

The Problems in Quantifying Risk

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The sixteen month duration of the financial crisis was a terrible time for investment professionals. From fund managers to consultants to investors, no one was spared market losses and anxiety over where the financial industry was headed and when the bleeding would end. Right before the financial crisis began risk quantification models were rampant, from value-at-risk (VaR) to Sharpe ratios to stress testing portfolios. In the end it did not matter – all models failed horribly. How could so many educated, experienced, intelligent, well-meaning professionals fail so badly? It all has to do with the basic concept of risk. Ask anyone who talks about risk to define the word, and you most likely will be met with a blank stare. Risk is a word we all talk about but do not define what we mean. This paper presents the issues in quantifying and discussing risk.

INTRODUCTION

On reflection of the financial crisis which started in December 2007 and continued through March 2009, to say that the financial system was in complete shambles and virtually no investments had been spared during that period would be a shock to no one involved in the financial industry. What is surprising is that many have used sophisticated modeling techniques, such as VaR (value at risk) and Sharpe ratios to determine how “risky” investments and portfolios were. Investors and consultants thought they had a notion of how much risk they were willing to take, what their tolerance was, and sought to include investments that met these parameters. All were wrong, the models failed, the pundits embarrassed themselves and the market dropped precipitously.

The question that this paper looks at is how can smart, experienced, technology enabled professionals be so wrong, and more importantly, where to go from here.

THE QUESTION OF RISK

It was after a long period of reflection that I arrived at where this paper begins – the inherent question of “what is risk?” When someone says an investment is risky, what do they mean? It is my sense that most would say that risk, in that context, is the probability of a return not meeting expectation, where expectation is usually in the form of a benchmark. But is this the beginning and end of what could be meant by risk?

There are many types of risk that may be present – below is a partial list of different types of risk faced by investors at an enterprise level:

- Market risk
- Model risk

- Collateral risk
- Volatility risk
- Bankruptcy risk
- Headline risk
- Rollover risk
- Interest rate risk
- Correlation risk
- Reputation risk
- Legal risk
- Currency risk
- Regulatory risk
- Commodity risk
- Compliance risk
- Operational risk
- Personnel risk
- Counterparty risk
- Inflation risk
- Credit risk
- Country risk
- Terror risk
- Systemic risk
- Political risk
- Liquidity risk

It would be extremely difficult to find an investor that has not encountered many of these risk items during the financial crisis. So when one person says an investment is risky, can we be certain we understand exactly what they are talking about?

THE DEFINITION OF RISK

If we want to talk about risk in terms that are known and agreed upon, we have to be in agreement about the definition of risk. To this end, I ask the following:

- is “risk” a noun, verb or adjective?
- is “risk” qualitative or quantitative?
- is “risk” notional, relative or nominal?
- is “risk” probabilistic, discrete, continuous or binary?
- is “risk” normally distributed or follow some other distribution?

I think the answer to these questions is “yes.” And there lies the problem. A single metric of risk can only be developed for those elements that are quantifiable on a similar scale, and a single element of risk might embody a quantitative as well as a qualitative aspect (for instance, purchasing an index fund subject to securities lending might embody a counterparty risk, a collateral risk, a liquidity risk, though probably no return risk. An equity fund subject to securities lending would have the risks noted for the index fund plus a return risk, operational risk, etc).

THE CHANGING NATURE OF RISK

Risk is a term that can be used in many contexts to describe many disparate situations. It can be used to describe the probability of a return not meeting a benchmark (return risk), at the same time it can be used to describe the inability to remove cash from an investment (liquidity risk) where the investment has met the benchmark, at the same time it can be used to describe an investment that has met the benchmark and has the ability to provide cash redemptions but has failed to provide the non-correlation (correlation risk) that was expected. Perhaps there was a single investment that provided a multitude of crossover risk

(think investing with Bernie Madoff – you have return risk, liquidity risk, headline risk, collateral risk, counterparty risk, systemic risk, reputation risk, legal risk, and maybe some others).

Most investments carry a return risk from the outset. What has been interesting in this market environment (and I use interesting in the same manner as your doctor would when he tells you there is something interesting on your x-ray – it seldom means something good) is that new risks, previously unanticipated and unconsidered, have been appearing. There was the issue of securities lending, where custodians and fund managers lent securities to enhance a return, and wound up investing the collateral in securities that were subject to write-downs, which meant the return enhancement was not realized and the investor who provided the securities that were lent had to make up the deficit in the collateral, and the custodian and fund managers were forced to limit redemptions.

Not only were these risks not quantified, they were not even considered. An index fund with 2 day liquidity (meaning any or all of the investment can be withdrawn with 2 days notice) has had the redemption provision changed so that investors may only remove 4% per month. Hedge funds have had redemption requests in excess of what they can handle, despite the requests being in accord with the fund documents.

So the hedge funds have limited redemptions and transferred assets equal to the redemption requests to a liquidating trust fund. As the trust fund sells assets cash will be distributed. What should have happened in 5 days (most hedge funds allow an annual withdrawal on December 31 with 30 - 45 days notice) will now take the better part of 12 – 24 months to accomplish, with the investors responsible for the additional costs of the trust fund.

SHOULD A SINGLE MEASURE OF RISK BE DEVELOPED?

The holy grail of risk measurement would be a single measure that nicely encapsulates all risks an enterprise might face. And there are those consulting firms that will sell you this single measure. The problem is that some risks are qualitative, some quantitative – how do you establish a single numeric that handles both? Risks might be distributed based on differing curves, depending on the risk – how do you normalize? Some risks might be binary or continuous or discrete – how do you assemble into a single figure?

It would appear that a single measure of risk not only is not achievable, but not be might useful. The purpose of measuring risk is to allow an investor to structure a portfolio to meet predetermined criteria, such as:

Goal 1 – perpetuity

Goal 2 – real, 5.75% return

Would a single metric help in this fashion?

SUMMARY AND CONCLUSION

The financial world has had a rough awakening to the idea that despite appearing as having useful quantitative analysis around risk no one had any idea what they were talking about, used flawed models, and worse, cannot agree on a definition of risk. The question becomes where do they go from here. Should they stop considering risk? Should they limit the discussion of risk to those items that they can understand and analyze?

This paper does not present the answers, only the questions.