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The Law of Large Numbers

Sir Francis Galton in 1889, describing what is now known as the Central Limit Theorem:

"… I know of scarcely anything so apt to impress the imagination as the wonderful form of cosmic order expressed by the "Law of Frequency of Error". The law would have been personified by the Greeks and deified, if they had known of it. It reigns with serenity and in complete self-effacement, amidst the wildest confusion. The huger the mob, and the greater the apparent anarchy, the more perfect is its sway. It is the supreme law of Unreason. Whenever a large sample of chaotic elements are taken in hand and marshaled in the order of their magnitude, an unsuspected and most beautiful form of regularity proves to have been latent all along…"

The universal nature of the law of large numbers, also known as the Central Limit Theorem, is essential to the smooth functioning of many industries. It allows many diverse businesses to manage what would otherwise be intractably complex problems. With this theorem, for example, insurers can manage the risk of their automotive policies without having to know every complicated detail of when or how car crashes actually occur; astronomers can measure the size and location of distant galaxies without having to solve the complicated celestial mechanics equations; investors in options can profit and manage risk without having to know exactly when or how the market will turn.

The key is applying this theorem correctly. One has to sample the data or insure the car or invest and trade many times in order for the law to work. Each individual trade should have a positive expected value such that, if done repeatedly, the ultimate odds of success are increased.

Currently, the lockdowns coupled with massive government intervention are creating unique positive edge opportunities across many asset classes. There are now higher opportunities in distressed, credit, macro, CTA, private-equity, volatility and more.

However, just because there might be a unique opportunity today does not mean there is a guaranteed profit tomorrow. One needs to invest in multiple opportunities repeatedly so that <u>on average over time</u> the profit potential materializes. Since these opportunities do not all present themselves at the same time, one must be willing to invest over time so that the law of large numbers (The Central Limit Theorem) can work in one's favor.

The problem: Today there is extreme risk of major market moving events. We are in uncharted territory resulting from massive government and central bank intervention. Investors who do not transition to the new world order are likely to be left behind. With equity markets hovering near all-time highs and rates hovering near zero, both equity and fixed income are at inflection points. Traditional bond vs stock allocations may not work going forward as historical relationships may no longer be valid. However, no one knows when the markets will turn nor how it will play out. One thing is fairly certain, both are going to move.

Solution: If you are a fixed income or an equity manager, continue to invest albeit with the correct insurance.

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The difficulty with insurance: The state requires you to have auto insurance and your mortgage company requires you to have homeowners insurance. You buy it and maintain it without question, each year, no matter the profit and loss of that policy. For an investment portfolio, it's a bit different. Institutions such as endowments and pensions are not required to insure their portfolios. Stakeholders, such as a new board member, may question why a hedging program appears to incur losses year after year. The benefit is not obvious because the Central Limit Theorem is an abstract concept. The key to a solution is to provide flat to positive drift in normal market scenarios but still maintain significant positive returns in shock scenarios. But how can it be done?

How NOT to implement: Just buying puts on the SP500 and letting them expire is like paying insurance premiums but not making a claim at the right time. It is a losing proposition. Just buying puts on a bond fund has a similar long term outcome.

This is a well known problem. Many investors attempt to solve this problem by reducing the cost of buying puts or calls via selling other options to fund the position. Zero-cost collars, puts spreads, call spreads and other simple spreads are attempts to reduce the insurance premiums paid. Consider why you would restrict yourself to just one, two, or three strikes. When should you monetize a gain? The long term performance of put spread collars is underwhelming.

The key to a solution:
Predefine your target premium expenditure and risk profile in advance (can be similar to a put-spread-collar) but do not restrict yourself to just three strikes. Instead, scan the entire universe of call and puts at various maturities and strikes (there are over 50,000 options to choose from) and run a large scale optimization resulting in numerous potential positions and hedges. Trade electronically every day to keep costs down, review and re-optimize daily. Sticking to this dynamic but disciplined process will allow for numerous positions to be added or removed while monetizing gains.

Result:
If implemented correctly the results improve substantially over the CBOE Put Spread Collar, with similar risk profiles. Similarly, overlaying a dynamic options hedge on treasuries shows superior performance while maintaining downside protection. This protection is achieved at little to no cost.

Why should it work? Hedging can work. Simple static strategies simply do not account for changing valuations and changing opportunities to take profits while maintaining the correct exposure. In order to skew the odds towards success, we believe that one must employ a dynamic and disciplined process to keep the desired risk exposure of a simple options payoff while maintaining numerous offsetting positions and hedges and recalibrating frequently.

There is a natural spread between what options costs and what they pay off over time. The key is to implement option trades with positive expected edge repeatedly over time. A single spread or position may or may not be profitable. However, if one updates the position and re-calibrates daily, then each new trade can make a small improvement. These small improvements add up and can completely dominate and outperform static methods. Just as multiple positive edge bets over time are more likely to outperform a single bet. This is the Law of Large Numbers at work.

Past Performance is not indicative of future performance. Data is subject to revision without notice.

Important information regarding the information provided herein:

HYPOTHETICAL PERFORMANCE RESULTS HAVE MANY INHERENT LIMITATIONS, SOME OF WHICH ARE DESCRIBED BELOW. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. IN FACT, THERE ARE FREQUENTLY SHARP DIFFERENCES BETWEEN HYPOTHETICAL PERFORMANCE RESULTS AND THE ACTUAL RESULTS SUBSEQUENTLY ACHIEVED BY ANY PARTICULAR TRADING PROGRAM. ONE OF THE LIMITATIONS OF HYPOTHETICAL PERFORMANCE RESULTS IS THAT THEY ARE GENERALLY PREPARED WITH THE BENEFIT OF HINDSIGHT. IN ADDITION, HYPOTHETICAL TRADING DOES NOT INVOLVE FINANCIAL RISK, AND NO HYPOTHETICAL TRADING RECORD CAN COMPLETELY ACCOUNT FOR THE IMPACT OF FINANCIAL RISK IN ACTUAL TRADING. FOR EXAMPLE, THE ABILITY TO WITHSTAND LOSSES OR ADHERE TO A PARTICULAR TRADING PROGRAM IN SPITE OF TRADING LOSSES ARE MATERIAL POINTS WHICH CAN ALSO ADVERSELY AFFECT ACTUAL TRADING RESULTS. THERE ARE NUMEROUS OTHER FACTORS RELATED TO THE MARKETS IN GENERAL OR TO THE IMPLEMENTATION OF ANY SPECIFIC TRADING PROGRAM WHICH CANNOT BE FULLY ACCOUNTED FOR IN THE PREPARATION OF HYPOTHETICAL PERFORMANCE RESULTS AND ALL OF WHICH CAN ADVERSELY AFFECT ACTUAL TRADING RESULTS.

FOR CUSTOMERS TRADING OPTIONS, THESE FUTURES AND FOREX CHARTS ARE PRESENTED FOR INFORMATIONAL PURPOSES ONLY. THEY ARE INTENDED TO SHOW HOW INVESTING IN OPTIONS CAN DEPEND ON THE UNDERLYING FUTURES PRICES; SPECIFICALLY, WHETHER OR NOT AN OPTION PURCHASER IS BUYING AN IN-THE-MONEY, AT-THEMONEY, OR OUT-OF-THE-MONEY OPTION. FURTHERMORE, THE PURCHASER WILL BE ABLE TO DETERMINE WHETHER OR NOT TO EXERCISE HIS RIGHT ON AN OPTION DEPENDING ON HOW THE OPTION'S STRIKE PRICE COMPARES TO THE UNDERLYING FUTURE'S PRICE. THE FUTURES CHARTS ARE NOT INTENDED TO IMPLY THAT OPTION PRICES MOVE IN TANDEM WITH FUTURES PRICES. IN FACT, OPTION PRICES MAY ONLY MOVE A FRACTION OF THE PRICE MOVE IN THE UNDERLYING FUTURES. IN SOME CASES, THE OPTION MAY NOT MOVE AT ALL OR EVEN MOVE IN THE OPPOSITE DIRECTION OF THE UNDERLYING FUTURES CONTRACT.

Futures, options and derivatives products inherently involve substantial leverage and also greatly increase the risk of loss. There is no additional portfolio leverage applied to generate the returns.

Risk Factors: Hedge funds and Managed Accounts have certain inherent risks associated with them, including but not limited to the following:

(i) the funds and managed accounts are speculative and involve varying degrees of risk, including substantial degrees of risk in some cases;
(ii) the funds and managed accounts may be leveraged and may engage in other speculative investment practices that may increase the risk of investment loss; (iii) the funds' and managed accounts performance may be volatile; (iv) an investor could lose all or a substantial amount of his or her investment; (v) the investment managers have total trading authority over the funds, the funds are dependent upon the services of the investment managers, and the use of a single advisor could mean lack of diversification and, consequently, higher risk; (vi) the funds may have varying liquidity provisions and limitations and there is no secondary market for investors' interests in any of the funds and none is expected to develop; (vii) there are restrictions on transferring interests in the funds; (viii) the funds' fees and expenses may offset the funds' trading and investment profits; (ix) the funds may not be required to provide periodic pricing or valuation information to investors with respect to individual investments; (x) the funds are not subject to the same regulatory requirements as mutual funds; and (xi) the funds are subject to conflicts of interest.

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