Understanding Market Evolution: a Scientific Approach

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1. Learning from the Natural Sciences

Both the business and popular press have spent a lot of time and ink recently covering what appears to be a never-ending set of random changes in the financial markets. Actually, changes in two kinds of markets: 1) the markets for financial instruments and 2) the markets for services related to those instruments, services like market-making, clearing and settlement, and asset management. While many of these changes appear to be, and are often treated as, issues unto themselves, they are actually part of an evolutionary process. So it behooves us to look at these changes the way natural scientists look at evolution in the physical world.

The Scientific Approach to Natural Evolution

Scientists have been studying natural evolution for at least 150 years, and they have come to a consensus on several topics.

1. There are always two kinds of forces at work in evolution, with two different timeframes.

    a. Gradual, sometimes almost undetectable forces, like climate change or tectonic plate movement. These forces have massive, permanent effects, but usually allow gradual adaptation by species, both flora and fauna.

    b. Sudden, cataclysmic events, like volcanic eruptions, asteroid strikes or tsunamis. These events throw every species into uncharted waters, and often cause mass extinctions. However, in each case some species emerge from these events stronger and more prolific.

    c. In natural evolution, these two kinds of forces interact. In some cases, the cataclysm compresses the gradual change, rendering gradual adaptation insufficient and forcing its pace. In other cases the cataclysm suddenly stops the gradual process, making it look like the species have much more time to adapt than they actually do.

2. Underneath the observable phenomena, scientists have found two evolutionary truths.

    a. Everything is connected to everything else. For example, changes in the stratosphere affect life at the bottom of the oceans, and changes in single-cell organisms can have a major impact on species at the top of the food chain. In evolution, there is no such thing as an isolated incident. Of course, the connections are fiendishly difficult to decipher, and scientists are still determining some of the causes, as well as searching for future effects.

    b. Also, in evolution adaptability is everything. History is full of species that weren't suited to their new world, and failed to make it, while other species adapted and thrived in the changing environment. Sometimes this adaptability is accidental, as with genetic mutations that happen to work. In other cases it is voluntary, like migrating to a new feeding ground or finding a new food source. Not all adaptations are successful, to be sure – some only hasten the end. The lesson, though, is that staying the same in the face of evolution is almost always a ticket to the fossil display at the natural history museum.

Evolution in the Financial Markets

So now we need to see how much of this is applicable to the financial markets we are concerned with, particularly the markets for financial services.

Our first finding is there are indeed two kinds of changes happening in these markets as well. First, there is the gradual kind of evolution found in such areas as the automation of both trading and trade reporting, or in the gradual compression of fee structures due to competition and efficiency. In the same long-term category is the compression of bid-asked spreads as many financial products mature. We also see the melding of many different financial products into an array of combinations that start out as bespoke offerings and evolve into standardized products. Finally, we see both the emergence and stagnation of various geographies or political structures, and the inevitable globalization of all markets. All these changes have been happening day by day over many years.

While these are going on all the time, we have seen cataclysmic events shake the markets as well. The credit bubble, and its bursting, that dominated most of the 21st century, is perhaps the most prominent example. While the bubble itself served to move the markets in one direction, the implosion snapped them sharply the other way. Then, the markets faced two external forces at the same time, both as a result of the credit bubble. The first was the actions of the world's central banks, as they attempted to prop up the world's economies through the money supply, often acting in an uncoordinated fashion. The second was a plethora of market regulations issued, again regionally, as governments tried to redress what they thought were the causes of previous market panics.

Now let's look at the scientific truths we identified previously to see whether they are applicable in the markets. The first is the axiom that everything is connected to everything else. For example, do changes in the regulation of the equity markets impact business processes in the settlement of currency trades, and, if so, how? And how do the prolonged very low interest rates we currently see worldwide affect the liquidity in the financial markets? There are, of course, dozens of such questions to be asked, and, needless to say, the answers are almost as difficult to find as they are in the natural world. But their difficulty doesn't render them unimportant. So the one thing we can be sure of is that reacting to just one change in just one aspect of the markets is very likely to miss a very important factor just out of our view, and render our efforts suspect, if not disastrous.

A much easier question is whether adaptability is as much a key to survival as it is in the natural world, which I assume we can all agree on. Once we do agree on that, however, we have to move on to determining which adaptations have the best chance of success and which are likely to be blind alleys. That, in a nutshell, is the question of survival, both in and of the financial markets.

Applying What We Have Learned

If we have arrived at the conclusion that the scientific methodologies applied to natural evolution can, in many forms, be applied to evolution in the financial markets, how do we go about doing that? Here are some guidelines:

- **Adhere to the rigor that science requires** – Scientists operate under rigorous a set of requirements, involving hypotheses, objective testing, peer review, and continuous reexamination. The worst thing that can happen to a scientist is to have his/her research be revealed as economically motivated or sloppy. The opportunity for both these missteps is much higher in the financial markets, so everyone

needs to be on the alert for subjective findings or rushes to judgment. Those in positions of thought leadership in the markets must be open about any research they do and how they reached any conclusions.

- **Make sure our research is broad enough** – Natural scientists know that missing a single input can render their conclusions misleading or false, and the same holds true for conclusions in market evolution. Attributing a trend, for example the decline in the number of futures clearing merchants (FCMs), to a single cause, such as increased regulation, will surely invalidate any conclusions, and can lead to catastrophic results. Taking everything into account is a tall order, but an order nonetheless.
- **Subject hypotheses to testing** – This is one of the hardest rules from the natural sciences to apply to market evolution. After all, we can't take segments of the market into a lab and inject them with something, but evolutionary scientists can't inject extinct species either, and they have found ways to test their hypotheses. Fortunately, the markets are overflowing with data, making metrics research not only possible but required. We just need to be smart and creative about how we test.
- **Treat research as a cooperative effort** – Scientists know that multiple approaches to the same problem, from multiple disciplines and backgrounds, are much more likely to hit the jackpot than single views, often clouded by intellectual biases or economic motivations. Only when we all see this work as serving a common purpose, as opposed to promoting an agenda, will we step out of the fog into the sunlight.
- **Reward effective research** – Market research, like scientific research, takes resources. Where that research benefits one segment, it is appropriate for that segment to fund it, but there are plenty of cases where the research benefits everyone equally. In the same way that the natural sciences solve this problem, the science of market evolution will have to.
- **Have no fear of breaking molds** – The progress of the natural sciences has been a long history of the skepticism of assumed truths. In market evolution, we should also expect a variety of structures to be torn down and replaced. Sacred relationships between vendors and customers, time-honored ways of doing business, even legal structures that once served a higher purpose, must all be viewed as suitable only when they fit with the evolving market.
- **Understand the objective of it all** – In some ways, this will be the hardest guideline to follow. For each individual participant in the markets, the objectives are clear – either profitability or statutory obligations to ensure market safety and fairness. But every market participant has a hidden objective, whether they know it or not – that the markets continue to function and provide a place to do business. Beyond all the individual competitions and struggles, the markets themselves are moving down a path that takes no notice of any single participant. So, while each participant may have complete understanding of its own environment, only together do we have the chance of adapting to evolution – and surviving, not to mention thriving. It really is up to us.

2. Surviving in the Jungle

For everyone involved in the financial markets worldwide, the last several years have had all the earmarks of a safari gone terribly wrong. Coming from a period of high volatility and even higher trading profits, with the concomitant inflation of trading desks and bonuses, we have somehow arrived at the lion's den, with falling revenues, higher compliance costs, layoffs, and disappearing bonuses all around. Deep in the darkest part of the jungle, it would be easy to conclude that there is no way out, that all the negatives are here to stay, and that there will just be the bones left to pick over.

The situation looks as dire as it does because it is the result of two forces acting at once: increased regulation and reduced volatility. Either by itself would cause some worry, but together they appear dangerous. Let's look at them separately first, and then together.

Increased Regulation

Ever since the G20 nations put out their market reform manifesto in 2009, market participants have been facing an onslaught of new market regulations. Unfortunately, the regs have come from everywhere and in many different forms. Even the creation of the Financial Stability Forum as a G20 overseer has done little to homogenize market regulations globally.

Of course, increased regulations by themselves can have unexpected consequences. One example is the concentration of risk resulting from the clearing mandate for derivatives. Coupled with the opacity of the clearing structure, where clearing members often obscure the CCPs' view who is actually taking on the risk, and the relatively low capital requirements for CCPs, this development carries some rather frightening possibilities. Some time ago I calculated that the $400+ trillion of fixed-float swaps, with an average tenor of six years, represented a $24 trillion mark to market for every 100 basis points rise in overnight rates. Even if we assume that 75% of these swaps are back to back, we are still looking at about $6 trillion in net variation margin for the same rate movement. And who would owe all that VM? Nobody knows.

At the same time, not only are local regulators somewhat in competition with each other, some regulations can be in conflict with other regulations in the same jurisdiction. In the EU, in particular, both the trading and pre-trade transparency obligations can conflict with the best execution obligation, leaving both dealers and asset managers standing between a lion and a tiger. In such crucial regulatory areas as market abuse, two regional regulators currently have such different requirements that no single person can be expected to apply them accurately trade by trade.

Attempting to deal with all these changes, using both people and technology, has resulted in very high compliance costs for all market participants.

Reduced Volatility

At the same time, while the persistent easy money policies by most of the world's central banks may not have had much effect on the level of economic activity, they have sharply reduced the volatility of the financial markets. Whatever your ideological view of economic policy, it is hard to ignore the impact of low rates for a long time on the workings of the markets. In addition, the various quantitative easing

programs around the world have left much less collateral available, and have reduced the need for market-making in many instruments.

One result of this externally-driven evolution is a drop-off in the number of market service providers. Whether it is brokers, dealers, clearing agents, or hedge funds, we see shrinkage across the service spectrum. Market-making, in particular, has changed drastically in the last five years. One major way is the replacement of human decisionmaking with technology. When we couple this with the smart order routers used by asset managers, we now see the science-fiction scenario of buy-side bots trading with sell-side bots.

Reduced volatility also masks the loss of market liquidity. Low volatility means low market spreads, which translates into a lower trading profits. When coupled with Basel III's increased capital and lower leverage requirements, this dearth of volatility is hiding a potentially serious condition of thin markets across many instrument types.

Looking Ahead

The most important aspect of this situation is the question of how the markets will work when volatility returns. There is a nightmare scenario that goes something like this:

1. When the central banks finally start to raise rates, many of the holders of debt instruments will rush to dispose of them, since many of them reached out along the maturity curve to get acceptable yields, and those holdings are no longer appropriate.
2. To the extent that trading decisions are being made by algorithms, both buy side and sell side could find themselves going in the same direction, enhancing market volatility.
3. A shortage of market-making capital and human resources could leave the buy side grasping at straws with their orders, which would also enhance market volatility.
4. The suddenly higher volatility could cause overnight rates to spike, which would suddenly increase the demand for variation margin. Even if a significant portion of fixed-float swaps are back-to-back, the daylight risk in the VM sector is huge.
5. The opacity of the clearing systems means that market participants wouldn't know who is actually on the hook for the market risk. Uncertainty is always dangerous, particularly as it relates to credit risk, and it would likely prompt a scramble to get out of cleared positions.

This is certainly not the scenario that the world's regulators envisioned when they started down their path in 2009. And some of these developments aren't regulatory at all, but evolutionary. However, regulation would play a part in that scenario, and not a good one. As we've seen, much of the problem would be the result of regulating global and interconnected markets on a local basis. But part would be a result of, as the generals say, fighting the last war, not the next one.

What to Do?

First, we could say that the above scenario is overly pessimistic, based on past experience. Except that we have never actually been through the past eight years before. We have never had at least five years of essentially zero overnight rates, coupled with increased capital requirements on those entities we will depend on for market liquidity. We have never seen a comparable shrinkage in human participation in the

dealer markets, or the dependence on algorithms for trading decisions on both sides. So this scenario might not happen. Then again, it just might.

Although only a portion of the market evolution is a result of regulation, it now behooves regulators to construct the scenario outlined above, to see what the outcomes would be and how they, acting in concert, might influence things. That scenario analysis should address the following questions:

1. If holders of 30% of the debt instruments with five to ten year maturities were to dump them, does the current market have the capacity to absorb that?
2. If overnight rates suddenly rose 100 basis points, what would be the VM impact in the swaps market, and who would bear it?
3. If 80% of the positions in 2 are cleared, does anyone know who is actually on the hook for those, and how the CCPs would determine that?
4. How much capacity do all the markets have to absorb concentrated selling by end investors?

Whether the regulators have the will or time to answer those questions is an unknown today. They could, of course, reach out for help. In the meanwhile, buy-side market participants, in particular, need to make plans of their own. Complying with all the regulations in the world, while it might be a necessity, won't keep you alive if and when all hell breaks loose. After all, the only real law in the jungle is survival.

3. Examining the Long-Term Forces

In the first section, I discussed the evolution of the markets and the requirement that we take a scientific approach to that evolution. Now it is time to apply this scientific approach to the market conditions I discussed in the second section. I will start with the long-term forces at work.

Looking at the Forces

Many of the gradual forces in the markets relate to the march of technology. Let's look at them chronologically throughout the investment cycle.

Investment Management – One of the most important trends, as highlighted in a Milken Institute report, is the six-year movement from active to passive management. Their report documents that, while inflows into active funds from 2012 to 2016 were about $200 billion, inflows into passive funds during the same period totaled about $1.8 *trillion*.

While this phenomenon has been noticed before, not much has been said about the possible causes. It would be tautological to say that during this period the ability of active managers to outperform the benchmarks hasn't justified their higher fees, so we need to ask why this is true. If humans, armed with all the research and judgment they can muster, are consistently tied with broad-based indices, has human judgment been superseded as an investment resource? Or was it always overrated, and we are just noticing it?

There are two possible explanations for this trend. One possibility is that, during the protracted period of very low interest rates and slow global economic growth, worldwide investment performance has been so homogeneous that attempts to beat the averages are futile. If that is the case, then whenever we revert to higher rates will we revert to better performance by active managers and a reversal of the trend? If that is not the case, we have to look elsewhere.

The other explanation is that investment management technology has become so good at assessing a wide variety of inputs and drawing conclusions that human management of investments will wither away. As we look at the advances in many types of technology, from automobile driving to quiz shows, and apply them to portfolio management, we may be seeing the first signs of the extinction of the human portfolio manager.

Order Management – Here we see a more obvious technological trend. As the trading venue landscape becomes more jumbled, and order processing enters the nanosecond era, much of order management disappears from human view onto the blades in the server rack. Even in illiquid markets, where humans have always been essential in decisionmaking, it is easy to envision applications that continually take the pulse of the market and structure orders to take advantage of every nuance they find.

If we do see this happening, we may need to upgrade from TCA to TQA – from Transaction Cost Analysis to Transaction Quality Analysis. If buy side software can be designed to discern whether market-maker software would be likely to respond positively to a bid or offer, not only might we see trading desks become trading bots, we might see market-making change its nature, and shift away from

universal banks to firms with smaller balance sheets. In fact we are starting to see some of that already. Which leads us to...

Market Making – One only has to walk around Wall Street, the City or Stamford to see the physical impact of evolution in this sector. Whether it is empty floors in office buildings or empty desks on the trading floors that remain, the transformation of market-making from a human to a computerized function is hard to miss. Another trend visible to the naked eye is the gradual departure of the universal banks from this function and their replacement by non-bank dealers.

However, this part of the evolution is quite a bit more complicated than some other parts. The same lack of volatility that is impacting the choice between active and passive management has made market-making much less profitable, as spreads have shrunk. In addition, the fragmentation of markets, particularly equities, has meant that anyone putting themselves out as a liquidity provider may only see a small portion of the order flow. This means that market-making has become much less attractive as a business. When we add increased costs and regulatory oversight into the equation, it is possible that the traditional market-making function may become too unattractive for just about anyone.

If and when rates start to uptick, or if there is some other shock to the system, the worry is that there will not be enough liquidity in the markets to absorb the flow of business. The resulting increase in spreads will surely attract some new, or perhaps some recently departed, participants, but the expectation is that there will be a painful period for liquidity takers until that happens.

Settlement, Custody and Clearing – Once the trade is done, we enter a whole new world, which is undergoing its own kind of evolution. The first thing to notice is that post-trade processing is quite different for different instrument types. Currency settlements are quite different from securities settlements, and they are both different from clearing futures, options, and swaps. However investors and corporate users have begun to treat all the instrument types as interchangeable and complementary.

The second thing is that management of risk, by investors, corporates, and market servicers, has become the highest priority. As market participants utilize the whole panoply of instruments, in a wide variety of ways, the ability to measure and manage both the market and counterparty risk of combined positions is paramount. Measurement and management are all about data, and modern risk management requires knowing *all* the data. All the positions, all the counterparties, and all the volumes in all the markets where an instrument trades.

Thus we see the post-trade emphasis changing from the mechanics of settlement and clearing to managing risk and cash flows across a wide variety of instruments, and that means managing mountains of information. For depositories and CCPs, that means getting a much better view of the end users of their instruments, and for custodians and clearing agents it means covering all instruments and processes, and offering data and risk management services in addition to actual processing.

Some Implications

We have lots more research to do, into such things as short-term forces and regulation, but perhaps we can draw some early implications.

1. **Where technology has taken over a function, we are not going back** – For a variety of reasons, the automation march, across all market functions, is not a reversible phenomenon. Technology will only get better at recognizing nuance and applying complex logic. Fears of technology running wild in the markets will not be enough to have firms backtrack from automation. This will be felt in every corner of every market, albeit to a greater or lesser degree.

2. **The relationships between market participants, and their roles toward each other, will probably change** – Time-honored relationships, such as between the buy side and sell side, or between depositories, custodians and investors, will shift under the tectonic pressures of spreads, costs, and risk. In some cases, a function will become unprofitable, and the provider will exit voluntarily. In other cases, the function will become more valuable to a different provider, and the predator will displace the prey, but we can be sure that standing in the way of the change will be useless.

3. **Regulations designed for the old world may have very negative consequences in the new one** – In the same way that generals often fight the last war, regulators often try to prevent the last problem. To the extent that the last problem as not a result of these long-term changes, that kind of regulation can be beneficial. If, however, the last problem (or, more to the point, the next one) is a result of evolutionary forces, then regulating it away is a problem in itself. Thus everyone in the market needs to distinguish between negative reactions to regulations in an attempt to preserve a flawed business model and those observations that highlight evolutionary mismatches, or worse.

In the next section I will look at the short-term evolutionary forces.

4. Examining the Short-Term Forces

In the last section, I discussed the impact of long-term evolutionary forces on market participants. Now it is time to look at the short-term forces at work.

Short-Term Forces in General

The first thing we need to know is that short-term forces are almost always longer-term forces that build up over time and are triggered by some event. So we need to understand both the force (and its cause), and the trigger (and its cause). One recent example of a short-term force is the bursting of the credit bubble, concentrated in the US, during 2008 and 2009. That bubble accumulated over at least ten years, until the overhang of unjustified borrowing collapsed the supporting structure, in the same way snow cover builds up on a mountainside until it lets go in an avalanche. At that point, a collection of rapid events overwhelmed the markets until some form of stability was reestablished.

So, in order to make sense of short-term forces, both in the recent past, and in the near future, we must first look at the suppressed long-term forces, then at triggers, and finally at the effects of the avalanche. Let's start with...

The Credit Bubble – All credit bubbles are a result of too much credit chasing too few quality assets. Whatever its cause, once this one got out of hand it's bursting brought the world's economies to their knees. With regard to market evolution, it brought into sharp focus the interconnectedness of all the financial markets, not to mention all financial institutions. So one important evolutionary result was an almost maniacal emphasis on risk, both market and counterparty/credit. It also pointed up several potential flaws in the markets, such as the opacity of counterparty relationships or the actual risk exposures of many of the largest participants.

But perhaps the biggest impacts the bubble had on market evolution were the ripple effects of the Lehman bankruptcy and the Reserve Fund's breaking the buck. In both cases, something happened that the market thought was impossible, and together they brought on the next short-term force...

Regulatory Reform – The long-playing soap opera of global market reforms has had many reverberations, such as higher costs for all market participants, conflicts between national regulators, and a boom in the compliance industry. However, its evolutionary implications are only now becoming apparent.

One result of the regional/national patchwork is the global balkanization of the markets themselves. As dealing across boundaries becomes more and more of a regulatory nightmare, more and more participants are deciding to deal only with counterparties in their own jurisdiction. The first market where we are seeing this is derivatives, but, as MiFID II and MAR come on stream we are likely to see it in such mature markets as equities, fixed income and even currencies.

Another result is a heavier reliance on technology for compliance, particularly in the pre-trade arena. Whether it is in business conduct under Dodd-Frank, market abuse under MAR, or the trading obligation/best execution conflict under MiFID, nobody in the market, whether dealer, asset manager, prime broker, or venue, can afford to rely on manual decisionmaking or surveillance. The inevitable, if

rare, compliance failure will only be excusable if the market participant was relying on an application that was previously deemed acceptable by the regulators.

Monetary Policy – It can certainly be argued that this force isn't really short-term, since we have had extraordinarily low interest rates worldwide for almost ten years. However, we can and will argue that it is still a temporary phenomenon. The ways in which current monetary policy affects market evolution are often camouflaged, but they are there nonetheless. One major effect has been the drop in revenue for, and the drop in the number of, FCMs worldwide. This may have exposed a flaw already existing in the business model of the clearing firms, which may simply accelerate the changes already occurring there, but the changes are happening quickly.

Another monetary policy effect is what will happen when rates start to go back to what everyone thinks of as normal levels. Here the impact is based on what short term investors have been doing to enhance their yield under the current conditions. If bank portfolios, money market funds, pension funds, and corporations have been reaching out on the maturity curve and down the quality spectrum for yield, will there be a mass exodus from those market segments when it looks like more attractive yields are on the way?

That question highlights the third effect of current monetary policy, the reduced volatility of most markets. Reduced volatility leads to reduced spreads, which leads to reduced liquidity as market-makers decide there isn't enough trading volume or profit to stay the course. Whether it is evidenced in the historically low number of primary dealers in the US government bond market, or the withdrawal of several of the big banks from market-making in many of the lesser markets, we are seeing the markets adapt to these evolutionary forces, which may suddenly change back.

Short-Term Effects

So do these short-term effects accelerate the long term ones, inhibit them, or operate in completely different spheres? Let's look at them in relation to the long term forces we discussed earlier.

The March of Technology – Here the short-term effect is clearly to accelerate the change. Whether we are looking at the increased regulatory burden or the greatly reduced market spreads, the immediate answer to most of the short-term forces, as well as many of the long-term ones, appears to be implementing more advanced technology across a wider range of functions. Some of these functions are repetitive and relatively simple, like cross-margining, while others are nuanced and challenging, like investment decisionmaking, but we can expect many of them to be done by algorithms in the future.

For some people, this raises the specter of a *Matrix* world, where people are walking around unaware that everything they do is dictated behind the scenes by a computer. For others, the risks to the markets are paramount, and for them the recent spate of flash market events are warnings that algorithms don't have the judgment that human traders do, and we turn our trading books over to them at our peril. And the regulators are walking the tightrope in the middle. But none of that will change the direction of the evolution.

The Changing Vendor/Client Relationships – In this area the short-term forces are also accentuating the long-term ones, although this process is much more disparate. In some cases, such as derivatives clearing and market-making, both the long-term and short-term economics are clear, and the markets are adjusting

accordingly. In others, such as specialized asset management or trade settlement, the process is more protracted, and sometimes appears not to be happening at all.

But whether current vendors are abandoning the market in droves or fighting to maintain their positions, change is in the air across the board. And it is important to note that this kind of change usually isn't initiated by the clients, but by the vendors. The most contentious kind of relationship change is when vendors begin to bypass their clients, in order to access their clients' clients. This is always a high-risk strategy, of course, but the alternative may be to hang on to a degrading relationship while a competitor swoops in and makes you yourself obsolete. Once again, doing nothing in the face of change buys you a place at the fossil display.

The "Catch-Up" Nature of Regulation – This regulatory problem becomes most apparent when we look at it in relation to the long-term forces. In particular, we need to look at the effects, both intended and unintended, of regulatory changes, and how they interact with the long-term trends. The most obvious dichotomy is the problem of regional regulation in global markets. This is a prime example of short-term events in direct opposition to long-term trends. As market participants weigh the decision to compartmentalize their business along regulatory boundaries, they have to give consideration to the longstanding migration toward "boundaryless" transactions.

Since regulation is itself a moving target, everyone is balancing the effort of complying with the latest emanations from ESMA, or the SEC, or the Japanese FSA, or the Canadian CSA, against the ceaseless drive toward global market efficiency. The hidden risk is that one relies too completely on the regulatory hodge-podge, only to be caught flat-footed if and when the regulators get their respective acts together. One solution not yet fully explored is that market participants attempt to operate in a "stateless" form, on the assumption that such an approach obviates much of the regulatory jungle. For many, this is the Gordian knot of modern markets. Now where did I put my sword?

In the next section, I will look our ability to measure market liquidity..

5. The Myth of Measuring Liquidity

A recent rule promulgated by the SEC, Investment Company Liquidity Risk Management Programs, and the press coverage of it, continue to perpetrate a myth, or maybe several myths, around measuring the liquidity of markets. Given the impending uptick in rates in the US, as well as global economic uncertainties, and the emphasis on liquidity in MiFID II, perhaps we should reexamine the phenomenon, real or imagined, of measurable market liquidity.

What is Market Liquidity?

The first thing we have to do, of course, is define what we mean by liquidity. We can begin with a 2011 paper by Gabrielson, Marzo and Zagaglia entitled "Measuring market liquidity: An introductory survey." And what do they say? "Providing a rigorous definition of market liquidity has, however, proven to be a cumbersome task ... this paper considers definitions of market liquidity that emphasize the role of the bid-ask spread and the estimation of its components.' So that's one approach.

Or we can look at a 2011 IMF paper entitled "Measuring Liquidity in Financial Markets." Its definition is, "The microeconomic concept of liquidity is multifaceted. Market participants perceive a financial asset as liquid, if they quickly can sell large amounts of the asset without adversely affecting its price ... [however] it is generally concluded (Baker, 1996, p. I) that there is no single unambiguous, theoretically correct or universally accepted definition of liquidity.'" I'm not sure that helped us much.

Or perhaps we can use the 2003 New York Fed's paper "Measuring Treasury Market Liquidity." However, this article has no specific definition of liquidity, except the ability to "buy and sell Treasuries quickly and with low transaction costs." In the end, can we agree to define liquidity as the ability to do transactions in a particular instrument in typically average size, quickly and without undue price concessions? A couple of observations about that definition: it applies to individual securities and only at the moment you are observing. Those two factors will become more and more important as we move along.

Measuring Market Liquidity

One problem with all these definitions is that they don't lend themselves easily to measurement. Since the three previous papers were specifically about measuring liquidity, let's see what they say.

"Measuring market liquidity: An introductory survey" defines the measurement as "the difference between the observed transaction price and the price that would [have] occurred in complete absence of transaction costs... Thus, the return of the more liquid asset will be higher than the return on the less liquid, because of the distorting effect due to transaction costs." Apparently, they define one of the transaction costs as price concessions necessary to complete the transaction. However, they have several other observations, such as "A rough measure of liquidity is represented by the traded volume," or "how much traded volume is necessary to induce a price change of one percent." or "a liquidity index where a stationary distribution of price changes is assumed to hold through the entire transaction time." In other words, we're still searching.

The IMF paper says that "Liquidity measures can be classified into four categories: (i) transaction cost measures that capture costs of trading financial assets and trading frictions in secondary markets; (ii)

volume-based measures that distinguish liquid markets by the volume of transactions compared to the price variability, primarily to measure breadth and depth; (iii) equilibrium price-based measures that try to capture orderly movements towards equilibrium prices to mainly measure resiliency; and (iv) market-impact measures that attempt to differentiate between price movements due the degree of liquidity from other factors... No single measure, however, unequivocally measures tightness, immediacy, depth, breadth, and resiliency." (emphasis added) So how liquid the market appears to you may be a function of which of their measures you choose.

The NY Fed appears to cut the Gordian knot by suggesting that "the simple bid-ask spread—the difference between bid and offer prices—is a useful measure for assessing and tracking Treasury market liquidity. The bid-ask spread can be calculated quickly and easily with data that are widely available on a real-time basis. Nonetheless, the spread is highly correlated with the more sophisticated price impact measure and it is correlated with episodes of reported poor liquidity in the expected manner." This is probably a useful way to compare the liquidity of two instruments that trade in the same market or, by comparing spreads over time, the liquidity of any single instrument in different market scenarios.

Dynamic Market Liquidity

All of this leads us inevitably to the conclusion that it isn't useful to measure market liquidity at any one point in time, but continuously over time. In other words, however we define liquidity, it's a dynamic phenomenon. A simple example of that is US treasury securities. When they are being auctioned and trade when-issued (WI), they are extremely liquid. Once they are delivered, and are what is known as on-the-run, they are very liquid, but probably less that the WIs. As time goes along, and the next issues are auctioned, these issues become off-the-runs and are even less liquid.

And the measurement is affected by a host of other factors. For example, sticking with the treasury market, the number of Primary Dealers has fluctuated from 41 in 1990 to 17 in 2008 to 23 today. Much of that fluctuation is due to costs of capital and market volatility, as well as to the various bouts of quantitative easing, where the Fed bought most of the Treasuries issued. The overall reduction in rate volatility worldwide over the last ten years has made market-making in most instruments much less attractive, as have increased regulation and capital demands.

The Liquidity Myth

So, however we want to measure liquidity, the question being asked is, how liquid are the markets today? According to a recent Bloomberg article, "The bond market is becoming more fragmented as dealers pull back, forcing fixed-income investors to step up efforts to find other sources of liquidity... Asset managers are having to become more proactive as they amass a growing pool of bond holdings that used to be held by dealers, bypassing sellside middlemen on electronic trading platforms and matching buy and sell orders within their own funds."

In a 2015 study, PWC observed that "We have identified four broad areas of decline in financial markets liquidity. These are: (i) difficulties in executing trades; (ii) reduction in financial market depth; (iii) increase in volatility; and (iv) decline in liquidity in the assets which have traditionally been less liquid ("liquidity bifurcation")."

If we assume that market liquidity is particular to a single instrument at a single moment in time, and that we don't have a generally accepted metric to measure it, we are left with general statements about whether liquidity is better or worse than it was in the past, or better in one instrument than another. This is not to say that general statements have no value, only that we should not delude ourselves into thinking that we can compare one level of liquidity to another with any precision.

This is all so important because many regulatory regimes such as Dodd-Frank, EMIR and MiFID II vary their requirements based on the liquidity of the instrument under consideration. We do have the ability to determine such metrics as average daily trading volume or average bid-asked spread, but those determinations, even over time, may not be applicable in high stress times, such as after the Brexit vote or the US presidential elections, when even the most liquid instruments or markets may seize up.

Of more importance to us all are two trends: 1) the withdrawal of many banks from the market-making functions globally, and 2) the shift in asset management from active to passive approaches, both of which serve to reduce market liquidity. We don't, at this time, know if either of these trends are long-term events or will be reversed in the foreseeable future, but tracking them and understanding how they affect liquidity in general will probably be much more helpful that attempts to measure market liquidity with precision.

6. The Evolution of Asset Management

In a previous sections I pointed out that markets evolve in the same way the physical world does, and that successful market participants must adapt to that evolution or risk becoming extinct. Of course all evolution is complicated, so adaptation involves more than just being flexible – it involves a careful reading and sophisticated interpretation of the signs. Perhaps the best place to start such reading and interpretation would be the asset management (AM) industry.

Understanding AM Evolution

One of the biggest stories in AM recently has been the persistent inability of active managers as a whole to outperform their benchmarks with consistency. Astute observers of the industry have noted that most active managers outperform in certain market conditions and underperform in others, which is probably to say that all actives have a style – either implicit or explicit – and do well when the market fits their style and poorly when it doesn't. So we need to determine how this trend is playing out amid market evolution.

Going back to our "two forces" understanding of evolution, what we really need to ask is whether this phenomenon is a long-term irreversible force or a result of the recent bull market driven by the actions of central bankers worldwide, which actions appear to be changing. If we start to see significantly higher volatility, both in rates and earnings, particularly in the face of lower liquidity across most markets, should we expect active managers to reassert their value by consistently outperforming their benchmarks?

Whatever we think, the AM customer set is already making their choice, by and large. According to a CNBC story in July, "In the last year, all categories of long-term active funds lost a staggering $308 billion, while passive funds (again, largely ETFs) attracted $375 billion ... The shift is occurring in all corners of the market, from institutional buyers to intermediaries to self-directed retail investors. It's occurring across all asset classes and geographic markets." So, whether AM customers are right or wrong about market evolution in the long run, they are dictating its path in the short run.

However, evolution never runs in a straight line. A recent article in the Financial Times indicated that "After a long period of rampant growth, the exchange traded fund industry is finally taking a more hard-hearted approach to members of the herd that have not lived up to their promise ... This year the US industry has shut down a record 108 ETFs of some kind, taking the total toll since 1993 to 568 vehicles." To be honest, this kind of pruning is exactly what we would expect in an evolutionary scenario, and doesn't actually decrease the pressure on the active sector.

Market Reactions

That sector is reacting in entirely predictable ways. Since there is a general belief that part of the active management disadvantage is due to higher management fees, active managers have been cutting expenses. According to a 2015 Morningstar report, "Investors are paying less for fund management. The asset-weighted expense ratio across all funds (including mutual funds and exchange-traded products, or ETPs, but excluding money market funds and funds of funds) was 0.64% in 2014, down from 0.65% in 2013 and 0.76% five years ago." Note that this statistic includes both ETFs and active managers, so it probably understates the drop in active fees.

Of course, active managers are looking hard at other ways to reduce costs, and one of the most popular is outsourcing any activities not directly related to investment decisionmaking. Most recently, that effort has focused on the middle office (M/O), which is usually defined as what happens between the execution and settlement of trades. Most of the large custodian banks are developing, or already offer M/O services to go along with the back office outsourcing they have been doing for a while.

There are some advantages, and one possible disadvantage to the active AM in outsourcing the M/O. Cost is one advantage of course, and that is what probably starts the discussion in the first place. However, breadth of scope, both geographically and by product, can be another advantage. For AMs who long ago set up separate M/O functions by region and/or by instrument type, the recent globalization and integration of markets can make that arrangement counterproductive. If the M/O outsourcer can provide integrated functions that also allow for disparate processes, outsourcing can result in both better quality and lower cost.

There is, however, one consideration that could weigh against M/O outsourcing, particularly for AMs that utilize complex derivatives. For many of these instruments, pre-trade decisions are very much a function of post-trade factors, like clearing, margin and ease of offset. This means that sophisticated users of these instruments must be able to model a variety of post-trade scenarios to make a pre-trade decision. M/O outsourcers that can't accommodate that kind of modeling will put a crimp in one of the AMs' most important competitive capabilities.

Looking Ahead

The main question about the future may be answered for us rather quickly after the first of the year. If, as many expect, market volatility returns in the new year, we should be able to tell in short order whether the active management performance shortfall is a long term or short term trend. If it is long term, then active managers will have to accelerate their actions on fees and expenses to get back in the game. Significant automation of manual investment processes would be the next development, as would be combining such services as custody and trust with portfolio management in order to reduce expenses for the customer.

If, on the other hand, increased market volatility exposes flaws in the passive management model, that sector of the market will have to make significant adjustments. One kind of adjustment would be the increased use of the kinds of models that adjust portfolio makeup based on market events – a sort of robo-active management. In fact, such a cross between active and passive management may well become the dominant new style in the AM field. After all, if evolution is always spawning new variants of old species, why not here?

7. The Evolution of Research

The business press is overflowing with stories about massive confusion in the world of investment research. While much of the confusion is attributed to the unbundling requirements contained in the EU's Delegated Directive C(2016) 2031 (the DD), what's happening in the market for investment research is a much bigger story. It is, in fact, a classic case of market evolution.

A Little History

An evolutionary saga can't be told until we go back in history, to a different age. For investment research, we can start in the middle of the 20th century, when the equities market, in particular, was still largely retail, and brokerage commissions were fixed. Investment research was almost entirely produced by brokerage firms, consisted of buy recommendations delivered by their sales reps, the cost of which was buried in the fixed commissions. Customers chose their broker based largely on the effectiveness of the research, since the commissions were not a competitive arena.

In the 60s and 70s the market for investment research encountered three major changes. First, fixed commissions were abolished, unleashing intense competition on that front. Second, after ERISA, institutional investors became a major force in the market, with different needs and approaches than retail. Third, DLJ introduced a new research approach, where they followed companies and industries on an ongoing basis, as opposed to concentrating on actionable buy recommendations, an approach that was tailored for the institutional investor. That approach became something of a standard in the institutional market.

Those changes, taken together, pushed investment research into totally uncharted waters, and forced adaptation by all the participants in the research market. Where we are today is largely a result of that adaptation. Among the issues resulting from those changes were: 1) opacity on how and how much institutional clients are paying for research, 2) difficulty in determining the effectiveness the research, and 3) a lack of controls on how research was bought and sold. These issues have existed under the surface for some fifty years, but they are now the center of attention.

Today's Forces

While the most obvious cause of the sudden attention is the unbundling regulations, there are several other forces at work in the market for research, and they will, in the end, have more influence than regulatory change. As with most evolutions, there are both long term and short term forces to be analyzed.

Long Term

The two long term forces we need to understand are the march of technology across all financial markets and the relentless compression of fees and spreads for all market participants. To begin with, fee compression for active asset managers, as well as the tectonic shift from active to passive management, mean that active managers have much less budget to pay for sell-side research than even a few years ago. Whatever the impact of the new regulations on how research is bought and paid for, the long term fee compression has pushed asset management customers to examine their fees and costs very carefully, and to ensure that they get the maximum value for every fee dollar.

The march of technology is beginning to impact investment decisionmaking, automating many data collection and scanning processes, and even how buying and selling decisions are being made by asset managers. Where it is common nowadays for the buy-side's trading bots to deal with the sell-side's bots, we are looking at a future where the buy-side's portfolio management bots may well be conversing with the sell-side's research bots. Bots definitely work differently than people.

Short Term

The most obvious short term force is regulatory change, but another force that appears to be short term is the relatively low levels of volatility and liquidity across most markets. Low volatility and liquidity make it more difficult for asset managers to turn investment recommendations into investment performance, which means that it is harder to monetize the imputed value of research. Being right about the market only works if you can establish sizable positions without destroying the opportunity, and then participate in a significant market move. To the extent that these are limited, the value of research will be limited.

And, of course, the introduction of the unbundling regulation under MiFID II has had a large impact, more perhaps in highlighting all these forces than in creating new ones. Asset management customers who weren't aware of what they were actually paying for the research that their managers were receiving now cannot duck their responsibility to evaluate it and decide whether to use it. For institutional customers, their management has a fiduciary responsibility to do that evaluation and make those decisions.

Envisioning the Future

Now that we have the various forces in plain sight, we can try to envision how all this will play out. Some possibilities:

1. **Technology changes the active portfolio management business** – As technology moves more and more into the decisionmaking or AI sphere, we should expect it to radically change the way research is used. People communicate with people much differently than machines communicating with machines, so both the content and delivery of research will change through technological progress.

2. **The movement to passive management continues** – This clearly has a negative impact on the value of research, but we need to understand some of the ramifications of the trend itself. The biggest ramification is the possibility of increased market volatility, since all ETFs, as a prime vehicle for passive management, will be driven by the same dynamic. In a market downtrend, the only way to beat the market is to get out, which becomes a self-fulfilling prophecy in the ETF world. After one or two such cycles, there could be a sudden movement back into active management.

3. **Asset management customers refuse to call the shots on research** – This responsibility is fundamental to the role of the asset manager, but not to the customer. Involving the customer in evaluating research puts paid to the idea that you hire a manager to make management decisions on your portfolio. Asking customers to make judgment calls on the research a manager is using to manage their funds is an invitation to go to a manager where this doesn't happen. So, in a few

years we can expect that there will be no RPAs left, and managers are absorbing the cost of whatever external research they use.

4. **The research industry shrinks, in both headcount and revenue** – Once managers have to bear the cost of external research, they will be ruthless in paring those costs down. Any research that is deemed to provide competitive advantage will probably be produced in house, and external sources will modify their content and delivery to be as efficient as possible. In the end, it won't matter much whether external research is provided by the sell side or by dedicated research shops – everyone will be subject to the same cost structures. One difference would be that managers would have to assume that the sell side will have positioned itself to take advantage of any research before passing it on.

5. **The art of evaluating research becomes a science** – With all the costs out in the open and under pressure, everyone will place a premium on developing those processes and systems that can determine the value of each provider and idea. This move from subjective to objective evaluation will inevitably move researcher providers away from following companies and industries and back to generating actionable ideas. In other words, are we going back to where we were fifty years ago? Interesting how that happens.

8. The Evolution of Clearing

Perhaps there is no more important or perplexing part of market evolution than the business of clearing. As we look at both the functions and viability of the financial markets, and of the markets for financial services, the functions and viability of clearing pops up everywhere. So we are well advised to pay close attention to this area.

Understanding the Fundamentals

In order to understand the evolution of clearing and the central counterparty (CCP), we have to review some of its fundamentals. Let's start with risks – two in particular: market risk and counterparty risk. Market risk lasts as long as you have a position, but counterparty risk only lasts until you settle the trade. So if you buy equities or bonds you have both risks for up to five days, and only market risk after that. On the other hand, for extended settlement products, or those that don't have an actual settlement during their life (like swaps), you have counterparty risk for a long time. It is in that second category that the evolution of clearing is playing out.

Of course, extended-settlement or no-settlement products have traded for years, and still do, without CCPs, and counterparty risk management has developed into an art, if not a science. However, the bilateral arrangement is limiting in both volume and breadth, because it requires so much monitoring. In other words, in extended settlement products the breadth of your business dealings is limited by the number of counterparties you can monitor. No matter how the business evolves, that limitation remains.

The Role of the Clearinghouse

With that as background, let's look at the role of the CCP. We can begin by observing that its only role is to *manage* counterparty risk across a wide range of parties. Much has been said about the idea that CCPs serve to *reduce* risk, but that is a serious misunderstanding of the facts. The amount of counterparty risk in a market is simply a function of the size of positions, the volatility of the instruments, and the concentration of the counterparties. How it is structured doesn't change the amount.

CCPs manage counterparty risk in a number of ways, some well known and some not so well known. Two of the well known ways are margin and the default waterfall. Margin itself is such an old subject that I won't discuss it here, except to point out that it is also used in bilateral positions, so it isn't unique to the CCP. The default waterfall is quite a different matter, since nothing like it exists in the bilateral world. Default arrangements, including the default fund and the mutualization of risk, on the other hand, have been discussed and debated throughout the industry, accompanied by plenty of jockeying for position.

The Structure of Clearing

Much less has been said, however, about the concentration of counterparty risk into the CCP. In the bilateral world, each party has direct exposure to each other party, and must manage that exposure individually. In the cleared world, everyone has exposure only to the CCP, or to the CCPs if there is more than one. In one sense, this simplifies counterparty risk management.

In another sense, it makes each party's risk management more difficult, if not impossible. This is because, since the CCP is simply a passthrough entity, it isn't its credit that market participants are relying on, it is

the credit quality of those who hold the positions. If you have any question about that, do you know how much capital each of the major CCPs has?

And there is one more caveat in the clearing structure – most of the actual risk lies with parties who aren't members of the CCP, but deal instead with FCMs. To the extent that FCMs act in an omnibus capacity, this means that CCPs have no visibility into the identities and the credit quality of those who have the ultimate positions. And, given that the FCM business is a competitive one, FCMs are unlikely to share information, including exposure information, about their clients, making the whole clearing structure extremely opaque.

The Evolution of Clearing

With that as a backdrop, let's look at the evolutionary forces at work in the clearing world. As with most of the rest of the finance industry, the primary long term forces in clearing are fee compression and the march of technology. So it shouldn't surprise us if this combination leads to lower revenues and a certain amount of consolidation, even as trading volume grows.

The major short-term forces are the very low interest rates that have persisted for the last decade and the increased regulatory load. To begin with, the new requirement that FCMs hold capital against customer balances has certainly contributed to the reduced profitability of the clearing business. Also, since interest income on free credit balances has been a major revenue source for FCMs for about the same time period, the low rates have been cited as a major cause of the drastic reduction in the number of FCMs, to the point that some smaller users of derivatives are no longer able to find the necessary clearing services. However, it is now clear that the long term forces we have identified here have exacerbated these short term phenomena.

All these forces and changes now leave the clearing business very much at an inflection point. While cost and revenue pressures are squeezing both FCMs and CCPs, counterparty risks appear to be increasing as a long period of low volatility appears to be drawing to a close. What is quite clear is that the old profit model for FCMs is gone forever, but what is not so clear is the new model for the industry.

There are a few indicators, though. A combination of the decline of the FCM business and a discomfort with the opacity on the part of the CCPs does point to more direct participation by customers in the clearinghouses. The tentative feelers in that direction, tentative because FCMs are very jealous of their customer relationships, are perhaps the earliest signs of that change.

But there is a long way to go in the clearing world. The pressure to reduce costs is in direct opposition to the pressure to manage counterparty risk. And the volume limitations that good risk management seems to require are in direct opposition to the volume efforts of both exchanges and CCPs. One evolutionary path that bodes well for all sides is an enhanced process for closing out positions, particularly in what used to be called OTC derivatives. The overhang of back-to-back positions in that area may not increase market risk, but it certainly increases counterparty risk. So, whoever makes it as easy to close out positions as it is to open them will be one clear winner in the ongoing evolution of the clearing business.

9. CCP Resolution: Diving in Murky Waters

The recent publication by the Financial Stability Board (FBS) of its *Guidance on Central Counterparty Resolution and Resolution Planning* refocuses attention on an issue that has been lurking under the surface for some time – what happens if and when one of the large CCPs runs into a major default by one or more of its members. It turns out that a lot has been written on this subject, but, if the waters are already murky, stirring things up again may only make matters worse. So we need to take a deep breath and dive into this scary subject.

Who Said What

The CFTC

In July of 2016 the CFTC issued Letter 16-61, covering recovery and wind-down plans for DCOs. The letter points out that CFTC Reg 39.39 requires each DCO to "identify scenarios that may potentially prevent [the DCO] from being able to meet its obligations, provide its critical operations and services as a going concern and assess the effectiveness of a range of options for recovery," and "(1) to identify the range of specific scenarios that may adversely impact the DCO and (2) to assess fully their respective impacts on the DCO, the DCO's clearing members, and other relevant stakeholders."

After reviewing various DOCs' plans, the CFTC notes that, "a DCO need only identify and address the types of scenarios referenced in Regulation 39.39(c)(1), not each market scenario that would result in losses. Thus, a DCO is not expected to analyze the number of specific scenarios or events that may be necessary for stress testing." Why the CFTC would take that position is beyond me. It does, however, lay out a nonexclusive list of scenarios:

"a. a settlement bank failure;

b. a custodian bank failure;

c. scenarios resulting from investment risk;

d. poor business results;

e. the financial effects of cybersecurity events;

f. internal fraud, external fraud, and/or other actions of criminals or public enemies;

g. legal liability not specific to the DCO's business as a DCO; and

h. losses resulting from interconnections and interdependencies among the DCO and its parent, affiliates, and/or internal or external service providers."

Notably missing from this list is a high-risk strategy undertaken by a market participant, cleared through a number of FCMs who are not aware of the full exposure of the participant. The requirement does include, among other things:

"a. description of the scenario;

b. the events that are likely to trigger the scenario;

c. the DCO's process for monitoring for such events;

d. the market conditions, operational and financial difficulties and other relevant circumstances that are likely to result from the scenario."

So it would be useful if we could review the recovery and resolution plans the DCOs have prepared in response to Reg 39.39. However, according to the CFTC, neither the regulation nor the agency require such plans be made publicly available, so we are left guessing as to what they say.

The FBS

The FBS takes what appears to be a more practical approach, indicating, for example, that: "CCP resolution should seek to:

(i) maintain market and public confidence while minimising contagion to the CCP's participants, any entities affiliated to the CCP and to other FMIs;

(ii) avoid any disruption in the operation of links between the CCP in resolution and other FMIs [Financial Market Infrastructures] where such disruptions would have a material negative effect on financial stability or the functioning of markets; and

(iii) maintain continuous access by participants to securities or cash collateral posted to and held by the CCP in accordance with its rules and that is owed to such participants."

Then the document takes up the contentious question of contractual obligations to and by the CCP. It would give the resolution authority "the power to enforce any outstanding contractual rights and obligations of the CCP, including any existing and outstanding contractual obligations of the CCP's participants to meet cash calls or make further contributions to a default fund, or any other rules and arrangements of the CCP for the allocation of both default and non-default losses (including for the repayment of liquidity providers) where they have not been already applied exhaustively by the CCP prior to resolution." That looks equivalent to the powers of a bankruptcy court in the US.

Then it looks at the status of derivative contracts specifically, and says "The resolution authority should only consider applying a partial tear up if market-based actions to return to a matched book (e.g. auctions or direct liquidation of positions into the market) have failed or are expected to fail, or would likely result in losses that exceed the prefunded and committed financial resources that are available under the CCP's rules and arrangements to cover those losses, or would otherwise compromise financial stability," and envisions full tear-ups as a last resort.

The Worst-Case Scenario

While no one wants to talk about a worst-case scenario, we have to do that. We can begin with a market participant that has taken some wrong way positions, such as a hedge fund, a dealer, or a corporation. Faced with a loss and a backlash, the participant decides to make a hail-Mary bet in the derivatives market. The participant either already has or proceeds to open clearing accounts with multiple FCMs, in multiple jurisdictions, at more than one CCP, and loads up all the accounts with the same position. If the

accounts are all omnibus, and the FCMs do not share their customer information with other FCMs, none of the FCMs nor the CCPs know the full extent of the participant's exposure.

Now the market moves decisively against the hail-Mary position. Faced with massive margin calls, the participant peremptorily files bankruptcy in its home jurisdiction, possibly even before the FCMs actually make the margin calls. Only after the FCMs follow up on the missed calls do they find out the size of the total exposure, and only then do the CCPs begin to understand that the multiple positions they are carrying are all for the same party.

What happens then is a cascade of rumors and bad news, prompting FCM customers to attempt to withdraw any free cash balances, potentially crippling the FCMs. Because nobody knows who actually owns all the positions at the CCPs, everyone assumes the worst. The rumors and news also accentuate the volatility of the markets, increasing the margin calls, and possibly precipitating additional defaults. Only when the regulators step into the markets, perhaps declaring a trading halt, and identify all the end participants in all the positions, would sanity return to the markets. And then the blaming would begin.

An Ounce of Prevention

In the aftermath of such an event, the immediate outcry would be, "How could this have happened?" The simple answer is opacity. Once the participant established the positions in opaque silos, nothing could be done to prevent the meltdown. Any recovery and resolution program at any CCP would be overwhelmed by the market-wide panic.

The opposite of opacity is, of course, transparency, but transparency is often hard to come by in the markets, and clearing is no exception. Neither CCPs nor FCMs are anxious, or even willing, to give out the identities of customers/position holders or the sizes of their positions. Except that they already give it to someone else, for US futures and options. Under Part 16 of the CFTC's regulations exchanges must provide the Commission with confidential information on the aggregate positions and trading activity for each of their clearing members.

Specifically, "Each reporting market shall submit to the Commission ... a report for each business day, showing for each clearing member, by proprietary and customer account, [position and owner] information separately for futures by commodity and by future, and, for options, by underlying futures contract (for options on futures contracts) or by underlying commodity (for other commodity options), and by put, by call, by expiration date and by strike price." In this case, however, the reporting is being done by the exchange, not the FCM or CCP.

On its face, there is no reason why similar information about cleared OTC derivatives positions couldn't be reported confidentially to regulators in the various jurisdictions, and no reason they couldn't pool their confidential information to get a consolidated view of cleared positions in pretty close to real time. Of course, the global reporting of trades in OTC derivatives has been pretty much of a failure, with every regulator complaining that they can't make heads or tails of what they are seeing. However, since we are focused here on cleared instruments, we should hope that the reported information to be somewhat better than the market as a whole.

There doesn't appear to be any better way to enhance the transparency of cleared positions, so this appears to be the best option for clearing the water. On the other hand, we could keep swimming around in the muck, hoping there are no sharks around.

10. The Evolution of Market-Making

So far we have looked at the effects of market evolution on two major business areas – asset management and clearing. Now it is time to look at the area that has gotten the most coverage, if not the most thoughtful consideration – market-making. As we will see, this is the most important and perplexing area affected by market evolution.

The Nature of Markets

The first step is to understand some things about the basic nature of markets in financial instruments. Whether they are physical (as in exchanges and trading pits), electronic, or over the counter (which usually means telephonic), it is important to understand that the basic nature of a market is adversarial. In other words, whatever better price a seller gets always comes at the expense of the buyer, and vice versa. This is often expressed as a zero-sum game, but that is different subject. As long as there are investors with savings to put to work and issuers needing to raise capital, both sides of a trade can be winners. But they have opposite agendas, for sure.

The second thing to understand about markets is the basic differences between liquidity takers and liquidity makers. Takers are in the markets because they need to be in order to fulfill some outside requirement. Makers are in there purely to make money. In other words, takers are trading when they need or want to, makers are trading when the takers need or want to. So makers need to be enticed into the market with the potential to make a profit. When the profit potential drops, the number of market-makers drops, and vice versa.

Finally, the most basic truth is that what is really traded in most markets isn't securities or commodities or FX, it's information. For liquidity makers, in particular, the keys to profitability are the ability to amass information, much of it about the intentions of the takers, filter out the irrelevant parts, and use the remainder to execute profitable trades. In the olden days, when much trading was verbal in nature, this was an art. As trading has become more and more electronic, it has become more and more of a science.

The Forces at Work

Readers of the Market Evolution Series already know that the next subject we will be looking at is the evolutionary forces at work in the field of market-making. As per our policy, we will look at the long-term forces first. And it will be no surprise that we begin with the march of technology. Here, though, we need to identify some of the technology changes happening outside of market-making. In particular, we need to understand some of the changes in areas that generate the orders that arrive at the markets.

The most prominent trend is the automation of more and more of the judgment-based processes that lead up to an order. Whether it is risk management by commercial companies, portfolio positioning by traditional asset managers, or even the selection of ETFs by retail customers, more and of the basic decisions to buy or sell are being automated. And, as technology becomes more and more intelligent about judgment decisions, this trend will only continue.

At the same time, the handling of the orders that result from these decisions is already almost completely automated. Anyone doing significant trading business today without a smart order router is woefully

behind the times. Particularly in markets with multiple types of trading venues, virtually every order from a taker comes from a computer.

Another long term trend that may be seeing something of a short-term reversal is the globalization of markets and order flow. Over the long term, we should expect takers in every geography to be trading with makers in every geography in instruments domiciled in every geography. However, as a result of the regulatory reform of the last decade, we are seeing the emergence of market regulations that differ significantly between major geographies and jurisdictions. Whether it is the trading obligations, definitions of market abuse, transaction reporting formats, or clock synchronization, global market participants now have to look at every order or trade to see whose rules apply to which parts. The unavoidable result of this is balkanization, as both takers and makers start to compartmentalize their businesses so as to minimize regulatory violations. However, globalization is still a long-term force.

On the short-term side, as always, we find regulatory changes, which have served to drive up many people's costs, including the costs of market-makers. When we couple higher costs with the recent period of low volatility and the resulting low spreads, we find the inevitable short-term phenomenon of lower liquidity across most markets. As long as volatility stays low, lower liquidity will look like a long term phenomenon; but when volatility jumps it will look like a major short-term problem. As volatility increases, liquidity, in the form of market-makers, will return, but not right away. Just as it took a while for the lower volatility to thin out the ranks of market-makers, it will take a while for increased volatility to bring them back.

Painting the Picture

So where does all of this leave us, or, more particularly, where does it leave market-makers? To an extent, in the dark. As more and more trading decisions by the takers are entirely automated, and fewer people talk to people in the markets, there will be less and less information of the human kind in the markets. There will, however, be another kind of information available.

To the extent that the algorithms being used to generate orders are predictable, or even replicatable, then we should expect market-makers to be setting up their algorithms to predict and replicate. To the extent that the takers' algorithms are affected by things happening away from the markets, we should expect the makers' algorithms to be monitoring those things and factoring them in. So, to the extent that people are no longer talking to people in the markets, we should expect computers to be talking to computers in the ether. Eventually, when the taker's sell order arrives at the market, the maker's algorithm will be waiting for it with a short position.

All this brings up pictures of an algorithm gone wild, of course, with the inevitable reference to flash crashes. However, that's not the real danger. The real danger is not in a single algorithm gone wild, it is in a large number of takers' algorithms coming to the same conclusion at the same time. This is particularly true in the passive investment management field, where index ETFs generate the very real specter of a self-fulfilling prophecy. In cases where the index has a relatively long period of decline, the holders of the ETFs start to sell, which emphasizes the decline, which causes more sales, and so on. Eventually it bottoms, of course, but it can be pretty scary until it does.

So the market-maker of the future will evolve, over time, into a set of complex algorithms monitoring the things humans monitor today, but probably in a volume many times larger than people can handle and many times more quickly. The algorithms will both make predictions and learn on the fly, much like humans do. And the algorithms themselves will be monitoring their own short-term results, correcting their predictions when they are wrong. Oh, and there will be a human watching over it all, in the deathly quiet of what used to be a noisy trading room, making sure disaster doesn't strike out of the blue. You didn't think this was all science fiction, did you?

11. Dealing With Market Evolution

In the last several sections, I discussed market evolution in general, and the impact of both long-term and short-term evolutionary forces on market participants. But how do we react to all these? Now it is time to look at an approach for dealing with these forces.

The Scientific Approach

Based on my research, as set out in the previous articles, there are several bedrock principles we need to follow in preparing any business to profit from market evolution.

We have to look at the future – This may sound obvious, but we have found it anything but a universal practice. The markets are full of firms of all sizes reacting to their present conditions – getting out of markets, laying off people, selling businesses – but far fewer positioning themselves for the opportunities they see coming. Of course, by its nature finance, and markets in particular, are cyclical businesses, but it never ceases to amaze me how many people who are smart about cycles in financial instruments are caught unawares by cycles in the markets for financial services.

To be sure, looking at the future isn't easy. In the strictest sense, it isn't actually possible at all. But it's still essential. So how do we sharpen our vision of the future? The best way is to have lots of eyes on the picture. Customers, vendors, and even competitors can all give input, and that input might reveal something hiding in plain sight. This "all eyes" process can be a purposeful arrangement, like industry working groups, or just resourceful investigation, as in deciphering a competitor's view of the future from their current preparations. But it requires a constant commitment to the effort.

We have to look broadly – This is the corollary to looking at the future. Since all markets, both geographic and product, have impacts on all other markets, we need to take account of things happening far away from our home turf. The connections can be in the form of alternatives (if one product becomes more expensive to use, I'll switch to another), regulations (if one jurisdiction restricts a particular product, I may switch to another jurisdiction), or economics (increased risk in one market may prompt increased volume in a completely different market).

We have to make sure to look broadly at the markets for financial services as well. A decline in one form of asset management, for example, will lead to a decline in the demand for certain kinds of services to those managers. The emergence of certain kinds of financial instruments, at the expense of other kinds of instruments, will lead to the emergence of certain kinds of services, at the expense of other kinds of services. And we never know where that impact will come from, so glossing over one sector or market that hasn't been important for a while may just miss a crucial clue.

We have to distinguish the cyclical from the secular – Anyone who has worked in the financial markets knows the truth of this. There is nothing worse than buying at the top of a cycle or selling at the bottom. But market participants also know that the secular trend is your friend.

The same thing is true for the market for financial services. Do the current very low interest rates constitute the end of a cycle or the new normal? That's important to know if you are one of the remaining FCMs. Are the current market regulations the high point in a cycle of fear and acceptance, or are we in

regulatory purgatory until we all pass away? In making determinations like this, we have to rely on our ability to differentiate self-limiting and self-correcting forces from the inevitable march of time.

We have to test our hypotheses – Here is where the scientific approach really pays off. As sure as we are of the conclusions we come to, we must treat them as hypotheses that require testing. In some cases, this testing consists of any other observations that support or contradict our conclusions. In some cases the test is a consistency check across a wide range of services, instruments and parties. In some cases it's a reality check with others in the same sector or geography. And in some cases it's a combination of all these.

However, the hypothesis testing is never really done. Even as we put our plans into effect, and spend the money and person-hours to make them a reality, things can change. Experienced traders will tell you that yesterday's big winning trade can be tomorrow's big loser, and the same is true here, so we can never stop testing our hypotheses. Which means...

It's a big closed loop – Because evolution never stops, adaptation never stops. Stock traders, bond traders, or currency traders, for example, know that every morning they start over, with new trades to be made, new risks to manage, and new factors to consider. One day it's the Fed minutes, the next day it's civil unrest somewhere, the next it's an earnings announcement, and so on. And, they will tell you, that's what makes it fun.

The market for services works the same way. Every day we have new factors to consider – technology makes something that was hard easy, regulators issue a new rule or rescind an old one, firms leave lines of business or enter new ones, or former competitors merge. Every day something is happening somewhere, perhaps far away from where we are or the last event we saw, perhaps slowly or very suddenly, but it all impacts the market evolution. And, after all, isn't that what makes all this fun?

Next I will look at a methodology and some interesting examples of adaptation.

12. Methodologies for Success

In the last section, I discussed several bedrock principles we need to follow in preparing any business to profit from market evolution. Now it is time to look at some methodologies for success.

The Methodological Principles

Given the importance of market evolution for all market participants, it is essential that we follow a structured methodology throughout. And, because evolution is a constant process, "throughout" means the foreseeable future. Only if firms become accustomed to an ongoing evolutionary effort will they start to see the real benefits. Here are the principles of the evolution methodology.

Forming the Team – As always, the structure of the team is the first step to a successful effort. To begin with, let's dispense with the obvious admonitions to populate the membership with representatives of all the major business units, and focus instead on what the members have visibility into. Because we are undertaking the difficult job of peering into the future, it will be important that some members have first-hand knowledge of what is happening in other market segments, as well as to customers, customers' customers, vendors, and vendors' vendors. And the team must value their input. Finally, objectivity will be crucial, so the team will need knowledgeable outsiders, at least in the beginning.

Setting the Mandate - This can be a surprisingly difficult job, as well as sticking to the mandate once it's set. The mandate must walk a narrow line between excessive granularity and fuzziness. It must recognize that all predictions are dependent on external factors that can change on a dime, as well as the fact that we must make decisions with whatever facts we have at hand. Thus the mandate will combine current choices with continuous backtesting. All that being said, the mandate has to be accepted by both the team and the firm as a whole, and be a foundation for moving boldly into the future.

Developing the Pictures – Once the team and mandate are in place, the team starts to paint pictures of the markets in general one, five, and ten years out. The team begins with the markets in which the firm operates, and then broadens the view to markets that have a direct impact, and then to markets further afield.

These pictures must adhere to a set of requirements:

- *They must be objective* – With the well-known tendency to protect turf, and the natural antipathy toward forced change, it would be easy for the team to conclude that the future of the firm's markets will look pretty much like the present. While that might actually be true, it might also be decidedly false. Thus this part of the process must incorporate lots of possibilities, even ones that are uncomfortable to consider.
- *They must be wide ranging* – Since we already know that change can come from almost anywhere, the pictures' ingredients must come from almost everywhere. One way to handle this requirement is to "reverse engineer" the demand for the firm's products/services. This focuses on the determinants of the customer demand, and then the determinants of those determinants, and so on. Another way is to "forward engineer," or focus on the market segments of most rapid change,

no matter where they are, and trace the impacts of those changes through other markets until we get to the firm's markets. Or we can do both.

- *They must allow for flexibility* – Given all the impacts on market evolution, the one thing we can say for sure is that some part of today's pictures will be obsolete tomorrow. Thus any picture we construct will actually be a movie, not a snapshot. What that means is that we have to capture all the links we used to construct the pictures, and use them to incorporate any changes we see.
- *They must be understandable* – Finally, everyone in the firm must be able to see how we got to the pictures and what they mean. This isn't to say that everyone has to agree with them, since intelligent people can disagree with the inputs, but any unexplainable picture will only generate controversy, not solutions, so the explanations are part of the pictures.

Vetting the Pictures – Having done all that work, we now have to treat our output as a set of hypotheses that must be tested. The first and simplest test, of course, is acceptance within the firm itself. The risk in that is that we simply reiterated the company line, even if it was off base. Thus we have to vet our pictures outside the firm, and that can get tricky. We may not want to reveal what we are doing to competitors, we may be leery of showing customers a picture that puts them in a bad light, and even vendors can be dangerous observers of our work.

There are some solutions to these problems. We can use outside firms, like consultants, to vet things anonymously. We can make tangential suggestions in industry groups. We can use industry publications and conferences to float trial balloons. Or we can use all these methods at once. By accumulating responses to all our inquiries, we can filter out those that are obviously agenda-driven, compare the others, apply various logic tests, and end up with a fairly objective assessment of our predictions.

Binging it Home – Now that we have a clear, if moving, picture, we need to apply it to our firm. And that step has a whole set of requirements of its own.

- *We have to assess our own capabilities in the new world* – The pictures contain, in the detail, a set of requirements for each vendor, determined without regard to our own capabilities. Now we must compare those requirements to those capabilities, as well as those of our competitors. This is one of those places where objective outside observers are crucial, since it is easy to overplay the things we've spent so much time and money on, and underplay the things we missed. Of particular importance here is our institutional knowledge and culture.
- *We have to assess our customers and vendors, and our relationship with them* – As we have already seen, evolution doesn't just affect us and our competitors; it affects our customers and our vendors as well. So all the assessment we just did on ourselves, we must do on business partners, both upstream and down. If we are well positioned with a customer set that is endangered, all our capabilities may be for naught. On the other hand, if we can supply our customers with an offering that ensures their survival, we will be sitting pretty. Or we may just acquire some of our customers or vendors, or bypass them, or partner with them.
- *We have to play out various possibilities, perhaps with customers or vendors* – Some would call this game theory, since it asks, "If we did this, what would our competitors do? And our customers? And our vendors? And then what would we do?" We can hypothesize what others would do, but it is probably better if we ask. If we can't ask, we need to apply the same kind of

tests we used in vetting the pictures. In addition, we have to determine, as best we can, the upsides and downsides of both our actions and others'.

- *We have to set up a recurring implementation process* – Once we decide what, if anything, we should do, we set up the implementation process. If we identify major dislocations in our markets, this will be a full-on project, with budget, deliverables, steering committees and the usual tracking. But we also need to establish a permanent process for monitoring changes across all markets and relating them back to our position. Initially, this concept may be foreign to many in the firm, but once we detect the first evolutionary change, and adjust to meet it, it all starts to make sense.

Capital Markets Advisors, which developed this methodology, is ready to discuss it in detail with any Tabb Forum readers.