likely to buy a call option, which gives that person the right to buy that asset but not the obligation to buy it during a certain time period at an established price. Options may cost less money than buying a security. About 70% of the time they are actually cashed in: i.e., the trader turns in the call in exchange for the asset to the investor (also known as the writer) who offered to sell the asset to the trader for a fee. Then the trader can sell the asset at the price it’s going for, which will be higher than the price the trader paid for it or the call would not have been turned in (or “exercised”).

If the call is exercised, the trader makes money. If the call expires without being exercised, the trader loses less money than if that individual had bought the actual asset IF the decline is big enough and/or the trader didn’t pay too much for the option. The price that the trader could pay for a call option changes as the price or value of the asset goes up or down. How quickly that call price could change is important information for a trader to know because it provides information about how the market values that asset. For example, Delta could be telling the trader that the market is saying, “Yes, I value a yacht manufacturer...but if the economy tanks, then no, I don’t value a yacht manufacturer” or “Yes, I value a soap manufacturer and I always want the same amount of soap from that manufacturer no matter what state the economy is in.”

For traders like Joan Rockey where the opportunities change in a blink based upon volatile world events, Delta also helps her manage her risk and decide what positions she perhaps needs to hedge (i.e., to buy/sell another investment to reduce the risk of loss from price fluctuations in a transaction), especially since Delta does not always stay the same value—it’s not constant.



GAMMA

Question #3: What is “Gamma”?

- a) A measurement of how fast Delta changes.
- b) The third letter of the Greek alphabet.
- c) A unit of magnetic field strength equal to one-hundred-thousandth of an oersted.
- d) A Portuguese navigator who led an expedition around the Cape of Good Hope in 1497.
- e) The way brightness is distributed across the intensity spectrum by a monitor, printer, or scanner that may impact significantly the way colors are perceived.
- f) All of the above.
- g) None of the above.

Did you think that because of the illustration above of a Portuguese navigator’s helmet that the correct answer might be (d)? Well, you’re right...but not totally, as all of these Google definitions for the word “Gamma” are correct, which makes (f) again the right choice. However, the best investment definition for the word “Gamma” is (a): A measurement of how fast Delta changes. Because Delta isn’t constant, Gamma’s ability to accurately forecast what Delta’s value is likely to be is extremely helpful for traders like Rockey who count on the Greeks to manage and hedge away potential risk.

Another way that watching Gamma’s number is of value is in identifying what investment funds are more likely to blow up than others. According to Olivier Le Marois, the CEO of Riskdata, in a blog interview on 1/23/09 with Felix Salmon entitled *Using Software to Gauge Hedge Fund Risk*, many macro and commodity funds are buying (i.e., going long) when markets are going up so they have long-Gamma values. On the other hand, when markets are going down, many funds are selling (i.e., going short). Long-Gamma funds, says Le Marois, are safer places to have your money invested than short-Gamma funds.

CLUE #2 CATCHING A MANIPULATION

If a fund has a short Gamma, Le Marois encourages investors to investigate whether the fund is just selling out-of-the-money puts like MIT professor Andrew Lo’s Capital Decimation Partners maneuver.

VEGA

Question #4: What is Vega?

- a) One of the brightest stars in the sky, found in the constellation Lyra, which the Greeks thought formed the harp of Orpheus with Vega as its handle.
- b) A very unreliable car launched in 1971 by Chevrolet.
- c) A measure of the sensitivity of an option's price to the market's expectation of what the range of the price swings could be in the underlying asset.
- d) A prolific Spanish playwright who lived from 1562 to 1635.
- e) A Spanish surname that means "dweller in the meadow" or "one who lives on the plain."
- f) A loose translation of the Arabic word "Wega" meaning "falling", which sources translated as "falling eagle" or "swooping vulture" in ancient Egypt and India, respectively.
- g) The 25th letter of the Greek alphabet.
- h) All of the above.
- i) All but one of the above.
- j) None of the above.

The correct answer is (i) because Vega is not a member of any Greek alphabet! It's the fake Greek. As a component of the Five Greeks, the best definition for Vega is (c): A measure of the sensitivity of an option's price to the market's expectation of what the range of the price swings could be in the underlying asset.

For example, the market's expectation is that the yacht manufacturer's stock price should be a certain figure. The market, however, knows that more or fewer yachts are likely to be sold depending on what the state of the economy is. This same market has a stock price it's reached for the soap manufacturer but it also knows that people buy about the same amount of soap in good times and bad. In other words, the market's expectations of the price swing range for the yacht manufacturer is larger than what it expects the soap manufacturer's price swing range to be.

The market's expectations of what the range of the price swings could be in the underlying asset is a pretty good non-technical definition of the term "implied volatility." Therefore, the investment definition of Vega is also the amount that the price of an option changes compared to a 1% change in the implied volatility of the underlying asset.

Vega changes when there are large price movements in the underlying asset or when there are market expectations that there could be large price movements in the underlying asset. Vega also falls as the option gets closer to the end of its exercise period.

Robert Kimmel, Assistant Professor of Finance, Ohio State University, notes that the Greeks are calculated using the Black-Scholes option pricing formula, which assumes that volatility and interest rates are constant.

"Under these assumptions, Vega is useless because it measures sensitivity of an option price to changes in volatility and, according to the model, volatility is constant. But traders care about Vega a great deal. As important as the Black-Scholes formula is in option pricing theory, its constant volatility assumption is clearly false," states Kimmel. If volatility changes over time, the assumptions used to calculate the Greeks aren't correct. However, the volatility in the Greeks' formulas is really implied volatility, which is related to volatility but not exactly the same so there's a little room for traders to interpret the Greeks a bit differently than in the strict Black-Scholes sense.

Do keep in mind that the Greeks are figures provided by a computerized solution that calculates them for you so your numbers will be only as good as the algorithms used in the model to determine them.

THETA

There are only a few definitions for Theta. Theta is the eighth letter of the Greek alphabet and it's the rate of change in the price of an option as the time decreases and nears the end of its exercise period. Theta is pretty boringly predictable except in a fairly simple type of hedge called a Delta hedge that's used to reduce the risk of a trading position or for arbitrage purposes (i.e., capturing price variations in similar securities in different markets or forms to net a profit).

"If an option is Delta-hedged and financed with borrowing, then the Gamma and Theta of the position are related — big Gamma means big profits if the stock price moves a lot, but it also means big Theta, so you lose money quickly if you don't get the big price changes," explains Kimmel.



There are no cars or stars named after Theta. There are no geographic features or companies or even people named after Theta because Theta is time decay...and no one wants to be named after time decay! Although atomic physicists occasionally use Theta as a symbol in equations, Theta is not even used much by a number of traders. Poor unloved Theta.

RHO

Rho is the seventeenth letter in the Greek alphabet and, more importantly for investors, it is the rate of change in a given option's price that results from a 1% change in interest rates. Rho is one of the least critical measurements to watch because changes in interest rates generally move asset prices more than interest rate changes move option prices...and Rho measures the effect of interest rates changes on an option price—not the underlying asset price. However, even though Rho is not that significant, a number of firms not related to interest rates have named themselves "Rho something or other," which makes Rho at least mentioned more than lonely Theta.



SUMMARY

Investment management is dependent upon a trader buying or selling the relevant securities. Each trader may have a different strategy that involves dissimilar needs for transparency, speed, and risk management.

Because Rob Piton from Resonance Wave Absolute Return Fund, LLC has a private equity type approach, his asset purchases are probably held for a longer time than Joan Rockey’s from Hadelrock Capital Management LLC. Piton’s risk is more related to someone discovering what his purchase strategy is and then trading against that strategy so that the other party makes a profit off Piton’s position. No wonder more transparency makes Piton shudder, which is just the opposite reaction of some investors who want and need more transparency.

Remember that day in the fall of 2008 when most people expected the U.S. Congress to rapidly approve the TARP bank bailout and Congress didn’t...and then they finally did but much later? What if one of Haldelrock Capital Management’s trades was a position on that event—imagine the consequences to Rockey and her investors if her trade had been delayed on that day. In an event-driven strategy, speed is to Rockey what minimal transparency is to Piton.

Although there are probably many ways Piton and Rockey use the Five Greeks in the same manner, it’s interesting to note the different emphases on where they see the most value in the Five Greeks. With Rockey’s fast changing positions, she uses them as a risk management and rewards assessment tool. Piton uses them as a dashboard to gain perspective on current and likely future market views as he positions his portfolio for continued profit from his longer term asset holdings. Piton’s approach could be used by any investor with or without options in their portfolio.

CLUE #3 ESTABLISH A DASHBOARD REVIEW
 Review each of your chosen options and its relationship to its underlying asset using the Five Greeks to determine how likely each of your options is to react a lot or a little to:

- price fluctuations today (Delta) and tomorrow (Gamma)
- changes in how large a range the market thinks that asset could have in price swings (Vega)
- the passage of time (Theta)
- interest rate changes (Rho).

Understanding the concepts in investment management and the strengths and weaknesses of each approach, strategy, and tool utilized makes investors and professional money managers great sleuths in detecting potential investment thieves before they strike. With comprehensive knowledge comes the ability to ask during and before the investment commitment the necessary questions, including ones such as:

- How much redundancy do your computer systems have? (protect against system breakdown)
- What are the firewalls between departments and clients? (protect against information leakage)
- What are the backgrounds and turnover of your computer professionals, traders, back office, and money management staff? (human error and ability assessment including level of corporate memory loss)

The investors in Madoff’s fund didn’t ask the right questions and didn’t understand how he was making their returns. There’s never such a thing as a stupid question because investment words can have many different meanings and interpretations. If after asking questions and doing your due diligence, something doesn’t make sense, you’re absolutely right. It doesn’t make sense, so just walk away with your money to invest another day with a firm that can explain in plain language and demonstrate its process.

ABOUT THE AUTHOR

Kathy Graham is the founder of Highest Quality Scripts, Inc., a firm that publishes her writings about finance and financial career development, plus edits and ghostwrites articles, newsletters, and books for other financial institutions and individuals. Most recently, Graham is the author of a book that sneakily teaches children international economics and personal choice while they enjoy an engrossing fable. She is also a career strategist, providing advice on how to grow your career in any environment, as well as the owner of three other firms (retained executive search, educational seminars, plus compensation studies and other services) that connect finance people with what they need. Graham has a MBA in Finance, Analytic Finance, Econometrics and Statistics from The University of Chicago. She can be reached at graham@highestqualityscripts.com.