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FORECASTING FINANCIAL MARKETS AND ECONOMIC DECISION-MAKING

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BEHAVIORAL FINANCE AND ITS APPLICATIONS ON DECISSION MAKING IN FINANCIAL MARKETS

Abstract – *From being highly controversial in the late nineties, for challenging the dominant paradigm of efficient markets, behavioral finance gained a lot of adherence in both academic and professional circles. This theory is actually an application of behavioral research from the eighties to decision making in investment finance. Behavioral Finance shows us that decision biases, that were essential to build up knowledge, society and economy, may lead to undesired effects when decisions about investments are being made. This paper aims to give some insight in the non-rational behavior of investors and tries to indicate some routes that could lead to better investment advice and decisions.*

1   Content

2   Introduction

Behavioural Finance is more than just a new buzzword in finance: it is a new paradigm. It is a paradigm where the investor in all his aspects is key to any investment decision. It is a paradigm that leads us to a world without any buy or sells advice related to specific stocks, but with an integrated, investor centred approach. It is a world where the investor, his objective and subjective constraints will determine a strategic asset allocation.

This is extremely important since the strategic asset allocation is known to account for the bulk of the variance in returns. Brinson et al. (1986 and 1991) found that 93,6% of the variance can be explained by the strategic level. All the rest like tactical asset allocation, active or passive management, quality of the asset manager, etc. only accounts for slightly more than 6%.

This text tries to use Behavioural Finance as a starting point for point for better investment decisions, from selection of the strategic asset allocation to the asset management itself.

3   Cognitive Biases

We generally think about ourselves as reasonable creatures. At least we are sure that the way that we see the world corresponds to "reality". We have no doubt that "perceived reality" is "the reality". This is based on many empirical observations; it is the basis of our learning process.
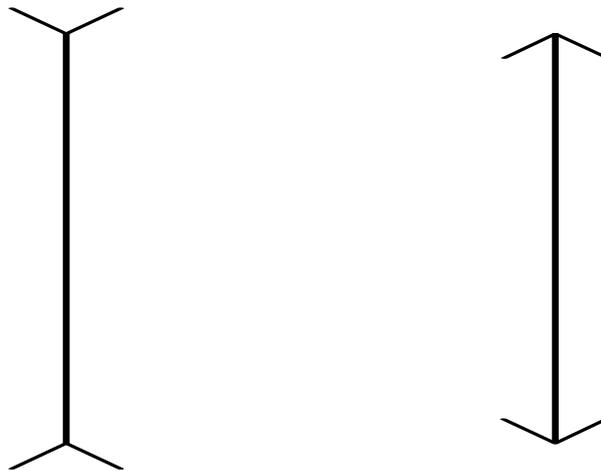
Figure 1. Which line is longer?

Now, have a close look to the vertical lines in Figure 1. You know (and in case of any doubt, just measure them) that these lines are of equal length, but you will always see them as different: the one on the left seems longer. This is a visual bias: the lines are of equal length, and even if we know it, we cannot avoid seeing them of different length.

This modest example is actually very rich and instructing. The line on the left hand side looks like the intersection of a wall that is further away than the paper, whereas the second looks to be closer to the eye than the paper. This is enough information for our brain to assume that "if they appear of equal length, that the one further away must be the longest one". This kind of interpretation is fully automatically in our brain; we have not any control over it. This has been programmed in the unconsciousness part of our brain since we tried to move around in our 3 dimensional world. Actually, this is a very good thing, because this allows us to move around, even if we would loose eyesight of one eye, and hence our real depth view.
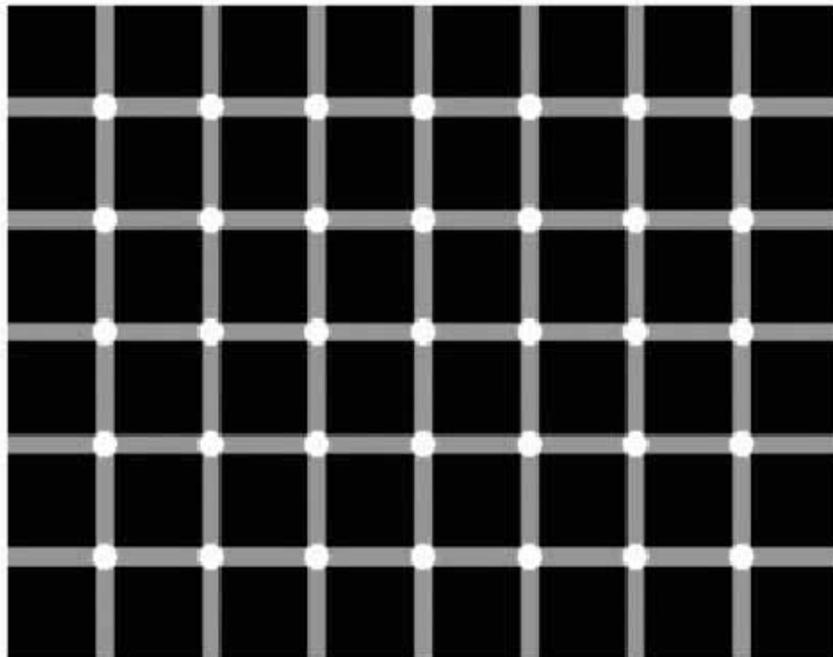
Figure 2. Do you see the black dots between the black squares? They aren't there but you cannot avoid seeing them around your focus! Where we generally think of "seeing" as an extremely objective process, we have to realize that our brain adds much to the objective perception!

These visual biases are not only very instructive and interesting, but they also indicate that our mind "suffers" from perception biases in general and that it is actually very reasonable to assume that similar biases are also present in other perceptive processes.

Through next chapters, I would like to show you some of these biases that are particularly relevant in decision-making in finance and economy in general. First I present you some questions, and in the next chapter, we will explore cognitive biases in decision processes, that can be understood from these questions.

3.1 Some Questions

Please go through the following list of questions, it is worth to take a pencil and write down your answers. Avoid the use of a calculator or any other aid to answer the questions, it is intuition that we are after.

In the next chapter "3.2 And answers" you will find some interpretation, background and information about empirical research around these questions.

3.1.1 Confidence

Now, consider the following thought experiment. You are in a room with all your colleagues, all have a drivers licence. We will now divide the whole group in 2 sub-groups: the 50% best drivers and the 50% worst drivers. Do you think that you will end up in the group of

- (a) 50% best drivers
- (b) 50% worst drivers

3.1.2 Logical Deduction and Probabilities

Tossing a coin, which sequence is more likely to appear?

- (a) KKKKKK
- (b) KHHKHK

3.1.3 Hindsight

Thinking about the "dotcom-crash" did you expect this bubble to burst and why?

Can you think of a big mistake that you made? Why did it go wrong? What were the odds that it would go wrong?

3.1.4 Rational feelings about mistakes

Imagine that recently the shares of company X crashed and shares of company Y rallied. Who is the most upset?

- • (a) Paul owned shares of X, considered to switching to Y, but did not.

- • (b) John had shares of Y, and switched to X

3.1.5   Rational feelings about close misses

Paul and Frank are both seasoned investors, and both found the investment opportunity of their lives. Paul bets on share X and Frank on share Y, they both plan to sell when the stock reaches a certain level, and then they plan both to retire. But it goes wrong, and both ruin their financial wealth. Who will be the most upset?

- • Paul's share X, went south immediately since he bought it.

- • John's choice went up, and continued to perform till almost the target level was reached, and then it crashed.

3.1.6   Rational and independent mind functioning

The index Dow Jones Industrial Average (DJIA) was introduced in 1896, with an initial level of 41. In 2004 (en of May) the index was 10,188.41. Knowing that the average dividend yield of this index is about 3 to 4%, what would be the level of the index with dividends re-invested?

3.1.7   Expected Value

You have the chance to win €10'000. How much do you want to pay to additionally increase your chances?

- • (a) from 0% to 1% (this can be considered as buying or not buying a lottery ticket)

- • (b) from 48% to 49% (you have 48 of the 100 1%-tickets, how much is it worth to acquire another one?)

- • (c) from 99% to 100% (how much would you pay to be absolutely sure to win)

3.1.8   Rational Selection of games with uncertain outcome

Here we present two different situations: in the first game (A), you can only win; and in the second (B), you can only loose.

[A] Imagine that you won €20'000, an now get the opportunity to choose between

- • (a) 100% chance to get €5'000

- • (b) 50% chance to win €10'000 and 50% chance to win nothing

[B] Imagine that you won €30'000, an now get the opportunity to choose between

- (a) 100% chance to <u>loose</u> €5'000

- (b) 50% chance to <u>loose</u> €10'000 and 50% chance to loose nothing

3.1.9 Problem solving abilities

Consider that you get are participating in a game that consists out to two gambles: A and B, so choose an option in question A and B

- [A] Choose an option.

  - (a) 100% chance to win € 2'400

  - (b) 25% chance to win € 10'000 and 75% chance to win nothing

- [B] Choose an option.

  - (a) 100% chance to <u>loose</u> € 7'500

  - (b) 25% chance to <u>loose</u> € 10'000 and 75% chance to loose nothing

3.1.10 Rational Choices

What do you prefer?

- (a) Junk bond

- (b) High Yield bond

3.1.11 Free Choice

Imaging that you are on holidays, and you're strolling along the cay. You're getting very hungry and you see only two restaurants next to each other. Which restaurant would you choose?

- (a) Restaurant A (which is empty; so you would be the very first guest)

- (b) Restaurant B (which is more than half full of guests, visibly enjoying their dinner)

3.1.12 Rational interpretation of news and evidence

It is logically to expect that P/E ratios predict the future evolution of the stock exchange, since for example low prices and high earnings will cause the price of a stock to increase. Markets were bullish in the 1990-ies (forecasted by low P/E ratios), and bearish in the

2000s (also correctly forecasted by the extreme high P/E ratios resulting from the bull-run in the previous period. So, is all this …

- (a) valuable information, to trust P/E as a forecasting parameter, or

- (b) useless information, and P/E is not to be trusted.

3.1.13 Unbiased perception of reality

More than half of the investment funds have a better performance than their benchmark (the passive index such as DJIA for example):

- (a) True

- (b) False

- (c) 50% of funds outperform their benchmark, and 50% underperform their benchmark.

3.2   And answers

Describing these behavioral biases is not straightforward, our mind is limited, but our language is even more limited. Our language is not really adapted to discuss issues related to the subconscious, and you will notice that there are generally deeper concepts that are hard to grasp, but that will show in different ways and we only catch these appearances. Much like an iceberg that would have different smaller parts sticking out of the sea when it flips over, but the main part remains hidden for our eyes.

3.2.1   Overconfidence

Well, think honestly about this question, and probably you will come up with the idea that you end up among the 50% best. This is a normal reaction, in fact something like 90% to 98% of the people believe to end up among the 50% best!

This is called overconfidence, lots of scientific experiments show that humans are always overconfident in their own skills and abilities to make decisions. In fact it is even so that when we say "to be absolutely sure" that there are not 0% of errors but up to 15% or 20%. The impression of being "absolutely sure" seems to be a shortcoming of the mind, since there are so few things about which we, from our limited position, could ever be "absolutely sure". However, this has proven to be the mindset that was the most adapted not only for survival, but also to provide the highest level of offspring. It has been an

essential aspect in development of science, war, creation of nations, using new techniques, etc.

3.2.2 Hot Hand Fallacy / confirmation bias

Unless you have a strong statistical background, you will probably have answered that the sequence B was the most probable to appear. Indeed, when looking at both series, it seems that the first is "designed by a higher logic" and that the second is pure random.

However both have the same probability to appear, the probability for each series is

$$P[KKKKKK] = P[KHHKHK] = \left(\frac{1}{2}\right)^6 = \frac{1}{32} = 0.03125$$

Actually, when we would do the experiment, throw up six times a coin, and series B would appear, we would consider it as "normal". Whereas, if series A would appear, we would be utterly surprised and classify it as a miracle.

This is another basic bias that allowed mankind to understand something of his environment. Without this bias, we would have no "surprise" when we see a pattern appear, we would draw any conclusion, and we would never have had any scientific progress.

This bias together with our disposition to "believe in higher steering power" is a unique combination that allowed us to make scientific progress. We saw patterns, and tried to understand things: we saw every day the sun come up and we put the earth in the centre of the universe, and the reason was God. So we create for our mind a small set of problems, that can be solved, and hence isolate a set of problems that we can solve. All the problems with our theory can be disregarded since there is God. (further interpretation: see 3.2.9).

Once we are convinced of something, then we see confirmation of it all around. This bias is called confirmation bias, because we are fooled by confirmative information (but forget to look for disconfirming feedback). This was first studied among basketball players; they were (and probably still are) convinced that they had good days and bad days. When they had a good day they spoke of a "hot hand", and nothing went wrong, and when they had a bad day they could not play well because they had a "cold hand". Statistical research showed that these were just normal deviations from the mean and that all series could be explained as totally random data series from a Gausian distribution. So, nothing like a hot

hand existed, but in players' and coaches' minds they do exist and they see every day confirming evidence.

3.2.3 Hindsight

Probably, you will have answered that you saw the crash coming, and you will have loads of arguments ready to explain why it was a bubble and why it had to burst. This is indeed a very general feeling, after the course of actions we are always very convinced that what happened had to happen. Experiments have shown that even if we make a decision and believe that this is the right one (for example buy the shares of the dot-com-companies); after failure we will say "it had to happen, I should have it seem coming", and suddenly we see all the arguments why it went wrong and we forget the arguments why we made our initial decisions.

3.2.4 Hindsight and perceptive difference between actions and non-actions

For a perfectly rational investor, there would be no difference. The result is exactly the same for both A and B. But for us, there is a difference, a very subtle one, but one that makes significant difference. John, who decided to switch to X shares will be more upset; for the simple reason that he will have to deal with the feeling "why have I done this, since it was so obvious that this would happen. All signs were there that the market value of X would crash, and I even had Y!"

As you can see, strengthened by the hindsight effect, he will more regret his action. The problem for Paul is of a lesser kind. He only has to cope with the issue that he had X shares and then it went south. For most humans this is a smaller problem to deal with, resulting in lesser regret. Experiments have shown that when people are asked to mention the one action or omission of action that they regret the most, that 80% of the respondents reports an action (regret of commission). So, only 20% reports that they feel the deepest regret from an omission of action.

Only to avoid such regret people will for example always use the same numbers in lotteries. This means that in order to avoid regret of commission, we will adapt our choices in such a way that when it turns out wrong, we will minimise regret. Generally this is choosing regret of omission rather than regret of commission, and hence doing nothing (or not changing anything).

3.2.5   Hindsight and close misses

Similar to the previous question, we know that there is no difference for the rational person, since both are ruined. But we feel that John will be much more upset. What a close miss! If he only had sold half of it before the top then he would still be rich, if he only would have been slightly less ambitious and put himself a lower target, etc.

Lots of additional considerations increase the pain of the failure, especially because with hindsight John knows very well why it went wrong. A close miss is much harder to cope with than a total and clear failure.

This is probably the reason for "dollar cost averaging", i.e. not investing a big amount at once, but investing it in different steps, according to a pre-set scheme. Rationally, it is sub-optimal behaviour[1], however it is able to minimize regret when it goes wrong.

3.2.6   Anchoring

The correct answer is 858'671. Chances that you answered a much lower number are high. This is because of the information given in the question about the index without dividends sets an anchor in our mind. We try to use this anchor to make an estimate. This heuristic will give us a good indication given that:

- the dynamics are linear, and

- the anchor is relevant.

In this example the anchor has some relevance, but the dynamics are exponential, and our mind is not well equipped to cope with this.

However experiments have shown that also totally irrelevant information is used as anchor. There seems to be an urging need for our mind to find an anchor if we have to think about magnitudes that are new or unknown. More deeply this bias helps us to gain some confidence in new environments, helps us to build new knowledge on already acquired knowledge. Without this predisposition, it would be very hard to build up any scientific progress.

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[1] The inferiority of dollar cost averaging was much studied for example by Weston (1949), Constantinides (1979) or Rozeff (1994).

3.2.7   Non-Linear appreciation of probabilities

Chances are that you want to pay more than one percent to get the 1% lottery ticket, this is the very basis of any lottery. You pay a small amount, and you can be almost sure to loose it, but there is that one small chance to win the jackpot! Millions of people buy on regular basis lottery tickets.

The second issue, increasing chances from 48 to 49% will not activate any special trigger in our mind. Chances are that you are willing to pay from zero to one percent (the latter corresponding to the expected value).

But, if we can be absolutely sure … well, that is worth a lot! The increase from 99% to 100% is really worth paying for.

All these considerations seem logical to us, however they can never be fully rational. Since all three options involved are a 1% increase in probabilities. However from a functional point of view this bias does not seem to be useless. Paying a small effort but possibly getting a big reward is worth trying (would we ever have gone hunting otherwise?). On the other hand of the spectrum (you possess 99% of all lottery tickets already), it is worth to pay maximal to be completely sure, because there is a lot at steak (since you paid much in order to acquire the 99 first tickets). If another tribe would attack then you would even risk your own life in order to protect wives and offspring, probably the right evolutionary reflex.

3.2.8   Loss Aversion

Most people will choose the safe option when gains are involved, and go for the gamble when losses are involved (60%). This means that we are basically loss averse. If we would draw a utility function, then it would be going down steeper when losses are involved than on the upside.

However, if we look carefully both options are exactly the same! Both boil down to:

- (a) 100% chance to win €25'000

- (b) 50% chance to win €10'000 and 50% chance to win €30'000.

It seems normal and healthy that most people have chosen the save bet when gains were involved and go for the gamble when losses are involved, but what is really stunning is the fact that both were the same. So, the way the question was posed, determined the answer. In other words, the frame used to approach the problem determined the answer.

These results show us also that people valuate changes and not states; people care about return and not about wealth. A rational investor would only care about his "total wealth", but the behavioral investor disregards wealth and focuses on return. This is a much smaller concept (a much "narrower frame"), and not what you would expect from a rational person. Another interesting example is the much-studied preference for dividends and coupons.

This bias is probably the right one if you realize that our mind never had enough information to make a good estimation of probabilities, and on top of that is very bad in interpreting them. So, better be careful, and avoid any losses, protect what you already have instead of risking in order winning much. A very clear example is a hunting party, imagine you managed to kill a bird and this will provide your tribe with the small amount of much needed nutrition elements, and now you see a tiger. What do to? Take your second arrow and shoot him, or run as fast as you can?

3.2.9   Framing and Mental Accounting

The following example is even more stunning. What would you choose?

- (a) 25% chance to win € 2'400 and 75% chance to loose € 7'600

- (b) 25% chance to win € 2'500 and 75% chance to loose € 7'500

This is easy: (b) is clearly the better option. However, going back to the question in 3.1.9, we realize that due to loss aversion most people ended up in choosing (a).

Framing refers to the fact that we tend to use a narrow focus when solving problems. We solve problems one by one, without overseeing the overall picture.

People attach too much value to the buying price, and therefore focus on loss or gain, and not on total wealth (which is a wider frame). Therefore people are not volatility averse at all but are loss-averse.

It also means that we also overlook covaricances/interdependence because we solve problems one by one. This leads to mental accounting. We don't consider all our assets when making investment decisions; we have a mental account for a home, retirement savings, scholarship savings, a shot at richness, etc. This is described by behavioural portfolio theory (see 4.2.1).

Framing seems to be a heuristic of our mind that makes our problems solving skills sub-optimal; however we should realize that generally the only way to understand nature and

to build up complex mechanisms is to break down the problem to elements that are easy to understand. This is a bias that was essential in developing science.

Without this disposition we would have to wait till we have a good theory that includes everything. This could be General Quantum Dynamics, and indeed we must conclude that all influences all and that there is no way to predict anything. Actually in general quantum dynamics it is not possible to calculate anything more complex than the hydrogen atom (and we have good approximations for the helium atom).

There is at least one school that tried this approach, and did not overlook correlations and look at the big picture. Lao-Tse (604-531 BCE) introduced Taoism, and the central idea in this philosophical school is that everything influences everything and forms one cosmic unity. Therefore it dos not make much sense to try to understand parts of this cosmic unity. This philosophy blocked scientific progress for more than thousand years[2], and the society that had everything to conquer the world stalled. This society that had a thousand years technological advance just waited till other civilisations came to pick up their compasses and not to continue to orient houses for a good feng sui, but for ships; till the same western civilisation came to copy the formula of gunpowder and not to use it only for flares during ceremonies, but to use it in firearms. And the rest is history.

3.2.10 <u>Labeling</u>

Unless you know that both refer to the same type of issuers, there would be a definite preference for high yield bonds over junk bonds. Bonds with low rating but high interest were of no interest, and they were called "junk bonds"; till they were marketed as "high yield bonds", resulting in widespread ownership of those bonds. Even special high yield bond investment funds were created, and they all wore that name, none is called "Junk bond fund".

For the rational investor the name of an instrument cannot be important. However, we are all fooled by the appearance of things. From our first impression when meeting someone, to packaging of commodities in the supermarket the appearance of things plays a major role.

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[2] Indeed Taoism (introduced by Lao-Tse (604-531 BCE)) is the opposite of what we call here framing, and therefore it made all scientific progress impossible. However, it must be stated that Confusius (551-479 BCE) added to this the strong conviction that that in an honest society everyone and everything has his place, and that your only ambition should be to excel in your role. This philosophy added to the rigidity of the system and the thinking, no-one would ever think out-of-the-box!

3.2.11 Herding behaviour

Well, most people would choose the restaurant that has already some clients. The reasoning is that "if so many people chose this restaurant, they cannot all be wrong". As many animals, our natural tendency is to follow the herd, or more general be a trend-follower rather than having an own vision. But looking at the dynamics of this reasoning we realize that this heuristic boils down to the choice of the first client, and since he could not use the herding heuristic, his choice was probably random[3].

Also in financial markets, we will generally invest in stocks that are going up (so stocks that are preferred by other investors). If this is true, then one would be able to see trending patterns: tendency forming on short horizon and mean reverting on the longer horizon. These dynamics were indeed observed and are further described in chapters 4.1

That humans feel comfortable in a herd was yet another essential characteristic to group together in tribes, create some specialisation (the mother of all trade), creating the necessary conditions to allow for progress in all aspects.

3.2.12 Over- and under-reaction related to confirming and disconfirming evidence / confirmation bias

Meir Statman (2000) showed clearly that P/E has no forecasting power at all. He studied the stock market (of the USA) between 1872 and 1999 and found that bullish and bearish periods were both preceded by an equal number of periods with P/E ratios both higher and lower than their historical average. This means that after a period with low P/E ratios, you have 50% probability to see a period with high returns and 50% probability to see a period with low returns.

Of course we recognize here the hot hand fallacy, but also we must admit that additionally to this, we have the tendency to overlook evidence that disconfirms our believes. Further we are much more perceptive to confirming news or evidence. All this adds of course to the overconfidence bias.

In financial markets, this will lead to underreaction to bad news when a stock is rising (especially in a bullish market), and to overreaction to bad news when a stock is in a bearish period, and vice versa.

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[3] In these herding dynamics we clearly recognise the basic dynamics of a bifurcation in chaos theory.

For individual investors, it has been proved that they "ride losers too long" and sell winners too early (Hersh Sheffrin et al. 1985). The first is clearly a reflection of this bias.

3.2.13 Availability bias

If you are active in asset management, you know of course that there are actually much more funds that have a worse performance than their benchmark. However generally fund companies advertise their best funds, newspapers publish top 3 (and eventually 3 worst) funds, etc. It is even so that the very bad funds just disappear or are merged into other funds (see for example 4.1.2). Because good funds are much more available in our memory we get the impression that they form the majority.

This bias is called availability bias. Our mind will remember better things that it recognizes, since they are more "available".

3.3   Impact of Cognitive Biases to Our Ability to Select Investments

In previous chapters, we described some mental biases relative to what one would call "a rational person". We also understand now how these biases were necessary in the evolution of mankind, that without these biases, we would still, despite of our awesome brainpower, live like the average monkey. So, the first hypothesis could be that if these biases helped mankind so much, they cannot harm us much on the stock exchange.

Unfortunately this is wrong. One of the milestone studies investigating the impact of overconfidence is from Barber and Odean (2001). Looking for two distinct groups of population showing different levels of overconfidence, they find and extensively document, that man are (at least what investments concern) more confident. They even provide a test: if this is true, man should trade more than women. And it is true.

Because men are more confident, they will trade more. But unfortunately, it seems that every trade that is executed by the individual investor has a negative expected value. If someone decides to replace stock X by stock Y, then we will see that (even without taking trading costs into account) stock Y will underperform stock X a year later. This means that on average we make the wrong decisions, and the less we trade the better our performance will be.

Barber and Odean found indeed that men trade much more than women, and that their performance is much worse. Performance was measured relative to "own benchmark" or the initial composition of the portfolio.
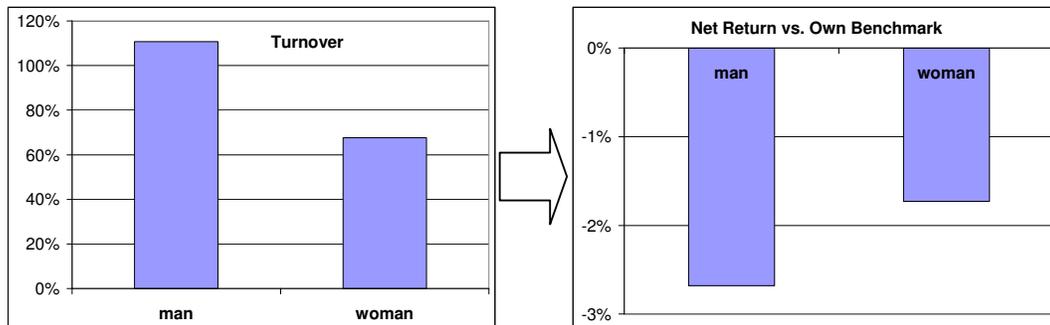
Figure 3. Annual Turnover of portfolio and the resulting underperformance relative to the initial composition of the portfolio.

Another relevant test would be to calculate the average performance of the average decision for men and women. This is remarkably enough not done by Barber and Odean. But doing so, we see that the percentage of underperformance (disregarding the transaction fees) per percentage turnover is for both man and woman comparable.
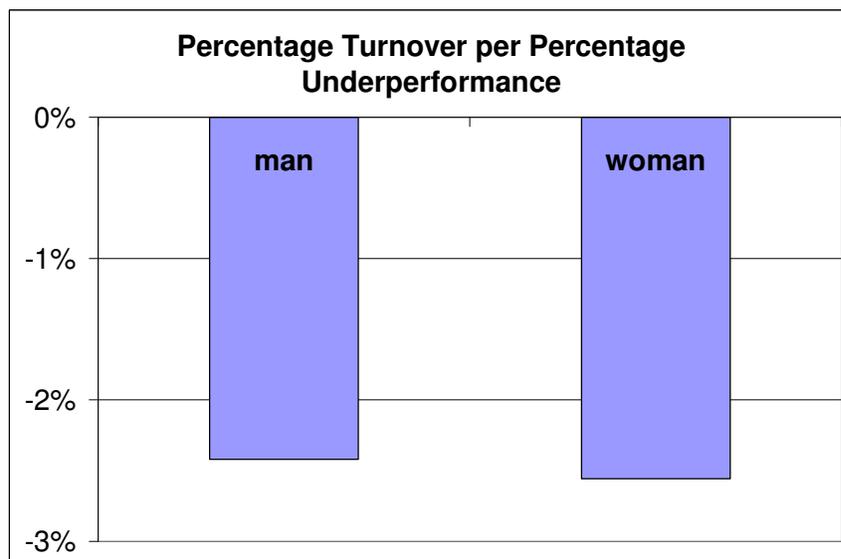

Figure 4. The relative performance for each percent of turnover: if a man increases his turnover by 1% then, he deceases his performance by 2.42% (a woman on average decreases her performance by 2.52%.

This finding makes the results even more striking. Even if the average man in this sample is able to make slightly[4] better decisions, he will significantly underperform due to too frequent trading induced by his higher level of overconfidence.

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[4] The difference is actually very small: 0.1%, might be significant (error is about 0.04% - estimated from the paper of Barber and Odean). We should also be careful when making such interpretations since we should compare this to the results of the broker. If the broker is lousy, then it can just mean that women better follow the advice; if the broker gives on average good advice, this would enforce this finding.

With this work, we can consider it as a proven fact that overconfidence is a bias that is not adapted for trading on the stock exchange. For the other biases as discussed above, the situation is less clear.

We could divide them in three groups. The first group, containing those biases that logically leads to sub-optimal decision processes and hence should lead to sup-optimal financial decisions. In this group I would place: hot hand fallacy, anchoring, framing and mental accounting, labeling, non-linear interpretation of news, hindsight (with its subcategories related to actions and non-actions and close misses has for example negative impact since it encourages us to use dollar-cost-averaging).

In the second group we find those biases from which the impact is less clear, such as: non-linear appreciation of probabilities and loss aversion. The herding effect is maybe a class apart since it creates its own market dynamics, as will be discussed in chapter 4.1.

3.4   Conclusions

Well, it might have come as a shock, but we, homo sapiens, are much less rational than we would expect (or like to think). We perceive the reality distorted, our brain adds information and interprets this distorted reality in a biased way, our intelligence is driven by heuristics that deviate strongly from the rational. This makes us to what we are behavioral beings: humans and not rational machines.

It can be expected that when all these behavioral beings meet together in the marketplace (financial markets for example), irrational behavior of the market would result. Also this is supported by numerous scientific researches. We can conclude that financial markets are not rational, and hence not efficient, and that the needs of it actors are not necessarily rational either. We need another approach for decision making, investing, advising, etc.
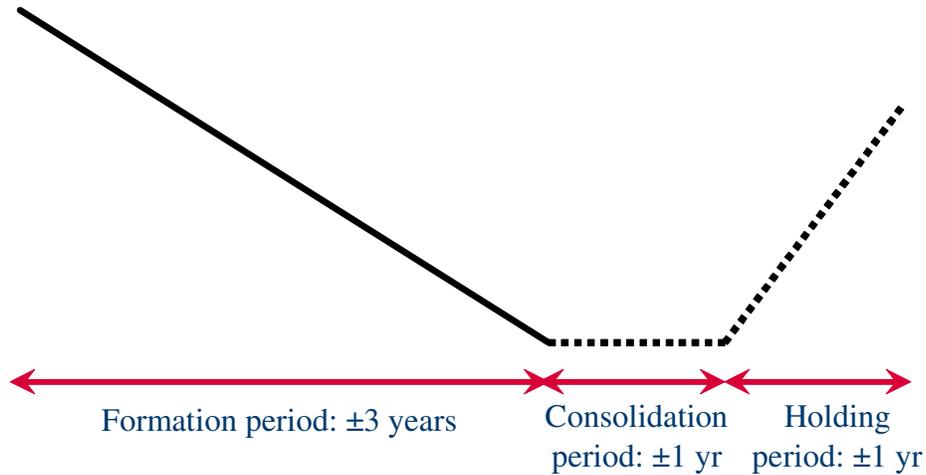
4   Applications on Financial Decisions

4.1   Portfolio Management

Assuming the behavioural biases from chapter 3, this should lead to patterns in financial markets that are not completely random. Generally speaking, if investors behave like herds, and once (overconfidently) a direction chosen, they will disregard disconfirming evidence and this should lead to a trend in the market. But on the long run these trends (even if initially correct) will pass beyond the real price, and the pattern should revert.

So, assuming behavioural investors this should lead to non-efficient markets with trending patterns on the short run and mean reverting patterns on the long run. This is indeed what academic research suggests.

4.1.1   Trading Patterns on Stocks

The first pattern recognized was the mean reverting pattern (De Bondt and Thaler, 1985).

Formation period: ±3 years   Consolidation   Holding
                                     period: ±1 yr   period: ±1 yr

Figure 5. A scheme representing the mean reverting behaviour of financial markets.

The second pattern was discovered by Rouwenhorst (1998). He found the causal element of the mean reverting pattern: the trend.

Formation period: 9 à 12 months   Holding period: ±6
                                              months
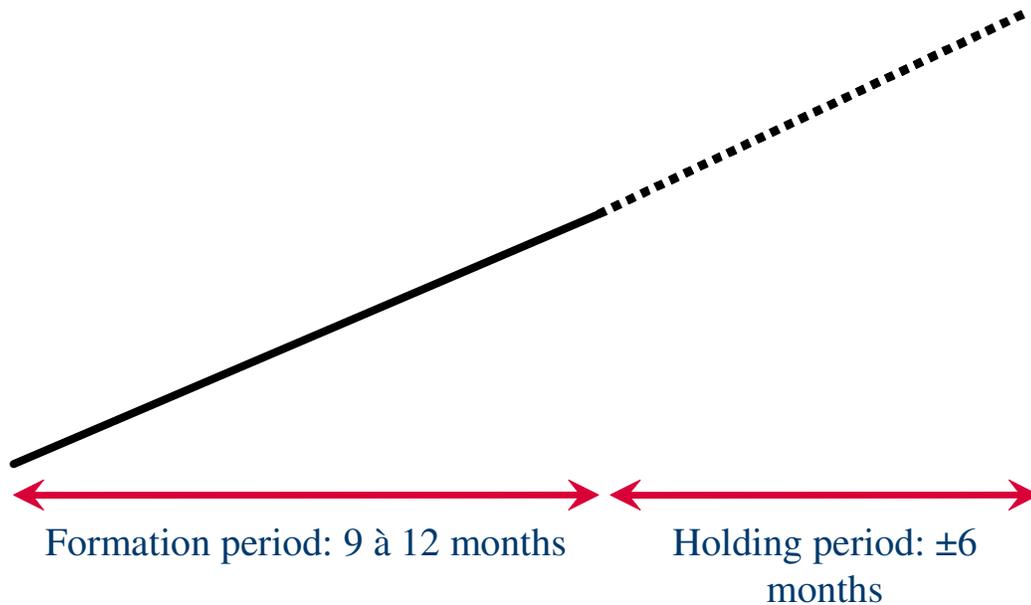
Figure 6. Rouwenhorst (1998) found that if a stock increases during 3 to 4 quarters, that it has a higher probability to continue to increase the next half year.

Different studies revealed similar results on historical financial data. Even some academic attempts on constructing portfolios out of such trends or reverting patterns were successful.

4.1.2   Portfolio Construction

This academic research has lead to the conviction that it should be possible to beat the markets by exploiting the cognitive biases in human nature. Some research even suggested to the possibility to build portfolios that would systematically beat the markets, by using some simple heuristics.

Cumulative Average Residuals for Winner and Loser
Portfolios of 35 Stocks (1–60 months into the test period)
Cumulative abnormal returns for two portfolios, one consisting of past losers and the other consisting of past winners. Past losers subsequently outperform, while past winners subsequently underperform.
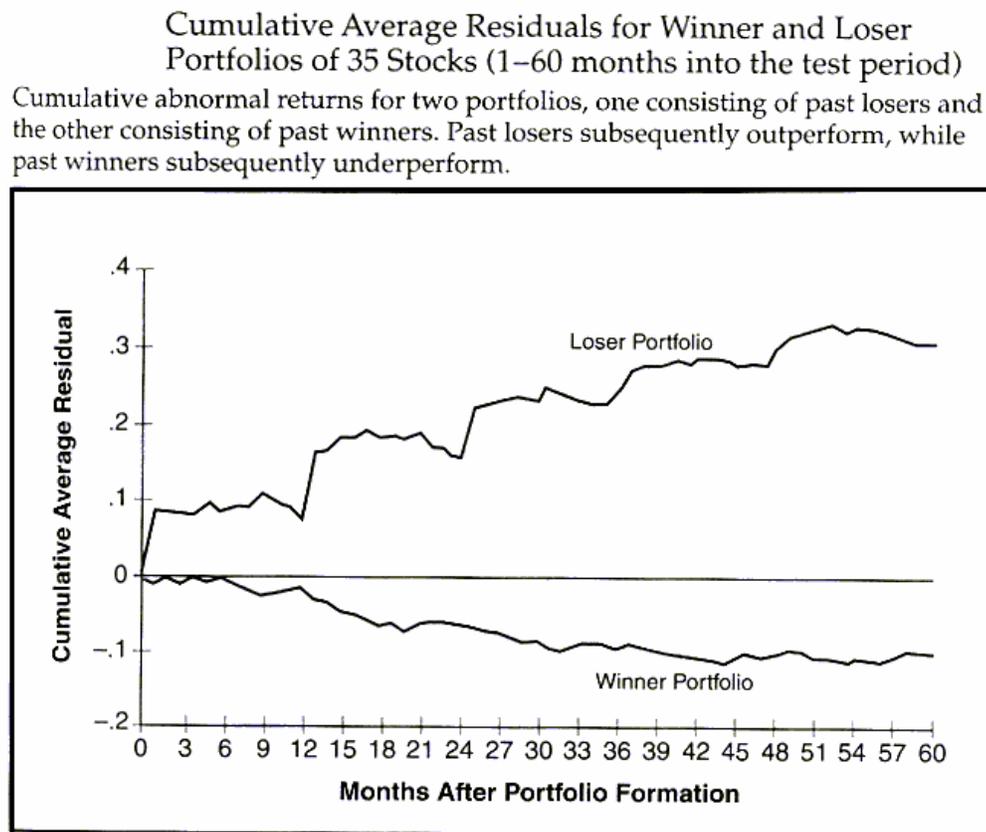
Figure 7. A fragment from the book of Hersh Sheffrin (p. 35) displaying the effect of selecting a portfolio of losers (stocks that underperformed) and winners (stocks that performed better than average).

This research for example inspired ABN to set up a "Behavioural Finance Fund". The investment process was based on the postulation that return could be explained as the sum of market return and excess return[5]; and that the excess return is composed of the

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[5] I would be very careful with using such postulation. This is of course true, but the causal logic is not always clear. It can be that the performance of individual stocks is driven by the market, but in some

weighted sum of image effect (value ratios), overrraction (price reversal / last months return), underreaction (momentum / 12 month return) and overconfidence (revisions).

The result was a disaster, and the fund was absorbed by the "European Equity Growth Fund" after two years and 4 months existance.
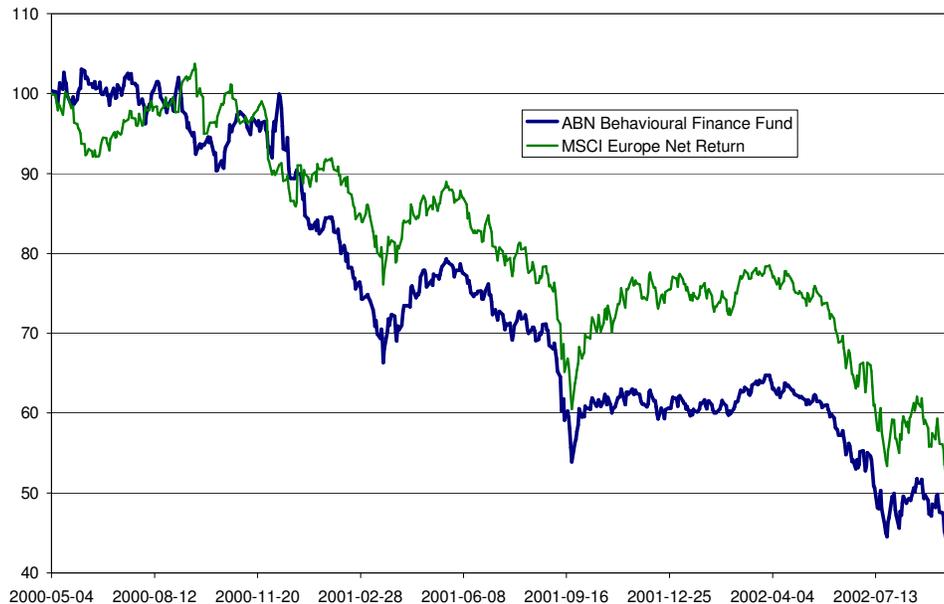
Figure 8. The performance of a "behavioural finance fund" and its benchmark. After 2 years and 4 months the fund was merged into another one, and the "experiment" was closed.

Already during the IMR behavioral finance conference in London in April 2001, I argued with them that the investment policy of the fund was rather an example of displaying behavioral biases.

Some problems were that:

- I would classify the postulation mentioned (the assumption about the mechanism of the price of a stock) as a very overconfident. For example,

  - it is a selection of biases (why are we sure to have selected the right ones?);

  - the parameters used to account for the bias could be one indication, but I would not be so sure that they are a unique, sufficient or even correct

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situations it might well be that markets are driven by the variations in individual stocks. In the later case, we will not be able to predict the movement of the stock by this formula. This is like steering a boat by looking at its bow (and not using the compass).

indicator. Assuming this without further research can only be done by the very confident;

- this model implies that the market is driven only by cognitive biases, I have never seen conclusive evidence about this and I would not be confident enough to postulate this.

- The world is complex, and the very popular method of adding variables of different dimensions by a scaling factor is not a good method, but the rest of the herd uses it (for example questionnaires to determine risk profile). This indicates overconfidence in believing that we found the good method.

- Confirming bias could found in the fact that the mechanism of the investment philosophy was back-tested out of sample; and that this was interpreted as evidence that it would continue to work.

- Framing is in the fact that the model will explain stock returns only by market and cognitive biases. This is remarkable, since all individual stocks compose the market, and hence the only driver recognized is the behavioral bias. This simple fact indicates that we are operating in a very narrow frame.

So, it might be clear that even if we theoretically know what kind of biases our mind has, that we will not avoid that our mind functions like that. Very much like visual biases, even if we know that they exist, our mind will still adapt the objective information from our eyes in the same consistent (biased) way. Please have another look at figure 1 and 2, the left line still seems longer, and the black dots still appear on the crossings of the gray.

4.2   Individual Investors

In previous chapter, we have seen that even for seasoned asset managers, it is (right now) not really possible to get a consistent outperformance by trading against the biases of our minds in the stock market. So there is no reason why the individual investor should even try[6]. There are for sure nicer ways to loose money.

For any investor the major question is to get the strategic asset allocation right (see for example Statman Meir, 2000). Strategic asset allocation refers to choosing the asset

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[6] Except You of course, but don't forget what the first, most outstanding and best documented bias is!

classes[7] and their relative weights in your portfolio. The strategic asset allocation explains (depending on the study) 91.7 to 93.6% of all variance of a financial portfolio invested in liquid, financial assets[8]. This means that the remaining 6 to 8% accounts for tactical asset allocation, stock picking, market timing, manager, style, active or passive, influence of costs, etc.

4.2.1   <u>Portfolio Construction</u>

Taking previous remarks into account, constructing a portfolio is in the first place constructing a benchmark (reference portfolio) that reflects the strategic asset allocation.

Since 1952, we have Harry Markowicz' theory about Portfolio Selection. It is a consistent theory on how to select an optimal portfolio. An essential element in this theory is to consider all elements of your portfolio and take into account correlations among them. This will indeed lead to a portfolio that is from a mathematical point of view optimal, but it will not be really adapted to its owner.

Persons tend to suffer from framing, and therefore they need mental accounts in order to understand it and feel comfortable. Already very long time, we have special savings accounts for pensions, studies of children, etc. All these savings belong to us, and in our mind they are separated portfolio's: mental accounts.

Just as in Maslow's Humanistic Psychology (1970) the hierarchy of needs is described by the Pyramid of Needs, in Behavioural Finance the composition of a portfolio is explained by a similar hierarchy of needs. Both hierarchies are of striking similarity, and Maslow's more general theory can explain our hierarchy of portfolios.

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[7] As asset classes should be understood: cash, equities, bonds, real estate, etc.

[8] Even if most authors do not make this remark, it is rather essential. Humans (unlike corporates) have a finite life, have other basic needs (cf. for example the need pyramid of Maslow), and we have (hopefully) at the end of our life a period of inactivity. This results in the need to invest for example also in real estate (i.e. having a place to live in), and not all our assets should be allocated to financial investments!
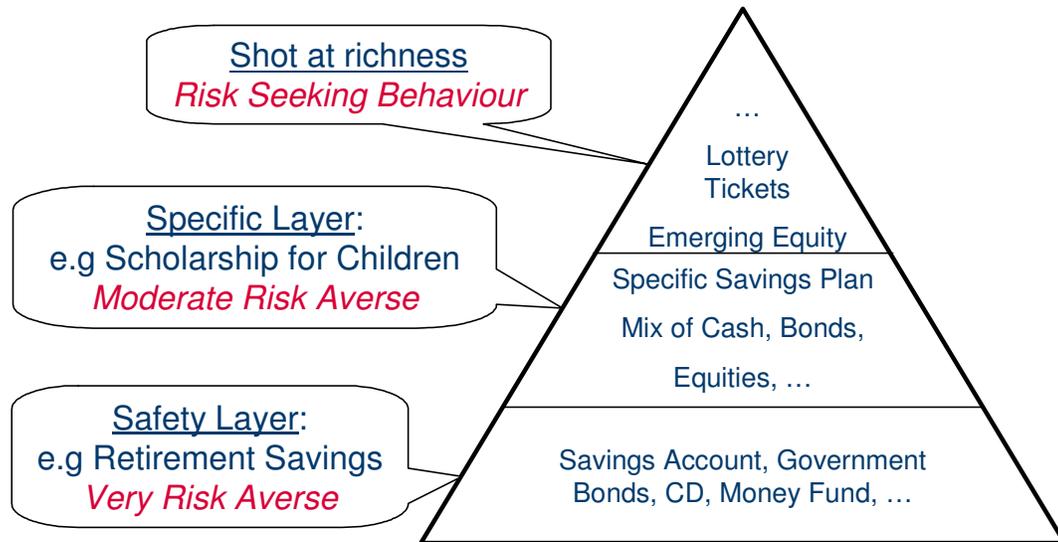
Figure 9. The composition of a "behavioural" portfolio, or how a normal person approaches his money as it is usually presented.

Comparing this with Maslow's hierarchy of needs, the similarity is striking. I propose to even go further and try to have a complete match of both.

Maslow's Level of Need	Mental Account in Behavioural Portfolio	Method	Risk appetite
Self actualisation	Shot at richness	Own trading account, …	Very Dynamic to risk seeking
Esteem	Specific layer	Special Investment funds, own account	Dynamic
Love	Specific layer	Basic Investment Funds and accounts for children	Defensive
Safety needs	Safety layer	Pension schemes, deposits, cash funds, …	Very defensive
Physiological needs	Consuming + first house → no liquid investments	n/a	Risk avoidance

Table 1. A proposition to match the needs for a financial portfolio with the Levels of Needs that were introduced by Maslow.

4.2.2   Advice

The behavioural biases discussed above, seem to be weaknesses when making decisions on stock markets. However these biases have proven to be essential strong points in the development of mankind. Without a solid dose of overconfidence, extrapolation, etc. no one would ever try to understand the world and make scientific progress nor would anyone dare to start up a factory. Without these biases, mankind would have a civilisation comparable to that of animals. This is because we would never dare to use our true brainpower (no overconfidence), we would get stuck in too large and complex problems (no overlooking of correlations), we would not see simple mechanisms (no extrapolation when it is statistically irrelevant), etc.

The only problem is that these biases, that served their purpose during thousands of years, are not that well adapted to decision making on stock markets as we know them the last few hundred years.

Asset managers have already tried to exploit Behavioural Finance to trade against these biases and make more money. But what seemed to be an easy conquest turned out to be a Hanibal's trip over the Alps. However it is possible to use this knowledge to advice investors and strengthen our decision process. The first step in making better decisions is to recognize the presence of heuristics and the cognitive biases on which they are based.

- Know that you are overconfident, so if you feel sure, then take into account that you can be wrong. In other words: know what you don't know; and be prepared to be surprised[9].

- Among what we know most things are just believes, some are true and some not. We should be open for disconfirming evidence.

- Avoid narrow framing; look at the same problem through different angles. Another frame can give other insight. Try to see the whole picture. Select always a larger frame if possible; and try to overlook the whole picture when dealing with lots of sub-problems.

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[9] The next year's winning asset lass is likely to surprise you, but a well diversified portfolio over all asset classes (and eventually managed in mental accounts according to different levels of needs) is very probable to protect you from major disappointment.

- And if that does not work … Create mental accounts, in order to solve the problem, but give it a try to look back and oversee the whole picture.

- Try to see the connection (correlation) between different problems/decisions.

- Try not to over- or under-react to any information. Especially look for evidence and news that does contradict your believes. Dare to review your opinion.

- Try to understand the true value of information, avoid extrapolation. (If stock A has been performing better than stock B for the last 4 year, this is no evidence to predict year 5); nor is the performance of the few good funds indicative for the market.

- Avoid self-serving explanations: be aware of the extrapolation effect, and accept that you make errors and try to learn from them.

5 Research Related Issues

5.1 Suggestions for Further Research

1. How to determine the strategic asset allocation for each of the shelves in the behavioural portfolio? Precautions to use questionnaires and their potential dangers.

2. After the research of Barber et al. about the effect of overconfidence on portfolio performance, the effect of other cognitive biases on performance is still largely unexplored. This is essential research in order to advice.

3. More concretely, it would be interesting to study the effect of the advice of the broker's advice in the research of Barber et al.

5.2 Original contributions in this paper

1. The proposition to match behavioural portfolio theory and Maslow's hierarchy of needs, and the proposition about how to match them (see 4.2.1)

2. Adding to the research of Barber and Odean (2001) the element to compare the performance of each decision on the two considered classes of persons. (see 3.3)

3. Critics on the behavioural finance funds (see 4.1.2)

4. Interpretations about the usefulness of cognitive biases. (see 3.2)

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