

DRW Investment Research

Investing by Probabilities

Abridged Version



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FROM THOSE THAT KNOW...

Risk comes from not knowing what you're doing.

Warren Buffett

And the day came when the risk to remain tight in a bud was more painful than the risk it took to blossom.

Anais Nin

You can measure opportunity with the same yardstick that measures the risk involved. They go together.

Earl Nightingale

The policy of being too cautious is the greatest risk of all.

Jawaharlal Nehru

History has not dealt kindly with the aftermath of protracted periods of low risk premiums.

Alan Greenspan

To be alive at all involves some risk.

Harold MacMillan

Adventure without risk is Disneyland.

Doug Coupland

I will tell you how to become rich. Close the doors. Be fearful when others are greedy. Be greedy when others are fearful.

Warren Buffett

Investing means putting your money on something that has a good chance of winning in the short to medium term, and an even better, if not dead-certain, chance of winning in the long term.

Paul Clitheroe

I am sure that back in 1914 the typical person had a much clearer idea of what he meant by investing his money, and what he meant by speculating with his money. He had no exaggerated ideas of what an investment operation should bring him.

Ben Graham

In this business if you're good, you're right six times out of ten. You're never going to be right nine times out of ten.

Peter Lynch

The greater the uncertainty, the more people are influenced by the market trends; and the greater the influence of trend following speculation, the more uncertain the situation becomes.

George Soros

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1. What is investment risk?

- **A Basic Premise**

Most investors perceive investment risk primarily as the risk of losing capital, but it may also include the risk of not achieving a certain minimum return, for example, investment returns better than inflation. In short, investment risk can be defined as the possibility of being disenchanted with your investment plan in not meeting your investment objectives.

Understandably, it is immensely difficult to develop a uniformly accepted definition of investment risk since investors apply different time frames to the outcome of their investing efforts. For example, some investors do not want any capital losses over any period; another group might tolerate some short-term losses in the hope of doing well in the long run, while others realise that exceptional gains are not likely without exposing themselves to some real risk.

In order to gauge this likelihood of “disappointment”, the professional investment industry uses a common indicator, namely the volatility of investment returns. The volatility of stock market investments can be defined as the dispersion of investment returns below and above the mean, otherwise known as the standard deviation of returns.

The concept of volatility is widely used in the investment industry. Typically, the allocation of investment strategies and fund selections to an investment plan are based on their respective volatilities and whether it fits the risk profile of the prospective investor. Therefore, it is important for investors to understand the limitations and uses of volatility as a barometer of investment risk.

- **Investment risk is a multidimensional concept, concerning:**

- The volatility of returns over time (volatility risk);
- The risk of losing the purchasing power of money (inflation risk);
- The risk of losing capital (capital risk or default risk)

Additional investment risk, such as liquidity risk (the ability to trade or cash-in an investment at any time), often poses a real threat to investors, especially if it is misunderstood or underestimated, like investments in physical property, unlisted securities and securities listed on alternative exchanges. However, well-regulated investments, like collective investments, should not present any liquidity risk for investors.

- **Two key strategies to address investment risk:**

- Investment diversification across different asset classes;
- Time diversification – the longer one's investment horizon, the smaller the probability that investment returns will disappoint one.

Note, however, that investment risk cannot be eliminated altogether, but only be managed in any sensible investment plan!

For example, if an investor wants to avoid volatility risk, and thus increases the exposure to less volatile asset classes, such as cash and bonds in an portfolio, it is more than likely that inflation risk – the likelihood that the investor's return will not keep up with inflation – will become a major concern.

2. Asset Class Returns

- **The past fifty years (1961-2010):**

From Table 1 and Table 2:

- Equities yielded an average return of 20% per annum or annualised return of 18% per annum over the past fifty years, but with a standard deviation (volatility) of 25%, while bonds and cash yielded much more modest average returns (11% and 10% respectively) but at much lower volatilities.

Table 1: Annualised returns from asset classes

Return	EQUITY	BONDS	CASH
Average return	20%	11%	10%
Std deviation	25%	11%	5%
Annualised return	18%	10%	10%

Table 2: Lowest to highest annual returns (1961-2010)

Category	Equity	Bonds	Cash
Decile 1	-9%	-4%	5%
Decile 2	-2%	2%	6%
Decile 3	8%	5%	8%
Decile 4	13%	7%	9%
Decile 5	19%	10%	10%
Decile 6	23%	14%	11%
Decile 7	31%	16%	12%
Decile 8	40%	20%	14%
Decile 9	55%	29%	16%
Decile 10	94%	36%	22%

From Table 3 and Table 4:

- Equities yielded a real return of 9% per annum while bonds and cash performed only slightly better than inflation.

Table 3: Real return from asset classes

Return	EQUITY	BONDS	CASH
Average	12%	2%	2%
Std deviation	25%	12%	5%
Annualised return	9%	2%	2%

Table 4: Lowest to highest annual real returns (1961-2010)

Category	Equity	Bonds	Cash
Decile 1	-19%	-11%	-3%
Decile 2	-12%	-7%	-1%
Decile 3	-1%	-4%	0%
Decile 4	3%	-2%	1%
Decile 5	14%	1%	2%
Decile 6	17%	4%	2%
Decile 7	24%	7%	3%
Decile 8	26%	13%	4%
Decile 9	43%	19%	7%
Decile 10	80%	28%	14%

3. Managing Equities: The Riskiest Asset Class

- The value of time diversification

Reduction in risk = Square root of time

For example, if the standard deviation of equity returns over a one-year holding period is 20%, over a four year-holding period the volatility should be:

20% divided by square root of four years = 10%, etc.

- Chart 1 depicts the expected and actual volatility of equity returns over different holding periods. Clearly, the volatility of equity returns over longer term periods is lower than predicted by statistical inference.

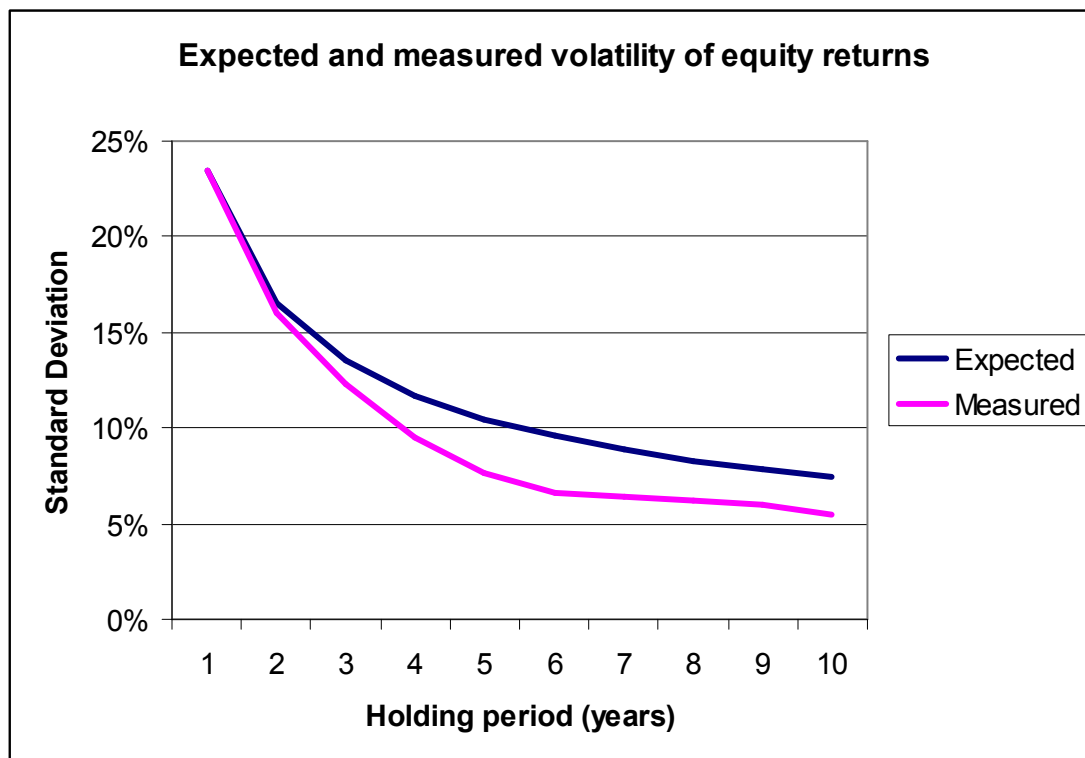


Chart 1: Expected versus realised volatility of equity returns over different holding periods

- Chart 2 illustrates the range of annualised equity returns over different holding periods. During the past fifty years no negative equity return was ever recorded for any investment period longer than four years. Furthermore, equity returns over longer holding periods revert to the mean, i.e. a relatively small divergence of annualised returns for ten-year investment periods, etcetera.

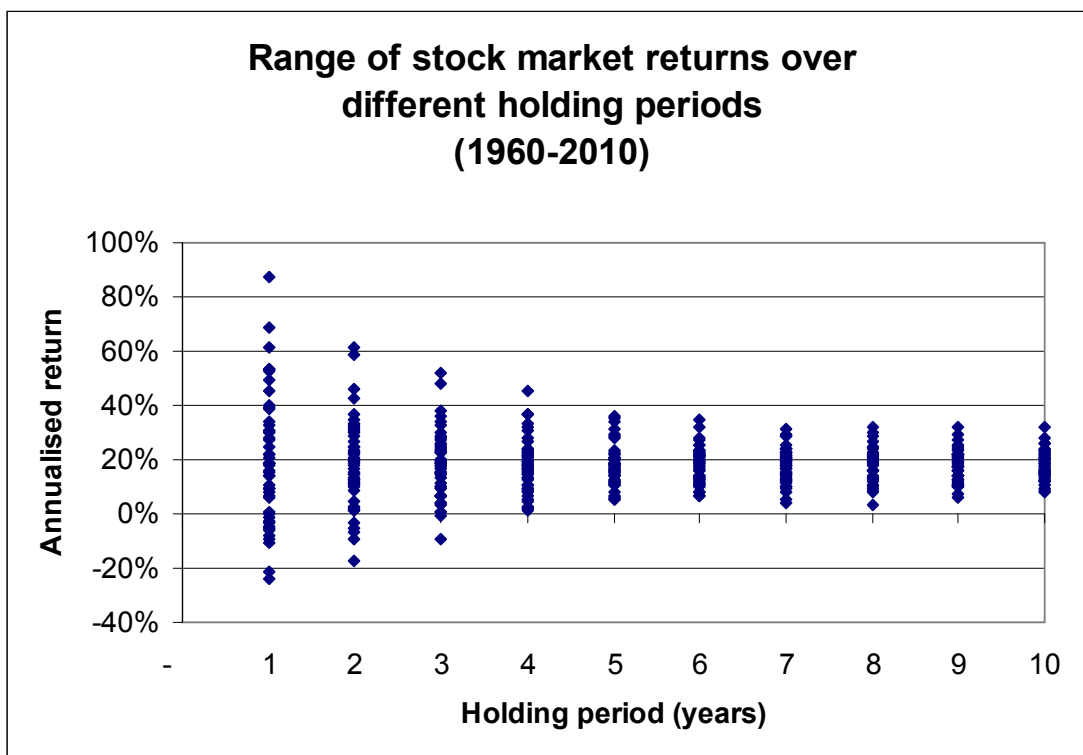


Chart 2: Range of equity returns over different holding periods

- **Why volatility is not necessarily bad for the long-term investor**

Stock market volatility is by no means a constant and like our oceans is characterised by periods of storms (high volatility) and periods of relative calmness (benign market volatility). The former is usually brought about financial and economic uncertainties (crises) or geopolitical tensions that may surface from time to time. Once the threat of such a crisis seems to be under control or well-managed, one can expect market calmness to return. The latter state, however, does not represent the “normal” or “usual” condition. Rather, it is normal for markets to exhibit both high and low volatilities, hence the analogy with conditions we might experience at sea.

Chart 3 depicts the annualised standard deviation of the stock market, based on the rolling 36-month volatility over time. It is apparent that the transition between low and high market volatility is not gradual, but swift. Furthermore, a period of high or low volatility is “sticky” – meaning it will typically remain in that state for a considerable period of time before changing course again.

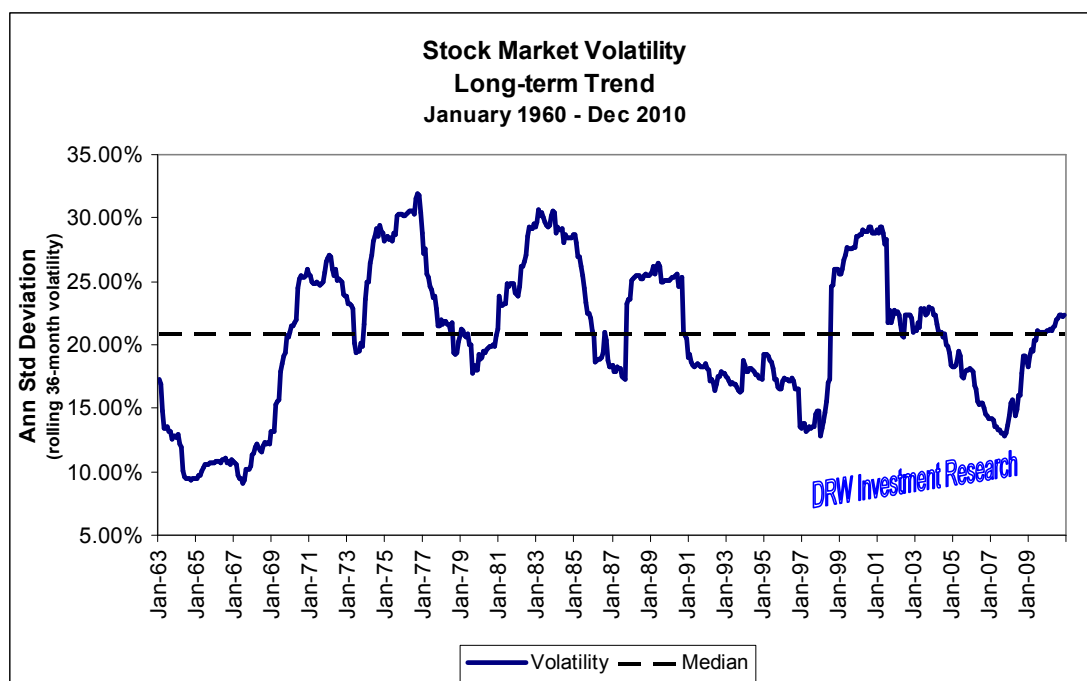


Chart 3: The cyclical nature of volatility

What does the cyclical nature of stock market volatility imply for the investor? While periods of high market volatility may not be reassuring or comfortable for the investor, it poses often fantastic investment opportunities.

For example, consider the subsequent 5-year historical returns from the stock market when an investment was made at various volatility levels. Chart 4 shows a significant positive relationship between the level of market volatility at the start of the investment and subsequent market returns (total return over 5-year holding periods). Alternatively, when market volatility is divided between above-the-median (high volatility) and below-the-median (low volatility) periods, the former period showed an average total return of 168% over the subsequent five years, while investments made at low market volatility yielded 110% on average over the same holding period.

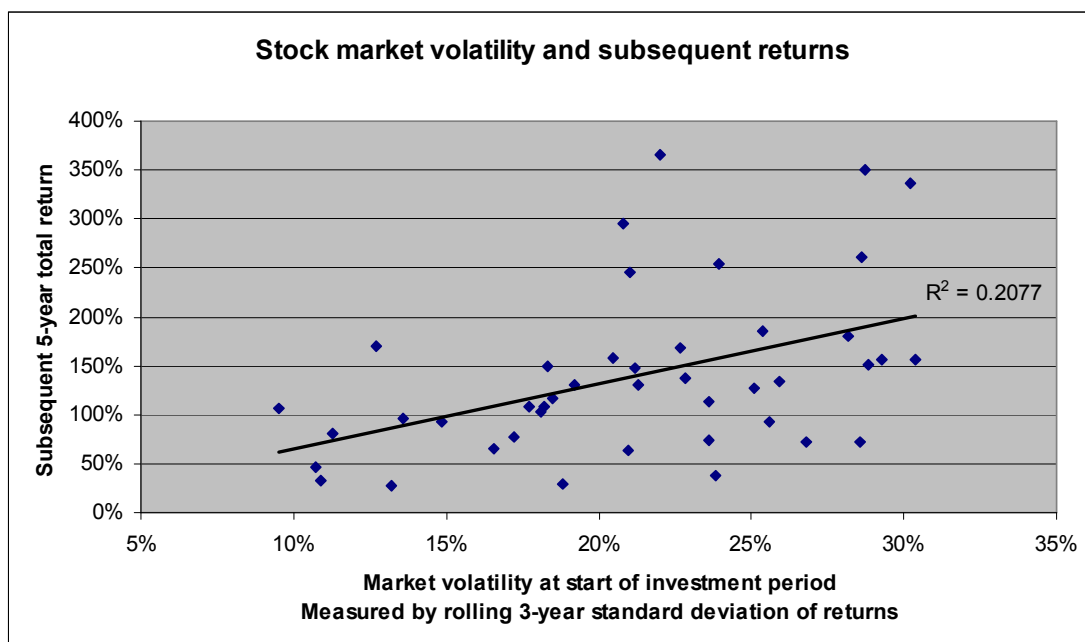


Chart 4: Investment opportunities

4. Equity Investing: Know what to expect

What should equity investors know about the potential prospects and outcome of their investments? More specifically, what is the likelihood of negative returns – both nominal and real – in any one year and over different holding periods?

While the idea is certainly not to emphasise only the probabilities or risk of bad outcomes from equity investing, it is important that an investor should be informed and prepared for such experiences. Any investor should make investment decisions on the balance of probabilities (what is likely to happen) and not based only on good stories or recent investment experiences.

- **The probabilities of negative returns**

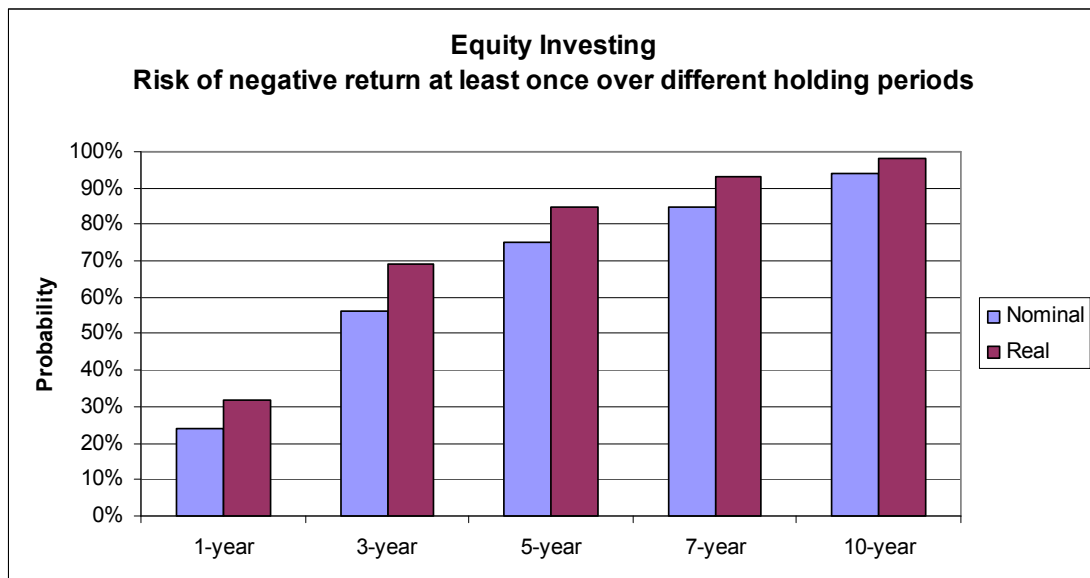


Chart 5: Probabilities of negative return occurring at least once

- **Capital losses at the end of a period**

The aforementioned analyses highlighted the risks associated with negative returns occurring at least once during an investment period. However, it does not reveal anything about the risk that the final investment value will be less than the initial investment (capital risk). For this purpose a Monte Carlo simulation model was used to assess the potential risk of capital losses.

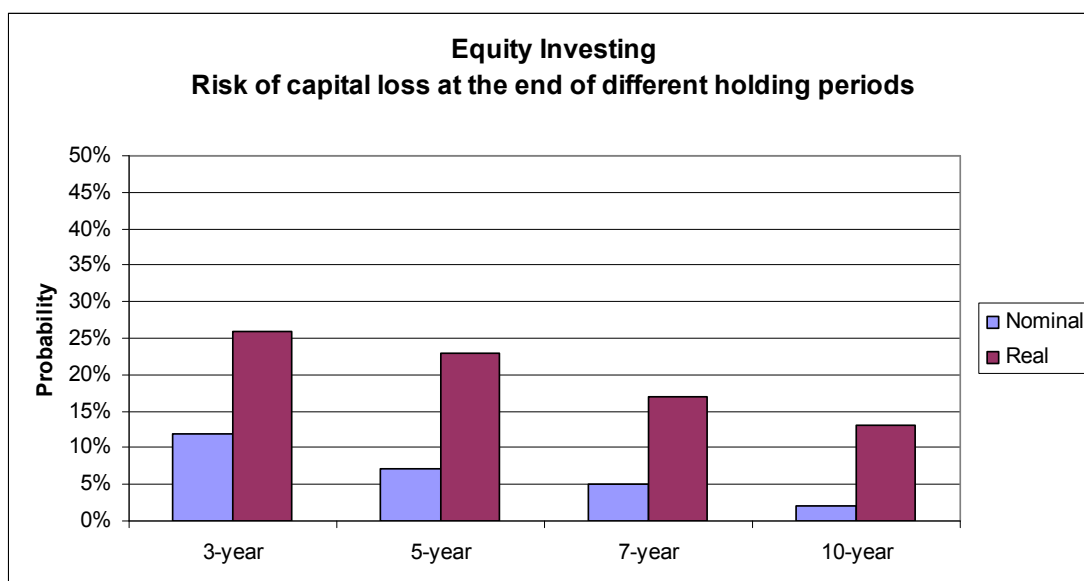


Chart 6: Probabilities of capital loss at the end of a period

- **Investor behaviour**

In practice investors do not review their investments only after three years, five years or whatever investment horizon they may have decided upon at the start of their investment term. More likely, investors are constantly reviewing portfolio performances. What if investors experienced a slump in investment value below the initial value within the investment period? More than likely investors will consider taking some drastic action. Thus we are not only concerned about the risk of capital losses at the end of an investment period, but also what happens to the investment value within the holding period.

For example, an investor has set herself a long-term investment horizon, typically more than ten years, to invest in the equity market. After, say, three years the stock market is experiencing a sharp correction and the value of the investor's portfolio drops below the initial investment value. An investor will be tempted at that stage, especially with the usual pessimism abound after such a sharp correction, rather to withdraw from the market and park her monies in more secured investment options. However, in all likelihood this will be the worst possible strategy, because possible temporary losses will be made permanent.

- **Capital losses within-period**

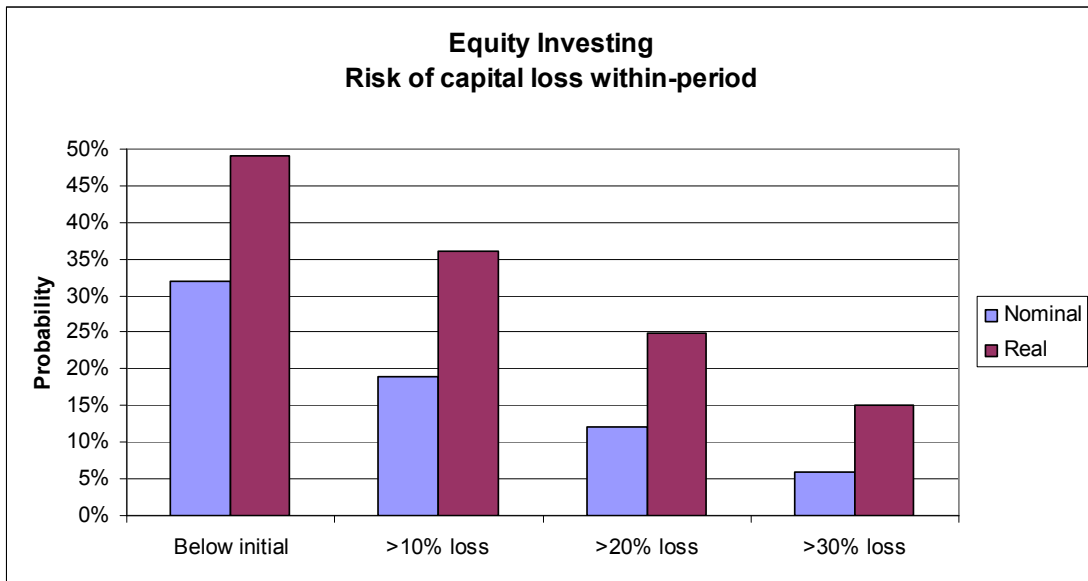


Chart 7: Probabilities of capital loss within-period

5. Asset Class Diversification: Know what to expect

- Consider a managed portfolio that is invested in different asset classes, namely:

50% Equities

30% Bonds

20% Cash

- Return profile:

Average annual return over the past fifty years: 15%

Average annual real return over the past fifty years: 7%

Volatility of annual return over the past fifty years: 14%

Annualised return over the past fifty years: 15%

Annualised real return over the past fifty years: 6%

- The probabilities of negative returns

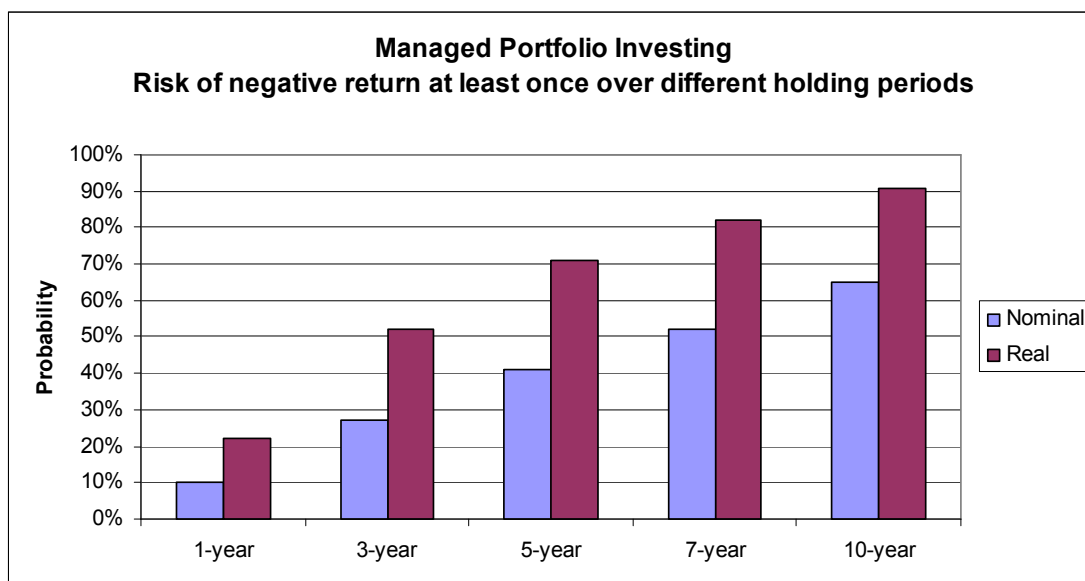


Chart 8: Probabilities of negative return occurring at least once

- Capital losses at the end of a period

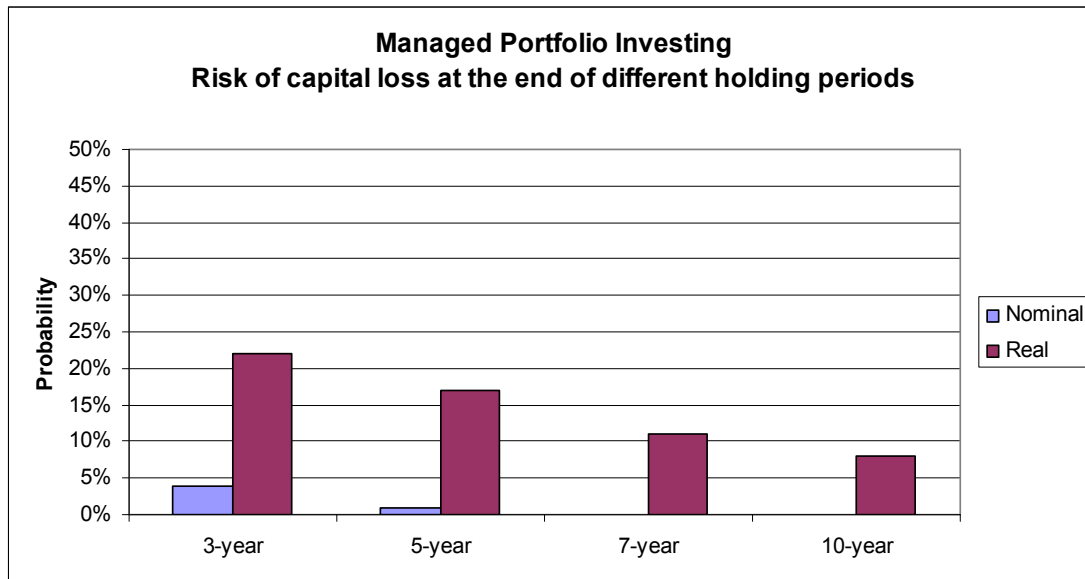


Chart 9: Probabilities of capital loss at the end of a period

- Capital losses within-period:

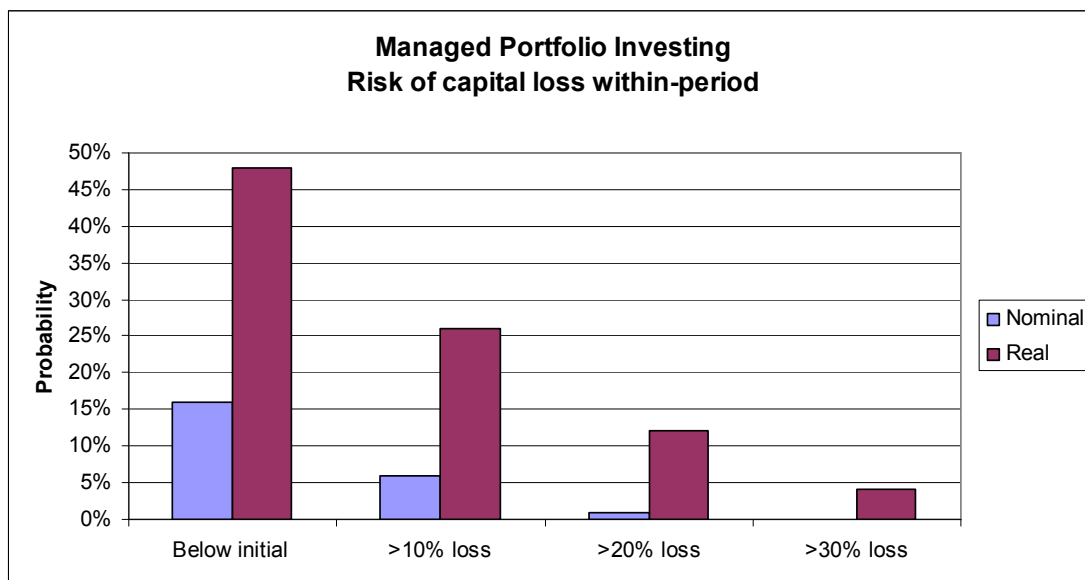


Chart 10: Probabilities of capital loss within-period

6. Summary

- Investment risk is multidimensional in nature and refers to the likelihood of the loss of capital in nominal and real terms, volatility of returns and liquidity of an investment.
- The standard deviation or volatility of returns is typically used to express investment risk, but is an incomplete representation of investment risk.
- Based on historical evidence it can be argued that periods of high market volatilities often represent good investment opportunities, whereas periods of low market volatility may well be “expensive” investment periods resulting subsequently in suboptimal returns.
- In an investment plan investment risk can be managed and mitigated, but not completely eliminated.
- Sensible ways of reducing investment risk include: Invest in regulated investments and listed securities, asset allocation and portfolio diversification, and the appropriate time horizon.
- Portfolio diversification (asset allocation) reduces the volatility of returns and the possibility of negative returns and capital losses in nominal and real terms.
- The likelihood of capital losses is largely reduced by the investment period. A vast difference exists in the likelihood of nominal and real capital losses between a three-year and a ten-year investment period.

- While the risk of nominal and real capital loss over a long-term investment period is finite, the risk of capital loss within-period is much greater. Chances are that these losses will be temporary, and thus it is best for investors not to panic and to remain invested.
- Inflation risk or the likelihood that an investment will lose its purchasing power over time poses probably the biggest challenge to most investors. When investors are overly concerned about the risk of losing capital in nominal terms or price volatilities, it is likely that very conservative portfolios will be preferred at the expense of the ability to manage inflation risk.
- Investing by probabilities means that an investor is aware of the possibilities and likelihood of various outcomes of investment portfolios over time. It provides a framework for making informed investment decisions based on the overweight of likely outcomes, and not solely relying on past performances or some good stories and prospects about future performances. Past performance is only one outcome from many that could have transpired in the past. Likewise, good stories do not guarantee future performances and are often told for a reason, namely to market a fund or securities to the investing public.

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Additional Sources:

Franco Buseti, 2009. "The Effective Investor", Pan Macmillan SA (Pty) Limited.

Mark Kritzman, and Don Rich, 2002. "The Mismeasurement of Risk", Financial Analysts Journal, May/June edition, pp 91-99.

Wessels, Daniel R., 2006. "The Characteristics of Stock Market Volatility"
Available at: http://www.indexinvestor.co.za/index_files/MyFiles/StockMarketVolatility.pdf



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