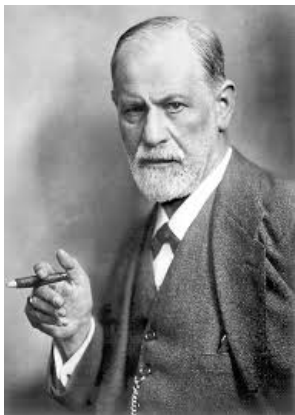


“Sometimes a Cigar is Just a Cigar”



Neurosis is the inability to tolerate ambiguity.

– **Sigmund Freud (1886 – 1939)**

To learn which questions are unanswerable, and **not to answer them**: this skill is most useful in times of stress and darkness.

– **Ursula K. Le Guin, “The Left Hand of Darkness” (1969)**

Is everything connected, so that events create resonances like ripples across a net? Or do things merely co-occur and we give meaning to these co-occurrences based on our belief system? Lieh-tzu’s answer: it’s all in how you think.

– **“The Liezi”, ancient Taoist text attributed to Lie Yukou (c. 400 BC)**

- Deckard:** She’s a replicant, isn’t she?
Tyrell: I’m impressed. How many questions does it usually take to spot them?
Deckard: I don’t get it, Tyrell.
Tyrell: How many questions?
Deckard: Twenty, thirty, cross-referenced.
Tyrell: It took more than a hundred for Rachael, didn’t it?
Deckard: [realizing Rachael believes she’s human] She doesn’t know.
Tyrell: She’s beginning to suspect, I think.
Deckard: Suspect? How can it not know what it is?
 – **“Bladerunner” (1982)**



I remember when I was a very little girl, our house caught on fire.
 I’ll never forget the look on my father’s face as he gathered me up
 In his arms and raced through the burning building out to the pavement.
 I stood there shivering in my pajamas and watched the whole world go up in flames.
 And when it was all over I said to myself.
 “Is that all there is to a fire?”

– **Jerry Lieber and Mike Stoller, “Is That All There Is?”, as recorded by Peggy Lee (1969)**



I call our world Flatland, not because we call it so, but to make its nature clearer to you, my happy readers, who are privileged to live in Space.

– **Edwin A. Abbott, “Flatland: A Romance of Many Dimensions” (1884)**

Homey don’t play that game.

– **Damon Wayans, “In Living Color” (1992)**

There's only one question that matters today in markets: why is the government bond market going up and down like a yo-yo? How is it possible that the deepest and most important securities in the world are currently displaying all the trading stability of a biotech stock?

As with all market questions of singular importance and vast attention, these are questions of meaning. We seek the why and we seek the cause because we are desperate to understand what it *means*. We are – all of us – convinced that this market behavior must mean something profound. Surely this insane quivering within the bond market means that we are on the cusp of a quantum shift in the market landscape. Surely this is the rumbling of a deep tectonic plate that presages a massive earthquake. Surely, as more than one Master of the Universe proclaimed at SALT the other week, the long-awaited bear market in government debt is nigh.

Maybe. Or maybe all those Masters of the Universe are just talking their book. I know ... shocking.

We are all market neurotics today, in the Freudian sense of the word, incapable of handling ambiguity in Narrative after 5+ years of global coordination and cooperation among The Monetary Powers That Be, 5+ years of being told by a monolithic Voice of Command *how we should think* about every single data point that crosses our Bloomberg screen. This is the most hated bull market in history, precisely because we all believe that it is a creature of policy and Narrative, and when the Voices are silent or they say conflicting things, we start to freak out. We run from pillar to post, getting whipsawed at every turn. Importantly, the whipsawing is occurring in the securities that are most closely linked to policy and Narrative – government bonds – and that's why I believe that what we're experiencing is more akin to neurosis than some shift in market fundamentals.

Here's my point: volatility ≠ instability. Or more precisely, a system can be volatile or unstable in a local sense but highly stable in a global sense.

Unfortunately, however, because we live in the local rather than the global ... because every bit of our modern financial services system, particularly financial media, is by *business necessity* focused on the local rather than the global ... we are as unaware of our true positioning in the world as Rachael in "Bladerunner". Or Deckard, who sure seems like a replicant to me. **From a local perspective these bond market gyrations make it seem as if we are totally unmoored and markets are on the brink of some life-altering change. From a global perspective, however, this is a tempest in a teacup.** Or to paraphrase the late, great Peggy Lee, is that all there is to a bond market fire?

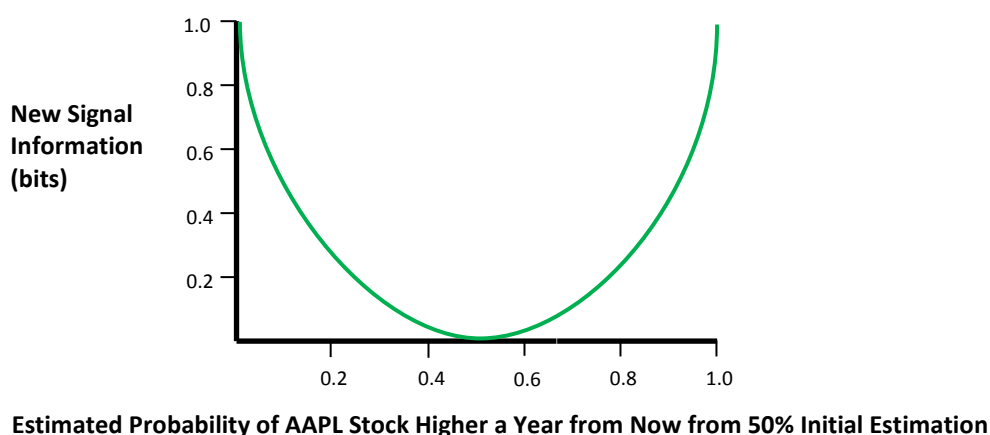
Okay, Ben, that's quite a mouthful: "unstable in a local sense but highly stable in a global sense". Translation, please?

The Rosetta Stone here is Information Theory, and to introduce that it's probably easiest if I quote directly and extensively from one of my very earliest Epsilon Theory notes, "[Through the Looking Glass](#)". I wrote this almost exactly 2 years ago, back when I only had a few hundred readers, so it should be fresh for 99% of the audience. It's a lot to digest, but I promise that you won't see markets in the same way once you finish. Information Theory is, in fact, the beating heart of Epsilon Theory. That said, one of the beautiful things about releasing content into the wild is that readers can do with it what they will. For the TLDR / Short Attention Span Theatre crowd, [click here](#) to skip to the chase on page 10.

*Defining the strength of a signal as the degree to which it changes assessments of future states of the world dates back to Claude Shannon's seminal work in 1948, and in a fundamental way back to the work of Thomas Bayes in the 1700's. Here's the central insight of this work: **information is measured by how much it changes your mind**. In fact, if a signal doesn't make you see the world differently, then it has zero information. As a corollary, the more confident you are in a certain view of the world, the more new information is required to make you have the opposite view of the world and the less information is required to confirm your initial view. There's no inherent "truth" to any signal, no need to make a distinction between (or even think of) this signal as having true information and that signal as having false information. Information is neither true nor false. It is only more or less useful in our decision-making, and that's a function of how much it makes us see the world differently. As a result, the informational strength of any signal is relative. The same signal may make a big difference in my assessment of the future but a tiny difference in yours. In that case, we are hearing the same message, but it has a lot of information to me and very little to you.*

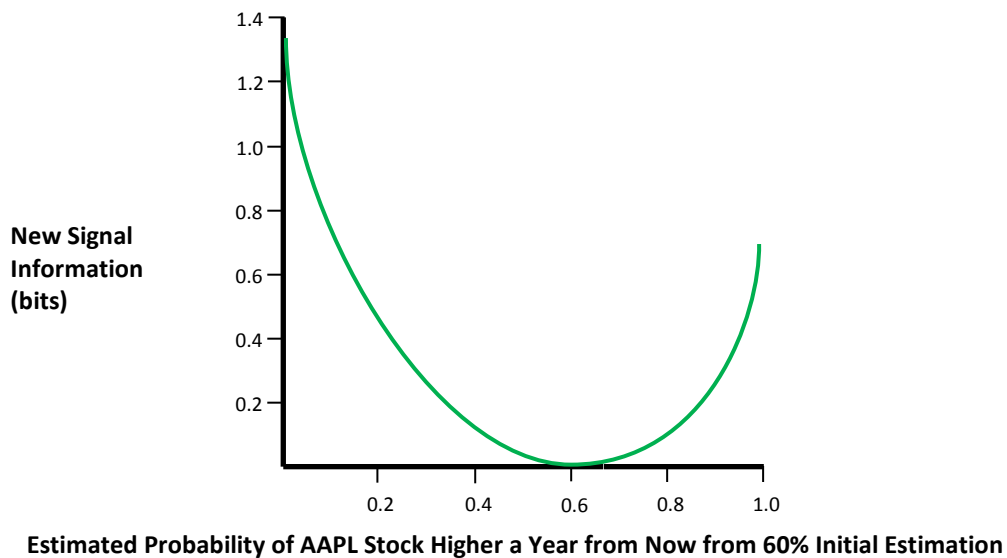
Let's say that you are thinking about Apple stock but you are totally up in the air about whether the stock is going up or down over whatever your investment horizon might be, say 1 year. Your initial estimation of the future price of Apple stock is a coin toss ... 50% likelihood to be higher a year from now, 50% likelihood to be lower a year from now. So you do nothing. But you start reading analyst reports about Apple or you build a cash-flow model ... whatever it is that you typically do to gather information about a potential investment decision.

The graph below shows how Information Theory would represent the amount of signal information (generically represented as bits) required to change your initial assessment of a 50% likelihood of Apple stock going up over the next year to a post-signaling assessment of some new percentage likelihood. These are logarithmic curves, so even relatively small amounts of information (a small fraction of a generic bit) will change your mind about Apple pretty significantly, but more and more information is required to move your assessment closer and closer to certainty (either a 0% or a 100% perceived likelihood of the stock going up).



Of course, your assessment of Apple is not a single event and does not take place at a single point in time. As an investor you are constantly updating your opinion about every potential investment decision, and you are constantly taking in new signals. Each new update becomes the starting point for the next, *ad infinitum*, and as a result all of your prior assessments become part of the current assessment and influence the informational impact of any new signal.

Let's say that your initial signals regarding Apple were mildly positive, enough to give you a new view that the likelihood of Apple stock going up in the next year is 60%. The graph below shows how Information Theory represents the amount of information required to change your mind from here. The curves are still logarithmic, but because your starting point is different it now only requires 80% of the information as before to get you to 100% certainty that Apple stock will go up in the next year (0.8 generic bits versus 1.0 generic bits with a 50% starting estimation). Conversely, it requires almost 140% of the same negative information as before to move you to certainty that Apple stock is going down.



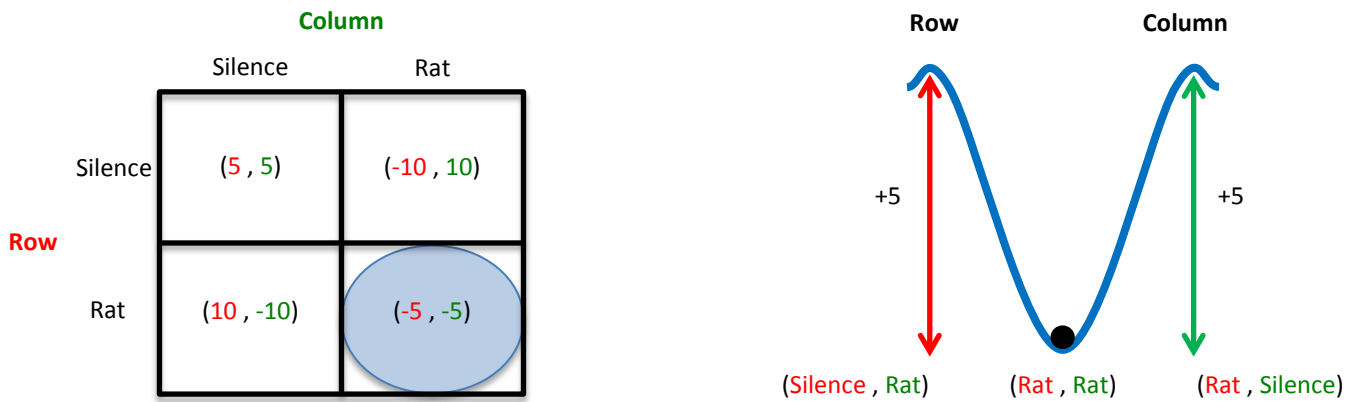
What these graphs are showing is the **information surface** of your non-strategic (i.e., without consideration of others) decision-making regarding Apple stock at any given point in time. Your current assessment is the lowest point on the curve, the bottom of the informational “trough”, and the height of each trough “wall” is proportional to the information required to move you to a new assessment of the future probabilities. The higher the wall, the more information required in any given signal to get you to change your mind in a big way about Apple.

Now let’s marry Information Theory with Game Theory. What does an information surface look like for strategic decision-making, where your estimations of the future state of the world are contingent on the decisions you think others will make, and where everyone knows that everyone is being strategic?

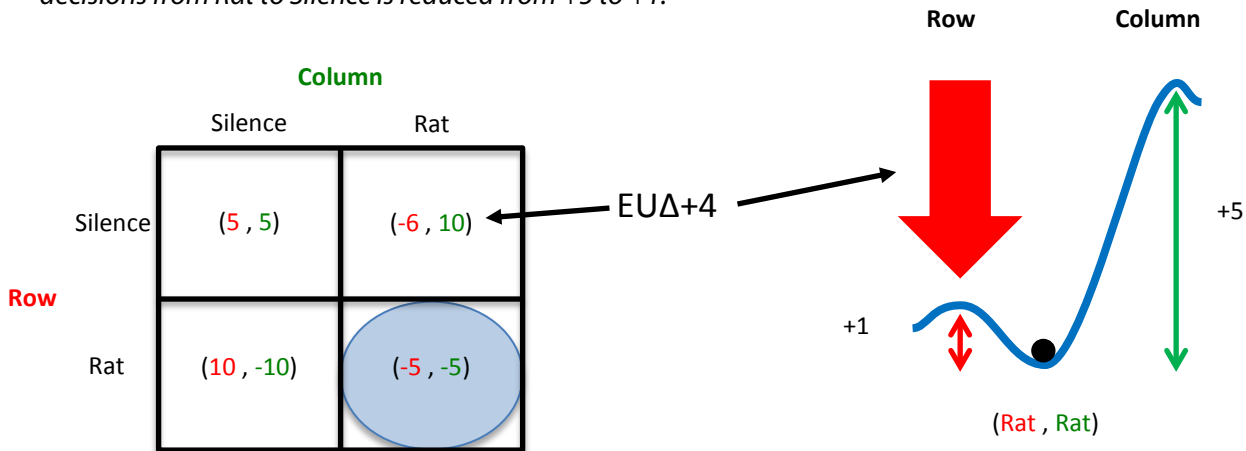
I’m assuming we’re all familiar with the basic play of the Prisoner’s Dilemma, and if you’re not just watch any episode of Law and Order. Two criminals are placed in separate rooms for questioning by the police, and while they are both better off if they both keep silent, each is individually much better off if he rats his partner out while the partner remains silent. Unfortunately, in this scenario the silent partner takes the fall all by himself, resulting in what is called the “sucker pay-off”. Because both players know that this pay-off structure exists (and are always told that it exists by the police), the logical behavior for each player is to rat out his buddy for fear of being the sucker.

Below on the left is a classic two-player Prisoner’s Dilemma game with cardinal expected utility pay-offs as per a customary 2x2 matrix representation. Both the Row player and the Column player have only two decision choices – Rat and Silence – with the joint pay-off structures shown as (Row , Column) and the equilibrium outcome (Rat , Rat) shaded in light blue.

The same equilibrium outcome is shown below on the right as an informational surface, where both the Row and the Column player face an expected utility hurdle of 5 units to move from a decision of Rat to a decision of Silence. For a move to occur, new information must change the current Rat pay-off and/or the potential Silence pay-off for either the Row or the Column player in order to eliminate or overcome the hurdle. The shape of the informational surface indicates the relative stability of the equilibrium as the depth of the equilibrium trough, or conversely the height of the informational walls that comprise the trough, is a direct representation of the informational content required to change the conditional pay-offs of the game and allow the ball (the initial decision point) to “roll” to a new equilibrium position. In this case we have a deep informational trough, reflecting the stability of the (Rat , Rat) equilibrium in a Prisoner’s Dilemma game.

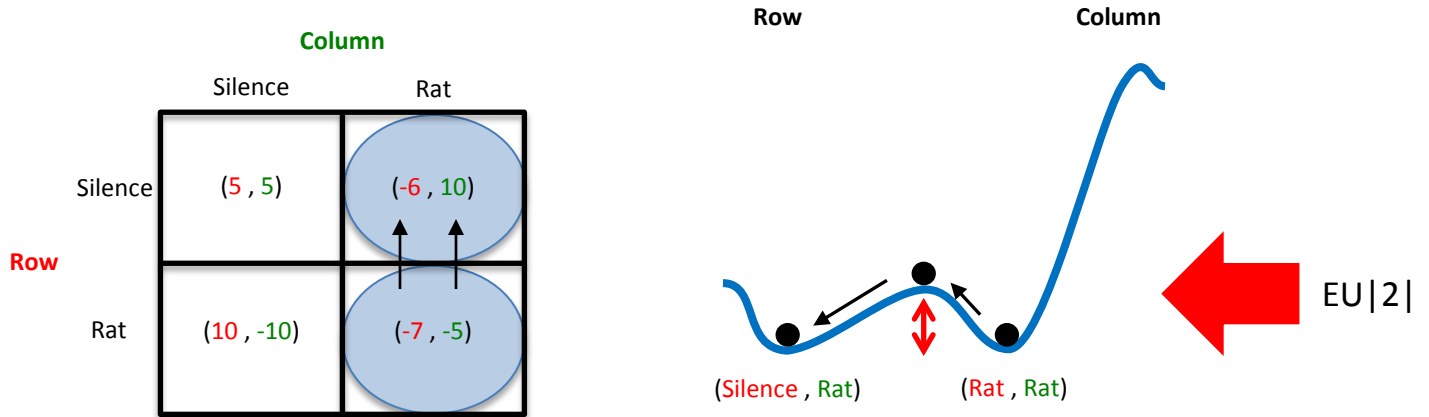


Now let’s imagine that new information is presented to the Row player such that it improves the expected utility pay-off of a future (Silence, Rat) position from -10 to -6. Maybe he hears that prison isn’t all that bad so long as he’s not a Rat. As a result the informational hurdle required by the Row player to change decisions from Rat to Silence is reduced from +5 to +1.



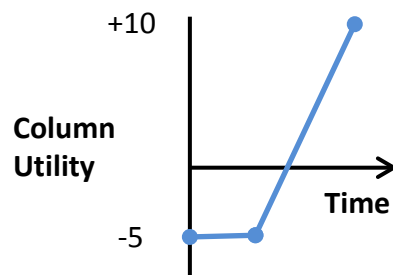
The (Rat , Rat) outcome is still an equilibrium outcome because neither player believes that there is a higher pay-off associated with changing his mind, but **this is a much less stable equilibrium** from the Row player's perspective (and thus for the overall game) than the original equilibrium.

With this less stable equilibrium framework, even relatively weak new information that changes the Row player's assessment of the current position utility may be enough to move the decision outcome to a new equilibrium. Below, new information of 2 units changes the perceived utility of the current Rat decision for the Row player from -5 to -7. Maybe he hears from his lawyer that the Mob intends to break his legs if he stays a Rat. This is the equivalent of "pushing" the decision outcome over the +1 informational hurdle on the Row player's side of the (Rat , Rat) trough, and it is reflected in both representations as a new equilibrium outcome of (Silence , Rat).



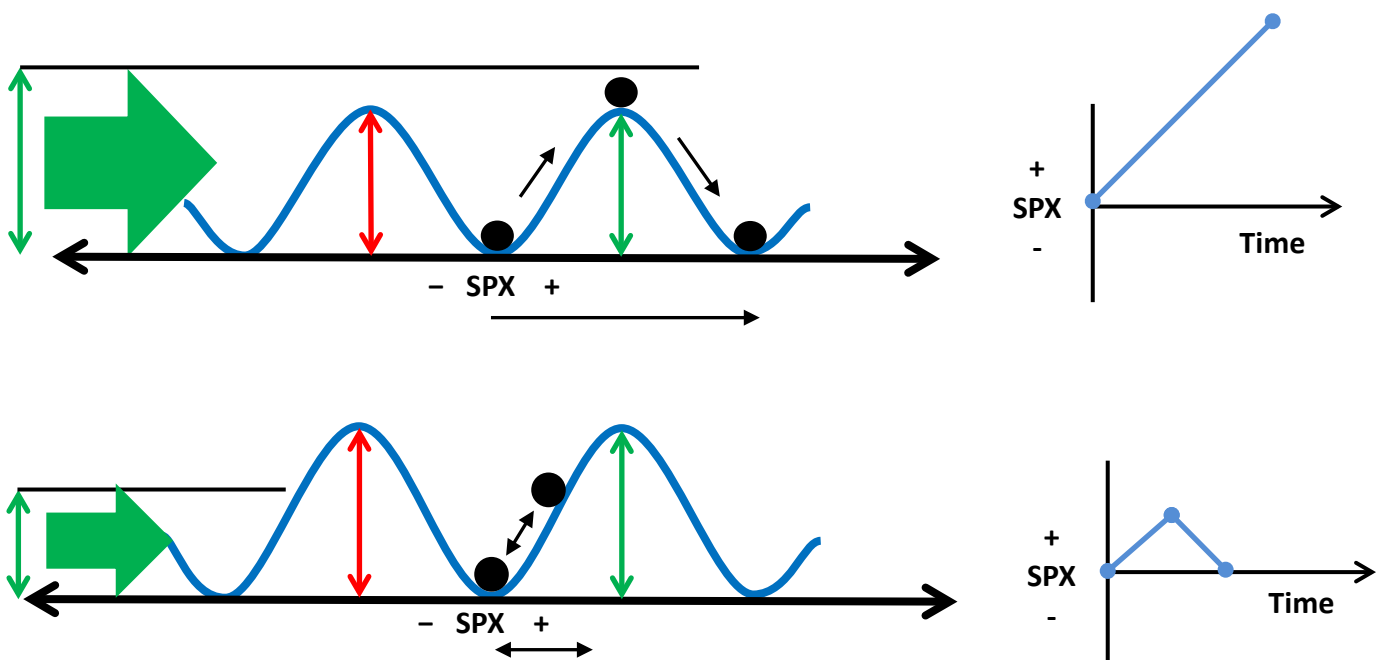
This new (Silence , Rat) outcome is an equilibrium because neither the Row player nor the Column player perceives a higher expected utility outcome by changing decisions. It is still a weak equilibrium because the informational hurdle to return to (Rat , Rat) is only 1 informational unit, but all the same it generates a new behavior by the Row player: instead of ratting out his partner, he now keeps his mouth shut.

The Column player never changed decisions, but moving from a (Rat , Rat) equilibrium to a (Silence , Rat) equilibrium in this two time-period example resulted in an increase of utility from -5 to +10 (and for the Row Player a decrease from -5 to -6). This change in utility pay-offs over time can be mapped as:



Replace the words “Column Utility” with “AAPL stock price” and you’ll see what I’m going for. **The Column player bought the police interrogation at -5 and sold it at +10.** By mapping horizontal movement on a game’s informational surface to utility outcomes over time we can link game theoretic market behavior to market price level changes.

Below are two generic examples of a symmetric informational structure for the S&P 500 and a new positive signal hitting the market. New signals will “push” any decision outcome in the direction of the new information. But only if the new signal is sufficiently large (whatever that means in the context of a specific game) will the decision outcome move to a new equilibrium and result in stable behavioral change.

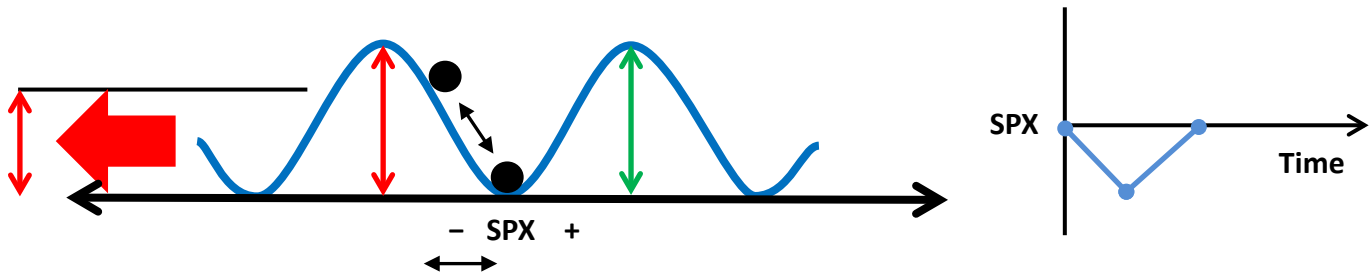


In the first structure, there is enough informational strength to the signal to overcome the upside informational wall and push the market to a higher and stable price equilibrium. In the second structure, while the signal moves the market price higher briefly, there is not enough strength to the signal to change the minds of market participants to a degree that a new stable equilibrium behavior emerges.

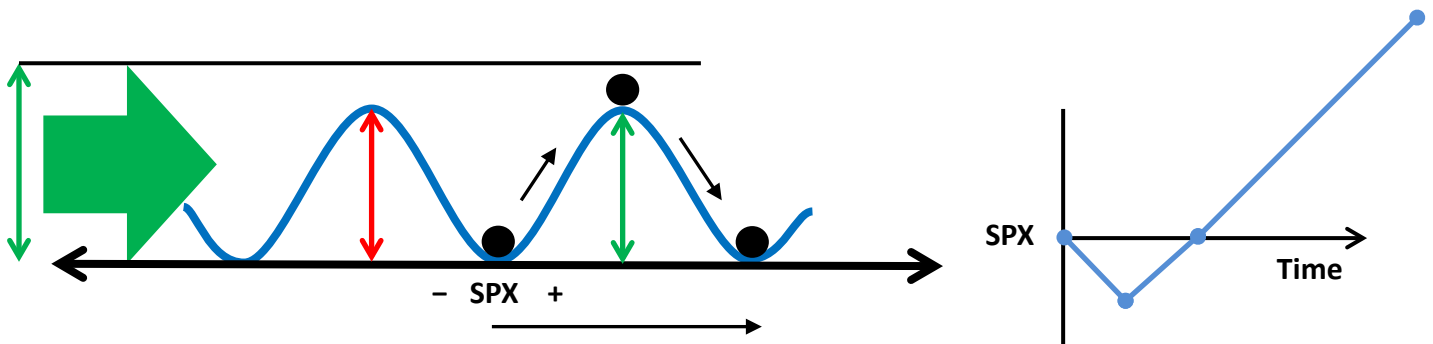
All market behaviors – from “Risk-On/Risk-Off” to “climbing a wall of worry” to “buying the effin’ dip” to “going up on bad news” – can be described with this informational structure methodology.

For example, here’s how “going up on bad news” works. First, the market receives a negative Event signal – a poor Manufacturing ISM report, for example – that is bad enough to move the market down but not so

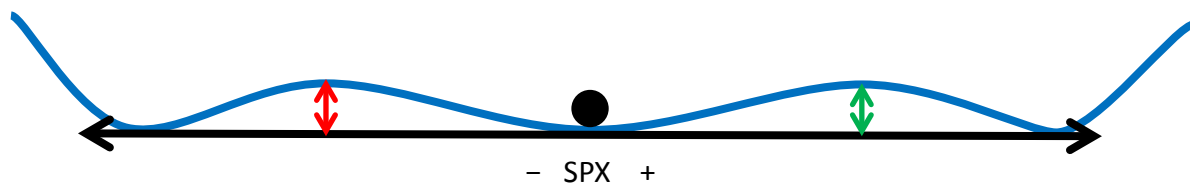
terrible as to change everyone's mind about what everyone knows that everyone knows about the health of the US economy and thus move the market index to a new, lower equilibrium level.



Following this negative event, however, the market then receives a set of public media signals – a Narrative – asserting that in response to this bad ISM number the Fed is more likely to launch additional easing measures. This Narrative signal is repeated widely enough and credibly enough that it changes Common Knowledge about future Fed policy and moves the market to a new, higher, and stable level.



So what is the current informational structure for the S&P500? Well, it looks something like this:



The market equilibrium today is like a marble sitting on a glass table. It is an extremely unstable equilibrium because the informational barriers that keep the marble from rolling a long way in either direction are as low as they have been in the past five years. Even a very weak signal is enough to push the marble a long way in one direction, only to have another weak signal push it right back. This is how you get big price movements “for no apparent reason”.

Why are the informational barriers to equilibrium shifts so low today? Because levels of Common Knowledge regarding future central bank policy decisions are so low today. The Narratives on both sides of the collective decision to buy or sell this market are extremely weak. What does everyone know that everyone knows about Abenomics? Very little. What does everyone know that everyone knows about Fed tapering? Very little. What does everyone know that everyone knows about the current state of global growth? Very little. I'm not saying that there's a lack of communication on these subjects or that there's a lack of opinion about these subjects or that there's a lack of knowledge about these subjects. I'm saying that there's a lack of Common Knowledge on these subjects, and that's what determines the informational structure of a market.

I wrote all that right before the Fed's Taper Tantrum in the summer of 2013, which can be understood using this Information Theory framework as a massive public relations effort by Bernanke et al to create a new [Common Knowledge structure](#) that would shape the informational contours of the market. The immediate signal of this initial effort at "communication policy" was a big red arrow pointing left, and almost all asset classes everywhere around the world took a dive as the strong signal sent the equilibrium marble skittering to the downside across the largely flat informational surface. **But the longer term effect of communication policy was just as Bernanke hoped (and as he spoke about extensively in [his farewell address as Fed Chair](#)): it built an enormous Common Knowledge "wall" off to the downside left of the market informational surface – [a Fed put based not on continued asset purchases, but on continued words of Narrative influence](#).**

Those words form the [Narrative of Central Bank Omnipotence](#), the overwhelming belief by market participants that central bankers in general, and the Fed in particular, determine market outcomes, and for the past two years this has been the only thing that matters in markets. I've been tracking and studying political Narratives for my entire professional career, close to 30 years now, and I've never seen anything like this. It's a heck of a trick that Bernanke started and Draghi perfected and Yellen continues, and it's the key, I think, to seeing recent bond market turbulence in the most useful perspective.

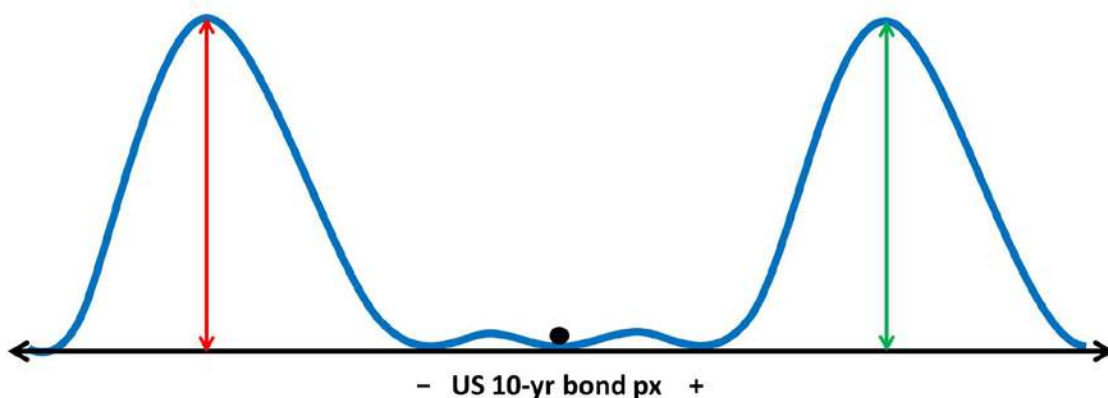
Everything I wrote about the informational surface of the equity market in early summer 2013 is exactly applicable to the informational surface of the bond market in early summer 2015. The bond market today is like a marble sitting on a glass table. There are very few informational structures or

barriers to keep the price of US bonds from skittering this way or that, within a price range as expressed in yield terms of, say, 2.25% and 1.85% on the 10-year bond. **This is what always happens when the Fed comes out and says that it's increasingly "data dependent"** ... our local equilibria become much less stable when the Fed says that it hasn't made up its collective mind about the pace or scale of monetary policy shifts.



With an informational structure like this, the 10-year bond could trade *anywhere* on this segment of the price line. Moreover, it takes a signal with precious little information to change people's minds about whether the US 10-year should yield 1.90% today or 2.20% tomorrow. Precious little information means just that – precious little information – and it's a classic mistake to infer grand theories or reach sweeping conclusions on the basis of precious little information. Don't do that.

Because here's the thing: the informational surface is only flat in this immediate vicinity of current bond prices. **There are enormous Common Knowledge walls just off to the left and just off to the right of the price line segment shown above, Common Knowledge structures created by the entirely successful efforts by central bankers to mold investor behaviors and by [the entirely unsuccessful efforts by central bankers to fix the real economy](#).**



I really can't emphasize this point too strongly – monetary policy since March 2009 has created a phenomenally stable global equilibrium in both markets and the real economy, *an equilibrium that since the summer of 2013 no longer depends on massive asset purchases by the Fed.*

Does the stability of the global equilibrium require *someone* to be making asset purchases, if not the Fed then the ECB or BOJ? To some degree I'm sure it does. But then I remember that Draghi's mere words and an OMT program constructed out of whole cloth were sufficient to save the Euro in the summer of 2012. My strong sense is that the launching of central bank asset purchase programs may move the entire informational structure farther along to the right of the price line (higher prices, lower yields), and vice versa leftwards along the price line if the programs stop, but they don't diminish the Common Knowledge structures themselves. Maybe the locally unstable price range of the US 10-year as expressed in yield terms goes to 2.75% - 2.35% if the ECB were to summarily stop its asset purchase program, but I still think you have an extremely stable global informational structure on either side of that new range, whatever it is. Among market participants today there is almost unanimity of belief that central bankers Will. Not. Allow. a global recession to occur, much less a deflationary equilibrium. But at the same time there is also almost unanimity of belief that central bankers Can. Not. Create. a global recovery, much less an inflationary equilibrium. [That unanimity of belief establishes a global informational equilibrium of unparalleled strength and stability](#), or at least unparalleled in my experience.

And that leads me to my other main point: a highly stable equilibrium cuts both ways, for good and for bad. **Another way of saying that you're in a highly stable equilibrium is to say that you're well and truly stuck.** Yes, there are HUGE informational barriers to prevent economic behaviors that would create a recession in the US or horribly crush any major market or asset class. But by the same token, [there are also HUGE informational barriers to prevent economic behaviors that would spark robust growth in the US or wildly elevate any major market or asset class](#). I'm not saying that the doomsday or heavenly scenarios are impossible. I'm saying that it would take an almost unimaginably large amount of new information to change people's minds about what everyone knows that everyone knows about markets today, for *either* scenario to occur. Could happen. But I really don't think that's how you want to place your bets. My money is on [the long grey slog of the Entropic Ending](#).

I know it sounds weird for me to say that we're living in a deep, deep valley with giant mountains on both sides of us when it *feels* like we're a marble sitting on a glass table, but that's exactly the mixed metaphor that I think accurately describes our lives as investors here in the Golden Age of the Central Banker. I know it sounds weird to think that we could be living in that deep, deep valley and yet be completely oblivious to its existence, completely convinced that the narrow field of view foisted on us day in and day out by the *business imperatives* of the financial services industry, especially financial

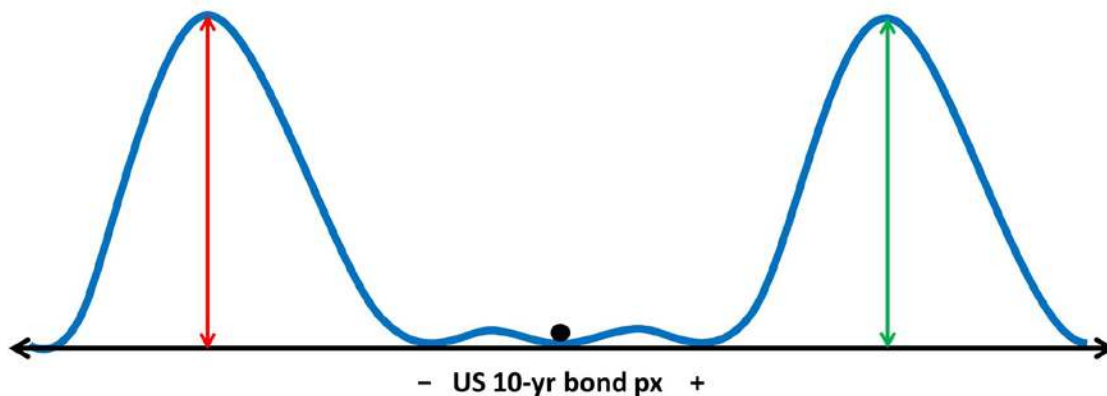
media, is the only possible field of view. But myopically focused on what we are told to focus on is exactly how we humans (and replicants, too, I suppose) tend to live out our lives. Shifting our perspective to take a more global view, whether that's on the dimension of time or emotion or, yes, asset price levels, is probably the most difficult thing any of us can hope to achieve, and it will always be an imperfect shift at best. Yet it's never been more important to make that effort, else we allow our innate search for meaning to be subverted by [mass-mediated, faux-authentic signalers](#) that profit from making us look over here rather than over there. And I'm not just talking about market signals. It's EVERY expression of power in the modern age – financial, political, legal, medical, etc. – that suffers from this mass-mediated form of social control, this manipulation of the Common Knowledge game. The human animal is a social animal. We are biologically evolved over millions of years to infer meaning from social signals. We swim in a sea of socially constructed signals, and we can no more ignore the words of Yellen or CNBC or a Master of the Universe than an ant can ignore the pheromones of her queen. We can't ignore the words. But we can recognize them for what they are. We can ask ourselves "Is that all there is?" and take a more global view.

Sometimes there's significance in signs and portents. Sometimes there's real meaning to be gleaned from careful study of localized phenomena, from the interpretation of immediate events to generate far-reaching conclusions. **Then again, sometimes a cigar is just a cigar, and that's how I'm thinking about recent gyrations in the bond market.**

One final point, perhaps the most important one I've got, and it's addressed to everyone who asks questions like "so, Ben, when do you think the Fed is going to raise rates?" or "so, Ben, where do you think the price of oil goes from here?" The answer: I don't know and I don't really care. Seriously. These are unanswerable, entirely over-determined-in-retrospect questions, and the worst possible thing you can do with an unanswerable, entirely over-determined-in-retrospect question is to try to answer it in deterministic fashion! **The popular fetish with demanding an Answer with a capital A to this sort of question is a crystallization of the market neurosis that afflicts us in the Golden Age of the Central Banker, and it's the quickest path I know to poor investing.**

What I DO care about is Adaptive Investing. What I DO care about is understanding the informational structures of the market that determine the likely market price *reaction* to some new signal, whether that's a Yellen speech, an earnings report, or technical trading data. Trying to predict what that signal is going to be or when that signal is going to come is a losing proposition. Sorry, but I don't play that game. And neither should you. My god, we need more pundit predictions about the Fed or oil prices

like we need an asteroid to crash into the Earth. **What we need is an investment and allocation STRATEGY for whatever comes down the pike, whenever it occurs.** That's exactly what an Information Theory perspective on markets can provide. Take another look at this informational surface.



This graph says nothing about when and what the Fed will do. It says everything about how to THINK about the bond market in a dynamic, non-myopic way, about how to prepare for probabilistic waves of new signals and how to react once they hit. **There's an entire investment and asset allocation strategy embedded in this graph, and I think it's the most useful contribution I can make with Epsilon Theory, far more than adding one more voice to the cacophony of Fed "predictions" that drive our collective market neurosis.** We are slowly being driven nuts by the paradoxes and ambiguities of the Golden Age of the Central Banker, a maddening time in the truest sense of the word, and I don't begrudge anyone's coping mechanisms or business models for dealing with this clinically insane market environment. I submit, however, that our mental health and financial health are best served by taking a strategic view of markets, a view that engages with the game without succumbing blindly to it. That and a regular dose of Epsilon Theory.

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