In northwest Brazil, near the town of Manaus, the two largest tributaries of the Amazon River, the Solimoes and Rio Negro, converge in dramatic fashion in what is known as the ‘Encontro das Aguas’ or ‘Meeting of the Waters’. The Solimoes River is light and milky in color due to receding sediment from the Andes Mountains. The Rio Negro River is dark black derived from decaying plant matter collected in the jungle. The two rivers co-exist in vivid contrast, running side-by-side for miles but never mixing, due to differences in temperature, speed, and water density. The ‘Meeting of the Waters’ marks the beginning of the Amazon River, one of the longest, most mythic, and dangerous rivers in the world.

The ‘Meeting of the Waters’ is also a fitting analogy for today’s market: the seven year bull market run in US equities, the second longest in history, has now converged side-by-side with an ominous and dark tributary, leading into an unknown future. Today’s financial market is now two markets in one, a dark bear market with significant fundamental risk, and a light bull market buoyed by central bank interventionism and share buybacks. The daily returns of this convergence of risk are a rare combination of positively and negatively skewed regimes. These two distinct market risk tributaries have converged since August of last year flowing simultaneously side-by-side but never mixing. Twice over this period, the US equity market experienced peak-to-trough drawdowns of over -10% (August to September 2015, January to February 2016) that were quickly erased by feverish buying sprees (October to November 2015, February to March 2016) instigated by central bank intervention, share buybacks, and short covering. The whipsaw nature of risk, including some of the lowest levels of volatility persistence on record (comparable only to 2003 and 1960s based on GARCH models), led to the worst start to the year for active strategies in over a decade. While this market is highly unusual… it can be quantified. Rather than navigate this ‘Meeting of Markets’ by boat, let us take to the air to see the bigger picture.
**Multi-Modal Probability Distributions in the Amazon**

Mathematically, when different states of the world converge but do not mix, their characteristics can be modeled by a *multimodal probability distribution*. The multimodal distribution is a mixture of two or more probability distributions with similar variance but different means. For example, the statistical average color of Brazil’s ‘Meeting of the Waters’ is less compelling than the extreme local color of each tributary. The milky color of the Solimoes is one peak, and the dark color of the Rio Negro the other.

Like the rivers, the S&P 500 index and VIX index represent a combination of two entirely different positively and negatively skewed market regimes. This oddity becomes apparent when we compare the probability distributions of daily returns for each index against their long-term historical distributions.

**Two Rivers of the VIX Index**

The typical distribution of daily VIX Index returns shows a pronounced peak around zero and fat right tails (representing volatility jump risk). The recent distribution of VIX returns (July 2015 to March 2016) is a highly unusual tri-modal distribution with three distinct means representing both up and downside shocks. The VIX is now part of two rivers co-existing but not mixing, one skewed toward volatility spikes and tail risk, and the other skewed toward volatility declines and market gains. When measured statistically, the skew seems normal, but when visualized it is clear that the peak of the return distribution has been suppressed to favor a skew in both directions. While volatility has increased since 2014, spot-volatility declines (the left of the return distribution) are occurring six times more frequently than normal at the expense of the center of the distribution. As a result, crisis alpha opportunities have given back gains quickly, and arbitrage inefficiencies are harder to exploit without taking directional bets. This is one reason why, quixotically, the CBOE Long Volatility Hedge Fund Index (-2.71%) and CBOE Tail Risk Hedge Fund index (-4.48%) have both experienced losses since July 2015 despite higher overall volatility. In historical context, this is just plain weird. In fact, the daily returns of the VIX between July 2015 and January 2016 were the second most anomalous in history (next to 2004) when compared to any six-month historical distribution since 1990.
The S&P 500 index is exhibiting much the same multi-modal peculiarity as the VIX index. To understand the dividing line between light and dark markets look no further than the month after earnings announcements, when the SEC-mandated share buyback blackout period officially ends. In the past two years, this period has encompassed three of the top ten “supernormal” volatility drawdowns in history. It is no longer a secret that share buybacks are a key driver of these stock market rallies (see Artemis’ December 2015 letter to investors for full analysis). Corporate share buybacks attributed $165bn of stock inflows in the quarter, the highest pace since 2007, while mutual funds, ETFs, and foreign investors have been net sellers. In essence, share buybacks are now the only buyer keeping the stock market afloat; something that cannot continue indefinitely. Below we graph the probability distribution of S&P 500 index daily returns in the dark waters of the buyback moratorium (August-September 2015, January to Early-Feb 2016) vs. the light water buyback periods (October to November 2015, February to April 2016). The contrast is startling. Both the light water and dark water SPX probability distributions are multi-modal, with the core difference being positive or negative directionality of the secondary mode.
The Federal Reserve has also played a major role in supporting markets, first by surprising in September 2015 with no rate hike, and then in March 2016 with dovish guidance. Never underestimate what global central banks are capable of doing to support stock prices and real estate – anything really - up to the point where people take to the streets with pitchforks due to further income inequality. The risk of an extended hyper-bubble in all financialized asset is a very real possibility given this level of institutionalized moral hazard and political aversion to another market crash. At the same time, the credibility of central banks and their power over markets seems to be waning with each new round of stimulus, as evidenced by hostile market reactions to recently implemented negative rates in Japan and Europe.

**Light and Dark become the Amazon**

Eventually even the Rio Grande and Solimoes River become one AMAZON. Something will give – the market cannot rely on stock buybacks indefinitely absent fundamental earnings growth. Central banks from the Fed, ECB, to the BOJ are quickly losing credibility. At these valuations in a late phase bull market there are three forms of defense that have historically performed: 1) long volatility 2) US treasuries and; 3) cash. . As for bonds and cash - zero to negative yields is starting to do more to cause volatility than prevent it - and this creates risk in both these traditional safe havens. The cure has become the disease... keep that in mind as we float down two merging rivers into an uncertain and dark jungle.

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*Notes: Special thanks to Michael Holmes, PhD – Artemis VP of research – for suggesting the “Meeting of Rivers” analogy. Michael spent two years in Northern Brazil and speaks fluent Portuguese in addition to many other talents relevant to volatility trading. Images from Reddit and Wikipedia. Data from Bloomberg and Artemis Capital.*
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