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***"If you're gonna play the game, boy you gotta learn to play it right."***
***— Kenny Rogers***

Imagine that we had absolute knowledge that the S&P 500 will be 10% higher in one year.

How much should we invest and with how much leverage?

We could take all of our savings and get long the market. We could buy on margin, buy futures and call options and earn multiples on our investment by year's end. We could lever even more by borrowing from every available source to make as much as possible. Unfortunately, applying massive leverage, even to a certain outcome, is likely to lead to *certain* ruin.

The financial markets have uncertainty, randomness and variability. Even the most accurate forecasts or the world's best investors will have unpredictable noise in their P/L prior to the investments' ultimate fruition. The trading edge, no matter how good, is invariably accompanied by volatility and randomness.

If the average variability of an average stock is about 30%, this variability in conjunction with interim drawdowns means that leverage of more than three times is potentially ruinous. This is because the market will fluctuate prior to reaching the guaranteed price and a drawdown in the market of 30% during the year will wipe us out. Too much leverage and we get stopped out at a complete loss prior to being able to receive the guaranteed return.

A "margin of safety" rule is always required, even for successful investments. Not just because the ultimate prediction may be wrong, but also because there will be volatility until the prediction is realized.

One great business where profits are "certain," albeit with interim volatility, is the business of owning a roulette wheel.

***"I want to be the house… the house always wins."***
***— said everyone***

What if you were the proud owner of a roulette wheel? Every day a gambler lines up at your wheel to bet $1,000 on either red or black. The gambler bets once each day, 252 days a year, every year. We do not know if the gambler will bet on red or black on any given day, nor do we know if the spin will land on red or black (or green). All we know is that sometimes the gambler will win and sometimes the casino will win. On any given day, both the bet (red or black) and the results of the bet are random and unpredictable. Over any length of time, we also do not

know the exact string of reds and blacks. It is all random and unpredictable. However, when spun multiple times, the cumulative results become predictable.

Over numerous plays and time, the house has a small advantage. If the roulette wheel has 18 blacks, 18 reds and 2 greens, the house edge is 2/38 or 5.3%. The P/L on any given day will be up or down $1,000 and will show volatility in either direction, including strings of gains and losses.

The casino will have to maintain a certain amount of capital in reserve to cover the expected drawdowns and variability. In order to minimize the risk of ruin, a suitable reserve for a $1,000 bet turns out to be $66,000.[1] If the house maintains too little in capital it is likely to run out of money when the gambler sometimes wins. Conversely, if the house keeps too much capital on hand, it will not make as much of a return.

If the gambler plays every single day, 252 days a year for 17 years, betting on either red or black, the payoff and risk to the house can be simulated on a computer, an example of which is given by the following performance:

*Figure A: Simulated cumulative return of investing in a roulette wheel where each day a bet of $1,000 is placed on red or black and the cash held is $66,000. Profits are not reinvested; therefore, "book size" remains constant.*

[1] The probability of a drawdown worse than the capital reserve of $66,000 in a single year is less than 0.005%. This capital reserve also protects the casino against drawdowns that span more than one year.

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | YTD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2015** | 4.5 | 1.5 | 10.6 | 1.5 | 7.6 | -7.6 | 16.7 | -4.5 | 7.6 | 1.5 | 1.5 | -4.5 | **36.4** |
| **2014** | 7.6 | 1.5 | 1.5 | 1.5 | 7.6 | 10.6 | -4.5 | -4.5 | 4.5 | 1.5 | -1.5 | 16.7 | **42.4** |
| **2013** | 4.5 | -7.6 | 7.6 | -4.5 | 4.5 | 7.6 | 1.5 | 10.6 | -7.6 | 4.5 | -4.5 | -4.5 | **12.1** |
| **2012** | 4.5 | -4.5 | -1.5 | -7.6 | 13.6 | -1.5 | -1.5 | -1.5 | 22.7 | 7.6 | -1.5 | 4.5 | **33.3** |
| **2011** | -1.5 | -10.6 | -1.5 | 1.5 | -4.5 | -7.6 | -4.5 | -4.5 | 7.6 | -1.5 | 4.5 | 4.5 | **-18.2** |
| **2010** | 10.6 | -4.5 | 16.7 | -1.5 | 4.5 | 4.5 | -10.6 | -4.5 | -1.5 | 4.5 | -13.6 | 4.5 | **9.1** |
| **2009** | 1.5 | 1.5 | 1.5 | -1.5 | 7.6 | 1.5 | -4.5 | 7.6 | 1.5 | -7.6 | 4.5 | 16.7 | **30.3** |
| **2008** | -1.5 | -1.5 | -7.6 | 1.5 | -13.6 | 10.6 | 4.5 | 4.5 | -10.6 | -4.5 | -4.5 | 4.5 | **-18.2** |
| **2007** | 1.5 | 10.6 | 4.5 | 1.5 | 1.5 | -7.6 | -1.5 | 10.6 | 1.5 | 7.6 | 13.6 | 7.6 | **51.5** |
| **2006** | 4.5 | -1.5 | 1.5 | 1.5 | -1.5 | -1.5 | -1.5 | -4.5 | 13.6 | -4.5 | -4.5 | 4.5 | **6.1** |
| **2005** | -4.5 | -7.6 | 7.6 | 10.6 | -4.5 | 4.5 | 10.6 | -4.5 | -1.5 | 1.5 | 1.5 | 7.6 | **21.2** |
| **2004** | 1.5 | -1.5 | 7.6 | 1.5 | 7.6 | -1.5 | -1.5 | -1.5 | -4.5 | 1.5 | -1.5 | -1.5 | **6.1** |
| **2003** | -1.5 | 16.7 | -7.6 | -7.6 | 7.6 | 10.6 | 7.6 | 1.5 | -7.6 | 10.6 | -1.5 | -4.5 | **24.2** |
| **2002** | 4.5 | -4.5 | 4.5 | 4.5 | 4.5 | -1.5 | 7.6 | -1.5 | 7.6 | 10.6 | 1.5 | -7.6 | **30.3** |
| **2001** | -4.5 | -10.6 | 10.6 | 4.5 | -7.6 | 1.5 | -1.5 | 1.5 | -1.5 | 4.5 | -4.5 | -1.5 | **-9.1** |
| **2000** | -10.6 | -7.6 | -10.6 | 7.6 | 1.5 | -1.5 | -1.5 | 4.5 | 4.5 | 1.5 | -1.5 | -1.5 | **-15.2** |
| **1999** | 1.5 | 1.5 | 4.5 | -1.5 | -1.5 | -1.5 | 7.6 | 1.5 | -7.6 | -1.5 | -4.5 | 10.6 | **9.1** |
| **1998** | 4.5 | 4.5 | 7.6 | 1.5 | 7.6 | -4.5 | 7.6 | -7.6 | 1.5 | 10.6 | 7.6 | 7.6 | **48.5** |

*Figure B: Simulated gross returns of owning a roulette wheel where each day a bet of $1,000 is placed on red or black and the cash held is $66,000. Profits are not reinvested; therefore, "book size" remains constant.*

The expected return and risk of owning this roulette wheel generates an average annual return of 16.7% with a Sharpe ratio of 0.8 as well as the following performance metrics:

| Metric | Value |
|---|---|
| **Annualized Return** | 16.7% |
| **Rolling 12 Month Return** | 36.4% |
| **% Positive Months** | 56% |
| **Average Monthly Return** | 1.4% |
| **Average Positive Month** | 5.8% |
| **Average Negative Month** | -4.4% |
| **Sharpe Ratio (0% risk-free)** | 0.8 |

| Metric | Value |
|---|---|
| **Annualized Standard Deviation** | 22.1% |
| **Monthly Standard Deviation** | 6.4% |
| **Best Monthly Return** | 22.7% |
| **Worst Monthly Return** | -13.6% |
| **Worst Drawdown** | -54.5% |
| **Calmar Ratio (0% risk-free)** | 0.3 |
| **Sortino Ratio (0% risk-free)** | 1.3 |

The monthly return table shows volatile performance. The business experienced a drawdown of nearly 55% (with no leverage). It had numerous back-to-back months of losses and had strings

of years with no P/L. The exact return on any given month is random. The timing of strings of positive vs negative months is random.

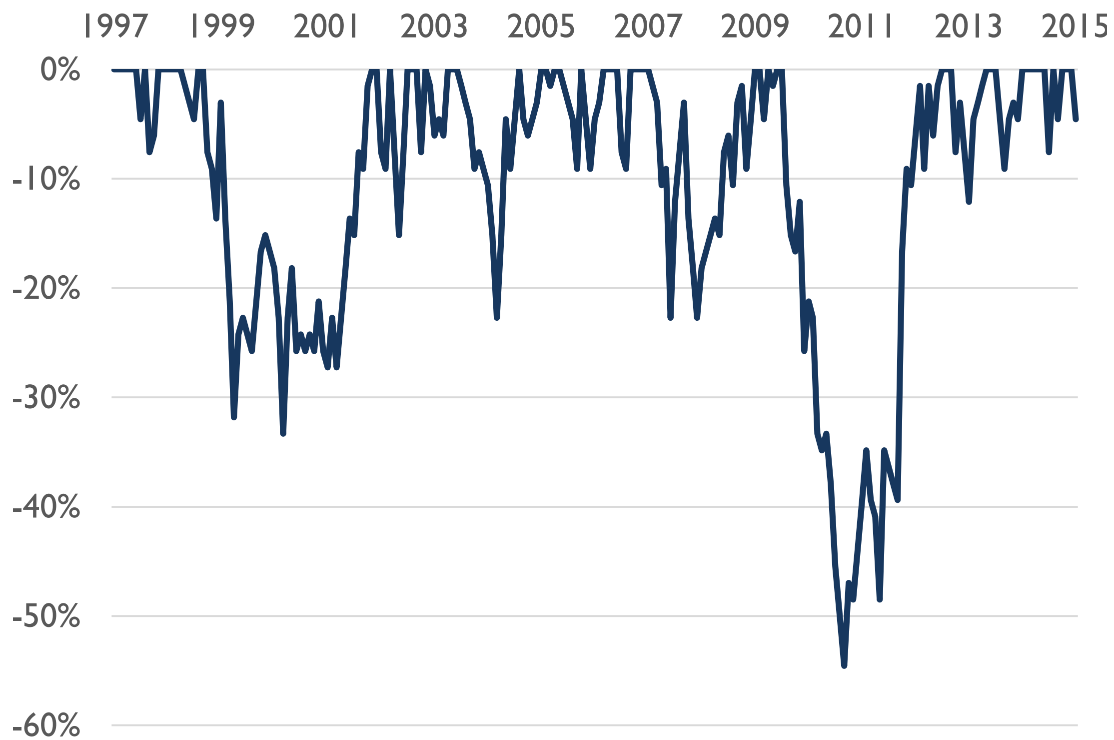


*Figure C: Drawdowns (in %) of owning a roulette wheel where each day a bet of $1,000 is placed on red or black and the cash held is $66,000. Profits are not reinvested; therefore, "book size" is constant. Drawdown is measured in percentage as cumulative losses less the prior maximum.*

An investor who thought that owning a roulette wheel is certain to be profitable because the house has the edge must be willing to suffer losses and variability in the interim.

Investors might attempt to add "trading rules" such as stop-losses in the hopes of reducing risk, but this will only result in locking in losses when they occur and preventing the inevitable recovery over time. For example, if the wheel losses $10,000 and the investor decides to stop, then what? Will he never invest in a roulette wheel again? Did he stop because he didn't realize the wheel can have losses on the way to profits?

An investor who only looks at the monthly return numbers without realizing that he actually owns a roulette wheel may think the investment is "no longer working" after a drawdown or flat year.

Other investors might attempt to time the "market" by looking for fundamental or technical reasons to be in or out. Trying to explain why the wheel had strings of positive or negative performance after the fact provides little value because the wheel is ultimately random.

The key here is to set the book size in advance, remember that you own a business with a positive expected return, run it and accept the variability.

It is hard to find investments as good as a roulette wheel. Most do not have the same built-in favorable odds. The few that do will have similar variability and drawdowns on the way to profits. Many would jump at the chance to be the house, but are often surprised with the risk and uncertainty that comes with it.

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