



MercenaryTrader

Theory Report:

THE BOYDIAN FRAMEWORK

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The Boydian Framework

“Forty Second Boyd” was regarded as the greatest military strategist of the 21st century.

Colonel John Boyd was regarded as the greatest military strategist of the 20th century. He was also one of the greatest U.S. fighter pilots of all time. In simulated air-to-air combat as a flight instructor, Boyd defeated every challenger who took him on in less than forty seconds – hence the nickname “Forty Second Boyd.”

Boyd permanently changed aerial dogfighting tactics with his theories and insights. His manual of fighter tactics had an impact on every modern air force in the world.

Boyd also literally changed the way fighter planes were designed with his Energy-Maneuverability Theory, and is considered the father of the F-15 and F-16 (two legendary fighter planes).

Colonel Boyd’s devotion to military strategy led him to insights into all types of fighting, including ground combat. He is likely the only Air Force fighter pilot in history to teach the U.S. Marine Corps about ground-fighting tactics – and who was in turn embraced by the Marine Corps as one of their own (something that basically never happens).

In his insatiable appetite for knowledge, Boyd studied military history and strategy and tactics dating back thousands of years, from Patton to Clausewitz to Sun Tzu. He was an early student of chaos theory and nonlinear dynamics, at a time when these concepts were so bleeding edge basically no one else in the military was thinking about them.

Boyd was a multi-disciplinary omnivore, synthesizing knowledge across a wide range of disciplines.

To develop his ideas and improve them, Boyd became a multi-disciplinary omnivore, consuming whatever he could find in the realms of psychology, philosophy, biology, physics, engineering, biology, history, complex systems, the whole nine yards. It was his ability to synthesize this knowledge that led to most of his breakthrough insights.

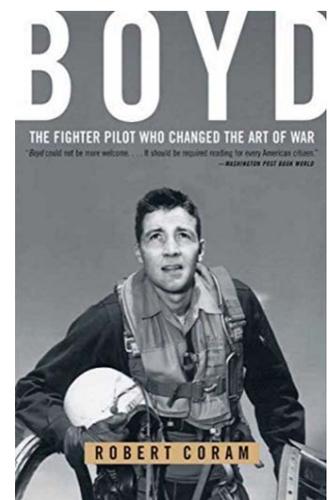
Boyd was a loud, passionate, intensely driven maverick, with a habit of constantly chomping on cigars and drinking huge quantities of what he called “smart juice” (black coffee). In his long and distinguished career, Boyd never made it past the rank of colonel because he pissed off too many generals with his loud and fierce bluntness.

On more than one occasion Boyd had been known to call out or dress down a superior officer in a loud voice and directly to their face, thumping them in the chest and spilling cigar ash on their shirt as he did so.

The OODA Loop barely scratches the surface of Boyd’s theory contributions.

Boyd’s theories have also been globally applied to business models and corporate strategy. He is most famously known (though still very much an obscure figure) for his “OODA Loop” concept, which stands for Observation-Oriented-Decision-Action. The OODA concept, as popularly understood, barely scratches the surface of Boyd’s broad and deep contributions.

If you want to learn more about Boyd directly, we recommend the excellent biography *Boyd: The Fighter Pilot Who Changed the Art of War* by Robert Coram.



Trading as Combat

From a trading perspective, a few things about Boyd's ideas and theories stand out:

Combat – human versus human, mind versus mind – is like no other endeavor.

Combat – human versus human, mind versus mind – is like no other endeavor. To understand combat and develop his theories of fighting, whether in the air, on the ground, or applying to whole armies or nations, Boyd deeply understood the reality that combat is about humans taking on humans. Combat is extremely messy and complex, with layer upon layer of feedback loops and non-linear dynamics, because combat is one thinking human versus another thinking human, or one human group against another human group. That form of competition, mind against mind, is like no other. There is a comparable dynamic in trading, in which one is not just attempting to “beat the market,” or to find an attractive investment or trade, but to *take on other humans* in a minus-sum game.

Combat – like trading – is multi-disciplinary. To truly understand combat, and to implement high-level techniques, Boyd had to become a student of psychology, physics, history, mathematics, engineering, and numerous other disciplines in order to develop his ideas, shape the development of US fighter planes, and communicate those ideas to the US military. Trading and investing at a high level has a similar multi-disciplinary feel and flow.

Boyd's ideas and Quantum Fund had a lot in common.

Boyd's nonlinear dynamics were comparable to Soros' Quantum Fund. The Quantum Fund, started in 1973 by George Soros and Jim Rogers, was one of the most groundbreaking vehicles of its time in Quantum Funds' willingness to push in any direction like an amoeba, to use leverage, to treat a portfolio as a three-dimensional structure, and to apply nonlinear dynamics and philosophical ideas to money management. Quantum Fund earned returns of +30% per year over multiple decades. This emphasis on flexibility, agility and the use of unconventional ideas was very “Boydian” in the sense that Boyd was applying a comparably similar revamp of strategy and tactics to improve the capabilities of US fighter pilots and the US military.

Boyd's ideas favor speed and flexibility over mass and bulk. In the global market ecosystem there are players of all sizes, with the market landscape dominated by giant institutional funds and other bulky, slow-moving entities that rely on size and firepower (depth of resources and research) to try and earn acceptable returns. These players are comparable to large, powerful militaries and the tendency of a powerful military to play off advantages in strength and size. Boyd understood that size and bulk can also be a real weakness, and his ideas emphasized how smaller, lighter units, through more flexibility and better use of information, could defeat opponents many times their size. This is comparable to the advantages that accrue to light, fast and flexible traders, when pitted against large, slow-moving opponents with far greater firepower (in terms of research and reach) but far less flexibility.

Above all, trading is a form of combat.

Above all, **trading is a form of combat** – and Boyd was a master of combat theory, having synthesized and refined strategic observations on combat all through the ages (while adding his own experience). As such, there is much to learn from Boyd. In applying what we call “The Boydian Framework,” our goal is to take Boyd’s core ideas and insights and apply them to trading in a practical way, in order to generate the greatest possibility of superior trading and investing returns.

If trading is a form of warfare, and it is, then we want to practice unconventional warfare to the greatest degree possible, in order to best separate ourselves from the crowd, and Boyd’s concepts are a rich and deep vein for doing that.

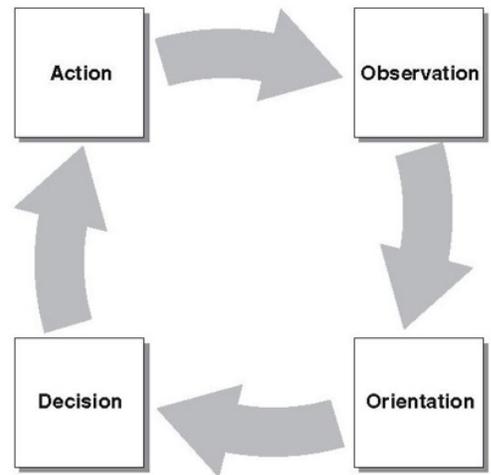
The Boydian Framework is a philosophical way to think about markets, providing theory guidance to strategy and capabilities.

The Boydian Framework as such is a philosophical way to think about markets, and to apply lessons from military combat theory to markets, while also providing theory guidance to modify strategy and capabilities in Boydian ways (e.g. finding ways to reduce rigidity, while enhancing speed and flexibility through better use of information, a more diverse use of trading instruments, and so on).

Complexity and the Real OODA Loop

The simple version of the OODA loop, by way of Frans Osinga, is shown below.

This visual representation of OODA is what most people are familiar with, indeed if they have heard of Boyd’s ideas at all. The loop is a continuous forward progression of Observation – Orientation – Decision – Action, with feedback then requiring observation and the OODA loop starting over to repeat as necessary.



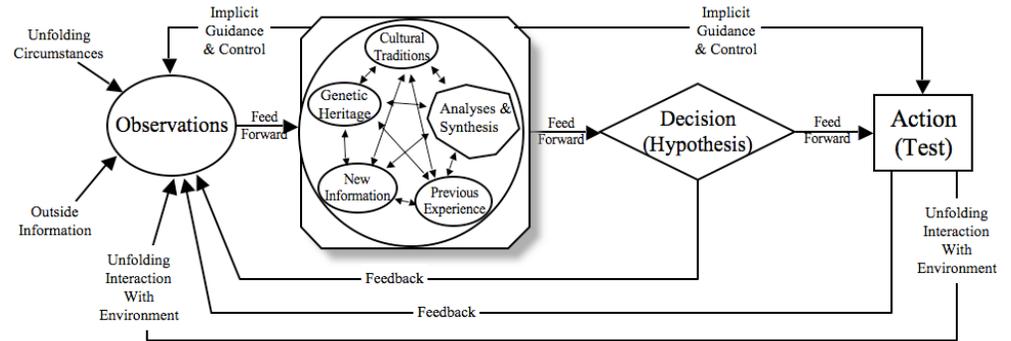
The core of the OODA loop is “getting inside the decision cycle” of your opponent.

In combat, whether the combat is aerial dogfighting in fighter planes, a clash of armies, or a clash of opponents in poker or trading, the idea is to “get inside the decision cycle” of your opponent.

If you can run your OODA loop faster than your opponent runs theirs, it becomes possible to derail your opponent through incremental edge-building, contributing to your opponent’s confusion and chaos. As you cycle through decisions and actions faster than your opponent can keep up, their ability to respond degrades as their disarray increases, until finally they experience some form of collapse.

This need to “get inside the decision cycle” of the opponent is one of the reasons why information processing speed is key – an ability to think quickly and act quickly, although “quickly” is relative. (For instance, a company that can run through a manufacturing design process in six months, when the standard industry window is twelve months, would have an OODA advantage on its competitors.)

But what many do not realize – even if familiar with OODA – is that the simplified graphic does not capture the full scope, and is not what Boyd shared or taught. (He also preferred dashes between the letters e.g. O-O-D-A.) The real OODA loop, in the form Boyd might have used in a slide while delivering a multi-hour strategy briefing, is far more nuanced as shown below.



The real OODA loop is too nuanced for pop culture to embrace.

You can see why pop culture didn't so readily absorb this one.

The same basic components – Observation, Orientation, Decision, Action – are still there (flowing from left to right). But the internals of the actual decision-making process are significantly more involved. Some of the factors in the diagram are:

- Cultural traditions
- Genetic heritage (i.e. natural talent)
- Analysis and synthesis
- New information
- Previous experience
- Feedback
- Implicit Guidance and Control
- Unfolding Circumstances
- Outside Information
- Unfolding Interaction with Environment

Boyd's OODA loop is a bit of a brain-bender at first. But all the elements make logical sense when absorbed.

That is because OODA applies to the emergent property of good decision-making in chaotic, complex, rapidly changing and highly uncertain environments. That is what military combat "is." That is also what trading "is."

Trading is war and trading is combat... against motivated and equipped opponents... which is never "simple" in the manner many might wish it to be.

Simplicity is a destination, but complex analysis is part of the path.

An outcome might be simple... and a final decision may be simple... and in fact that ability to "arrive at simplicity" is a desired and deliberate goal. But this kind of simplicity is comparable to the movement of a chess piece. A significant amount of analysis may apply before taking a "simple" action, like moving the bishop to square E6 or what have you. The analysis itself had multiple layers to it.

Trading is about the rapid-processing of information flows.

As such trading, like combat, is rapid-processing information flows, developing an emergent understanding, and making consistently better decisions on that emergent basis – faster, smarter, cleaner, more decisive – than one’s opponents.

Tempo and Rapid Deployment

To understand the importance of tempo and rapid deployment, chess is a useful example because of its observable contrasts:

The act of analyzing a chess position can be complex, with many layers and subtleties involved. This complexity provides an edge to experienced players, who have thousands of position templates already stored in their heads. In many instances the expert only has to remember, pulling up a known template, whereas the novice has to sweat and strain and think.

The act of moving a chess piece is simple, in the sense that the game progresses in linear fashion and only one piece moves at a time. In this manner we can see how a complex action (analysis) is designed to produce a simple action (moving a piece) in the context of a strategy (which goes back to complexity again).

All chess analysis is oriented toward a narrowly pragmatic outcome, in the sense that the purpose of analyzing a position is to produce the best move or series of moves, and the purpose of producing the best series of moves is to win the game.

Chess, trading and combat analysis are oriented toward narrowly pragmatic outcomes.

Trading and combat are like this too.

Complex analysis is meant to facilitate simple movements, with simplicity and efficiency the elegant result of observation and hard work (or hard-won past experience). The actual movements are simple and clear, in the context of a broader strategy, and everything is oriented to a narrowly pragmatic outcome (defeating the opponent, generating profit, winning the long-run game).

So here is a thought experiment. It’s also something you can try with a friend (if you feel like playing around with a chessboard).

Imagine a chess match between a world-ranked chess grandmaster and a functionally competent amateur.

There is just one adjustment to the normal rules: **For each time the grandmaster is allowed to move once, the amateur can move twice.**

If the amateur is anywhere near decent, i.e. not an idiot / not terrible, he will *crush his world-class grandmaster opponent* with this rule set... perhaps nine times out of ten or even ninety-nine out of a hundred.

A rapid deployment advantage can allow the amateur to crush the grandmaster.

By giving the amateur one core advantage in the arena of tempo and rapid deployment – just one – the tables are turned as such that the grandmaster’s skill-and-experience advantage is wholly overwhelmed.

The question is “Why?” What is the mechanism that turns the tables?

Rapid deployment makes all the difference. In combat, having a two-to-one movement advantage is like *twice the firepower with the same amount of materiel*.

A Truly Massive Advantage

But the advantage is so much bigger than that. Doubled deployment speed means both threats and opportunities can be responded to more rapidly. It means greater leverage can be brought immediately to bear on relevant pressure points, which offers an edge far bigger than a simple doubling or tripling of materiel.

This offers a clue as to why Wall Street’s giant pools of capital are not as competitive as they seem. They are forced to move slowly, at all times, even (and especially) in the times when rapid deployment would serve oh so much better.

This is due to a combination of unwieldy size (huge bulk sums gathered for the purpose of fee generation) and rigid structural rules (committees, style guidelines, exposure mandates etc). Rapid deployment is enabled by the flexibility and capability to analyze quickly and respond quickly – faster than one’s opponents.

The faster you can move, the greater capability you have to disrupt your opponent’s OODA loop.

This goes directly back to the OODA loop concept, and “getting inside the decision cycle” of one’s opponent. The faster you can move, the greater capability you have to disrupt your opponent’s OODA loop – or to defensively or evasively adjust your own OODA loop, and personal exposure, to new developments and threats.

This further relates to tempo, also known as speed of motion or pace. In athletic competitions, “controlling the tempo” means the game is unfolding at a pace that favors the controlling team; the opponent, meanwhile, is thrown off their game via being forced to move too fast or too slow versus their preferred rhythm and pacing.

The ability to control tempo and rapid-deploy can create a decisive advantage via snowball effects over time. It allows the advantaged competitor to gain a small incremental edge... and then another... and another... and another... until the opponent is either hopelessly far behind or tangled up and demoralized to the point of implosion.

She who can rapid deploy, under the right circumstances, can in turn overwhelm her opponent... in turn causing the opponent to shut down via loss and fear and gridlock.

Another interesting implication of the chess experiment (where the amateur is given a two-to-one move advantage): This slight variation in the rules of the game would render much of the grandmaster’s traditional experience useless, or even worse than useless.

Flexibility is a key virtue, especially when a familiar environment shifts.

The grandmaster wouldn’t have a roster of stored pattern recognition templates to defend against a two-to-one mover, and many of the grandmaster’s existing intuitive hunches, based on previously reliable information, would be off-base. The new combo possibilities, via the new rules, would render much of “normal” chess strategy useless.

This is more relevant than it seems, to the degree that flexibility is another key virtue. Sometimes, if a familiar environment shifts dramatically, the inability to mentally shift along with it – to orient to a new and unfamiliar landscape – can be dangerous.

In trading, the rapid deployment opportunity set arises with respect to crystallization of new awareness in the immediate aftermath of situation-changing data or inflection points... that “moment of clarity” when a path becomes clear. This is followed up with the ability to *act forcefully* on that dawning awareness, and to then mobilize forces and get moving, getting a big position on (or taking one off) while others are still in the drawn-out stage of deciding what to do (if acting at all).

Jesse Livermore captured the spirit of this idea in *Reminiscences of a Stock Operator*. Though written in 1923, a few years prior to John Boyd’s birth, the following *Reminiscences* passage is “Boydian” to the core – in the emphasis on multi-disciplinary study, in the OODA aspects (observe, diagnose, act), and above all in the table-pounding importance of rapid deployment and tempo (speed):

Livermore’s ideas were very “Boydian” before John Boyd was even born.

The training of a stock trader is like a medical education. The physician has to spend long years learning anatomy, physiology, materia medica and **collateral subjects by the dozen**. He **learns the theory** and then proceeds to devote his life to the practice. He **observes and classifies** all sorts of pathological phenomena. He **learns to diagnose**. If his diagnosis is correct- and that depends upon the accuracy of his observation- he ought to do pretty well in his prognosis, always keeping in mind, of course, that human fallibility and the utterly unforeseen will keep him from scoring 100 percent of bull's eyes. And then, as he gains in experience, he learns not only to do the right thing but **to do it instantly**, so that many people will think he does it instinctively. It really isn't automatism. It is that he has **diagnosed the case** according to his observations of such cases during a period of many years; and, naturally, after he has diagnosed it, he can only treat it in the way that experience has taught him is the proper treatment. You can transmit knowledge- that is, your particular collection of card indexed facts- but not your experience. A man may know what to do and lose money- **if he doesn't do it quickly enough**.

Notice another “fast-slow” contrast in *Reminiscences* that is very Boydian.

In various places Livermore (Larry Livingston) emphasizes the critical aspect of acting quickly: “*You must act instantly or be left.*”

And yet Livermore also pounds the table for “*being right and sitting tight,*” that is to say, holding fast to a good position and not messing with it.

There are also multiple instances where Livermore emphasizes the dangers of acting too early – and the need to wait patiently until the time is right.

Act quickly, or even instantly if need be... yet “be right and sit tight”... yet also sometimes be patient and don’t move at all, if the best thing to do is nothing.

Shifts between speed and patience are the logical response to a subtle and varied trading environment.

Are these contradictions? No, not at all. They are logical responses to a subtle and varied trading environment, with different responses to different situations.

The cartoonish picture of someone with great speed – the ability to move quickly – is that they are constantly racing around like Speed Racer, doing *everything* at speed: Getting in, getting out, buying then selling again, fast fast fast, talking like the Joe Pesci character Leo Getz in the *Lethal Weapon* movies.

But speed for its own sake is pointless (and often self-defeating). The point of a decisive advantage, in tempo and rapid deployment terms, is knowing when to use it, not attempting to use it constantly and at all times.

Rubin and the Running Back

Robert Rubin, the former head of Goldman Sachs and Treasury Secretary from 1995 to 1999, was famous for what became loosely known as The Rubin Principle:

The Rubin Principle: The idea that, when making a decision, the ideal is to wait until *the last reasonable moment* before committing to a course of action, to allow as much time for information gathering as possible.

The longer you wait to act, the better off you are – as long as you can still act with time to spare.

Based on the Rubin Principle, the longer you wait to act, the better off you are – assuming that you can still act with time to spare .

This is because your delayed action allows for more information gathering, and the possibility of obtaining a crucial piece of information that came late in the stream.

But think about what is implied by the Rubin Principle: In order to make use of it, you need the ability to *quickly and decisively*. Why? Because if you can't act quickly and decisively, it isn't safe to delay your course of action!

The ability to wait for more information, and to act decisively when a tipping point level of information arrives, is a crucial advantage.

This can be considered a **rapid deployment and tempo** advantage – because the ability to wait and be patient is enabled by the ability to move quickly and decisively.

The ability to move instantly is what allows you to be patient and sit still.

The **ability to move instantly** is what **allows you to be patient and sit still...** which in turn allows you to consistently hold a **decision-making information advantage** over your opponents.

Another way to illustrate this concept is to think of a football running back, or a soccer forward, running straight at the defender before cutting left or right.

The more agility the running back or soccer forward has, the more likely they are to wait until **the last possible moment** before cutting left or right in front of the defender.

This ability to run straight at the defender, to the last split second, is a form of denying information to the defender. *Will they cut left or cut right?* That remains unknown – until the last possible moment.

Critical inflection point moments offer significant advantage to nimble and flexible market participants.

In markets as in combat, this kind of agility can be a decisive advantage at “critical inflection point” type moments – where it is possible to wait patiently and then act with speed and force, or to otherwise change direction dramatically and quickly. This advantage is available to nimble and flexible traders and money managers, but not to bulky or rule-bound or indecisive ones.

The Challenge of Triple-C Environments

What do aerial dogfighting, trading, poker, and football (or soccer) all have in common? They are all what we call “Triple-C Environments” (which is our term, not Boyd’s). The standard Triple-C Environment is:

Standard Triple-C Environments are Combative, Chaotic and Complex.

- COMBATIVE
- CHAOTIC
- COMPLEX

To say an environment is “combative” means other humans have become the competition. That immediately makes the game non-simple.

In markets, a common goal is outperformance of the passive average over time. Statistically speaking, it is impossible for more than 50% of any group to outperform the average of the total group. (Although it possible for the percentage of outperformers to be smaller, e.g. 10% net winners with average-to-poor performance for the other 90%.)

And most competitions involving money (like poker and trading) are not zero sum games, but minus sum games, in the sense there is a cost just for playing.

Poker is a minus sum game because there is a cost to sit at the table, taken in the form of rake and tips. Trading is a minus sum game because of commission and slippage and research and equipment costs. (And even if one could play or trade for free, time and energy would be a cost.)

Most jobs and professions are not combative in the direct sense.

Most jobs and professions are not combative in the direct sense. Dentists and accountants are not in direct competition with anyone, for example. At the business level, one dentist or accounting office might compete with others for a limited pool of customers. But in terms of daily work, performance is not the result of game-like interaction with other humans on a direct level.

Weather patterns were the original chaotic systems – understandable but not easily predictable.

To call an environment “chaotic” is to observe that outcomes are neither totally predictable nor totally random, but marked by uncertainty while generally operating within a range of discernible patterns and outcome ranges. Weather patterns were the original chaotic systems because we can understand the drivers of weather behavior on a very deep and granular level, but there are too many variables for real-time prediction.

Dentistry and accounting (not to pick on them) are, for the most part, reliably predictable and stable professions. There is very little element of surprise (usually) in cleaning someone's teeth or reconciling a set of books. The majority of professions are more predictable than unpredictable in this way, which is part of what makes markets such a shock when coming from the "normal" world.

Combat, poker and trading, on the other hand, are filled with surprises and unknowns. You don't know what is coming around the next bend... or whether it will be challenging or destabilizing. As such it could either hurt you if not prepared, or help if you know how to respond to it or take advantage of it. That is a chaotic flow. And again "chaotic" is different than "random." In a purely random environment, skill and preparation would not make a difference. Chaotic environments have a randomness component embedded in them, yet skill and experience remain worthwhile because chaos tends to operate within generally definable parameters. You can harness chaos in the subset of moments when temporary clarity emerges, but randomness is all random.

Chaotic is wholly different than random.

And finally, "complex" environments are ones in which multiple variables have influence on a given outcome, making it very hard (if not impossible) to give a cause-and-effect answer containing just one explanation factor or just one variable.

When trying to answer the question "Why did X happen?" in a complex environment, there is usually a multi-factor response (if the response has actual analysis value).

Complex environments have multiple factors and drivers.

The presence of event "X," or the intensity and magnitude of event X, was likely not based on just one thing or just one factor. Instead it was an emergent phenomena, born of multiple inputs and drivers.

Contrast this to, say, the job of the 20th century auto mechanic. While internal combustion engines can be tricky to fix when having a problem, usually it's a matter of "identify the problem, fix the problem," with one identifiable root cause for an issue. The route from problem to solution is much more straightforward.

Many people miss the implications of trying to understand complex environments.

They mistakenly assume (or desire to believe) that cause-and-effect chains can be explained by one thing, just one variable, when that level of analysis is actually too simplistic to be useful, and may even be harmful to the degree it fuels false confidence.

Complexity of analysis also produces the ability to outperform.

It is possible for skilled poker players to consistently earn six-figure livings, for example – taking that money weaker lesser opponents over time, while paying the house vigorish – because poker is an endless string of one competitive complex analysis situation after another. The gap in analysis quality thus persists, with gains accruing to the better analyzer (observer, information processor, agile mover) over an extended time period.

Competitive complex analysis situations produce opportunity when facing off against lesser skilled opponents.

The standard view of trading and investing, as popularly conceived, does not recognize the deep implications of markets as a classic Triple-C Environment.

There are hand waving references to competition, or to trading being “hard,” but mostly there is a tendency to focus on “the cards in one’s hand,” e.g. to look at a chart and assume that trading is mainly all about charts... or to look at a pair of queens at a poker table and think “I have a strong hand, so I should bet a lot” without conducting situational analysis or considering the behaviors of opponents... or to invest in a new business without thinking about competition factors and their impacts... and so on.

The better one understands the deeper implications of Triple-C Environments, the better one can prepare, with generalized mental models and skill sets that gear towards Triple-C Environments and apply across disciplines.

Many crosslinks exist between combat, trading and poker specifically due to the Triple-C Environment connection. To be excellent at one is to have a potential leg up on the others, because so many intuition-shaping conceptual factors are recognizably the same.

Why Boydian Edges Dominate

In the context of the Boydian Framework – thinking about OODA Loops, rapid deployment and tempo, and so on – why is rapid deployment such a significant edge? Why does possessing it create the ability to dominate opponents?

To put it another way... why is there such an asymmetry? Why is it that so many of one’s opponents, in combat, trading and elsewhere, do NOT possess edges of the Boydian Framework variety? Why is there so little of this going around, in turn making rapid deployment and OODA advantages so valuable?

In the real world, you can’t just request that your competitor spot you a handicap (as with the grandmaster giving the amateur a two-to-one move advantage for the sake of an experiment).

The ability to rapid deploy is thus a **relative advantage which is not conceded** by your opponent – you have to be faster, more flexible, more efficient in terms of *skill set*.

This in turn requires hard-to-obtain capabilities such as:

- Superior information flow
- Superior decision-making capability
- Superior communication skill
- Superior complexity management

We can say roughly say that **these four things** – information flow, decision-making capability, communication skill, and complexity management – are the building blocks of rapid deployment, and thus of edge-building in the Boydian Framework context.

We’ve described elsewhere why the Efficient Market Hypothesis (EMH) is bunk.

Others have developed extensive critiques and position papers saying the same thing with far greater detail, that EMH is an academic theory not suited to the real world.

The ability to rapid-deploy effectively is based on a hard-to-obtain skill set.

The Efficient Market Hypothesis is bunk, but the Competitive Markets Hypothesis no doubt applies.

But markets are, in fact, quite competitive, so something like the *Competitive Markets Hypothesis (CMH)* is very real. (Market's aren't "efficient," but they are tough.)

One should not assume markets are efficient (they are not). But nor should one assume significant profits can be picked up *easily or without effort*. There are no free lunches, except perhaps in the hunter's trap.

Rapid deployment – moving decisively and at speed, with good information and justified confidence – is hard to execute properly and consistently, because the skill set building blocks take a good deal of training and logistical development to put into place.

To further expand on the building blocks:

Information flow is more about the ability to process information than the exclusivity of said information.

Superior information flow. This is not at all about hidden information or "inside" information. As various SEC prosecutions of insider trading cases have shown, often times inside information is not even profitable or correct! In today's world, large volumes of good quality information are available. But the ability to flow that information into consumable streams, and then interpret those streams in a timely manner, is not available to everyone – this capability in fact is only demonstrated by a select few. If you point a firehose of relevant information at three different traders, and one is able to channel that information into useful streams whereas the other two cannot, one of those traders has superior information flow – whereas the other two are either less informed or forced to lag in their decision making, and thus at a disadvantage.

Superior decision-making capability. It isn't enough just being able to make decisions quickly. They also have to be high-quality decisions, made for rational reasons, that contribute to an overall coherent strategy and approach. Product engineers have a joke: "*Faster, better, cheaper... pick two.*" Idea being that whichever two you pick will come at the cost of the third. The same thing applies to decision-making capability – it is necessary to come up with a way that is "*faster, better and cheaper*" *across the board* to make superior decisions. This can be done. It just can't be done easily!

Communication skill is critical, even for a solo practitioner on an internal basis.

Superior communication skill. Whenever people work together in teams, communication is huge advantage. We can see this via the shocking lack of communication quality in the majority of organizations today. There is a reason why so many management books are written on communication and teamwork. It is a constant pain point and most teams are bad at it. Communication skill also applies to the solo practitioner, in terms of having a system and a methodology where different aspects of the portfolio "communicate" with each other, where emotions are in synch with landscape inputs, and so on. Again this one is not at all easy.

Superior complexity management. This is the big kahuna, the challenge to rule them all. There is never a call to voluntarily introduce artificial complexity into a challenging endeavor... because the complexity will arise

Complexity management skill is a meta-level edge that flows into all other edges.

all by itself! Complexity in the presence of decision making is an inherent feature of the universe, like the forces that cause headphone cords to snarl in the pocket of your jeans. This tendency for variables to intertwine and create strange combinations is probably why sentient life exists in the first place – the tendency for novel combinations to result from entanglement is a driving force behind evolution. But the pragmatic competitive result is that complexity management is quite challenging... and thus superior complexity management is an edge that flows into all the other edges.

The shorter answer to the question, “Why are Boydian Edges So Dominant,” is that the powerful capabilities created by such edges are valuable because they are scarce. It is not an easy thing to get a substantial edge on one’s opponents in areas like information flow, decision-making capability, communication skill, and complexity management. But once obtained, such edges are *durable and long-lasting* for the very same reason.

Observation and Agility

One of Colonel Boyd’s great contributions to fighter pilot design was the development of Energy-Maneuverability Theory, or E-M theory for short.

As Wikipedia describes it:

Energy–maneuverability theory is a model of aircraft performance. It was developed by Col. John Boyd, and is useful in describing an aircraft's performance as the total of kinetic and potential energies or aircraft specific energy. It relates the thrust, weight, drag, wing area, and other flight characteristics of an aircraft into a quantitative model. This allows combat capabilities of various aircraft or prospective design trade-offs to be predicted and compared.

The whole of E-M theory can be compressed into a single value using the following formula and components:

E-M theory made it possible to judge a fighter plane based on its design.

$$P_s = V \left(\frac{T-D}{W} \right)$$

V = Velocity

T = Thrust

D = Drag

W = Weight

Using E-M theory, it became possible to judge a fighter plane based on its design. You could look at the specs of the plane and get a sense of how well it would fare in combat. Superior combat planes had more velocity and thrust, less overall drag, and so on, in a total combination that created superior aerial combat capability.

E-M theory was a breakthrough success, but there was one big mystery that drove Boyd crazy until he figured out the answer.

In the Korean War, American fighter pilots flew the F-86 Sabre, a swept-wing fighter (as shown at right) meant to counter the Soviet MiG-15.

In aerial combat terms, the Korean war was a huge success for American pilots flying the F-86... and thus a disaster for the Soviet MiG pilots.

It was so lopsided, in fact, that the American pilots, in the F-86, had a **10-to-1 kill ratio** against the MiG. There was simply no contest.

So this was the mystery: **According to E-M theory, the MiG had a superior design!** Based on factors like velocity, thrust, drag, and weight, the MiG was a superior fighter plane compared to the F-86. The lopsided combat outcome, in favor of the Americans, made no sense if E-M Theory was valid.

This drove Boyd crazy because he knew his E-M Theory was sound... and he knew the MiG was superior to the F-86 in overall design terms... and yet, the American F-86 pilots absolutely crushed their MiG counterparts.

Why was this happening?

Boyd could have just said *“Well, the Russians must be really shitty fighter pilots,”* and left it at that. But that kind of intellectual dishonesty was simply not his style. He was forced by his own brain to wrestle with the puzzle until he figured it out.

What Boyd figured out would inspire him greatly, and change everything in future – leading to the breakthrough OODA Loop observations that followed.

The a-ha! moment is explained in the following excerpt from *Boyd: The Fighter Pilot Who Changed the Art of War* (emphasis ours):

In doing advanced conceptual design work on the lightweight fighter, [Boyd] went over all his notes from the past, from as far back as Korea. He remembered his early E-M work and how difficult it was to prepare accurate E-M charts for the F-86. He remembered the F-86's countless battles with MiGs. He remembered how, on paper, the MiG was a superior aircraft in almost every respect. But the F-86 had a ten-to-one kill ratio against the MiG. Why?

Boyd pored over the notes again and again. Could there be something else, some other element, perhaps an element not covered by E-M, that held the answer? Boyd made a list of attributes of the MiG and the F-86. For days he went into frequent trances as he groped for the answer. In the end he came up with two significant advantages the F-86 had over the MiG. First, the F-86 had the bubble canopy that gave the pilot a 360-degree field of vision, while the



American F-86 pilots had a 10-to-1 kill ratio against a “superior” aircraft.

The F-86 pilot had a much easier time observing the enemy than the enemy had observing him.

The F-86 pilot could transition from one maneuver to another more quickly.

Observation and agility factors trumped all other superior traits.

Visibility and maneuverability are products of observation and agility.

MiG pilot's view to the rear was blocked. **Thus, the F-86 pilot had a much easier time observing the enemy than the enemy had observing him.**

Second, the F-86 had full hydraulic controls, while the MiG did not. This meant that the F-86 pilot could control his aircraft with one finger, while controlling the MiG was so difficult that MiG pilots often lifted weights between flights in order to gain strength. The unboosted controls of the MiG meant that its pilot grew fatigued more quickly than the F-86 pilot but, far more importantly, **the F-86 driver could go from one maneuver to another more quickly than the MiG driver.** In a practical sense this meant the F-86 pilot could go through a series of either offensive or defensive maneuvers quicker than could his adversary. And with each maneuver he gained a half second or a second on his enemy until he could either break for separation or be in a position for a kill. The MiG was faster in raw acceleration and in turning ability, but **the F-86 was quicker in changing maneuvers.** And in combat, quicker is more important.

These observations – **better observation and greater agility** – would make the lightweight fighter an even more extraordinary aircraft. This concept of agility was an intimation of what in another few years would be the best-known part of Boyd's legacy.

The MiG was a superior plane – **except in the areas of observation and agility**, where the difference mattered most.

Because American F-86 pilots had superior observation capability (via the bubble canopy) and superior agility (via hydraulic controls), they routinely obliterated their Soviet opponents, who technically had a more powerful plane.

And again, this advantage was not small. A ten-to-one kill ratio is practically the definition of overwhelming dominance.

That dominance came from superior observation and agility capabilities, which translate back to factors like tempo and rapid deployment. These ideas, in turn, feed into the OODA Loop concept and the ability to act decisively with better information processing.

Visibility and Maneuverability

With observation and agility in mind, **visibility and maneuverability** are operational capabilities to strive for.

The more you can observe, the more visibility you possess *on average over time*.

The more agile you are, the more maneuverability you have *on average over time*.

In aerial combat – dogfighting between fighter planes – the crucial determinants are visibility and maneuverability (as produced by observation and agility).

Visibility – the more you can observe (and process) the better.

Maneuverability – the more direction-changing capability the better.

Maximum fluidity of response is crucial when a target moves and shoots back.

An ideal fighter plane can change its direction, altitude, and airspeed, in any combination, at any time. This allows for maximum fluidity of response. This is crucial because in dogfighting the target is not fixed. It moves fast and it shoots back.

In similar fashion, a skilled trader can change their net exposure, gross exposure, and position concentration levels – in any combination, at seemingly “extreme” differentials (e.g. from cash to dramatically net long or short), turning on a dime, at any time.

This is important because the market, like a dogfighting opponent, is dynamic rather than static. It moves arounds and pulls evasive maneuvers and shoots back.

The ability to move enables stillness when stillness is called for.

Again, this doesn’t mean one is always moving – the ability to move enables stillness when stillness is called for. Wasteful movement is inefficient, and the right mix of positions can be held for long periods, or a quiet lack of action can extend over long periods. It is about exploding with force as called for, with minimal action otherwise.

Inflection point events can dramatically shift a market landscape in the space of 24 hours, or even in the space of minutes. So the idea is always having the *capability* to move – in appropriate measure for the situation – so that you’re never caught out NOT being able to move when immediately adjusting the mix is the smartest thing to do.

Trading is thus far closer to the aerial metaphor of dogfighting than the popularly conceived notion of “Market Timing.”

The popular conception of market timing is that you pick an “exact moment” to go long or short in a big way.

This mental picture is one of static waiting... doing nothing, other than consulting some crystal ball array of future-predictive signals... and then attempting to be correct at the exact right point in time with a full-boat position commitment (or even a full-boat portfolio commitment).

The whole idea of market timing is a straw man (or a red herring).

“Market Timing” (as popularly conceived) is not real trading, because **the whole idea of Market Timing is a straw man (or perhaps a red herring).**

Critics often refer to the folly of Market Timing in pointing out that predicting the future doesn’t work. Well of course predicting the future doesn’t work... because **predicting the future is not what trading (or combat) is all about.**

Probability, Not Prediction

Some moments are more perfect than others, but the trade is always a *probability bet* oriented to available information in the moment – with the inescapable uncertainty that comes alongside.

There is almost never 100% certainty in any combat situation, only opportunity sets ranging from bad, to good, to best in terms of likely outcomes and payoffs.

Neither fighter pilots nor poker players traders focus on predicting the future.

Does a fighter pilot predict the future? NO. They respond in the moment, processing information fluidly and in real-time. There are emergent pockets of clarity, where the odds say “X” is about to happen, or strategy “Y” opens up – but this is nowhere near “prediction” in the popularly understood sense. It is real-time probability response, making use of visibility and maneuverability in OODA terms.

Does a world class poker player predict the future? NO. (Unless they are cheating in cahoots with the dealer. Always play high stakes in a reputable casino with cameras!) Poker is not about prediction and rarely leans on certainty. Skilled poker players have zero ability to know the turn of the next card in advance. Most of the time, they do not know their opponent’s holdings other than within the context of a range. Can these individuals dominate their opponents anyway, to the point of accruing large profits over time? Yes. How do they do it? Via deployment of superior skills, analysis and capabilities in real-time complex analysis situations.

Trading is not predicting the future either (which, for the most part, is what the popular conception of Market Timing falsely suggests). It is skillfully navigated combat! In an aerial dogfight, you are trying to shoot your opponent... and your opponent is shooting back. You are conducting evasive maneuvers... and so is he. You are jockeying for position, trying to get on his tail. And he is trying to tail you back.

This is what markets are like, because trading is ultimately done against other humans. The trader is involved in messy, chaotic combat. There are windows of opportunity, changes in direction, shots taken that miss. It is a test of wits and will.

Top traders at the world’s best hedge funds are repeatedly documented to have 90/10 or even 95/5 profit ratios.

Top traders at the world’s best hedge funds have been repeatedly documented to have 90/10 or even 95/5 profit ratios. This pattern has shown up consistently, over and over again. The lion’s share of profits comes from a small fraction of the big winning trades.

To understand why, think of the dogfighting metaphor. Imagine these traders as fighter pilots. They are not sitting back and passively watching the market, waiting for a magic bell to ring or consulting a market timing crystal ball. They are **actively engaging with the market**, taking small to modest sized positions, trying to get a fix on possible targets.

At the same time, they are conducting evasive maneuvers themselves. They take small losses, evade enemy fire, make probability based forecasts and then iterate and re-evaluate, and constantly engage and re-engage, seeking out the max opportunity kill shot.

And then, when they find the kill shot, **they ramp up size and really blast it.**

The 90 to 95 percent of time spent maneuvering, cutting small losses and evading counterfire, was meant to set up those opportunities that unfold suddenly and quickly... in the midst of engagement... sometimes after a long build-up, sometimes in a surprising twist and somewhat out of the blue.

Market engagement and market timing are not the same thing.

This is not market timing because you don’t get your kill shots (big trades) by consulting a crystal ball, being right on the first try, or otherwise “knowing what will happen.”

You get them by engaging the market and using your ability to maneuver, until you maneuver into a perceived window of opportunity, perhaps after multiple limited risk setup attempts, to go in with guns blazing.

The popular conception of market timing is based on magical thinking. There is no such thing as a guaranteed unfolding of future events. There are only odds and probabilities.

But if you go into combat with superior visibility and maneuverability, then guess what – the odds and probabilities can be tilted in your favor through iteration and patience.

Non-Boydian Weakness Dictates Behavior

In many respects, poor behavior in markets is dictated by weakness.

If an investor does NOT have the ability to move quickly or decisively, for example, they may be FORCED to make decisions too early on... and then FORCED again to take a beating when conditions change in an unfavorable way... thus FORCED to either consistently take losses that are large, or to subsist on wins that are always too small.

These unpleasant realities can be dictated by weakness – the result of being UNABLE to move flexibly and decisively in a Boydian manner.

Consider the lousy options available for the market participant who does NOT operate from a Boydian framework:

Lacking visibility and maneuverability, the non-Boydian investor can make a big bet and then not move (even when things go wrong). If you make a big bet and don't move and you are right, well that's great. But if you are wrong, you risk large losses doing this. (Just ask Bill Ackman!) This is what many investors and money managers do. They make the big bet, but they show no maneuverability. And they risk getting hurt badly if they are wrong, and if a pummeling comes they sit and take it, and these losses limit plausible position size and hurt long-term returns.

Alternatively, the non-Boydian investor or trader may simply never bet big at all, committing to a whole career of small bets and small wins. That is what another class of traders and investors do. They avoid the big bet entirely and try to stay small, always using small diversified positions. But if you never make a big bet, you never get a big payday. And if you continuously play small, you continuously get ground down by slippage and frictional costs – without any offsetting gains to make participating in the game worthwhile.

The way to combine desirable elements for the best of both worlds – high quality risk control plus gains accrued via betting big at the right time – is to “dogfight,” i.e. to embrace the Boydian framework!

The risk control part is equivalent to evasive maneuvers. Low-risk probing is looking for spots. And the kills, the big wins, are when things come into focus because you are engaged, and you see a window to safely take a kill shot and it works.

In many respects poor behavior in markets can be dictated by weakness.

A lack of maneuverability and flexibility results in lousy alternatives.

The way to combine desirable elements is to “dogfight,” i.e. to embrace the Boydian framework.

Again, this is what the best traders in the world do. It is why they end up with 90/10 and 95/5 P&L rosters.

The killshot is the emergent result as the result of a body of effort.

If they could avoid all the maneuvering they probably would. But they can't, because markets are hard. A trader must dogfight. The killshot is the product of the setup, which is the product of active engagement, which is the product of a full body of effort.

To successfully engage in aerial combat requires a framework.

Think of all the things a pilot has to do, well beforehand, to be in position to win a dogfight. She must know how to fly the plane. She must be comfortable at the controls. She must know the full roster of evasive maneuvers. She must have ample amounts of both theory and practice. She must be versed in aerodynamics and the theory of dogfighting itself. She must know the limits of the craft and what it can do under stress.

It is just an incredible amount of material that has to be integrated well and presented (and evolved) in layers. And theory has to be intertwined with low-risk practice – the equivalent of flying the plane in simulated dogfight situations, or otherwise finding opportunity to “learn by doing” without risking serious capital at first.

When the A.I. Becomes Your F-16

In Boyd's time (he died in 1997) the pilot flew the plane. Increasingly these days, the plane is showing an ability to fly itself. The following is from a *Popular Science* article titled “A.I. Downs Expert Human Fighter Pilot In Dogfight Simulation.”

Artificial intelligence can now beat human fighter pilots in dogfight simulations.

A pilot A.I. developed by a doctoral graduate from the University of Cincinnati has shown that it can not only beat other A.I.s, but also a professional fighter pilot with decades of experience. In a series of flight combat simulations, the A.I. successfully evaded retired U.S. Air Force Colonel Gene "Geno" Lee, and shot him down every time. In a statement, Lee called it "the most aggressive, responsive, dynamic and credible A.I. I've seen to date."

...The secret to ALPHA's superhuman flying skills is a decision-making system called a genetic fuzzy tree, a subtype of fuzzy logic algorithms. The system approaches complex problems much like a human would, says Ernest, breaking the larger task into smaller subtasks, which include high-level tactics, firing, evasion, and defensiveness. By considering only the most relevant variables, it can make complex decisions with extreme speed. As a result, the A.I. can calculate the best maneuvers in a complex, dynamic environment, over 250 times faster than its human opponent can blink.

Machines can now trounce humans in aerial combat... within a simulation at least.

This is the direction the world is going. Machines are getting smarter... faster... better... more useful. And that pace of change is accelerating.

Does this have implications for trading and investing? Of course it does.

The natural instinct is to be afraid. Are humans even needed anymore? Or will they simply be replaced by machines?

Clues to the answer can again be found in chess – where the strongest computer beat the strongest human decades ago.

In February of 1996, the world champion chess player Garry Kasparov went up against IBM's Deep Blue in a series of competitive matches.

Kasparov won 4 matches out of 6, a triumph for humankind. But then, in May 1997, Kasparov agreed to a rematch... which a new and improved Deep Blue then won.

After Deep Blue beat him, Kasparov might have gone off and sulked. Instead, he had the idea to promote a new kind of chess, dubbed "Advanced Chess"... in which humans were allowed to compete *with the help of machines*.

The first ever "Advanced Chess" event, in which human competitors had access to computing analytical engines, took place in June 1998 in Spain. Advanced Chess events have been held on a regular basis since then.

Kasparov popularized this "Advanced Chess" idea – also known as "Cyborg Chess" or "Centaur Chess" – in the late nineties after his loss to Deep Blue.

But the original idea was at least decades older still, dating back to the 1970s. Here is a quote from a science fiction novel *The Peace War*, written by Vernor Vinge in 1984:

"An interesting possibility which arises from the 'brute force' capabilities of contemporary chess programs is the introduction of a new brand of 'consultation chess' where the partnership is between man and machine..."

This also describes the future of discretionary trading.

In the future, the best computer programs will not replace the best humans. Rather they will be *fully at the disposal of* the best humans.

It's impressive to know that an artificial intelligence (A.I.) program can beat a human fighter pilot in a flight simulation.

But consider this. For future traders, the A.I. will become *the fighter plane itself*. "Human trader" will have the same relationship to "A.I." as "fighter pilot" now has to "F-16."

The best of hardware will be combined with the best of wetware. The combination will be unprecedented. It will be amazingly powerful. We are just on the cusp of this.

But wait, won't the giant Wall Street firms dominate this?

Won't the "big guys" just take all the profits for themselves, with their vast resources and supercomputer budgets? Absolutely not, for reasons that are abundantly clear.

The future of humans in trading is illuminated again via chess.

The best computer programs will not replace the best humans, but will be at the disposal of the best humans.

For one thing, literally trillions upon trillions of dollars are run by technology luddites. Not to pick on value investing, for example, but let's pick on value investing: The gospel of value says don't pay attention to macro, don't use risk points, don't use scenario development, and in fact pretty much don't do anything you couldn't have done with a quill pen and a ledger fifty years ago. The "state of knowledge" for the investment industry as a whole is decades behind.

The Boydian Framework, for most investors, remains somewhere between a foreign language and religious heresy. Which is great!

Then too, trillions upon trillions of dollars – again, the vast majority of sums invested – are scared to death of volatility and concentration... and are instead wholly geared towards rigid asset allocation, conventional risk limitations, "career risk minimization," herd following, and minimized exposure to non-conventional ideas.

In fighter pilot terms, the institutional world demands the comfort of a bulky 747. The idea of doing barrel rolls or pulling G's would make their eyes bug out... and the size of the sums they manage make such a proposition impossible in the first place. The vast majority of capital pools would find it *logistically impossible* to trade in the Boydian style or the Livermore style, even if they genuinely wanted to. (Which they definitely don't.)

Wall Street will not dominate the future of trading – it has neither the stomach nor the desire nor the flexibility.

What about the quants? There are, indeed, amazing advances being made in data sorting and sifting techniques – but it is almost all geared towards finding super-subtle edges on a micro-scale, once again to sidestep all that volatility investors are scared of.

In quant-world, everybody wants natural language processing capabilities to trade hundreds of stocks at a time, deploying micro-edges to earn a smooth return. It's the anti-volatility bias again, leaving big blue skies for those who don't fear turbulence.

Furthermore, it's the *creative experience*, the *methodology edge* and the *trigger pulling* that are key... and none of those are easily replicated, regardless of the sheer computing power at one's fingertips.

It's the creative experience, the methodology edge and the trigger pulling that are key.

Even if the A.I. firepower equivalent of F-16s were made available to everyone – all investors, all traders, all money managers – you would still have to *train to be a fighter pilot* in the first place, and then have the guts to really fly your portfolio – to do the barrel rolls and take the kill shots to truly get superior results.

How many will do that or even attempt it? Very few...

What about high frequency trading? Don't those guys already have an edge? In their specific niche, yes. But HFT is a very different game than discretionary trading's 95/5 profit ratios and concentrated position focus... night and day different.

In terms of volume-at-scale, HFT is closer to the grocery store business or shipping logistics business, making money via tens of thousands of transactions per day, with huge hardware costs and average profit measured in fractions of a percent.

Also, and as we predicted would happen years ago, the profit margins for HFT are being brutalized by competition – because, again, it is closer to being a grocery business or a bulk-volume commodity business than anything resembling discretionary trading.

In keeping with our Boydian Framework context, we do not fear “the rise of the machines”... because we as human traders will be fully equipped to *utilize the machines more skillfully than our opponents*.

We do not fear the rise of the machines, because we will be equipped to utilize them more skillfully.

The A.I. doesn't have to be your opponent in other words – it can be the cockpit you climb into to enhance your own human decision-making capabilities, which will always dovetail with A.I. in respect to the fact that courage, creativity and the ability to navigate ambiguity will always be human advantages (which machines can then augment).

To survive in the 21st century world of trading, it will be necessary to rapidly evolve, and then evolve some more, and then yet more... to such scope and degree that rapid evolution and adaptation are built into one's structures and routine as a way of life.

But the Boydian Framework will remain useful for the duration, as the available leverage from harnessing technology – and trading in the Boydian style – will only grow more compelling (particularly as becalmed markets cycle back towards inflation and volatility).