The Little Formula That Makes a Difference

Sizing Positions – Part 1

Trading and investing is simple, very simple actually. Particularly in financial markets. Because all we can do there, is just buy and sell stuff. Yet at this very basic decision making level, things already start to go awfully wrong. So however simple it may be, it sure is not easy. In this article we explain the single most important formula any trader and investor should know. We will discover how most people who know the formula already, probably interpret and apply it the wrong way. Finally we will get into how to exploit all this and work the numbers.

If buying and selling is the only thing we can do, it has to be the only thing we can do wrong. And if problems start to emerge from those basic actions, we had better look into them carefully. Any transaction in financial markets is the consequence of orders being executed. When taking a closer look at any order, at least three types of information always have to be included:

- direction: whether we want to buy or sell
- selection: what we want to buy or sell
- sizing: how much we want to buy or sell

Next to that, we must decide when to buy or sell. This is called timing. Timing can be explicit, when timing information is provided within the (conditional) order, or implicit, when timing is done by actually placing the order for immediate execution, in which

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case "when" gets narrowed down to "now".

This leaves us with four main dimensions: direction, selection, timing and sizing. In this article we are going to have a good hard look at what dimension matters most in trading. In the following articles of this series, we will quantify everything in a practical way.

There is a bit of basic calculus in the next section. But hang in there, it definitely will be worth your while.

On the Origin of Profits

Where does a net profit or loss come from? If we can answer that, maybe we will have a better shot at obtaining the first and avoiding the latter. Let us take a case at hand. Suppose we have the following profits and losses:

$$-2-1-3+4-1+5+2-1-2+1 = 2$$

This makes for a total net profit of 2. We are using small and whole numbers here, for the sake of simplicity. But any numbers could be used without compromising what will be derived from it. First we will reorder the sequence and separate winners and losers. Of course, changing order will not have any impact on the net result at all.

$$4+5+2+1-(2+1+3+1+1+2) = 2$$

Next we multiply and divide the sum of profits by 4, which again keeps things neutral as to the net profit. We are merely rearranging things at this moment. We do the same for the group of losses but with the number 6.

$$\frac{4+5+2+1}{4} * 4 - \frac{2+1+3+1+1+2}{6} * 6 = 2$$

In case you wondered where the 4 and 6 come from, and you had not figured it out yourself already, 4 is the number of winners, while 6 being the total number of losses. Any part this equation can be calculated without changing the net result.

$$3 * 4 - 1{,}67 * 6 = 2$$

By doing this the values 3 and -1.67 turn up. 3 being the average profit of all winners, -1.67 the average loss of all losers. Finally let us divide everything by 6+4, the total number of trades
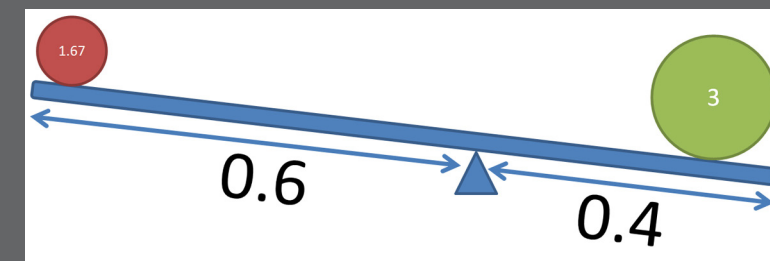
$$3 * \frac{4}{4-6} - 1{,}67 * \frac{6}{4+6} = \frac{2}{4+6}$$

Simplifying things a bit, gets us

$$3 * 0{,}4 - 1{,}67 * 0{,}6 = 0{,}2$$

In this final form, it is very clear we have 4 out of 10 trades giving us an average profit of 3, while 6 out of 10 trades have cost us 1.67 on average. Of course the

F1) Expectancy Equilibrium Scales

On these scales the average profit (green) is balanced against the average loss (red). More importantly, the arms of the scales are proportional to the frequency of winners and losers. As such, in this example the average loss has a bit more moment of force than its counterpart on the other side. Nevertheless the frequency and average profit of winners makes up for the frequency and average loss of the losers, resulting in a net profit.

Source: TRADERS´ graphic

net value does not equal the total net profit of 2 anymore, since it also got divided by 10. Hence, on the right side of the equation we obtain 0.2, the average net profit per trade.

This formula was originally proposed by Blaise Pascal some 400 years ago as expectation or expectancy, written more generally as:

$$\text{result}_{avg} = f_w * P_{avg} - f_L * L_{avg}$$

Or fully:

average result per trade = frequency of winners * average profit per winner - frequency of losers * average loss per loser

It gives us a condensed way of summarizing profits and losses. But it is more than that.

Expectancy Dissection

Do you want this sugar coated or right between the eyes? Every trader is familiar with expectancy in some way or the other. But here is the catch. It is useless.

At least as far as the numbers are concerned. Popular trading theory has it that one only has to put in the numbers to see if a system will be profitable, i.e. show a net average profit per trade. Having a positive outcome has become so important in research and backtesting they

even gave it a name of its own. Referring to it as having an edge.

But all numbers are based on past trades. The frequency of winning and losing, as well as the average profit or loss, are only known in hindsight. And none of these numbers have been or ever will be constant through time in this ever changing environment. What is more, these numbers are bound to a period and are, therefore, useless. Any edge over a certain period can hide several smaller intervals within that same period having a negative expectancy.

Beware of books and money management techniques based solely on the principle of meeting an edge by figuring out and building on historical expectancy. For one thing, it is a formal fallacy called confirming the consequent or converse error.

Those models may do a great job at greatly simplifying the problem at hand of understanding the importance of money management.

However, their simplification is artificially introduced and not a property of the reality they try to model. Besides, evidence mounts that hardly any distribution in this context is statistically normal. What is more, winners and losers have a tendency to cluster. Such clusters will coincide with periods of above and below zero expectancy. While expectancy

may indicate a system as bad, clusters may point well towards the opposite. Good systems have a tendency for seeing their winners and losers cluster (*).

Bottom line is that any expectancy we calculate is just a historical number that might aid an analysis of the past. But it cannot be used for extrapolating the future.

Back to the Drawing Board?

So, out goes the expectancy formula, right? Well, not entirely. There are quite some important messages to take away from expectancy. At least, if you start looking at it from the right angle.

Consider Figure 1, where we visually depicted the example's final state. In this picture the average profit and loss are placed as weights on equilibrium scales. Mind the subtle difference in the length of the scales' arms, being proportional to the frequency of winners and losers. This picture sets the stage for more insight in the highly important concept of position size.

In this visualisation of the expectation formula, two dimensions become clear. We have the size of the average profit and loss on the one hand, represented by the weights. The frequencies of winners and losers on the other hand are represented by the length of the arms.

F2) Analysis Effort Power Law
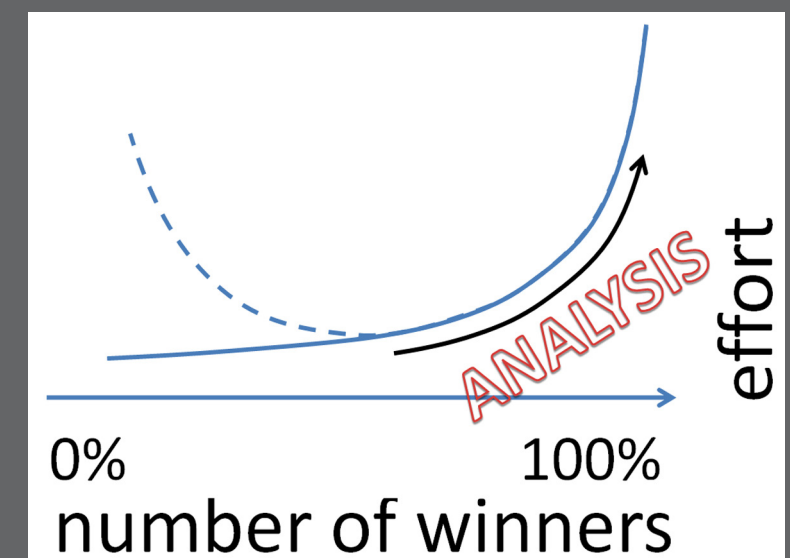
Behold doing too much analysis. The marginal effect of every bit of analysis we add to the picture, shrinks the higher our number of winners gets relative to the number of losers. So a successful system, as measured by its liability, has a natural resistance to becoming even better. Compare it to falling from the sky and reaching terminal velocity, the speed at which gravitational acceleration becomes balanced by air resistance. Or a boat's sail encountering more air resistance the faster the boat goes.

Source: TRADERS´ graphic

The frequency of winners and losers is actually one degree of freedom instead of two, because they complement each other. So we can define both with one number, typically called reliability. If you would happen to have 100 per cent winners, there would have to be zero losers and this would correspond with the utmost reliability. The other dimension, average size of profits and losses, can also be compressed into one number most often identified as the profit/loss ratio or P/L ratio for short.

Let us go back to the example. We have a reliability of 40 per cent, which stands for 40 per cent winners and consequentially 100 - 40 = 60 per cent losers. The average winners has a profit of 3, while the average losers amounts to a loss of 1.67, indicating a P/L ratio of 3/1.67 = 1.80. This number indicates that, on average, 1.80 was made for every 1 that was lost. If these numbers would scale by ten, say to 30 / 16.67, the P/L factor would stay exactly the same, meaning the scales would keep the same balance, even though expectancy would rise tenfold.

Who Is in Control?
Focus here should not be on what all those numbers might be for the future, however nice that would be. The important question here is what part of the equation gives us control. Is it reliability or rather the profit/loss ratio?

Let us look at reliability first. Do we have control over the number of winners and losers? We all would love to have 100 per cent winners. But that is impossible. For such a system would either throw financial markets out of action immediately or it would become a financial black hole eventually attracting all the money, again ending financial markets. So reliability must be somewhere

between zero and 100 per cent winners, as Figure 2 suggests. The effort needed to increase reliability is what we call analysis (also in determining direction). Pure fundamental analysis or technical analysis, despite heavy

> " The important question here is what part of the equation gives us control. "

discussion among their prophets, are nothing more than different extremes on both end of the same spectrum, manipulating numbers from the past. With new numerical material becoming available at different frequencies. But analysis only gets us so far. The relationship between analysis effort and reliability, appears to be a power law. This means that the effort to take us from 30 to 40 per cent winners, has to be doubled or even tripled to take us from 40 to 50 per cent. The closer we get to a 100 per cent, the harder it will be, in terms of analysis effort (money, energy, time, …), to get even closer. So while analysis can be worthwhile, people already do far too much of it. The problem is threefold. First,

we are evolutionary tuned for wanting to be right. Being right implies having control. Having control over your environment or being able to anticipate on it, offers a firm edge in evolutionary terms. Secondly, because people are looking for certainty in an uncertain environment over which they have no control, they crave the illusion of control. Doing more analysis certainly gives this illusion, if not the control. Thirdly, general opinion has it that doing too much analysis cannot hurt. Why not? Notice the dotted line on Figure 2. Would it be possible to obtain 100 per cent losers by doing more analysis? If 100 per cent winners is not reachable, why should 100 per cent losers be reachable?

The amount of ads aiming at system reliability shows my hypothesis right. If we would not bother too much about setups and analysis, but more on taking care of open trades, then ads would not pay for themselves and we'd stop seeing them. It is a demand driven supply.

Another indication that focus is way too much on analysis is the alarming amount of information we try to digest and the speed at which we try to do so. It is a

losing game, trying to beat the system by evermore analysis of evermore data on evermore smaller time frames. Instead we should zoom out and aim for even fewer but even bigger winners.

It is not that analysis is useless or should not be done at all. But given the marginal added value at a certain point, we should aim at "just enough". Given the 80/20 power law, the minority of our analysis accounts for the majority of its effect on our number of winners (**).

So analysis is overrated, but the point to take away here is that we have most control over the sizing dimension and the profit loss factor.

We do have a lot of control over the average size of profits and losses. Pure theoretically, if we sell every loser when it hits a 5-per cent loss, our average loss cannot ever get any bigger than five per cent. Control we have with the simple click of a mouse and can be automated through conditional orders and options. Something that needs no analysis at all.

Next Time …
… we will go into how we can use and implement the high degree of control we have over expectancy, by using risk control and controlling the size of our positions. We will also learn how to quantify position size. ◼