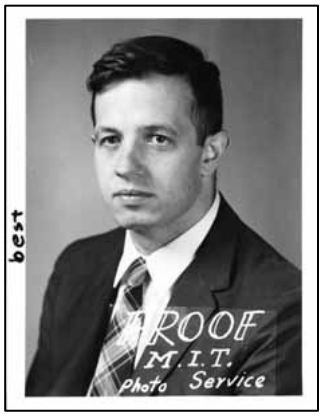
"Inherent Vice"



Nash: See, if I derive an equilibrium where prevalence is a non-singular event where nobody loses, can you imagine the effect that would have on conflict scenarios, arms negotiations …

Charles: When did you last eat?

Nash: … currency exchange …

Charles: When did you last eat? You know, food.

Nash: You have no respect for cognitive reverie, you know that?

Charles: Yes. But pizza – now pizza I have enormous respect for. And of course beer. *[leaves]*

Nash: *[throws stuff down and follows]* I have respect for beer. I have respect for beer!

– "A Beautiful Mind" (2001), biopic of game theorist John Nash (1928 – 2015).

1) If people do not believe that mathematics is simple, it is only because they do not realize how complicated life is.

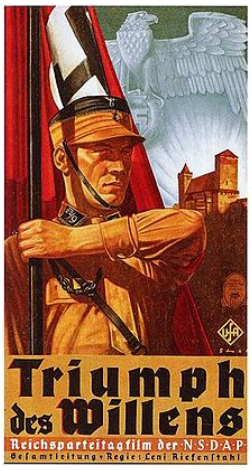
2) Young man, in mathematics you don't understand things. You just get used to them.

3) There's no sense in being precise when you don't even know what you're talking about.

4) It is just as foolish to complain that people are selfish and treacherous as it is to complain that the magnetic field does not increase unless the electric field has a curl. Both are laws of nature.

Four from John von Neumann (1903 – 1957), the father of modern game theory.

I'm interested in the fact that the less secure a man is, the more likely he is to have extreme prejudice.
– Clint Eastwood (b. 1930)



Insecurity is the worst sense that lovers feel; sometimes the most humdrum desireless marriage seems better. Insecurity twists meanings and poisons trust.
– Graham Greene, "The End of the Affair" (1951)

If freedom is short of weapons, we must compensate with willpower.
– Adolph Hitler (1889 – 1945)

One constant among the elements of 1914 – as of any era – was the disposition of everyone on all sides not to prepare for the harder alternative, not to act upon what they suspected to be true.
– Barbara Tuchman, "The Guns of August" (1962)

In a significant move to deter possible Russian aggression in Europe, the Pentagon is poised to store battle tanks, infantry fighting vehicles and other heavy weapons for as many as 5,000 American troops in several Baltic and Eastern European countries, American and allied officials say.
– New York Times, "US Is Poised to Put Heavy Weaponry in Eastern Europe", June 13, 2015

Be careful who you call your friends. I'd rather have four quarters than one hundred pennies.
– Al Capone (1899 – 1947)

We are all impaled on the crook of conditioning.
– James Dean (1931 – 1955)

There's nothing stable in the world; uproar's your only music.
– John Keats (1795 – 1821)

Shasta Fay: I went on a boat ride.
Doc: A three hour tour?
Shasta Fay: They told me I was precious cargo that couldn't be insured because of inherent vice.
Doc: What does that mean?
Shasta Fay: I don't know.
Narrator: Inherent vice in a maritime insurance policy is anything that you can't avoid. Eggs break, chocolate melts, glass shatters, and Doc wondered what that meant when it applied to ex old ladies.
– "Inherent Vice" (2014)

I was at a conference, on deck for a presentation, and I had the chance to listen to the Q&A for the speaker ahead of me.

"Assuming no external shock, how much longer can this bull market run?"

The speaker, not exactly the most sparkling of raconteurs under the best of circumstances, first replied with the obligatory, "well, that's a very good question", and then proceeded to give a detailed, bone-dry explication of exactly how long he thought this market would run, the likely level of the S&P 500 top, and a few winning sectors and stock picks for good measure. It all sounded very smart, and I'm sure he was … smart, that is. But boy oh boy, if there were ever a living embodiment of von Neumann's dictum that being precise is all too often a waste of time, this was it.

Because this wasn't "a very good question". It was, in fact, a pretty useless question, the functional equivalent of asking a botanist how big a tree can grow in the absence of storms, droughts, fires, blights, lightning, insects, or whatever. Answer: pretty darn big. Better answer: who cares? You don't need my help with an investment strategy for a paradise scenario, any more than you need my help with an investment strategy for a doomsday scenario. But where we could all use some help is with an investment strategy for the Real World in-between paradise and doomsday. What we all need is a good perspective or vantage point for differentiating between this potential shock and that potential shock, for evaluating what signals to press and what signals to fade. It's not a matter of predicting shocks, but rather a matter of reacting to incipient shocks smartly and strategically, of knowing, in the immortal words of Kenny Rogers, when to hold 'em and when to fold 'em. Now *that's* a good question, and it's one that Epsilon Theory is well suited to take on.

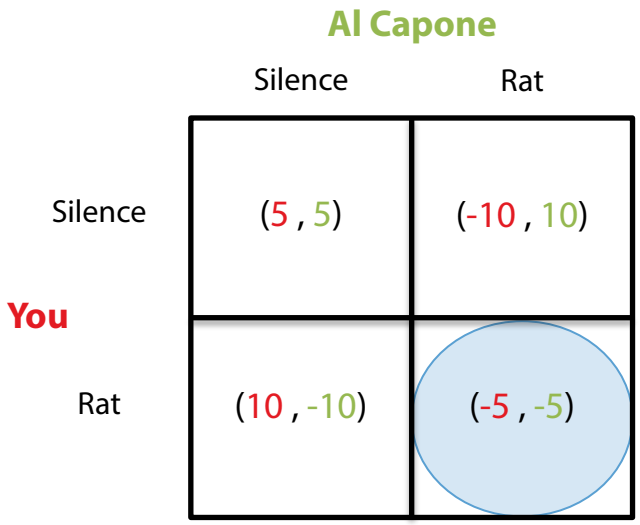
There's a specific sort of instability in the world today – a game theoretic instability – which means that it has an identifiable pattern and rhythm you can understand in order to improve your investment strategy. **It's the instability of the game of Chicken, and once you start looking for it, you will see it *everywhere* here in the Golden Age of the Central Banker.** Greece vs. the Troika? Chicken. Western sanctions on Russia over the Ukraine? Chicken. OPEC vs. US energy producers? Chicken. ECB vs. the Swiss National Bank? Chicken. Fed monetary policy communications to markets? Chicken. Abenomics? Chicken. US policy towards China? Chicken. ISIS vs. the world? Chicken.

Let me take a minute to describe why a game of Chicken is particularly and peculiarly unstable, because understanding the game's dynamics is crucial for understanding how and why Chicken has become the defining strategic interaction of nations and institutions today, just as it was in the 1930s, the 1910s, and the 1870s. To make that description, I'll be drawing on the concept of the *Nash equilibrium*, the most influential insight of mathematician John Nash, whose early career and lifelong struggle with mental illness was portrayed in the great movie "A Beautiful Mind", and who was killed last month in a car accident at the age of 87 (I'd like to think that his not wearing a seatbelt while traveling on the New Jersey Turnpike was a game theoretic exercise, but that's the Keats-ian Romantic in me talking).

The central idea of the Nash equilibrium is that a non-cooperative strategic interaction between players (for simplicity's sake we'll just talk about two player games, although the concept is applicable for any number of independent players) is in balance, i.e. in equilibrium, if neither player prefers to "move" from the current game position after consideration of both his preferences and potential

moves AND his opponent's preferences and potential moves AND the knowledge that both of you are thinking about the other in this manner. The Nash equilibrium takes seriously the notion that the other player is just as smart as you are and, as importantly, just as strategic as you are – meaning that both of you can look several moves ahead, and both of you are making moves that are contingent on the other player's moves. Like all great ideas the Nash equilibrium seems simple at first blush, but it's a deceptive simplicity, one that when applied rigorously can shed light on a raft of social interactions that otherwise seem irrational or unpredictable.

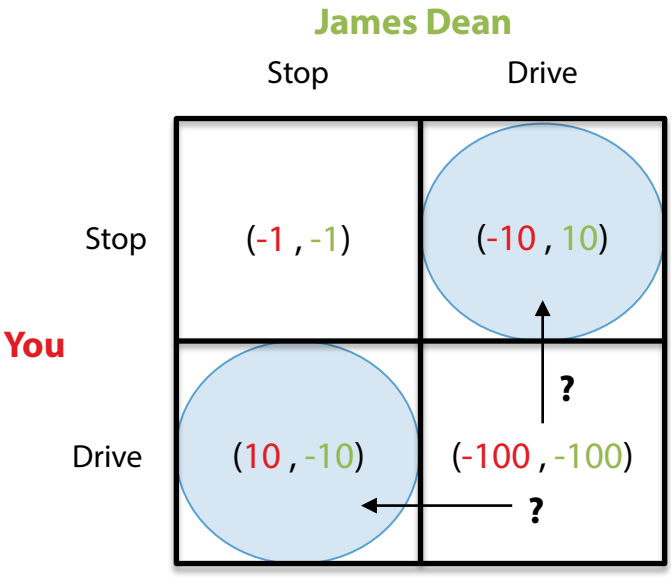
I'll start with a common game that has a straightforward Nash equilibrium, the Prisoner's Dilemma. I've written about this game in several prior notes, so I won't go into detail here about its meaning. It's just an example to explain the nomenclature. Below is the standard way of depicting a game between two players – in this case you and Al Capone – with each player having two behavioral choices – in this case Silence or Rat – and with the game payoffs in red for you and green for Al. The infamous Prisoner's Dilemma outcome, where both you and Al rat on each other even though you both suffer more than you have to, is marked with the light blue oval and is the stable Nash equilibrium.



The Rat-Rat outcome is a Nash equilibrium because you don't want to change from Rat behavior to Silence behavior (moving from the bottom right quadrant to the upper right quadrant) because your red payoff declines from -5 to -10. Ditto for Al Capone. He's not changing his behavior from Rat to Silence (moving from the bottom right quadrant to the bottom left quadrant), as his green payoff would be worse for making the move. **More interestingly, the Rat-Rat outcome is a highly**

predictable Nash equilibrium because no matter what quadrant or combination of behaviors you and Al start with, the game always ends up in the bottom right quadrant. Why? Because this is a non-cooperative game. Even if you and Al start in the happy upper left quadrant of Silence-Silence, where there is a +10 total utility to the shared outcome, there's no way for Al to prevent you from choosing Rat behavior and boosting your personal payoff from +5 to +10. That wouldn't be so bad in and of itself, but your choice to move from Silence to Rat is accompanied by Al's payoff changing from +5 to -10, and that's intolerable for him. So he decides to switch his behavior from Silence to Rat, to get out of what's called the "sucker payoff" of the bottom left quadrant if that's where you were planning to put him, or to put the sucker payoff of the upper right quadrant onto you if you were keeping your mouth shut after all. Of course, you are thinking about Al Capone in exactly the same way, and both of you know that both of you are thinking in this manner. All this combines to make the Rat-Rat outcome a very speedy equilibrium solution to the Prisoner's Dilemma.

Now here's the layout for the game of Chicken.



You and James Dean are each driving your car towards the cliff's edge, but unfortunately for both you and James there isn't a single Nash equilibrium for this game. Obviously it's disastrous for both of you to stay in the lower right quadrant where you're both dead and leaving behind pretty corpses. But why should you stop your car and enter the stable but embarrassing Nash equilibrium of the upper right quadrant (-10 for you, +10 for him) when it would be just as easy for James Dean to stop his car and move both of you into the far more enjoyable and just as stable Nash equilibrium of the lower left

quadrant? A game of Chicken has two Nash equilibria, each just as likely as the other, each just as "natural" an outcome as the other. **This is the inherent vice of the game of Chicken – it is *impossible* to predict the outcome of the game by looking at the fundamentals of the game.** It is inherently unpredictable – not because we don't know enough facts about the situation or because we're not smart enough to analyze the situation – but because it is the mathematical nature of this particular beast.

I'm often asked what I think the outcome of the negotiations between Greece and the Troika will turn out to be. Will Greece leave the Euro and default on its debt? Will Germany blink? And when I answer the question by saying that I don't know, I can feel the disappointment. Don't you even have an opinion, Ben? You seem to know a lot of the facts here, or at least you talk a good game about domestic Greek politics and multi-level game-playing. What good is game theory and all your knowledge if you can't even handicap the odds of a Greek default?

Game theory is useful precisely because it tells me that there is no fundamentals-based or structural methodology to handicap the odds of a Greek default! Sometimes the answer to a mathematical question is the same as the answer to a prayer or the answer to a Magic 8 Ball: NO. There is no greater understanding possible here through the use of science and mathematics. To paraphrase Von Neumann again, get used to it.

In my stump speech about investing in the Golden Age of the Central Banker, I always start by making the distinction between decisions under risk and decisions under uncertainty. In a decision under risk, you know the possible outcomes of a decision and you have a rough sense of the probabilities to associate with those outcomes. In a decision under uncertainty, you either don't know the possible outcomes or it's impossible to assign meaningful probability distributions to those outcomes. What's at stake in the distinction between the two? **All of modern portfolio theory and all of mainstream macroeconomic theory and all of econometric modeling – ALL of it – is based on the assumption that everyone in the world is making decisions under risk.** Violate that assumption – an assumption that is as deeply buried and indecipherably written within the edifice of academic economics today as the assumption that "a nationwide decline in home prices is impossible" was deeply buried and indecipherably written within the edifice of $10 trillion worth of residential mortgage-backed securities in 2008 – and your portfolio risk analysis suddenly has a hole big enough to drive a truck through. **Game theory provides a perspective and a toolkit to distinguish**

between decisions under risk and decisions under uncertainty. It can't work miracles by predicting the outcome of something that's inherently unpredictable, but it can identify the situations that are unpredictable and suggest coping mechanisms for dealing with them. And that's a lot. It can also highlight the situations where you have made a category error, where you have a misplaced confidence in your existing risk management toolkit or perspective. And that's a lot, too.

So what does determine the outcome of a game of Chicken? Surely it's not just a random outcome? Well, no, it's not random, but you're not going to like the answer I have for you any better. **The game of Chicken is not a test of power and capabilities. It is a test of will. It is governed by constructed signals of resolve, control, and – occasionally – lack of control. It is governed by Narratives, particularly by political Narratives when the game is played on an international stage.** Cooler heads rarely prevail in a game of Chicken, even if they're objectively the stronger player. Because we're all smart enough to know how to play the game, and because we know that the other players are going around and around in their heads trying to figure it out just like we are, the game of Chicken breeds insecurity, doubt, and miscalculation like no other. Play the game enough times and it will break you. It's un-insurable, plagued by inherent vice, and that means that it's un-investable, too.

I promised that game theory could provide some coping mechanisms for dealing with technically uncertain (as opposed to merely risky) investment or policy environments, and I'll write briefly about three in this note. The first two are methods for gauging which equilibrium the game of Chicken is moving towards by evaluating the relative strength of the competing player Narratives. The third is a more general observation about gameplay and timing.

First, watch for acceleration and deceleration in behaviors, not absolute levels of speed. Technically speaking, second derivatives are always more influential than first derivatives as signaling devices because they contain more information (data that makes you change your mind; see "Sometimes A Cigar is Just a Cigar" for a primer on Information Theory), and third derivatives are even more powerful. More colloquially, it's not whether your car is going faster than James Dean's, it's whether you are accelerating your speed more than James is accelerating his speed. Better yet, it's whether you start to accelerate at a faster rate than you were a second ago. Remember, the game of Chicken is all about intentions and willpower, not capabilities and structure, and pressing down on the gas pedal is the only structural (or to use a $10 word, endogenous) method of communicating those intentions.

Three quick examples of the primacy of change (and change of change) in determining market outcomes in Chicken environments:

1) What was the Fed Narrative that brought markets back from the abyss in the spring and summer of 2009? Answer: "green shoots" – the notion that even though the US and global economy were still declining, they were getting worse at a decelerating rate.
2) What was the market reaction to Bernanke's summer of 2013 Narrative that the Fed was not going to put on the brakes, but they were going to "ease off the accelerator" a bit? Answer: Taper Tantrum – a sharp decline in almost all asset classes in almost every market around the world, as investors reacted to the *change in intentions* signaled by the Fed (for more on this, see one of my first Epsilon Theory notes, "2 Fast 2 Furious").
3) Now fast forward to today and ask yourself why we are NOT seeing a similar sell-off in global markets as the Fed very publicly goes about its business of preparing to raise short rates. Answer: because from a second derivative perspective putting on the brakes is the same thing as taking your foot off the accelerator. Deceleration is deceleration; you're just crossing the zero-line when you put your foot on the brake. There is no essential *change in intentions* from the Taper Tantrum to today, and that's why this Narrative-dominated market continues to set new highs.

Second, watch for self-binding behaviors, particularly suicidal self-binding behaviors. These are very powerful Narratives for signaling intentions, and they are variations of the classic Chicken-winning strategies of ripping your brakes or steering wheel out of the car, or acting so crazy that your opponent believes that you prefer death to defeat.

By suicidal self-binding behaviors I mean politically suicidal, like John Boehner's go-to move in negotiations with the White House, where he "has no choice" but to take a hard line or else face a revolt from the Republican caucus, but I also mean physically suicidal. And before you say that this is only something that ISIS jihadists would do, consider that last week the US Defense Department floated a trial balloon in *The New York Times* saying that they were considering moving up to 5,000 US troops into Baltic and Eastern European countries. Now the press articles emphasized all the tanks and equipment that would be pre-positioned there, making it seem as if this would be a very potent fighting force, ready to take on a new Evil Empire if one materialized from Moscow. Please. These soldiers would be in Eastern Europe for exactly the same reason we stationed US soldiers in West Berlin during the Cold War: they are there to die. In the event of a Russian attack, their job is to be

killed so that the resulting hue and cry would guarantee an all-out NATO military response. Sorry, but it's true. It's a classic "tripwire" strategy, and the thing about tripwires is that they have to be broken in order to work. Of course, the Russians know exactly what the moves are here, which makes them less likely to engage in full-frontal military actions in the first place, which is exactly the Pentagon's goal. It's an effective way of playing the game of deterrence, which is a form of Chicken, but less effective and more risky the deeper you place the tripwire into Russia's sphere of influence. Color me nervous. Really, I don't see how the game is worth the candle here.

On the flip side of the self-binding spectrum, intentional ambiguity can also be a very effective strategy for playing Chicken, particularly if you're starting from a structurally stronger position than your opponent. What is not effective at all, however, is to switch back and forth between ambiguity and self-binding, as we have seen from time to time with the Fed (data dependence versus strong forward guidance) and *constantly* with this White House, particularly in its foreign policy.

Third, there is one redeeming quality about the game of Chicken – it takes a long time to play. Unlike the Prisoner's Dilemma, where you typically get to the single Nash equilibrium so fast it makes your head spin (and usually too quickly to react effectively in your portfolio), Chicken players tend to have a mutual interest in pushing back the day of reckoning as much as they can. That's because no matter how confident you are that you're "winning" with your clever signals and Narratives, neither your true will nor your opponent's true will are knowable or observable directly. Chicken is a game played through a glass, darkly. It's ultimately as unpredictable for the players as it is for investors, and if there's one group that hates unpredictability even more than professional investors it's professional politicians.

The upshot of all this for investors is two-fold:

1) Take your time in dis-engaging from the game. Yes, a game of Chicken is inherently unpredictable and hence inherently un-investable, but you have plenty of time to exit. Moreover, the passage of time can often make the ultimate car crash much less painful. For example, while a Greek default and Euro exit will spark trouble no matter when it occurs, it's absolutely less destabilizing today with most of the debt in the hands of the Troika than three years ago when that debt was spread all over the private banking sector.
2) Don't freak out on any individual signal or Missionary statement, but don't ring the all-clear bell, either. Because Chicken is a game of *constructed* signals and Narratives signifying hidden

will and intentions, there's almost always "room" for players to volley market-moving statements back and forth, regardless of the objective or structural characteristics at hand. In other words, it is virtually impossible for a single signal to push the outcome into either Nash equilibrium. When does time run out in a game of Chicken? When you see *competing* Narratives of "we have no choice" you've entered the death spiral phase of the game. That's when it's time to head for the hills, and quickly.

I'll close this note with the same line that I find myself using over and over again. The Golden Age of the Central Banker is a time for investment survivors, not investment heroes, and the ubiquity of inherently unstable games of Chicken is a big reason for that advice. There's no shame in picking your battles, in recognizing what's investable and what's not. There's also no reason to panic. But it's not easy to make that differentiation if you're looking at an uncertain world through risk-colored glasses. Time for a new set of lenses, one that takes seriously the patterns of strategic interaction and behavioral dynamics that rocked the world in the 1870s, the 1910s, the 1930s, and … I suspect … the years immediately ahead of us.

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