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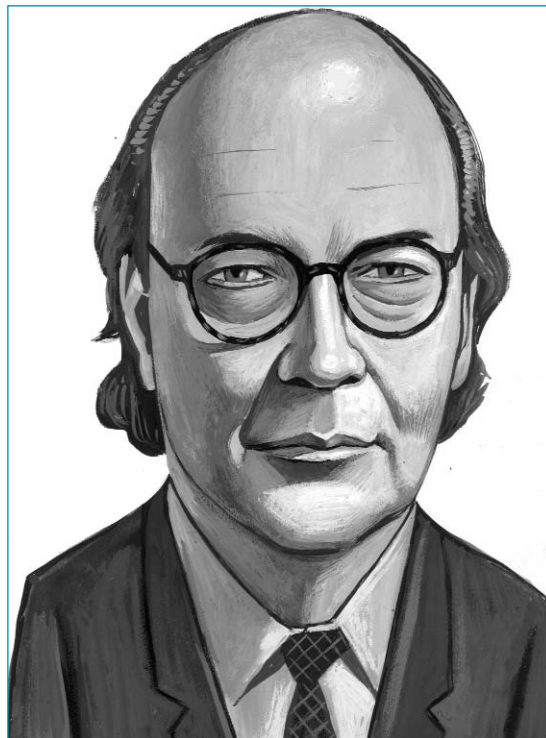
ALL ON WEBSITE

listeningin

Threat Finance

Capital Markets Risk Complex And Supercritical, Says James Rickards

James G. Rickards is a modern Renaissance man of sorts, a lawyer by training and an old hand in capital markets. With 35 years on Wall Street, he has been an internationalist all of his career, but now sees globalization as one of the key destabilizing forces threatening the financial markets. In part, that's because he's also made himself into an expert in risk analysis and econophysics, which the former general counsel of **Long Term Capital Management** lectures on at Northwestern's Kellogg School, among other places. Applying lessons from the realm of physics to the morass in the capital markets, Jim says the Street has been deluding itself about the nature of financial risk for a generation or two, creating a far riskier, and more unstable, market in its scramble for short-term profits. There's no mystery about the lessons of our mushrooming experiences with "fat tail" crashes, in Jim's view. The crime is that instead of making the obvious fixes, the government and the Street combined to "double down" after LTCM — and are still doing nothing constructive. If you get the idea that Jim, now senior managing director for market intelligence at **Omnis, Inc.**, a scientific consulting firm,



doesn't mince words, you are right. Read on. KMW

Your recent FT piece about Wall Street having a "Piñata Party" at Greece's expense caught my eye, but then I did a little research and discovered you'd be fun to talk to about everything from derivatives to the nature of risk. But first things first. What exactly does your firm do? Omnis Inc. doesn't just sound a mite Orwellian, it's based in McLean, VA, and its website boasts of

roots in the intelligence community. Just what is its "practice in threat finance and market intelligence" that you and a partner head? A cynic might suggest the first part of that description is redundant and the second, an oxymoron —

But I'm sure you know what Oscar Wilde said about cynics. We have a number of specialties in our firm, but the broadest way to think about what I do personally is to think about two usually separate worlds. Take the world of geopolitics and defense and national security and diplomacy on the one hand, and then take the world of capital markets, commodities, stocks, bonds,

Kathryn M. Welling
Editor and Publisher
welling@weedenco.com

*Published exclusively
for clients of
Weeden & Co. LP*

Lance Lonergan
Co-President, Global Sales
(800) 843-9333 or
(203) 861-7670
lance@weedenco.com

Thomas Orr
Managing Director, Research
(800) 843-9333
tom_orr@weedenco.com

Noreen Cadigan
Institutional Research Sales
(203) 861-7644
ncadigan@weedenco.com

Jean M. Galvin
Business Manager/Webmaster
(203) 861-9814
jean_galvin@weedenco.com

Subscriptions:
Pat Quill
(203) 861-9317
pquill@weedenco.com
Deirdre Sheehan
(203) 861-7636
dsheehan@weedenco.com

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by **welling@weeden**,
a research division of
Weeden & Co. LP,
145 Mason Street
Greenwich, CT 06830.
Telephone: (203) 861-9814
Fax: (203) 618-1752

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Charles Powell
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derivatives, etc., on the other. It's really the intersection of those two worlds that we are concerned with. In what ways does political instability or political risk affect markets? Then, conversely, what can we learn from markets that would help in the geopolitical sphere? So threat finance and market intelligence are basically about looking at capital markets and taking information out of the capital markets to help policy makers and decision makers in the area of national defense, security and intelligence.

Are you saying geopolitical threats are somehow linked to stock fluctuations or punts on pork bellies?

You are being way too literal. Basically, we think of the capital markets as a very rich source of actual information, assuming you know how to read it, how to drill down and to segregate information. And there are a lot of techniques that can be used there to do that. The basic idea is that nobody transacts in a vacuum. If you're buying anything or you're selling anything, there has to be a counterparty at a minimum.

And there may be a market, though not always. Sometimes these are over-the-counter markets, but even when you see activity in the over-the-counter markets, often the dealer or one of the market makers is hedging in some traded markets. The point being, when countries and organizations are transacting, they leave footprints; they leave ripples; they leave signals. If you can interpret those signals correctly, you can draw a lot of inferences about their actions, and that's very helpful to policy makers.

For instance?

A very clear cut example that a lot of people follow are Chinese activities in the U.S. government securities market. We saw this throughout 2009. They were shortening up their maturities

structure. But just very recently they have turned that around and now they're extending duration. Well, once you are able to get that information, then you can think about what it says about Chinese intentions and Chinese policy. Likewise, if countries are thinking of getting out of dollars and getting into euros or gold or commodities, you can see those activities as well. The acquisitions made by sovereign

wealth funds can tell us something about the intentions of nation states. My view is that these things are not just market transactions, they take place in markets, but they reveal something about strategic intentions and policies of other countries – which is helpful to the United States. So that's one way that the two worlds we watch come together.

There are others?

The other way is that if you're in the market, if you're a dealer, a market maker, an investment bank, a trader, a hedge fund, etc., obviously, you should care enormously about prospects for war between Iran and Israel, or about what's going on with Chavez

and Venezuela; how does China feel about Iran?; what is Russia's interest in the Middle East? Those are things that have huge impacts on commodities prices as well as other prices – and we can interpret those as well, for investors. The problem generally is that you have a lot of brilliant people and a lot of experts on both sides of the fence, but not too many people who can really stand on top of the fence and see the big picture.

And that's what you've been trying to do for about three years now?

No, I have worked in the capital markets for 35 years, but in terms of taking this particular approach which I have just described as looking at the intersection of capital markets and

“As general counsel of LTCM, I negotiated the bailout which averted an even greater disaster at that point. What strikes me now, looking back, is how nothing was changed; no lessons were applied. Even though the lessons were obvious, in 1998.”

geopolitics, I have been doing that since 2002.

Your company only dates back to 2004, doesn't it?

Well, I was doing some work on this before I joined Omnis, which was launched in 2004. Our Threat Finance and Market Intelligence division is just one of Omnis' three divisions. Another is Research and Development and the third is Training and Education. But our Financial Threat and Market Intelligence unit didn't really start operations until early 2007, so it's only a few years old. In that sense, you're right.

But being a new kid hasn't prevented you from picking up some blue chip clients –

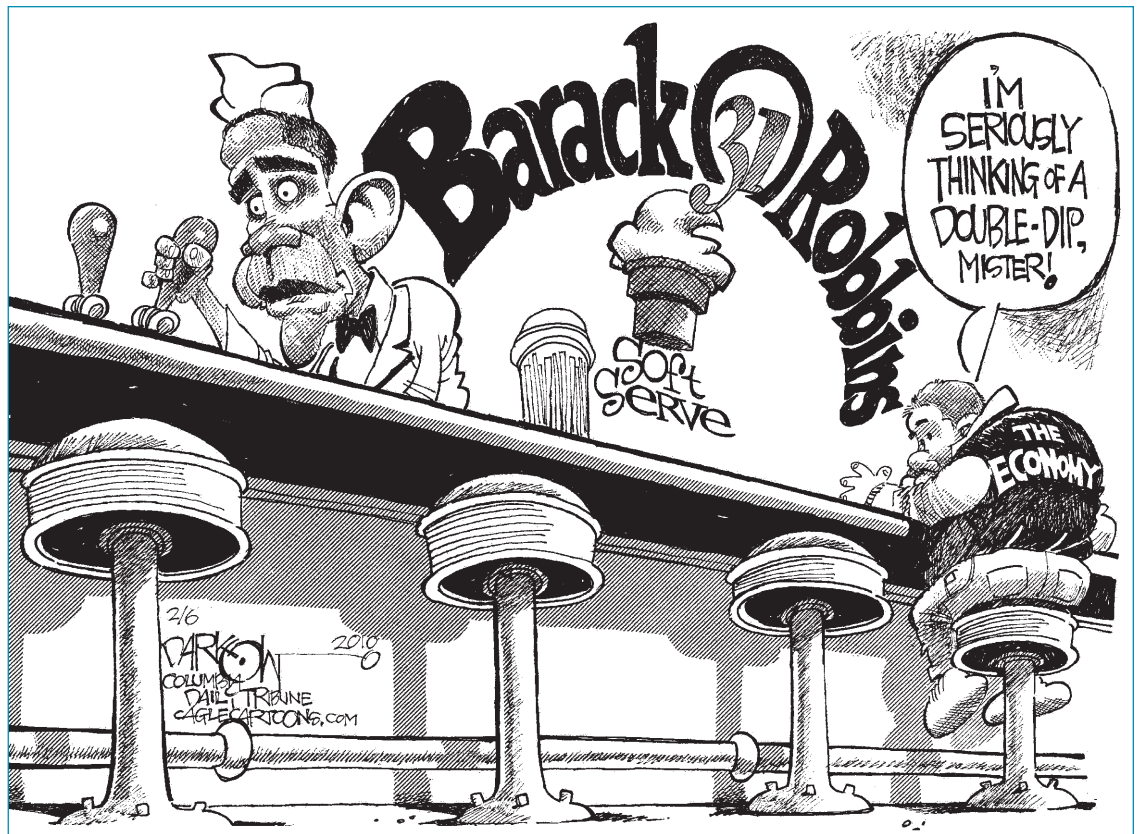
Correct. Many of our clients are various government directorates. Obviously, we don't disclose the clients' names unless we get permission. But among the ones we are allowed to mention are the Office of the Secretary of Defense, there's the Department of the Navy, the Director of National Intelligence, and some other components of the national security community. Then, on the private side, we have hedge funds, family offices, investment banks and high net worth individuals among our clients.

The usual suspects.

Yes.

Okay. But you're a lawyer. What does a lawyer – even one whose bio says he was the principal negotiator of the LTCM bailout – know about the capital markets and geopolitics?

Actually, it feels like I've been in the area forever. Going back, even prior to law school, I got a masters degree in international economics. Then, I worked at Citibank when I started my career – and one of the reasons I went there was that they had offices in more countries than the



State Department had embassies in, at the time. If I remember correctly, in the late 1970s, the State Department was in about 95 countries and Citibank was in 98 countries.

Even in those simpler times, Walter Wriston's big global push ended up creating all sorts of Latin American debt problems for Citi, as I recall.

There was certainly a learning curve. At any rate, after 9-11 there was a lot of outreach by national security professionals, looking for various experts in different fields, whether it was cyber security, critical infrastructure, counter-terrorism, or in my case, capital markets, and basically utilizing a lot of private sector resources to address national security issues. That was the time that I became more involved and we have taken it from a little, let's say, volunteer effort, after 9-11 into a full blown business, all essentially growing out of risk analysis.

Wall Street's attempts to analyze and manage risk were a key part of what went wrong and led to the credit bust. That was an obvious lesson we failed to learn from LTCM.

That's right. Western capital markets came to the brink of collapse in 1998, when hedge fund Long Term Capital Management, with a trillion dollar web of counterparty risk at all the major

banks and brokers of the time, failed. Then Fed Chairman Alan Greenspan and Robert Rubin, who at that juncture was Treasury Secretary, called it the worst financial crisis in 50 years. While the amounts involved and the duration of that crisis pale next to what we've been going through since 2007, it certainly didn't feel minor at the time.

You can say that again.

I know, I was there. As general counsel of LTCM, I negotiated the bailout which averted an even greater disaster at that point. What strikes me now, looking back, is how nothing was changed; no lessons were applied. Even though the lessons were obvious, in 1998. LTCM used fatally flawed VaR risk models. LTCM used too much leverage. LTCM transacted in unregulated over-the-counter derivatives instead of exchange-traded derivatives. So risk models needed to be changed, or abandoned. Leverage had to be slashed. Derivatives had to be traded on exchanges or cleared through clearinghouses. Regulatory oversight needed to be ramped up.

But none of that happened.

Even worse, the government did just the opposite. Glass-Steagall was repealed in 1999, so that banks could become hedge funds. The Commodities Futures Modernization Act of 2000 permitted the creation of more unregulated derivatives. The Basle II Accords and changes in SEC regulations in 2004 permitted more leverage. The U.S., in effect, stared near-catastrophe in the eye, with LTCM, and decided to double-down.

The government didn't exactly decide to that on its own, out of the blue. Wall Street spent a lot of money lobbying to make it happen.

Certainly the power of the lobbyists and special interests can't be discounted. Greenspan deserves a lot of the "credit" for pushing his belief that the markets could self-regulate. In fairness, he wasn't alone in that belief. But I don't think any of this could have happened in the aftermath of the 1998 crisis, without the comfort provided by Wall Street's quantitative risk models, most notably, VaR, which cast a hypnotic spell, as not-well-understood science often does, and assured bankers, investors and regulators that all was well, even as the ashes of LTCM still smoldered around them. Just about a year ago, I had a long piece published in the *Risk Management Association Journal* [March,

2009] on the subject of risk management and the problems of the models Wall Street has been using, and I gave testimony about the risks of financial modeling last September, before the House Science Committee's subcommittee on investigations.

I missed those, somehow, amid all the babble.

Well, most of the problems with VaR are fairly well known at this point. We are certainly not the first ones to point them out.

Little things, like being based on faulty assumptions – such as the Efficient Market Hypothesis, the random walk and that the bell curve applies to markets, you mean?

Exactly. VaR would be a fine methodology but for the fact that all three of those assumptions are wrong. Markets are *not* efficient; no amount of theory tweaking will make them so. Future prices are *not* independent of the past; *not* a random walk. Risk is *not* normally distributed. As the saying goes, "Besides that, Mrs. Lincoln, how was the play?" But what we're trying to do is go beyond that – not just point out the flaws in things like value at risk, which again are pretty well known – but to suggest alternatives. There *are* other analytic methods and other techniques that actually do give you an ability to understand risk in much better ways, but most people who have criticized VaR really haven't taken the next step and proposed alternatives. So one of the common defenses you hear from people continuing to use VaR is something like, "Yes, we know it has flaws, but we have to keep using it until something better comes along." Now, I don't necessarily agree with that. It's like continuing to drive a car with no gas in the tank just because you can't find a gas station. You're not going to get very far.

A more timely analogy might be a Toyota without accelerator repairs –

Maybe. The thing is, we actually *do* have alternative methods for modeling financial risk–

Are they any better, or just different?

Better. They are built around a different mathematical construct, which is very well-known, called a "power curve" or a "power law." Basically, it's a different kind of degree distribution. Any degree distribution is simply a plotting of the frequency of an event relative to the severity of the event. The mistaken belief that market risk is "normally distributed" is actually another corollary to the EMH, which expects future price movements to be random and so

says that their degree distribution will also be random, like a coin toss or roll of the dice. This random or “normal” degree distribution is most frequently represented as a bell curve in which the large majority of outcomes are bunched in region of low severity, with progressively fewer outcomes shown in the high severity region. Because the curve tails off steeply, highly extreme events are so rare as to be almost impossible. In other words, on a bell curve, the vast majority of events happen in a fairly narrow band of two or three standard deviations from a normal activity and are equally distributed on both sides, and so when you get to extreme events, which should be defined as five or six or more standard deviations, those are so rare as to be practically if not literally impossible. Therefore, people assuming a normal distribution of risk in the markets tend to discount the probability of extreme events happening.

Despite evidence they happen with disturbing frequency, resulting in enormous losses.

Exactly. Experience tells us that extreme events *do* happen all the time, and in fact the normal distribution of market risk has been known to be false at least since the early 1960s, when published studies of time series of prices showed them not distributed in the shape of a bell curve but in the shape of a *power curve* – studies that have been replicated many times since.

Can you explain what difference that makes to someone who isn't a quant?

A power curve, one of the most common degree distributions in nature, which accurately describes many phenomena, has fewer low impact events than the bell curve *but has far more high impact events*. When graphed on a double logarithmic scale, the power law describing financial market risk is a straight line sloping downward from left to right. A power curve says that events of any size can happen and that extreme events happen more frequently than the bell curve suggests. This corresponds to the market behavior we have seen in such extreme events as the crash of 1987, LTCM's collapse, the dot.com bubble's bursting in 2000, the housing collapse in 2007 – you get the idea. Statistically, these events should happen once every 1,000 years or so in a bell curve distribution – but are expected much more frequently in a power curve distribution. In short, a power curve describes market reality, while a bell curve does not. What's more, power curves are well-understood by scientists because they apply to extreme events in many

natural and man-made systems, from power outages to earthquakes. And power curve analysis isn't even new. Economist Vilfredo Pareto observed in 1906 that wealth distributions in every society conform to a power curve; in effect, there's one Bill Gates for every 100 million average Americans. Benoit Mandelbrot pioneered the empirical analysis in the 1960s that showed market prices move in power curve patterns.

But bell curve or power curve, doesn't that matter mostly to academics?

That's just it. The difference is not merely academic. Gaussian, or bell curve, distributions and power law distributions describe two entirely different phenomena: Bell curve distributions in this context describe continuous phenomena and power laws describe discontinuous but regular phenomena. Which one applies has enormous implications when what you're trying to model is financial risk. Power laws accurately describe a class of phenomena known as nonlinear dynamical systems that exhibit scale invariance –

Could you state that in plain English?

In other words, orderly patterns are repeated at all scales. What is often taken for randomness at a given scale actually produces order (albeit chaotic, or unpredictably deterministic) across scales. Earthquakes, as I mentioned, are an example of such systems in nature. Consider the Richter scale's inverse proportionality of the severity and frequency of earthquakes, with minor events being common and events rated seven or higher being quite rare. That's a power law distribution.

Well then how have several generations of academics and financial practitioners managed to get it so wrong, swearing allegiance to the notions of efficient markets and bell curve risks for more than 50 years?

Now you're getting into realms of philosophy and cognitive neuroscience, or at least behavioral economics. I'll just point out that the history of science is filled with false paradigms that gained followers to the detriment of better science. People really did believe the sun revolved around the earth for 2,000 years and mathematicians had the equations to prove it. The sociologist, Robert K. Merton, called this the Matthew Effect from a New Testament verse that says, “For to those who have, more will be given...” In effect, once an intellectual concept attracts a critical mass of supporters, it becomes entrenched, while other concepts are

crowded out of the marketplace of ideas.

Still, Wall Street, perhaps more than any other economic ecosystem, prizes what works. What generates profits. And there was loads of evidence, you point out, that the bell curve failed at critical junctures.

You do have to wonder. I don't know whether it was denial or inertia or because people got so wedded to the elegance of the mathematics they'd done that they hated to leave all that work behind. After all, the Black-Scholes options formula is based on bell curve-type price movements. The entire derivatives market is based on variations of Black-Scholes. So what people were doing when presented with the evidence was saying, "Yes, there are flaws in efficient markets, there are flaws in developmental distribution, but we're going to use it anyway and try to fix the flaws." In other words, Wall Street decided that the wrong map is better than no map at all – as long as the math is elegant. And that led to calling extreme events a sort of special case, a "fat tail," which just meant they were happening more frequently than a bell curve would indicate. So they would model risk to show a normal distribution most of the time, but fat tail events some of the time, and then create a new curve that was faded a little bit to include these fat tails. Then the Street employed a lot of rocket scientists to stress-test for fat tail events based on historical occurrences, such as the '87 crash. I call that pinning a fat tail on the bell curve and the problem with it –

Is that it made investors into donkeys–

Yes, exactly. But another reason the Street was loath to throw out the whole notion of normally distributed risk, and tried to salvage it instead by putting a fat tail on it, is that the alternative, a power curve, just didn't look that palatable to most practitioners and so comparatively little work has been done in applying power curves to financial markets.

Why is that, considering the vast resources Wall Street pours into every conceivable way of getting an edge?

Don't get me wrong, some excellent research has been done in the realm of power curves and the capital markets. The thing is, power curves don't have a lot of *predictive* value. Since most financial researchers approach the field precisely to gain a trading edge, once they discover power curves aren't much use there, they move on.

Naturally enough –

All too true. But short-sighted. Suppose geologists abandoned the Richter Scale, a classic power curve, as useless, just because it has low predictive power? We know that 8.0 earthquakes are possible and we build cities accordingly, even if we cannot know when the big one will strike. Likewise, we can use power curve analysis to make our financial system more robust even if we cannot predict financial earthquakes. And one of its lessons is that as you increase the scale of the system, the risk of a mega-earthquake goes up exponentially. If you increase the value of derivatives by a factor of 10, you may be increasing risk by a factor of 10,000 without even knowing it. Unfortunately, this is not something that Wall Street or Washington currently comprehends. That's why I urged in my Congressional testimony and have said repeatedly in numerous other forums that we should abandon the bell curve once and for all and accelerate empirical research into the proper risk metrics of event distributions. The bottom line is that the power curve is a degree distribution that works. It's ubiquitous in nature, we see it in everything from solar-flares to forest fires to internet backbone failures, to power grid failures to the time series of prices in capital and commodities markets. Even if the power curve's predictive value is low, there is value in knowing the limits of our knowledge.

Understanding the way risk metastasizes with scale might be lesson enough. It would offer a proper dose of humility to those trying to super-size banks and regulators. And once you accept the idea of financial risk following the power law distribution, you can start to draw very different conclusions about how capital markets actually operate. And that's what we have done. We have embraced that model, we have done additional research, we have published papers. And this has given us actually a very good ability to understand markets and stay ahead of the curve.

How ironic is it that all of Wall Street's "rocket science" innovations of the last 20-30 years – which had so much to do with, if not exactly causing the mess we're in, exacerbating it by dramatically increasing its scale and complexity – were based on such deeply flawed theories?

Yes. I've always thought the problem was that, although Wall Street was very active in hiring a lot of Ph.D.s – astrophysicists, applied mathematicians and others with very good quantitative theoretical skills, it didn't let them use

their heads. What happened was that their Wall Street managers said, “Look, here’s how the financial world works and we want you to model it and code it and develop it and write these equations and programs.” And so they did. But Wall Street – and all of us – would have been much better off, had they gone to those rocket scientists and asked, “How does the world actually work?” In other words, instead of telling them what to do, they should have listened. Because the idea of power law distributions, in particular, comes from physics. It’s the physicists who have identified the distribution and done the empirical work on it in a lot of fields. So Wall Street risk managers would have been better off listening to the physicists instead of telling them what to do.

If they could understand them. I noticed in your Omnis bio that you’ve delivered papers on something you call “econophysics.”

Yes. Econophysics is basically understanding the economy using tools derived from physics. So it’s exactly what we’re talking about. The field of nonlinear dynamical systems – which encompasses those described by a power curve – has recently been enriched by the concept of self-organized criticality.

Go easy on me, please. The only physics course I took in college was something called “Physics for Poets.”

The idea is that actions propagate throughout systems in a critical chain reaction. In the critical state, the probability that an action will propagate is roughly balanced by the probability that the original action will dissipate. In the subcritical state, the probability of extensive effects from the initial action is low. But in the supercritical state, a single minor action can lead to a catastrophic collapse. A concrete example may help explain this. Let’s just say you have a 40-pound cube of uranium sitting in front of you. It would actually be relatively harmless. You’d have to eat it for it to make you sick. But if you took the same 40 pounds of uranium and shaved part of it into a ball about the size of a softball and made the rest of it into a rod about the size of a baseball bat and then put them into a tube and fired them together at high speed and at the right angle, you would create a nuclear explosion. My point is that there is more to understanding those dynamics than just having a quantity of uranium. How it is shaped, how it interacts, how is it fired, also go into determining the difference between what’s called the sub-critical state, which is

when it’s sitting harmlessly on your desk, and the super-critical state, which is when it turns into a nuclear weapon.

And supercriticality has relevance in finance, too, you’re suggesting?

Yes, applied to capital markets, the same thing is true. In markets, you have numerous heterogeneous, autonomous, interdependent agents, each of whom has a critical threshold with regard to preference for dollars, euros, gold, stocks, bonds, etc. Are those agents and those critical threshold preferences arrayed in a stable sub-critical or in an unstable super-critical state? It’s through that kind of thought process that we take the physics concepts, apply them to capital markets, and get a better understanding of risk.

But it’s not the sort of model that you can feed lots of data into and expect it to tell you what the markets are going to do?

Well no, because you’ll never have that much data. And even if you did, the power needed to crunch it would exceed all the computing power in the world. Let me give you another example. Let’s say you have a movie theater and five people suddenly jump out of their seats and run out of the theater. Well, what is everyone else going to do? A few Nervous Nellies might run out too, but most are likely to decide those five are wacky and sit back to enjoy the movie. But if 50 people ran out, or 100, or 200, there’d come a time when they’d start a stampede. So the difference between acting as an autonomous individual and as part of a herd, that point where behavior changes, is called the critical threshold.

So it’s what Malcolm Gladwell calls “the tipping point.”

Correct, tipping point is the popular jargon. But my point is that different people in the theater have different tipping points. So let’s say that five people run out of a theater but the next lowest tipping point among the audience is 10. In that world, if five people run out, nothing else happens. That’s an example where an initial act dies out.

But then let’s assume instead that when those first five run out, there are 10 other people in the audience with a tipping point of five and a hundred people with a tipping point of 12 and then 300 people with a tipping point of 50. If that’s your system, just the five people run out will start a chain reaction as tipping points are hit that will empty the theater. So the second example shows how embedded preferences may

be potentially super-critical in terms of all the interactions. Now, instead of a couple of hundred people in a theater, imagine several hundred million people around the world buying and selling stocks, bonds, commodities, derivatives all day long. They all have different preferences. You would never be able to get that data. And even if you could, the interactions and the permutations could be so great they could never be modeled precisely. So one of the things you learn from complexity theory like this is a lot of humility. There are some things you can't know because the computational complexity of the problem exceeds our ability to compute it.

Sure. It's a meteorologist's standard excuse.

But that doesn't mean this new paradigm that sees the financial system as a self-organized, scale-invariant, nonlinear dynamical system in a critical state is worthless. What it means is that you can understand it theoretically and you can look for metrics, indications, and warnings that are valuable tools, even if you can't model it right down to the last individual actor. You can, for instance, analyze the markets in terms of the four operative aspects of a complex network.

Which are?

One is diversity, because your preferences are going to be different than mine and we'll both differ from the next guy. There also is connectedness, which is that people have ways of seeing what other people are doing and understanding what other people are doing. Then there's interdependence – what I do affects what you do. It's not just that we're connected and seeing each other, but also that my preferences are going to depend on yours, etc. Finally, there's adaptability. I may change my behavior based on what I see. So one thing we can do is dial up or dial down those four operative aspects and draw inferences about how risky or critical the system actually is.

And that tells you?

Well, what have we seen in the markets for the last 20 years, really? More diversity, with the Chinese and Indians – and I'm not talking about ethnic or national diversity alone. I'm talking about the diversity of preferences and opinions, partly as a result of globalization. We have more connectedness, because of the internet, email, and the exchanges and price services, and all the telecommunications facilities that come into being. We also have more interdependence, which is another function of glob-

alization. The Italian bourse used to be completely isolated from every other stock market. It was a local stock market, run in Milan, dominated by local firms and didn't have much interaction with other exchanges. That's no longer true, of course, because of globalization and the consolidation of exchanges. We're to the point that the New York Stock Exchange and Euronext are one big exchange. Finally, adaptability is just a function of – if I'm not locked into one country or one system, I can change my behavior based on what I see everyone else is doing. What I'm saying is that objectively – not just theoretically but objectively – all those things have been dialed up in the markets. What that tells you is that the system is more vulnerable and more risky than it ever has been. Meanwhile, it is operating on a larger scale than it ever has –

And you're suggesting this is a case where bigger *isn't* better?

Yes. While extreme events occur with much greater than normal frequency in nonlinear critical state systems, these events are nevertheless limited by the scale of the system itself. So if the financial system is a self-organized critical system, as both empirical evidence and deductive logic strongly suggest, the single most important question from a risk management perspective is: What is the scale of the system? Simply put, the larger the scale of the system, the greater the potential collapse with macroeconomic and other real world effects.

So much for the conventional wisdom that greater participation and diversification would take risk *out* of the system –

Right, the result of all this interconnectedness has been we have scaled up the system. So now when it fails, it fails catastrophically on a much greater scale than we have ever seen before. There's no normalized scale similar to the Richter Scale for measuring the size of markets or the size of disruptive events within them. But a few statistical estimates from the McKinsey Global Institute make my point: The ratio of world financial assets to world GDP grew from 100% in 1980 to 200% in 1993 to 316% in 2005. Over the same period, the absolute level of global financial assets increased from \$12 trillion to \$140 trillion. The drivers of this exponential increase in scale are globalization, derivative products, and leverage. Globalization, we've talked about. Derivatives have grown even faster than the underlying financial assets, owing to improved technology in their structuring, pric-

ing, and trading – and to the fact that the size of the derivatives market is not limited by the physical supply of any stock or commodity. It can theoretically achieve any size, since the underlying instrument is notional rather than actual. Thus, the total notional value of all swaps increased from \$106 trillion to \$531 trillion between 2002 and 2006. The notional value of equity derivatives increased from \$2.5 trillion to \$11.9 trillion over the same period while the notional value of credit default swaps increased from \$2.2 trillion to \$54.6 trillion.

Those numbers are actually incomprehensible. And leverage is the third key enabler?

It absolutely supports the massive scaling of financial markets; margin debt of U.S. brokerage firms more than doubled from \$134.6 billion to \$293.2 billion from 2002 to 2007, while the amount of total assets per dollar of equity at major U.S. brokerage firms increased from approximately \$20 to \$26 in the same period. In addition, leveraged investors invest in other entities which use leverage to make still further investments. This type of layered leverage is impossible to unwind in a panic. What I am driving at is that it's indisputable that the markets are larger and more complex than ever. What this means, in a dynamically complex critical system, is that the size of the maximum potential catastrophe is *exponentially* greater than ever. What's more, because systems described by a power curve, like the capital markets, allow events of all sizes and because such events can occur at any time – especially when the system is supercritical – I conclude that progressively greater financial catastrophes, like we've been experiencing recently, should be expected frequently.

And you have no doubt about it?

It's inescapable. The worst outcomes in a dynamically complex critical state system are not limited by historical experience. They're only limited by the scale of the system itself. The financial crisis which began in July 2007 has lasted longer, caused greater losses and been more widespread both geographically and sectorally than most analysts predicted or can explain precisely because the vastly greater scale of the financial system can produce an exponentially greater catastrophe than has ever occurred before. This is why the past is not a guide and why the current crisis may be expected to produce results as severe as the Great Depression of 1929-1941.

You're just full of good cheer.

Well, the good news is that once we understand the structure and vulnerability of the financial system in this way, some solutions and policy recommendations become obvious.

Do tell.

They fall into three categories: limiting scale, controlling cascades and securing informational advantage. A simple example demonstrates the importance of limiting scale: If the U.S. power grid east of the Mississippi River were at no point connected to the power grid west of the Mississippi, a nationwide power failure would be an extremely low probability event. Either the "east system" or the "west system" could fail catastrophically in a cascading manner. But both systems could not fail simultaneously except for entirely independent reasons because there would be no nodes in common to facilitate propagation across systems. In a financial context, what this tells me is that governments should consider preventing mergers that lead to globalized stock and bond exchanges and universal banks.

You'd roll back the clock on globalization?

Yes. But I wouldn't state it as a pejorative. The first order efficiencies of such mergers are far outweighed by the risks of large-scale failure, especially if those risks are not properly understood and taken into account. Maybe another example will drive home the relationship between the scale of a system and the extent of the greatest catastrophes possible in that system, which makes limiting scale so crucial. Let's say I have a ship, with a hold of a certain capacity. If I punch a hole in it, it fills with water and sinks. But now imagine the same vessel but with the addition of two watertight bulkheads, so its hold is now divided into three watertight sections. If I punch the same hole in the ship, the same size hole, the same place, this time only one compartment fills up with water and the vessel doesn't sink; it floats. So what is the impact of removing the bulkheads? Well, I increase the area at risk by a factor of three. But I increase the risk infinitely because I go from a vessel that doesn't sink to a vessel that's guaranteed to sink. So I have tripled the size of my system but I have exponentially increased my risk. Now, apply the same thing to capital markets. When we integrate exchanges, erase borders, come up with global players and global positions and global strategies on a massive scale, we have increased the interconnectedness in a way that's going to lead to greater and greater catastrophes, which is exactly what we're seeing. Because people are very good at estimating

the first order efficiencies, but they seem to be blind to the second order costs.

You're saying the game has changed into a 3-D chess match and we're still playing checkers?

Exactly. Which points to the next thing we have to do, which is control cascades. Let me use another example to explain what I am getting at. Suppose your town is full of stop signs that slow you down on your drive to work every morning, but that in the middle of the night someone steals all of them. The next morning, you'd be driving to work thinking, "Hey, this is great. I'm going faster; this is highly efficient." All would be wonderful – until somebody goes through an intersection, hits a school bus, and kills a bunch of kids. That's where the second order costs come in, and you see that the efficiencies of removing the stop signs are outweighed by the costs of accidents. Which is why we have stop signs. Applied to financial markets, everyone focuses on the efficiencies of larger scale markets. But they ignore the costs of the car crashes happening with more and more frequency.

So you're arguing for increased regulation?

Yes, to control cascades of failure, which is, in part, a matter of circuit breakers and pre-rehearsed crisis management so that nascent collapses do not spin into full systemic catastrophes before regulators have the opportunity to prevent the spread. The combination of diffuse credit and layered leverage means it is not feasible to assemble all of the affected parties in a single room to discuss solutions like in the old days.

What sort of circuit breakers are you talking about?

A significant one, which has been discussed for over a decade but which has still not been fully implemented, is a clearinghouse for all over-the-counter derivatives. Experience with clearinghouses and netting systems such as the Government Securities Clearing Corporation shows that gross risk can be reduced 90% or more when converted to net risk through the intermediation of a clearinghouse. Bearing in mind that a decrease in scale produces an exponential decrease in risk in a nonlinear system, the kind of risk reduction that arises in a clearinghouse could be the single most important step in the direction of stabilizing the financial system today; much more powerful than bail outs which do not reduce risk but merely bury it

temporarily.

A clearinghouse would also provide informational transparency that would allow regulators to facilitate the failure of financial institutions without producing contagion and systemic risk. Such "creative destruction" is another necessary step on the road to financial recovery.

The banks hate the clearinghouse proposal, for obvious reasons. But they insist it won't work because so many derivatives are bespoke contracts.

The technical objections to clearinghouse implementation based on the non-uniformity of contracts can be overcome easily through consensual contractual modification with price adjustments upon joining the clearinghouse – enforced by the understanding that those who refuse to join will be outside the safety net. Only by eliminating zombie institutions and creating breathing room for healthy institutions with sound balance sheets can the financial sector hope to attract sufficient private capital to replace government capital and thus re-start the credit creation process needed to produce sound economic growth.

Are there other regulatory changes you advocate?

I certainly would favor the Volcker Rule and I would favor bringing back something like Glass-Steagall. And I'd favor imposing stricter capital ratios on banks and brokers. I'm not alone. If you saw last Tuesday's *New York Times* there was a story headlined, "Elders of Wall Street Favor More Regulation, in which Louis Uchitelle interviewed people like John Reed, Paul Volcker, William Donaldson, George Soros, Nicholas Brady and Jack Bogle, all of whom said that restoring some version of Glass-Steagall would be a good thing.

Personally, I'd go further. Too big to fail is too big to exist. They should be broken up. They are manifestly too big to be managed well.

That's right. People in Wall Street, their lobbyists and patrons in Congress, try to say that Volcker Rule won't work. That's nonsense. We had the Volcker Rule from 1934 to 1999. It worked fine for 65 years. And I remember how things were in the late 1990s in Wall Street, around 1998, '99 and 2000, when Sandy Weill and John Reed and Phil Gramm were pushing for the repeal of Glass-Steagall. There was more than a bit of arrogance in the air. There was an attitude that somehow the people in the 1930s must have been dopes; didn't know what they

were doing. Or that they overreacted, so the law was inefficient and a thing of the past. Well, what people forget is that in the 1930s they had lived through something very similar to what we're living through now. They had had a boom in the '20s. They had a severe market crash in 1929. Then they had the Great Depression, which lasted until 1939, but the most acute phase of that was in 1930, 1931, and 1932. So by the time you got to 1933 and '34, when Glass-Steagall and the Securities Acts were passed, people had been traumatized. Those laws were their solutions to what they had just lived through. How could we be so casual about discarding them?

Good question –

But sure enough, we repealed the law and then went through 10 years that kind of looked like the 1920s, and then we crashed in a way that looks like the Great Depression. We have repeated all the same mistakes – and the basic causes of our troubles were the same, too.

Too much credit, you mean?

Yes. What happened in the 1920s that was so horrible? Well, banks originated loans – mostly in the form of corporate bonds and sovereign credits back then – which they then packaged up and sold to their customers. They didn't care if the loans were any good, because they crammed them down their customers' throats. Because of that abuse, in 1934, the Congress said "Look, you can be a commercial bank and you can take deposits and make loans. Or, you can be a securities underwriter, and that's fine. You cannot be both."

But in 1999, we repealed Glass-Steagall; let everybody into everyone else's business, which, by the way, is exactly like removing the watertight bulkheads in my boat analogy. So what happened? They originated a bunch of garbage loans and they crammed them down the customers' throats – except this time the customers are worldwide. European banks and pension funds and U.S. pension funds and hedge funds. There's the exact same conflict of interest and the exact same behavior with the exact same result, except that it all collapsed on a larger scale with even worse consequences.

So who are the dopes here? The Congress of the 1930s or the Congress of 1999? I would say that we once again failed to learn the lessons of the past, now have repeated the mistakes and are again having to suffer through the consequences.

With no obvious successors to the Pecora

Commission emerging.

Well, that's a very good point. We do have this Financial Crisis Inquiry Commission, the FCIC. Phil Angelides is the Chairman of it and you have Keith Hennessey, Brooksley Born and seven other individuals on it. They're doing the best they can, but I don't know if they're really going to be as tough as the Pecora Commission was; whether they're really willing to hold people accountable – including the Congress.

There's plenty of blame to go around. But as entertaining as public floggings can be, isn't it more important to put the right fixes into the system?

I agree there's a lot of blame to go around. You're certainly right about that. But the problem analytically is that if you say that everyone's responsible it's like saying no one's responsible. It's like oh, Wall Street was greedy and shortsighted and partly corrupt, and there was too much cronyism in Fannie Mae and Freddie Mac and not enough accountability, and the Congress was too busy pleasing constituents and promoting housing finance–

Not to mention that Congress was bought and paid for.

It was all bought and paid for and the rating agencies were asleep. That's all true. But then what do we do, just throw up our hands? Are we unwilling to untangle that mess?

How do you suggest going about it?

Let's liquidate Fannie Mae and Freddie Mac once and for all and get back to a private housing market. Let's allow other rating agencies to come in and compete with S&P and Moody's and let's eliminate the conflict of interest inherent in the issuers of securities paying fees for ratings. Let's break up the big banks and let them choose whether they want to be commercial banks or investment banks, but not both, etc. Those are all hard choices, but we have good reasons to believe that they will work. Yet I don't see any of those solutions being seriously pursued. Sometimes lip service is paid to the need to do something, but no one is doing anything.

Don't forget doing something to break the stranglehold of special interests on members of Congress.

Right. But what concerns me most right now is that *nothing has changed*. If anything, there is greater concentration in Wall Street and the only thing that is different is that the Fed has

printed so much money and the Treasury has spent so much money that they have papered over the problem temporarily. They also helped paper things over by changing the accounting rules. But the toxic assets are still there. The market has not cleared. Prices have not hit bottom. Balance sheets are not cleaned up, and lending has not begun. There is no demand for private credit and the consumer is flat on his back. So while we may have temporarily halted the slide, we haven't done anything to solve our problems, which means it's just a matter of time before one of two things happen: Either the slide resumes and we finally get to the market bottom that we never hit in 2009, or they keep printing money to paper it over, eventually destroying the dollar and undermining the entire economy. Those are the choices, but everyone is just kicking the can down the road right now.

That's pretty blunt.

Well, I think it's true. I mean, what the Fed wants is the one thing they're not going to get: Mild inflation. They're desperately trying to get some inflation going because they're scared to death of deflation. All of their quantitative easing and special programs with the Treasury and the fiscal stimulus are designed to weaken the dollar. They're basically trying to scare the markets into spending money. But right now, all Americans want to do, naturally, is save money, de-lever, pay down debt. All very sensible things to do on an individual basis. But when you do that, in a world where consumption is 70% of GDP, your GDP is going to collapse. That is reflected in the velocity of money. The whole notion that you can dial up nominal GDP by increasing the money supply rests on another false assumption, which is that velocity is fairly constant. Now, from 1950 to 1980, it actually *was* fairly constant.

But no one who has lived through the last couple of years can still believe velocity is a constant.

Well, they can't say it with a straight face today but, it was true for 30 years. The problem is that the whole monetarist project ignores velocity and assumes that you can control everything through the money supply, including nominal GDP. The theory is if you dial up the money supply to get nominal GDP up to 4% or 5%, when real GDP is capped at around 3%, you're going to get two or three points of inflation. And right now, the Fed would like that. But they're not succeeding because velocity has

dropped through the floor. It's kind of a scary thing when you print this much money and can't get inflation. So one answer is just to keep printing, and we'll get inflation eventually. But my view is that the market is dynamically unstable. Going back to my example with the uranium, there will come a time when you flip from a subcritical state in which everyone just accepts the dollars to a tipping point where people are repulsed by the dollar and get out of it as fast as they can and into gold or some other store of value. That's why I'd say the better alternative would be for the markets to clear at the bottom we never had last year and for the toxic assets to be written off. We should just let things crash and deflate to the point where all this capital that has been misallocated has been destroyed.

And another Great Depression wouldn't take down the system?

The markets have to clear. Right now, nobody is selling anything much. AIG is holding onto \$500 billion of credit derivatives. Citibank and JP Morgan and everyone else are holding on. Bank of America is holding onto the mortgage portfolios and private equity funds are holding on to their stocks, and other funds are holding on to the commercial real estate. Nobody's selling anything. People are holding on to their homes. Markets are still essentially frozen, which means that now it's a waiting game between the Fed's efforts to stimulate inflation, which could get things going again, and the juggernaut of deflation, which is still there, though it has been papered over. As I said before, that's not price stability; that's a very unstable tension. It's like an arm-wrestling contest between evenly matched opponents. When it starts, nothing seems to happen for a long time. Yet enormous stress is building up. Eventually, one opponent collapses and the other guy wins, so don't mistake no action for nothing going on. So what I see, when I look at PPI and CPI, which are pretty close to zero, isn't price stability. What I see is something like 5% to 7% deflation being countered by something like 5% to 7% inflation. They're netting out to about zero but, in fact, we have an enormous force for deflation, which we see in residential and commercial real estate, and we have enormous force for inflation, which we see in places like the Chinese stock market, gold, and other asset bubbles. I don't know which way it's going to tip, but I know that when it tips, it's going to go to one extreme or the other very quickly. And we might even get both; we might get a bout of

hyperinflation followed by deflation; that's what happened in Weimar Germany.

Let's turn to Greece's woes. Your FT piece basically said the country was being set upon by the Street like a piñata at a kid's party. And implied that credit default swaps make it all too easy to game the markets—

There are certainly people who disagree, but I wouldn't say I've gotten hate mail. There are people who say that it's Greece's fault; don't blame the dealers for something Greece did wrong; CDS prices are reflective of underlying realities, etc. In fact, that's what I would call the conventional wisdom on this. But the idea that CDS dealers just sit there and wait for the phone to ring – that someone calls up and says, "Hey, I'm really interested in buying one of those credit default swaps, can you make me a market? – is beyond naive.

Credit default swaps belong to that category of Wall Street product that is sold, not bought?

Exactly. And what I wrote is that when you look behind CDS prices, you don't find an objective measure of public finances in Greece (which are a mess, no doubt). What you find instead is something very different. What happens is that the dealers very aggressively call both sides of the trade; they call the pension funds, who are the strong hands who can afford to sell the "insurance" and then sit and wait, and they call the hedge funds, who are the fast money looking for a quick pop – and they tell them completely different stories. And of course the firm in the middle, Goldman Sachs or another large bank, books a fat spread for its exertions. I mean, we think we know why people might want to buy the credit insurance because Greece is in bad shape. But who on earth would want to *sell* the insurance? You'd have to believe it was tremendously mispriced. You would have to believe that the premium is very rich relative to the risk. In other words, you have to believe that the dealers are telling the long-only accounts and the institutions, the pension funds, that this is very good return for them. "Don't worry, in effect, the fix is in. Europe will ride to the rescue and Greece will not default," and that the institutions basically buy that story. Otherwise, why would they sell credit insurance on Greece?

Where does the piñata come in?

Once the counterparties have their positions, the banks start pounding thinly traded Greek (or any

other) bonds and pushing out the spread between them and the benchmark. That brings step two, which is to call for more margin from the pension funds, because the price has moved in favor of the buyer. That margin money gets put into the hedge funds, which enjoy the cash and paper profits – and 20% performance fees – particularly if this happens around year end. This dynamic of pushing out spreads and calling in margin is the same one that took down LTCM in 1998 and AIG in 2008 – and is happening again, in Greece.

Resulting in another bailout?

Eventually, and then the money flow will be reversed. But in the meantime, pension funds earn premium, banks earn spreads, hedge funds earn fees and everyone's a winner – except the poor investors in the hedge funds, who pay fat fees on fleeting performance, and the unfortunate inhabitants of the piñata. But all this has very little to do with Greece's fiscal fix. It's really not much more than a floating craps game in an alley off Wall Street.

But a very lucrative one for the banks.

True, but it looks like Goldman is probably facing some materially severe reaction from government officials in Europe – Germany and France in particular. They're very likely to be sued by investors because they were lead manager in a number of Greek bond issues at a time when Greece's off-balance-sheet swap financing, also arranged by Goldman Sachs, was never disclosed to prospective investors in the bonds. How on earth are you the lead manager of a bond issue and not tell the buyers that you secretly arranged \$1 billion of off-balance-sheet debt for the borrower? That seems like an open-and-shut case of securities fraud.

I'm sure they had legal opinions saying it was perfectly legal.

Well, yes, but that depends on what they had told the lawyers. If you give lawyers a set of facts, you'll get a certain opinion. Did the lawyers know all the facts? I don't know. But I do know that a lawyer's opinion is only as good as the facts presented to the lawyer. Everyone is entitled to his day in court so I wouldn't want to prejudge the case. But on the surface, at least, these are very serious issues that probably will take years to play out, between European government actions and private lawsuits.

You've also written about a major conceptual flaw in credit default swaps – that they allow someone without an insurable

interest to buy insurance, creating a perverse wish for the failure of companies or countries by those holding CDS.

I think there are two solutions. One would be to require an insurable interest so that if I'm buying insurance, I need to have some interest in the underlying risk being protected against, and if I'm selling insurance, I should be regulated like an insurance company, or at least have adequate reserves.

The other solution for more liquid markets is transparency. Put the trading of CDS and other derivatives on exchanges, have price reporting, show bids and offers, have a large number of dealers, etc. Now, I don't think you should need insurable interest to sell 10-year note futures on the Chicago futures exchanges. I'm fine with that market, because those are very liquid, very well-regulated, very transparent, very safe markets. But the thinner the market, the greater the need for insurable interest. It's as simple as that. And one final thing, please don't mistake CDS prices for valid indicators of a company or government's credit standing. If you look at the notional value of outstanding CDS relative to the underlying bond markets, you find most are terrifically thin. There are a very small number of dealers, two or three large international banks, not that many transactions, and it's very easy for dealers to put marks where they want them, causing collateral to move back and forth, and causing profits and losses to arise on the books of particular institutions without much linkage to the underlying market.

Indeed, if you look at what I would call objective metrics of fiscal responsibility, Greece's debt-to-GDP ratio is about half of Japan's. Their deficit-to-GDP ratio is not that different from the United States. So why are the U.S. and Japan the benchmarks and Greece is the problem child? Granted, there are other factors; there were other things going in Greece. And I'm not exonerating them from their own fiscal irresponsibility, but to suggest that the CDS markets are trustworthy, reliable indicators of fiscal distress, in Greece or anywhere, is nonsense.

Well said. Thanks, Jim.

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