Valuation is Risk

Thoughts on Value Investing

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Chapter 1. What is risk in investing?

Portfolio risk is commonly defined as standard deviation. However, this is simply not true. Others define it as volatility. This is also not true. The true risk experienced by an investor is actually the decline in his or her portfolio's value for a given period of time, i.e. the loss of money experienced, relative to a benchmark rate of return, such as for example 6% annual return. If, for example, I see a draw-down of 5% in the portfolio's value, and my target rate of return is 6%, the risk is 11%. Using this definition of risk, it is possible to build a portfolio in such a way that risk is quantified (based on valuation) and limited to a given risk tolerance.

Chapter 2. How do we estimate risk?

Risk can never be 100% quantified. It cannot be measured. It can only be estimated. There are qualitative ways you can measure risk, for example, using probabilities, or "high"/"medium"/"low" guidelines. For example, you could estimate a company's probability of bankruptcy (e.g. 10%), along with the impact of the bankruptcy (100% loss), and determine that there is 10% inherent risk (expected value = probability x amount lost) in owning that company.

What if you wanted to use valuation to determine risk? How would you go about that? Well, for example, you would start with the assumption that if an asset is overvalued, it carries greater risk than if it is undervalued. Based on that assumption, you can then determine a formula that uses price to determine risk. But price relative to what?

Hypothesis: The risk inherent in any large-cap long-history security is proportional to the ratio of price to money supply at any point in the asset's history.

Take for example the Dow Jones Industrial Average. Over long periods of time, its price tracks the total M2 money supply. It may deviate from that over shorter periods of time, however.

Hypothesis: The market is inefficient. It will over-price and under-price assets regularly.

Mr. Market is your friend, in that it can quote prices which are undervalued or it can quote prices which are overvalued. If you use M2 money supply as your benchmark, you can determine the average ratio of price to money supply over a long history, e.g. 91 years from 1929 – 2020. This gives you the baseline average ratio to compare with. Using this, you can then look at the price to money supply ratio now, and see if the ratio is above or below the baseline. If it is below the baseline, the asset is undervalued historically. If it is above the

baseline, the asset is overvalued historically.

So, to conclude, estimation of risk can be done by comparing Price:M2 to average Price:M2 over a long history. This will give you the % by which the asset is overvalued or undervalued. It won't tell you the risk, however.

To find the risk, we must compare current price not against the average price, but against the bottom price. What is the **lowest** price it can go to? To do that, we can use standard deviation or we can measure what variation there is between average and bottom at times when the market becomes extremely undervalued.

So let's say we now have a bottom price:M2 ratio. Good. We take this and divide it by our current price:M2 ratio, and subtract the benchmark % annual return that we desire from that. Then we take all that and subtract it from 1.

Risk Estimation Formula:
Fraction at Risk = 1 - Bottom Price:M2 / Current Price:M2 + Target Expected Return (%/Yr)

Now we're getting somewhere. For example, let's say our bottom Price:M2 is 0.5, and current Price:M2 is 1.4. This is the case for the Dow now roughly. We also expect a return of 10%. What is the risk? (1 – 0.5 / 1.4 + 0.10) = 0.743. Answer: 74.3%. The fraction of our investment at risk of loss is roughly 0.743.

It is almost always better to overestimate risk than to underestimate it. For that reason, we must add a margin of safety (20%) to the current price. That is, multiply current Price:M2 by 1.2. Why? Because we could be wrong by that much on our risk estimation. Nothing is perfect.

Chapter 3. Portfolio construction using risk first

Now that we've determined how to estimate risk, we turn our attention to constructing a portfolio by using risk as our primary metric to determine position sizes. Basically, we use here the risk tolerance of the investor (the maximum $ amount they are willing to risk), to determine what position sizes should be allocated for each asset in the portfolio.

Primary Rule – Diversification: When constructing a portfolio, it is always better to have 2 or more assets (diversification) as opposed to a single asset. Our risk-first approach works best when you have multiple assets in your portfolio.

So how do we do it? We must conserve the total risk. It must remain within the boundaries of the investor's personal risk tolerance. Since risk is independently additive, that is for each asset the risk in that asset adds to the risk in any other assets, because assets are generally uncorrelated, we must add up all the risk for all the assets in the portfolio and make sure that it does not add to more than the investor's risk tolerance. This is the essence of safety-first or risk-centric investing.

To begin to allocate assets in our portfolio, we must know the present risk in each asset. What fraction of my money can be lost? There is considerable engineering to this problem, as there must be rules added and questions asked, such as “how much are you comfortable selling each year?” or “how much weight do we give high-risk assets vs low-risk ones?”

This is an open-ended question. One financial advisor may view it differently than another. In creating MarketRisk, the software for portfolio management, I attempted to solve this problem by creating a set of basic rules to determine how much should be allocated. Rules such as “don't buy more than 15% per year” or “don't sell more than 20% per year” or “allocate more to low risk positions and less to high risk”. I won't list all of those rules here, as there are several and they are quite sophisticated.

To conclude, the correct way to allocate a portfolio in a risk-first way is to conserve risk in every year of readjustment. That is, at every adjustment period, recalculate position sizes such that risk is conserved and stays under the investor's risk tolerance. Risk tolerance can grow annually, by some amount (e.g. how much the investor is saving per year). The risk tolerance is sacred – it must not be exceeded. In fact, the investor may choose to under-allocate, so as to have a buffer in case prices go down and the investor wants to take advantage of bargains.

Chapter 4. The fun part – back-testing

So here comes the most fun part – testing portfolio histories. In designing MarketRisk, I took the approach of first gathering 91 years of real-world price data, for each asset, and then testing every combination possible, using my asset allocation rules based on risk, starting from no position in any asset, over a period of 91 years, with a risk tolerance that starts out at $1000 1929 dollars and rises at 4% per year.

Then, I took a peek into the performance stats of the portfolio for the last 50 years of its history – i.e. 1970 – 2020. The results were amazing even at the very beginning. Even with the early algorithm I had developed, I was able to get performance as high as 13% per year with a max draw-down of only 18% in one year. With some tweaking, I eventually got the algorithm to produce a performance on par with Warren Buffett's Berkshire Hathaway (BRK.A), of 16.3% per year, with three assets: Dow, gold, palladium. If you chose just S&P 500 and gold alone, you would have had a performance of 12.7% per year with a max draw-down of only 9% in one year.

The algorithm perfects any errors over time. That is, it tends to produce higher performance towards the end of the portfolio's history, rather than at the very beginning. For the estimation of risk, I used an M2 money supply starting at $60 billion in 1929 and growing steadily at a rate of 6.5% per year. My expected rate of return was set at 9% real return or 15.5% nominal. That is a very high bar to set, but it turned out to work very well.

Chapter 5. Considerations for the thoughtful financial advisor

What is a financial advisor to do with all this knowledge? Knowledge is power as they say. So having the knowledge of how asset prices fluctuate, what drives moves, can really empower a financial advisor to serve clients more effectively. First, a financial advisor must always consider risk when allocating a client's assets. Any financial advisor who does not even give the slightest thought to risk is simply a salesman, driven by motivation to earn commissions or other income based on the investor's hard-earned money. Since most common investors are risk-averse, risk should not be overlooked when allocating a portfolio. In fact, it should come first. You never know how risk-averse your client is unless you have a real, honest, one-on-one conversation.

In my case, I am one of the most risk-averse investors out there. Even losing 1% of my money, if I invested a large percentage of my net worth, would be a big deal to me. Therefore, when I use the risk-first approach, I am using it specifically to limit losses. But, someone else might use it because it actually provides superior returns. Back-testing has proven that the right algorithm for asset allocation can produce returns comparable to that of Warren Buffett, over the period from 1970 to 2020.

Chapter 6. Conclusion and caveats

Nothing is perfect. We are using assumptions to determine risk in a numerical way. While we do use margins of safety, the risk estimation itself could be flawed and yield invalid results from time to time. A prudent investor must assess the risk inherent in the estimation calculation itself, and based on that allocate less than 100% of the recommended position size.

Finally, while back-testing can be fun, it is not a prediction of the future. Past results may not necessarily be similar to future results. In fact, estimating risk does not tell us anything about the future – it does not reveal the likelihood that the risk will materialize. It merely tells us that, based on historic price fluctuations, this is the likely low price, but the price can exceed on the downside.

Additional dimensions should be added to risk calculation. For example, macroeconomic factors or interest rates can factor into a calculation of risk. If a financial advisor / investor is willing and able to go beyond just looking at money supply, they certainly should. There is nothing to say that additional measures of risk aren't useful. In fact, in future versions of MarketRisk, I would like to build additional factors into the calculation of risk, and see if they improve the algorithm's performance.

I did not have time, as a full-time developer and only part-time investor, to look at risk in depth. Someone with more time on their hands can create a much better assessment of risk and even be able to publish a full-fledged book on it. I merely created a framework for asset allocation **based on** risk. MarketRisk is in its early stages now, and over time will grow into a more complete solution.

Chapter 7. Addendum and random thoughts

The reason why I chose 50 years for back-testing is that it's just enough time for the results not to be a fluke. In other words, it proves consistent performance. Back-testing is key. I went through many different iterations, with different formulae and different algorithms, to eventually end up with something that has consistently top-notch performance.

The key principle to understand is that price movement is like a wave. It tends to oscillate around a mean, with maxima and minima. It has an amplitude, which is the difference between the high and the mean, and the difference between the low and the mean. Using this amplitude, it is possible to estimate a "bottom" price that results from undervaluation, given enough history. Note that this is a geometric amplitude - ratio between low and middle or between high and middle.

To get a good overview of possibilities, you would need at least 75 years of price history. In my initial research, I chose a period of 75 years but eventually decided it wasn't long enough and extended it to 91 years. Why 1929-2020? To capture the top that was reached in 1929 in the stock market.

One key takeaway from all of this is that achieving an edge in investing is possible, but it will likely be a small edge. If you account for taxes paid and trading fees, the algorithm I have created will likely improve your performance by 3-5% per year, versus just buying and holding. If you just held the S&P 500 for 50 years from 1970 to 2020, you would have gotten a return of 10% per year roughly. If you used MarketRisk instead and diversified with both gold and palladium, you would have gotten a return of about 15% per year after taxes and fees. This is the best result you can expect. Warren Buffett's Berkshire Hathaway would have returned 16.2% per year over the same period. This means that we're just about matching Berkshire Hathaway. Over the long term (50 years), 5% per year translates into 11.5X more.

Finally, what is my motivation for doing this? If the result is such a small improvement, why bother? The answer is that it avoids large risks. For me, peace of mind is more important than high returns. Applying a first-principles analysis of risk gives me the confidence that my investments are safe and bound to my own personal risk tolerance. That is paramount. Anything beyond that is gravy.

There are far too many risky ventures that I would never get into, for example crypto. I believe that crypto holds no intrinsic value, cannot be valued, and therefore is intrinsically high risk. It carries 100% risk of loss. Another example is leveraged instruments such as options or derivatives. Such exotic instruments carry high risk and have deliberately been excluded from MarketRisk in order to provide a safety-first interface. Remember – MarketRisk is for long-term investing, not for trading. Its portfolio adjustment frequency is every 1 year.