

The Kelly Method: A Better Way to Assess Financial Risk

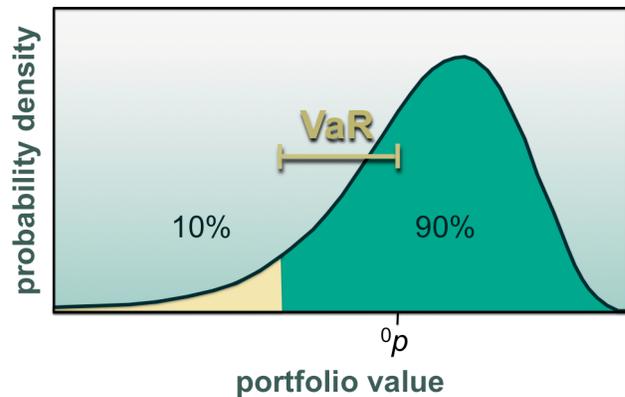
By Murray H. Williams

Bank failures in the United States are all too common. This is surprising considering all the banking safeguards and regulations put in place over the last century. From the Federal Reserve Act in 1913, to Glass-Steagall in 1932, to Dodd-Frank in 2010, the US government continues to enact legislation in an attempt to bolster the banking sector. Yet banks continue to fail. Governments often seem powerless when faced with a banking crisis and regulators are left scratching their heads wondering why they still happen.

Hedge funds also continue to blow up. From high profile failures such as Long Term Capital Management in 1998 and Bernie Madoff in 2008, these alternative investment vehicles can also be prone to spectacular failure. But are bank and hedge fund failures related? Risk management professionals who work at banks and hedge funds are obviously intelligent people. The question is why do these smart people take such dumb risks? Could it be the risk management training taught in our business schools is flawed? Could our educational institutions be at fault?

There are many ways to measure financial risk, the most common being Value at Risk (**VaR**). The limitations of **VaR** are widely documented. One manager described it like "an airbag that works all the time, except when you have a car accident." Without getting into specifics the main problems with **VaR** are that it:

1. Ignores low-probability, fat tail risks
2. Relies on highly subjective confidence levels
3. Justifies the use of leverage



Leverage combined with unlikely downside events is a recipe for disaster. Since the financial crisis of 2008-09, the risk management community has been reassessing the effectiveness of **VaR**. Stress testing with Monte Carlo simulation has become more stringent in an effort to evaluate **VaR** during extreme what-if scenarios.

Around the same time traders at J.P. Morgan were developing **VaR**, the Basel Committee on Banking Supervision (**BCBS**) published its set of minimum capital requirements for banks. Assigning risk weights to various financial assets, the committee tried to apply European standards to the international banking system.

The **BCBS** published its solvency parameters based on capital ratios and made recommendations. Here's a list of the most common capital ratios along with recommended levels:

- CET1 Capital Ratio = Common Equity Tier 1 / Credit risk-adjusted asset Value \geq 4.5%
- Tier 1 capital ratio = Tier 1 capital / Credit risk-adjusted assets value \geq 6%
- Total capital (Tier 1 and Tier 2) ratio = Total capital (Tier 1 + Tier 2) / Credit risk-adjusted assets \geq 8
- Leverage Ratio = Tier 1 capital / Average total consolidated assets value \geq 5%

But how effective are these capital requirements

at ensuring proper capital reserves and bank solvency? According to the FDIC over 488 banks have failed in the United States since 2008. Why is the failure rate so high?

According to the Basel framework, Tier 1 capital consists primarily of stockholder equity and retained earnings. Anyone who has taken an accounting class will tell you that these two figures are mostly just accounting entries. The problem is that if a bank needs to raise cash quickly, they cannot sell an accounting entry in the open market. You can only sell tangible assets, and if you're in a hurry you can only sell liquid tangible assets.

The problem with using total assets and stockholder equity in determining capitalization requirements is because many assets on the balance sheet cannot be accurately valued. From intangible assets like goodwill to more tangible assets like real estate, these accounting entries are difficult to assess. Goodwill is simply the premium an acquiring company pays for an acquisition over and above its tangible asset cost. It really is not even an asset in the true sense of the word. The concept was invented by accountants who could figure no other way to account for an acquisition using the double-entry bookkeeping system.

Stockholder equity is simply assets minus liabilities. With large intangible assets like goodwill, subtracting liabilities will often create a negative book value, or a zero net worth. Real estate listed on a balance sheet is often not marked to market and its real value can be significantly different from its acquisition date value.

Another criticism of these capital ratios is they are entirely subjective. Who's to say that 5% is an adequate leverage ratio whereas 4% is not? Who made this determination? The Basel accords also utilize the concept of *risk-weighted* assets. Risk weights are also highly subjective. For example, in 1988 the Basel committee assigned the risk weighting of assets as follows:

- Bullion, cash, and central government debt at 0%
- Mortgage-backed securities (**MBS**) at 20%
- Municipal bonds and residential mortgages at 50%
- Corporate debt at 100%

These risk weights have since changed, and especially since the financial crisis of 2008-09. The Basel III recommendations published in 2010 addressed the **BCBS** shortcomings that were revealed during the crisis. It remains to be seen how helpful these changes will be in the years to come.

Fortunately for us, there is another way to effectively measure risk. The Kelly method, named after John Kelly, Jr. who published his paper in 1956, gives a big picture view of total risk. Its premise is to maximize the geometric mean of outcomes from the standpoint of total return. In other words, its goal is to maximize the compound rate of return indefinitely. This is very different from expected return, which is what **VaR** and Modern Portfolio Theory (**MPT**) are based on.

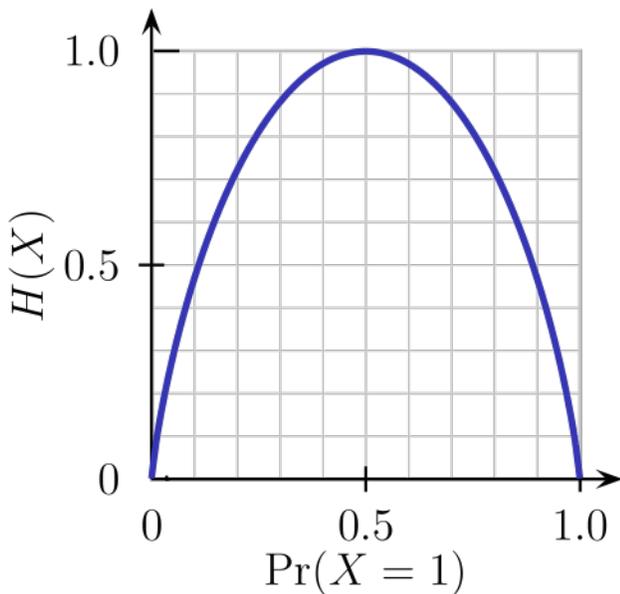
One of the main features of the Kelly method is that it focuses on liquid assets. Since proper liquidity is one of the primary concerns of banks, this makes perfect sense. The Kelly method can be applied to your trading book as well as your overall liquidity profile. It can determine the most profitable asset allocation based on your risk profile. It can also determine the proper liquidity profile that eliminates the possibility of a liquidity crisis. This is something that mainstream risk management cannot accomplish. The benefits of the Kelly method are as follows:

- Ensures the proper liquidity level that eliminates the possibility of a liquidity crisis
- Isolates the risk level that delivers the maximum return
- Strikes the perfect balance between risk and return

- Identifies the risk threshold beyond which lowers return
- Provides an objective view of risk as opposed to a subjective view

Additionally, stress tests are not needed with the Kelly method because the proper liquidity ratio is maintained. The worst case scenario is alleviated.

The Kelly risk/return relationship is plotted in the following diagram:



On the X axis you can see there is a risk level where maximum profitability occurs. This is central to the concept. Any risk taken beyond this threshold is foolish since it lowers return with the increased volatility. Many financial institutions are taking unneeded risks and do not know it. **VaR** cannot determine this threshold.

The Kelly method can be specifically tailored to banks and their unique liquidity requirements. Many economists believe the next financial crisis is right around the corner, which will cause a new wave of bank failures. The Kelly method will guarantee your institution stays solvent and profitable no matter what happens.

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