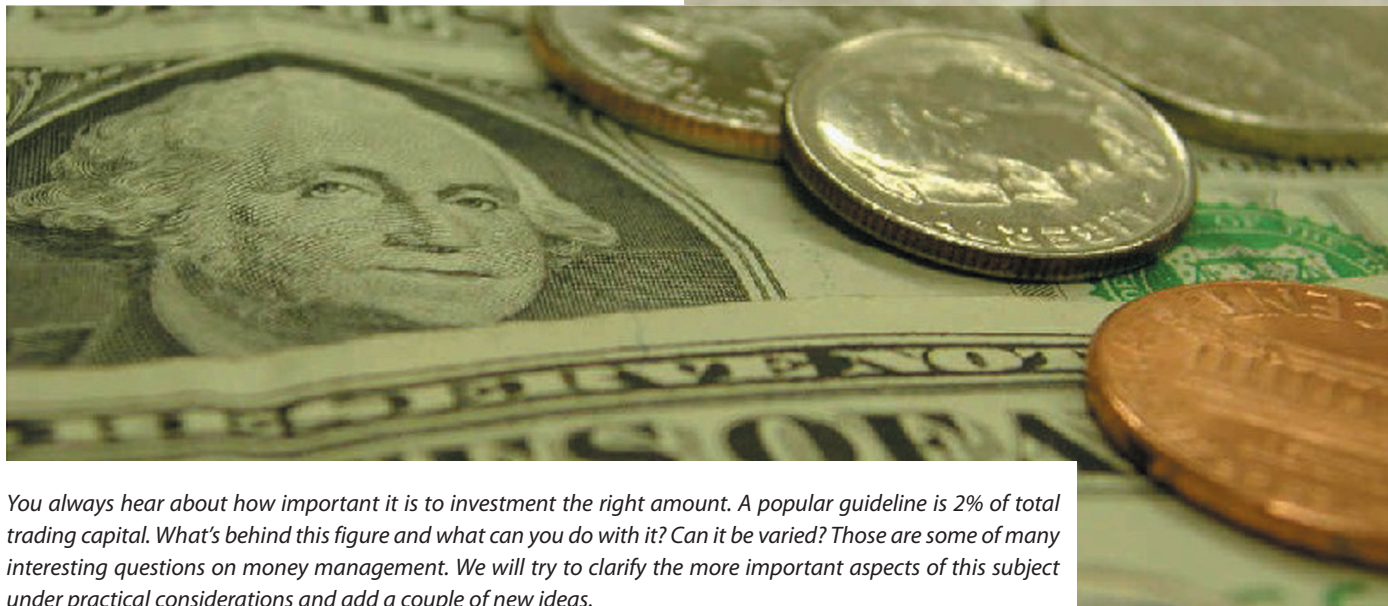


Money Management and Probability



You always hear about how important it is to investment the right amount. A popular guideline is 2% of total trading capital. What's behind this figure and what can you do with it? Can it be varied? Those are some of many interesting questions on money management. We will try to clarify the more important aspects of this subject under practical considerations and add a couple of new ideas.

Trading's Core Problem

Avoiding and limiting loss stands at the forefront of good trading, together with developing profitable investment strategies and good timing. The emphasis here though is on limiting loss. The markets are only tangible on a remote scale, making loss-producing trades a regular and natural consequence. The pragmatic goal of any trader cannot be to never have a loss, but instead, to have few as possible and to keep them as small as possible. The goal really is to be net profitable despite losses.

A trader can be net profitable, for example, when just three winning trades stand against nine losing trades. The profit of the three winners must on average be at least three times as high as the losers. The product of the profit ratios and their frequencies is called the Profit Factor. Its value is greater than 1 when trading is profitable, less than one with loss producing trading.

$$\text{Profit Factor} = \frac{\text{average win}}{\text{average loss}} * \frac{\text{win frequency}}{\text{loss frequency}}$$

Mathematically, the profit factor = $(3x / 1) * 3 / 9 = 9x / 9 > 1$ must be greater 1 in order to be profitable (the x in this case can be any positive value). On a purely statistical basis the number of trades should be at least 30, or the time frame with longer term trend systems should amount to at least 10 years before the profit factor takes on any relevance as a key value. At that point, however, it becomes a strong measurement of success. Although it must be every trader's goal to reduce losses, they are never completely avoidable. However, they must be controlled and managed, and that's where money and risk management comes in. The problem is not losses per se, but

instead, the number and, of course, the amount of losses. A serious trading problem exists if the profit factor is equal to or less than 1, and a time out should be taken.

Losing Streaks

It follows that the main problem facing traders is several losses in a row, in other words, a series or streak of losing trades. The question of how much may be bet or risked per trade depends on how often a loss trade is expected or how many in a row are expected. The size of the loss also plays a decisive role, so let's examine this point first.

Account Risk per Trade

As mentioned before, an accepted standard is a fixed account risk of 2%. In other words, a loss should not amount to more than 2% of current total capital. This is known as the "fixed fractional" approach. To calculate it, multiply the account total by 2% or 0.02. For example, a 20,000 Euro account would be $20,000 * 0.02 = 400$ Euro. The account risk is the amount in Euro that you lose in a failed trade and is not to be confused with trade size, or the amount of money being applied to the trade. Some find this number too small and go for more risk. But that's usually a mistake, because a series of losses can quickly lead to a much larger total loss. For an example, we will assume a series of ten losses:

$$\text{End value} = \text{start value} * (100\% - \text{loss in percent}) ^ \text{losses in row}$$

The calculation looks like this:

$$\text{End value} = 20,000 \text{ Euro} * (1 - 0.02) ^{10} = 16,341.46 \text{ Euro}$$

T1) Account Risk

p(x)	Loss	p(V(x))	in %	Capital - Loss of xx % of Starting Capital of 100%					
0.5	in Series			95	90	85	80	75	70
	1	0.5	50.00%	5.00%	10.00%	15.00%	20.00%	25.00%	30.00%
	2	0.25	25.00%	2.53%	5.13%	7.80%	10.56%	13.40%	16.33%
	3	0.125	12.50%	1.70%	3.45%	5.27%	7.17%	9.14%	11.21%
	4	0.0625	6.25%	1.27%	2.60%	3.98%	5.43%	6.94%	8.53%
	5	0.03125	3.13%	1.02%	2.09%	3.20%	4.36%	5.59%	6.89%
	6	0.015625	1.56%	0.85%	1.74%	2.67%	3.65%	4.68%	5.77%
	7	0.0078125	0.78%	0.73%	1.49%	2.29%	3.14%	4.03%	4.97%
	8	0.0039062	0.39%	0.64%	1.31%	2.01%	2.75%	3.53%	4.36%
	9	0.0019531	0.20%	0.57%	1.16%	1.79%	2.45%	3.15%	3.89%
	10	0.0009765	0.10%	0.51%	1.05%	1.61%	2.21%	2.84%	3.50%
	11	0.0004882	0.05%	0.47%	0.95%	1.47%	2.01%	2.58%	3.19%
	12	0.0002441	0.02%	0.43%	0.87%	1.35%	1.84%	2.37%	2.93%
	13	0.0001220	0.01%	0.39%	0.81%	1.24%	1.70%	2.19%	2.71%
	14	6.1035 ⁰⁵	0.01%	0.37%	0.75%	1.15%	1.58%	2.03%	2.52%
	15	3.0518 ⁰⁵	0.00%	0.34%	0.70%	1.08%	1.48%	1.90%	2.35%

The ten loss-trades in a row (with a 2% account risk) results in a total loss of about 18.3%. With 3% account risk, it's already 26.3% total loss, and with 4% it's already one third.

Little cause, big effect. Losing streaks happen, and to survive them you need "small" account risk values.

The advantage of the fixed fractional approach is that during a losing streak, the percentage loss per trade stays constant, whilst the absolute loss per trade decreases. Methods using fixed sums for each trade continually raise the percentage loss per trade in a series. This strategy of increasing risk during a losing streak is sometimes referred to as a Martingale strategy, a very risky method. It always assumes the next trade will be a winner, and that's exactly what's questionable. As a strategy it is very problematic, because account risk increases during a series of losing trades until it's finally too much. Again, the key word here is series of losing trades.

But why does account risk have to remain at 2%? Couldn't it be more or less? Let's have a look at table 1 for the answer.

The table shows, for selected parameters, the relationship between account risk and the probability $p(V(x))$ for a series of x losses in a row. The table assumes a failure probability of 0.5 for a single trade. That means a 50-50 chance for each trade. Column one shows losses in a row, column two the probability, and column three shows the probability in percent. The table can be read as follows: Let's assume you don't want to lose any more than 15% of your capital, so that 85% remains. Your account risk values can be found in column 6 under "85". This choice depends on your personal risk tolerance and can be completely different for someone else. You should shut down trading for a time if your maximum loss level is reached, or if you suffer a 15% account draw down. The second risk parameter is found in columns two or three - the probability or percent chance of the selected loss series from column 1. Again, your choice here depends on your own personal risk profile.

Let's assume a risk adverse trader sets a maximum loss limit of 15% (column six). Because he not interested in actually experiencing this scenario, he assigns it a low probability of 1 in 1000 cases, meaning a 0.10% chance that it will occur. This is found in column three on line 10 (meaning 10-trade losing streak as worst case basis). Moving right to column six ("85") he reads an account risk value of 1.61%.

A risk-oriented trader assumes, for example, a maximum total loss of 25% (column eight, 75% capital preservation), accepts a 1% risk of that happening, and finds his probability figure for a series of losses in line seven with a value of 0.78%. Moving right to column eight he reads a maximum account risk figure of 4.03%.

This simple procedure defines a cut-off point for your trading depending on your personal pain threshold. So, it's not the classic 2% account risk that matters, but your own personal exit or shut down level. This way you can predefine your account risk per trade by weighing the probability of a series of losses actually occurring. The advantage is that you have a concrete shut down level, and with the help of the account risk figure, are betting on the likelihood of reaching that level. If you lose the bet, you've only lost a predetermined sum. As Dr. Van Tharp once said in an interview, "Trading is a money management and probability game." So, this is your game.

Probability in Flux

According to the table, the probability of loss of a single trade is 0.5 or 50/50. The question arises, of course, whether this value is too high or low, or if it's dynamic. Naturally, in practice it's dynamic, fluctuating around a middle value that you first determine from your individual trade history by dividing winning trades by losing trades. With a trade count of 30 you begin to get a workable number, with 100 or more a solid forecasting basis. In order to track changes in this figure, always compare your last few trades with your forecasting model. This will help flag changes affecting performance before they become a problem. The rule here is, the more short term trades flowing into this calculation the timelier and more reliable it will be.

A further problem is how to view the resulting probability of a loss series. Isn't 1% a little too low? Isn't one in 1000 very low or even too low? Or is 0.1% maybe a little too high? Unfortunately, there's no generally accepted answer and opinion is widely divided. It boils down to the statistical problem of rarely occurring events. The chance of winning the Lotto with six correct numbers may be one in 14 million, but there are nevertheless Lotto players and even winners. A sad example of a rare and catastrophic event was the Tsunami in South East Asia. An event of that magnitude supposedly occurs every 700