Fasanara MACRO Voices Podcast FEB 2019



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Markets In Critical Transformation, Chaotic Behavior Has Just Began

CRASH HALLMARKS IN PLAIN SIGHT

DYNAMICS OF CRITICALITY

TODAY'S MARKETS EXHIBIT THE SIGNATURE CHARACTERISTICS OF CRITICALITY, LACK OF RESILIENCE, FLIPPING FEEDBACK LOOPS AND LIKELY PROXIMITY TO CRITICAL TIPPING POINTS.

F.C.

BE READY, BE PATIENT, BE SHORT

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- As Tail Risk disseminated across the financial system, no asset class provides value these days. Relatively better than ugly is still ugly.
- 2 There is no bull market left out there (Jim Cramer-type), no anti-bubbles to spot (Rob Arnott-type). Be fearful, not greedy.
- ³ "There Is No Alternative" and "There Is No Place To Hide" should read "from systemic risk". Unless you are paid to stay invested regardless, stay out or go short.
- "It is impossible to spot a bubble" and 'a bubble can be known only in retrospect', is jargon for 'I am not paid to spot a bubble' or 'bubble has even better odds of building up'.
 Human nature is the real driver of crises, invariantly over history.
- As Tail risk has easily a probability of 25% in 2018/2019, it hardly qualifies as a Tail risk anymore (Fat yes, a Tail no). One which is thus worthwhile positioning for, with the right instrument election. It has been so for 2 years now, despite sugar rush of tax cuts / late stage monetary stimulus / investors positive hysteresis. An opportunity hidden in plain sight.



As imbalances have grown to historical peaks, this may be a generational investment opportunity. BE READY, BE PATIENT, BE SHORT. Vol is still low, nothing much happened yet. BE CONVEX.

INTRODUCTION



WHAT IF..

Many interpreted the market being off all-time highs as an HEALTHY and TEMPORARY CORRECTION, driven by fears of trade wars escalation and their impact on economic growth.

But there may be an ALTERNATIVE EXPLANATION as to why we are still off, and that is CRITICAL SLOWING DOWN, decreasing rate of recovery: a general property of complex dynamical systems as they come close to a tipping point / bifurcation event, leading to a major critical transformation into an alternative stable state, a rupture caused by a relatively minor disturbance, or entirely endogenously. The unstable equilibrium, up until then in display, shifts into chaos outburst.

Dynamics of criticality: '*if we have reasons to suspect the possibility of a critical transition, early-warning signals may be a significant step forwards when it comes to judging whether the probability of such an event is increasing*" *Prof Marten Scheffer, (ecologist, math biologist)*

..THEN WHAT

Are we sure we can never know when a bubble is a bubble, and when will it burst? Does timing matter? If this is indeed a phase transition zone for markets, how severe a damage could be next? A still acceptable 5% to 10% digression below the moving average, or an easily justifiable 30% to 60%?

Have you ever seen a Fat Tail Risk with a 25% probability? Can it even exist? Have you ever seen it go unattended/unhedged, for both investors at large and regulators? What rare moment in history would that be?



INTRODUCTION



Our inability as market participants to properly frame market fragility and the inherent vulnerability of the financial system makes a market crash more likely, as it helps Systemic Risk go unattended and build further up.

For the first time in a while, elusive economic narratives started to fail at blaming market weakness on secondary-order factors: Trade Wars, the FED, Oil prices.

Attempts at dismissing market events as no more than a temporary turbulence miss the bigger picture and cast the fishing net on unaware investors looking for a dip to buy.

In contrast, over the last quarter, conventional market and economic indicators (e.g. breaks of multi-year equity & home price trend-lines, freezing credit markets, softening global PMIs/orders) have all but confirmed what non-traditional measures of system-level fragility signaled all along: that a market crash is incubating, and the cliff is near. Nothing has happened yet.



The System Resilience Indicator ('SRI'):

Systemic Risk As A Complexity Class



Sensor For Proximity To A Market Crash, With The Ricci Curvature



On the S&P500: A Visual History Of The Market Structure In The Last Twenty Years -Sequencing The DNA Of A Market Crash, Using Variations Of The Ricci Curvature



The System Resilience Indicator ('SRI'):

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Systemic Risk As A Complexity Class



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On the Nasdaq100: A Visual History Of The Market Structure In The Last Twenty Years - Sequencing The DNA Of A Market Crash, Using Variations Of The Ricci Curvature

WHAT IS THE 'EDGE OF CHAOS'

'YOU'VE GOT RANDOMNESS, AND YOU'VE GOT ORDER. AND RIGHT BETWEEN THEM, YOU'VE GOT A PHASE TRANSITION ZONE." John Beggs, biophysicist.

PILE OF SAND

POINTS OF NO RETURNS

POISED AT CRITICALITY:

- Sand grains are dropped one by one to form a pile. For a long time, nothing happens. Until when, at one point, a single grain can trigger a miniature avalanche.
- Nothing much else causes the slide, but just the additional grain. The pile falls under its own weight.
- Avalanches can be small or large.
 Sometimes they don't happen at all.
- Just before the pile enters its avalanche-prone state, it is poised for criticality.



THE POINT OF NO RETURN WHERE:

- snowflakes into avalanches
- fluid crystallize
- desertification rapidly oversets a green valley
- a volcano breaks into eruption
 - a forest burns itself out
 - a pandemic breaks loose

INTER-DISCIPLINARY:

- mathematics
- biology
- physics
- ecology
- psychology

Please refer to our Fragile Markets On The 'Edge Of Chaos', 10th January 2018

TRANSITIONS ARE COMMON IN ECOSYSTEMS



EXAMPLES OF CATASTROPHIC SHIFTS IN BIOLOGY, SOCIETIES, ECOSYSTEMS, CLIMATE,



A FASCINATING SUBJECT

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CATASTROPHY THEORY & TIPPING POINT ANALYSIS

CATASTROPHE THEORY attempts at isolating global properties for systems drifting into disorder beyond certain critical thresholds.

Analysis of Bifurcation Events

Beyond Chaos Theory and the 'butterfly effects', small change in initial conditions



Salvador Dalí's last painting, 'Homage to Rene' Thom' (1983): The Swallow's Tail Catastrophe



Cedric Villani pays homage to Boltzmann's Entropy equation

THE THEORETICAL ZONE, BETWEEN ORDER AND DISORDER



THE 'EDGE OF CHAOS': PHASE TRANSITION ZONE. WHERE RARE EVENTS BECOME TYPICAL

Complexity scientists from fields such as mathematics, biology, physics, ecology, psychology theorize on the **existence of this mysterious space**, **a theoretical zone**, **which sits in between order and disorder**, between symmetry and randomness. 'You've got randomness, and you've got order. And right between them, you've got a phase transition." in the words of biophysicist John Beggs.

It is the **space**, **hypothesized to exist by scientists**, where snowflakes suddenly accrete to form avalanches at some critical tipping point, where fluid crystallize, where desertification rapidly oversets a green valley, where a volcano breaks into eruption, a forest burns itself out, a pandemic breaks loose.

'Evolvability'

Order vs Entropy. Symmetry vs Deterministic Chaos

Stability vs Flexibility, Efficiency vs Redundancy

Positive Feedback Loops vs Resilience

Resilience is adaptability. It is the capacity of a system to bounce back from a shock and revert to original state, continue functioning, the capacity to learn from disturbances.

Evolution via major jump, a deep discontinuity

Critical transformation, into chaos and then an **alternative stable state**.

WHAT CAN BE LEARNED FROM NATURE



SYSTEM FRAGILITY: DISEASE IS THE CURE

"The more efficient a market is, the less resilient it becomes.

When a system is tight in all directions, it loses the ability to learn, it becomes brittle."

Roland Kupers, Resilience Action Initiative

"The disease is due to a deficiency of force. The disease is the body's attempt to cure itself. The disease is the cure.

It's a healing process."

Dr Isaac Jennings, founder of philosophy of natural hygiene

"If you never burn a forest the species in there who are capable of putting up with fire eventually go outcompeted; the only way to make a forest resilient to fire is to burn it.

The only way to make children resilient to the environment is to expose them to it ['sheltered kids do not make for capable adults' Lythcott-Haims]. Resilience is maintained by probing the boundaries of the basin, otherwise the basin becomes smaller and smaller.

That's how the body maintains a body temperature of 38 degrees (at 41 you die). We had 10 million years to develop the feedbacks we needed to adapt. Our earlier versions extinguished / got extinct." Brian Walker, Stockholm Resilience Centre

CRITICAL SLOWING DOWN



SYSTEM DEGRADATION, BASIN OF ATTRACTION FLATTENING

It is the theory that says that if the system is close to a critical tipping point the recovery rate decreases

It is hypothesized to exists at phase transition zones, when the system degrades following a weakening of its internal stabilizing forces (fading negative feedback loops and no buffers/redundancy left)

According to Professor Marten Scheffer, the loss of resilience will eventually be reflected in a critical slowing down in getting back to original positions after disturbances. Such critical slowing down has got to do with very fundamental mathematical properties of systems that are close to a tipping point. His analysis focuses on lakes and ecological domains, but can be applied broadly across complex systems.



system state

MARKETS LIKE COMPLEX ADAPTIVE SYSTEMS



SYSTEM FRAGILITY AND GENERAL PROPERTIES OF SYSTEMS APPROACHING A MAJOR SHIFT

This note posits that **systemic risk in financial markets should be analyzed through the prism of complexity science**, using the analytical tools available to non-linear socio-ecological systems, where a shift in positive loops comes in anticipation of a dramatic transformation.

Years of monumental **Quantitative Easing / Negative Interest Rate** monetary policies affected the behavioural patterns of investors and changed the structure itself of the market, in what accounts as **self-amplifying positive feedbacks**. This is the underexplored unintended consequence of extreme monetary policymaking. A far-from-equilibrium status for markets is reached, where system resilience weakens and **market fragility approaches critical tipping points**.

A small disturbance is then able to provoke a large adjustment, pushing into another basin of attraction, where a whole new equilibrium is found. While it is impossible to determine the threshold for such critical transitioning within a stochastic world, it is very possible to say that we are already in such phase transition zone, where markets got inherently fragile, poised at criticality for small disturbances, and where it is increasingly probable to see severe regime shifts. Fragile markets now sit on the edge of chaos. This is the magic zone where rare events become typical. The relevance of a tipping point is **clear to the human mind when associated to a simple element**. Too many people on the side on a boat, at some tipping point the boat flips. Or the pushing of a chair out of balance, at some tipping point the chair flips. However, we struggle with the concept when it comes to complex systems.

TIPPING POINTS:

The question then becomes one of identification of such critical tipping points, or 'bifurcation events'. What is the level beyond which a small change can provoke a large swing, a big transformation? What is the last grain of sand on the pile that the system can take in before transformation? **How to predict when a system collapses?**

CRASH HALLMARKS:

What are the 'early warning signals' that the system is approaching a tipping point and at risk of transitioning to a contrasting state

TRIGGERS: If the system degraded and the cliff is near, it is ready for critical transformation. A butterfly is all it takes then to flip into chaos outburst.

TIPPING POINTS, CRASH HALLMARKS, BUTTERFLIES



SYSTEM-WIDE FAULT LINES, EARLY SIGNALS, TRIGGERS



TIPPING POINTS ANALYSIS: MARKET SYSTEM IS TIGHT IN ALL DIRECTIONS



MARKETS IN A PHASE TRANSITION ZONE

'SYNCRONICITY' IN CAPACITY CONSTRAINTS IS WHAT MATTERS

Most institutional investors are all-in, invested between 90% and 100%. Limited scope for further valuation expansion, marginal buyers go scarce.



TWIN BUBBLES: extreme valuations for bonds and equities together. Disconnect to fundamentals is largest in modern financial history, when judged against most valuation metrics ever used. No buffer in bonds no

> Closeness BIS' to debt debt saturation / Rogoff's tolerance limits Minsky Moment for several subsets within the system, despite the record-low interest rates available to service such debt

MARKETS ON THE EDGE OF CHAOS



MARKETS THROUGH THE PRISM OF COMPLEX THEORY: LOW RESILIENCE, TIPPING POINTS AND CRITICAL TRANSFORMATION



UNSTABLE EQUILIBRIUM



AN EQUILIBRIUM CAN BE STABLE OR UNSTABLE

A body is said to be in unstable equilibrium, if it does not return to its original position after a small disturbance. The small disturbance can instead trigger outsized moves.



POSITIVE FEEDBACK LOOPS



CHANGING MARKET STRUCTURE: A REVIEW OF MARKET PLAYERS



Please refer to our **Positive Feedback Loops and Financial Instability: The Blind Spot of Policymakers**, Nov 2017

THE TREE OF POSITIVE FEEDBACK LOOPS





SYSTEMIC RISK: FUNDS, NOT JUST BANKS

SIZE + CONCENTRATION = SYSTEMIC RISK

In recent years, there was a meteoric rise in:

- CONCENTRATION OF RISKS ACROSS INVESTMENT STRATEGIES: ca. 90% of strategies today are TREND-linked or VOLATILITY-linked
- CONCENTRATION OF RISKS ON FEW TOP PLAYERS: top 8 AM shops account today for \$22trn, from \$8trn in 2006
- SIZE OF 'PASSIVE' OR 'QUASI PASSIVE': considering leverage and turnover, ca. 90% of flows in equity today are passive



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HOW MARKET RISK BECAME SYSTEMIC RISK

THE BLIND SPOT OF POLICYMAKERS

- The role of trending markets is known when it comes to systemic risks: a not sufficient but necessary condition.
- The role of volatility is also well-researched:
 - Hayman Minsky ("<u>Financial Instability Hypothesis</u>" in 1977): economic agents observing a low risk are induced to increase risk taking, which may in turn lead to a crisis: "stability is destabilizing".
 - Jon Danielsson, Director of the Systemic Risk Centre at the LSE (study), finds unambiguous support for the 'low volatility channel': prolonged periods of low volatility have a strong predictive power over the incidence of a banking crisis, owing to excess lending and excess leverage. The economic impact is the highest if the economy stays in the low volatility environment for five years: a 1% decrease in volatility below its trend translates in a 1.01% increase in the probability of a crisis. He also finds that, counter-intuitively, high volatility has little predictive power: very interesting, when the whole finance world at large is based on retrospective VAR metrics, and equivocates high volatility for high risk.

"WHEN YOU CHANGE THE WAY YOU LOOK AT THINGS, THE THINGS YOU LOOK AT CHANGE." Max Planck

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What is the role of prolonged periods of uptrend and low-vol on the Asset Management industry?

- In 2014, the Financial Stability Board (FSB), published a consultation paper asking whether fund managers might need to be designated as "global systemically important financial institution" or G-SIFI, a step that would involve greater regulation and oversight. It did not result in much, as the industry lobbied in protest, emphasizing the difference between the levered balance sheet of a bank and the business of funds.
- The reason for asking the question is evident: (i) sheer size, as the AM industry ballooned in the last few years, to now represent over \$15trn for just the top 5 US players!, (ii) funds have partially substituted banks in certain market-making activities, as banks dialled back their participation in response to tighter regulation and (iii), funds can indeed do damage: think of LTCM in 1998, the fatal bailout of two Real Estate funds by Bear Stearns in 2007, the money market funds 'breaking the buck' in 2008 amongst others.
- But it is not just sheer size that matters for asset managers. What may worry more is the positive feedback loops discussed above and the resulting concentration of bets in one single global pot, life-dependent on infinite momentum/trend and ever-falling volatility. positive feedback loops are the link for the sheer size of the AM industry to become systemically relevant. They morph market risks in systemic risks.
- If positive feedback loops are ignored and bubbles are left unchecked, that may one day most unambiguously qualify as a policy mistake: the addiction to monetary steroids and price control that could not be let go, on time. A bust that was entirely predictable, if only macropru conditions had been a real target, and short termism had not prevailed.

LOW VOLATILITY AND BOILING FROGS





The **boiling frog** is a fable describing a frog being slowly boiled alive.

If a frog is put suddenly into boiling water, it will jump out. However, if the frog is put in tepid water which is then brought to a **boil slowly, it will not perceive the danger** and will be cooked to death.

The story is often used as a metaphor for the inability or unwillingness of people to react to or be

aware of threats that arise gradually.



EARLY WARNING SIGNALS

EXTRAORDINARILY IMPROBABLE EVENTS ARE COMMONPLACE

David Hand, 'The Improbability Principle'

HOW PROBABLE IS A MAJOR GAP RISK



Assessing the probability of critical transformations: early warning signals

We can never predict the exact point at which the system transforms. We live in a stochastic world and the final little push out of equilibrium may happen randomly.

But what we can say is when the system has become inherently unstable, fragile, vulnerable, ready for small perturbations to trigger critical transitions, in phase transition zone.

"If we have reasons to suspect the possibility of a critical transition, the analysis of generic early warning signals may be a significant step forward when it comes to judging whether the probability of a transition is increasing." *Marten Scheffer*

EARLY WARNING SIGNALS



CRITICAL TRANSFORMATION HYPHOTHESIS



The rate of recovery rate after a small perturbation is reduced, and will approach zero when a system moves towards a catastrophic bifurcation point (less slope of basin of attraction). The difference to Oct14, Aug15, Jan16, Trump, Brexit may be informative. Calls for further investigation.

1) Volatility had already bottomed out 9 months ago; 2) Volatility rising with market in January; 3) Volatility still not reflected in longer expiries and other asset classes. As a bifurcation approaches (eigenvalue zero), the impact of shocks do not decay, and their accumulating effect increases the variance of the state variable

1) Correlation across asset classed increases at times of systemic risk. 2) Increase in autocorrelation, the memory of the system increases , the **state of the system** at any given moment becomes **more and more like its past state**

The **asymmetry of fluctuations** may increase. Rates of recovery are lower. As a result, **the system will tend to stay in the vicinity of the unstable point relatively longer** than it would on the opposite side of the stable equilibrium. Vicinity to 200 days MA may qualify.

In the vicinity of a catastrophic bifurcation, the system goes back and forth between the basins of attraction of two alternative attractors. Such behavior is also considered an early warning. rapid alternations between a cold mode and a warm mode are typical in climate changes over history. In epileptic seizures, smaller transient excursions in the vicinity of an alternative state precede the upcoming major shift. Call them 'EARLY TREMORS'. Violent rallies seen in bear market about to crash, may qualify.

XIV was only the first ETF to go , many could follow (issues of 'fake diversification', 'fake liquidity') Turkey, OIS-Llibor spread / DB, default events, HKD, EU Economic Surprise Index

Critical Transitions Follow Shifts In Feedback Loops: they can be the final stressors

How does the system degrade? How is resilience lost? One such way is with a change in feedbacks. It happens when self-correcting negative feedback loops weaken, and self-amplifying positive feedback loops arise, and the system degrades. Positive loops correlate to an increase in system-level fragility. Now they flipped again to negative: saturation.



One **key stressor in clean sight**. To markets, it is **REAL RATES RISING**. Inflation made a comeback, but it is really real rates that are rising. So, bond bubble started deflating, just started. Decade-long technical trend-lines are now broken. We will see below how further it can go, across the credit spectrum (HY, Lev Loans, Subordinated)

FEEDBACK LOOPS ACT IN REVERSE



THE AUTOLYTIC REACTION IS NOW JUMPSTARTED, AND UNFOLDING ACROSS PASSIVE AND QUASI-PASSIVE INVESTORS



SUGAR RUSH vs SUSTAINABLE GROWTH



WHY CYCLICALLY-ADJUSTED EARNINGS MATTER MORE THAN CURRENT EARNINGS



Source: OMB, BLS, Federal Reserve Board, Haver Analytics, Deutsche Bank Research

Not just mean reversion across the cycle

Aggressive tax cuts on QE environment, on already low tax rates (no VAT in the US), may count as financial doping

DB: "Aggressive fiscal expansion at this point in the business cycle is highly unusual"



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SMOKING IN A GAS STATION

ASKING FOR TRUBLE

So, to recap:

As default rates lagged behind debt /gdp metrics to which they are tightly correlated historically (slide) As spreads lagged behind default rates As covenant lite are as lite as ever, bondholders protection the tiniest on records As 35% is either floating or refinancing within 2 years

- Rates rise
- OIS-Libor widens
- QT progresses



Source: JP Morgan, Bloomberg, DoubleLine

Chap. 11 Bankruptcy Filings 3-month average year-over-year change







PASSIVE INVESTORS HAVE NO CASH BUFFERS

UNDER-PERFORMANCE VS OVER-WEIGHT

 What is the invariant difference between an active investor an a passive investor?

CUMULATIVE FLOWS INTO PASSIVE AND ACTIVE EQUITY ETFs AND MUTUAL FUND (\$BN)



Source: J.P. Morgan Quantitative and Derivatives Strategy, EPFR Global

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TRIGGERS: ELEPHANTS, NOT BUTTERFLIES



THINGS ALWAYS BECOME OBVIOUS AFTER THE FACT. TO PREVAIL IN AN UNCERTAIN WORLD, GET CONVEX. Nassim Nicolas Taleb





POPPING TWIN BUBBLES. TIPPING THE BALANCE OF UNSTABLE EQUILIBRIUM



ENDOGENOUS: STRUCTURE OF THE MARKET. Over-concentrated, across strategies and investors.

The autolytic effect already triggered by volatility (chain effect across major market players (Risk Parity funds, Short Vol ETFs, Low Vol ETF, momentum strategies). The rebalancing/deleveraging effect triggered by UP-TREND breaking down. The 200-days moving average is a Maginot Line (same fate).



EXOGENOUS TRIGGERS: LIQUIDITY TIDE PETERING OUT

The global liquidity tide from Central Banks is withdrawing. Flows work in reverse, for the first time in 10 years. First real crash test for momentum / volatility.



RATES RISING. THE CLIFF IS NOW IN SIGHT. It started raining. Over-indebtedness may may be closing in onto its Minsky point. Inflation or Real rates does not matter !

(IL)LIQUIDITY EVENT. The liquidity in markets is deceptive and ephemeral, likely to dissipate as markets move lower. XIV is no isolated case ! Other much larger ETFs exhibit 'fake diversification', 'fake liquidity'.

GEOPOLITICS / POLITICS. From populism in developed countries (Germany, Catalonia, Italy, Brexit, Trump) to confrontations in North Korea / Middle East (end of Pax Americana).

6 HOT SPOTS: TURKEY, ITALY, CHINA. Smoking in a gas station. What are weaker FX and geopolitical tensions to Turkey, what are rising rates to Italy, what are trade wars to China?

ELEPHANTS IN THE CHINA SHOPS



CAN WE REALLY STILL CALL IT A 'TAIL' SCENARIO ?

ELEPHANTS, NOT BUTTERFLIES





A CHINA SHOP, NOT A ROOM



A HUNDRED THOUSAND LEMMINGS CAN'T BE WRONG!





"You're overthinking this."

Source: Lemming Measures The Drop Off Of A Cliff is a drawing by Julia Suits, 10th August 2016.

OUR PREVIOUS NOTES ON THE SUBJECT



Today's presentation is the update to the deck on MARKET FRAGILITY we presented last year, and provides the conceptual framework around previous work on Tail Risk, where we argued that an unstable equilibrium in financial markets is brought about by positive feedback loops between public and private investors, exposing markets to systemic risk escalation. We here discuss specific points of critical transformation and upcoming regime shift for markets, pointing to the generic early warning signals for chaos outburst.

MARKET FRAGILITY | PART 1 | Presentation (Oct 2017) LINK

POSITIVE FEEDBACK LOOPS AND FINANCIAL INSTABILITY: The Blind Spot of Policymakers A Dangerous Market Structure is More Worrying than Expensive Asset Valuations and Record Debt (Nov 2017) LINK (and a MACROVoices podcast on the topic LINK)

FAKE MARKETS: HOW ARTIFICIAL MONEY FLOWS KILL DATA DEPENDENCY, AFFECT MARKET FUNCTIONING AND CHANGE THE STRUCTURE OF THE MARKET (May 2017) LINK

THE POSITIVE FEEDBACK LOOP BETWEEN FAKE MARKETS AND INVESTORS CREATES SYSTEM INSTABILITY, AND DIVERGENCE FROM EQUILIBRIUM (July 2017) LINK

THE TRAP OF SHORT VOL ETFS (July 2017) LINK

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Chartbooks February 2018 The Market System Is Tight In All Directions

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