Original Article

Target-oriented investment advice

Received (in revised form): 19th March 2011

Philippe J.S. De Brouwer

has studied both Theoretical Physics and Applied Economy. He stood at the cradle of structured funds in Belgium and Poland, where he also merged four asset management companies, and was for many years the CEO of KBC TFI. He is currently director and member of the Board in Eperon Asset Management, another company in KBC group, and – among many other responsibilities – he oversees the management of about 1000 investment funds totalling more than €20 billion.

Correspondence: Philippe J.S. De Brouwer, Vrije Universiteit Brussel, Pleinlaan 2, Elsene 1050, Belgium
E-mail: philippe@de-brouwer.com

ABSTRACT This article puts investments in the perceptive of the investor: investments are no goal in itself, but serve a purpose. Using this perspective, it aims to present concrete recommendations to individual investors and investment advisers about which portfolios should be held by private persons and how to construct these portfolios. Starting from the theoretical foundations that are based on the 'Hierarchy of Human Needs' (as proposed by A.H. Maslow in 1943), this article suggests to segregate portfolios into multiple sub-portfolios that each cater for a specific need. This postulation is then integrated with other key observations into a comprehensive, positive and normative portfolio theory. The result is a complete framework for personal financial decision making that is natural and helpful for both advisers and investors, and it integrates financial investments in an optimization of overall well-being.

Journal of Asset Management advance online publication, 30 June 2011; doi:10.1057/jam.2011.31

Keywords: portfolio choice; portfolio selection; personal financial decision making; portfolio theory; Maslowian portfolio theory

INTRODUCTION

Mental Accounting in personal financial planning has gained much interest since the formulation of behavioural portfolio theory by Shefrin and Statman (2000). For example, Das *et al* (2010) study the mean-variance optimization in a mental accounting framework and Amenc *et al* (2009) make a case for an asset-liability management approach for private investors.

Behavioural Finance used insights from psychology as main ingredients for theories about dynamics in economy and financial markets. This interdisciplinary approach was successful in explaining different phenomena observed in human decision making under uncertainty. However, it did not (yet) give rise to new normative theories about how investors *should* compose portfolios. Hence, the dominant normative portfolio theories are still those that were developed during the 1950s and 1960s.

This article presents a new approach based on the so-called *Maslowian portfolio theory* (henceforth MaPT – see De Brouwer, 2009), which might be very promising in designing a new normative framework that is both rational and compatible with framing and behavioural portfolio theory (see Shefrin and Statman 2000). This article will build on MaPT to create a new normative portfolio theory, called *target-oriented investment advice* (henceforth TOIA), which is directly applicable as a decision framework for investment advisers and private investors. This article argues that MaPT implies directly

an approach in which the investment target is the decisive parameter to select an investment portfolio. Doing so, one creates a portfolio that is fragmented as behavioural portfolio theory describes. However, TOIA is based on human needs and therefore has a strong claim of being prescriptive and not only descriptive.

This new approach might be able to create a new paradigm in investment advice that has many advantages and above all will reduce disappointment and weaken waves of panic and greed by providing a framework that tempers the impact of emotions on financial decisions. This approach mitigates the behavioural biases that tend to decrease the performance of people's investment portfolios. When widely applied, it might not only benefit the individual, but also the whole community by reducing the amplitude of bubbles and crashes.

MASLOW, FRAMING AND INVESTMENT TARGETS

MaPT is a normative theory based on the 'Hierarchy of Human Needs Theory', as developed by Maslow (1943). The key idea is very simple: start from the theory about hierarchy of needs and check what financial needs should be covered by each need level.

The idea was first mentioned by De Brouwer (2006) and further developed by De Brouwer (2009). The main thesis is that one should think of financial investments as layered portfolios that each cater for a specific need level. The approach could be summarized as follows. Start with the lowest (most urgent) need levels and once a need level is satisfied start working on the next one. The main steps of MaPT are as follows:

1. *Physiological needs*: Make sure to have enough cash at all times to acquire basic items such as food and beverages. Probably the best solution is to make sure that the investor keeps a cash buffer.
2. *Safety needs*: Make sure that the previous needs are not in danger at any time in the future. To satisfy this need level, one should seek to insure income, have retirement savings and so on.
3. *Love/belonging needs*: Here one finds multiple projects for different goals related to loved ones (partner, children, grandchildren and so on).
4. *Esteem needs*: Depending on the individual, esteem needs can (and often do) include projects that require extensive financial resources (yacht, car, second house and so on) or even money itself can be a source of esteem.
5. *Self-actualization*: This need level is a B-level and not a D-level such as all previous ones (terminology of A.H. Maslow, 1954), and the complete fulfilment of this level is generally not something that can be bought. Maslow mentions that in this need level one will find, for example, search for truth, religious interest and artistic expressions. In many cases, money will be an important tool to realize the project(s) of this need level. It is even possible that managing one's own portfolio and trying to vanquish peers or benchmark could be a way to realize self-actualization.

It is interesting to note that Maslow's approach to human needs is actually a monumental example of 'framing', as described by Tversky and Kahneman (1981). The fact that people focus on one need at a time as a fundamental motivational heuristic is the root of framing in financial decision making. Therefore, one could argue that framing was already described by A.H. Maslow in 1943.

Maslow's ideas are not without critics. Kenrick *et al* (2010) propose a complete renovation of the pyramid of hierarchy of needs from an evolutionary psychology point of view, and there are many more remarks to be made. However – as shown by De Brouwer (2011) – all these alternative theories have in common that they heavily

rely on the framing heuristic. Therefore, the key idea of MaPT – that investments have to sub-divided into mental accounts in order to be linked to investment goals – remains valid.

Although some critics of Maslow point to the fact that the hierarchy of human needs is not that strict, it is necessary to foresee sufficient flexibility in any normative portfolio theory. In TOIA, in particular, we suggest to use an iterative approach as illustrated in Figures 2 and 3, as opposed to a strict order of needs and projects.

TARGET-ORIENTED INVESTMENT ADVICE

On the basis of MaPT, we want to put forward a new approach to investment advice: TOIA. The main idea is that investments should primarily be chosen in function of the investment goals. Consequently, an 'optimal portfolio' consists of multiple ring-fenced sub-portfolios that each cater for a specific need or target.

Typically, each sub-portfolio will have different risk and return characteristics, constraints and goals. The risk profile is determined by the investment characteristics such as investment horizon and the importance of the goal and the degrees of freedom of the project. Only in some cases the psychology of the investor will play a (secondary) role.

As illustrated in Figure 1, TOIA is based on different existing theories. The complete theory consists of three essential constituents:

1. *MaPT De Brouwer (2009)*: People can increase overall well-being by accessing higher need levels, as explained in the theory of Hierarchy of Human Needs Maslow (1943). Financial investments should follow the priorities of life, adequate financial portfolios for private persons are composed of multiple sub-portfolios, each linked to a separate goal (and these goals are grouped in need levels). In other words, *overall well-being is the Holy Grail*. Financial investments are an important tool in increasing this well-being but are not a goal that exists in itself.
2. *Safety First Roy (1952)*: Roy's Safety-First approach Roy (1952) – henceforth SF – points to the importance of taking the investment goals explicitly into account when optimizing a portfolio. However, it is important to note that this method in itself does not lead to a correct approach. SF implies working with the quantile – which is the same as VaR (value at risk) – and this is not a coherent risk measure: it can lead to counter-intuitive results and does not ensure that the risk surface is convex, thus allowing for multiple local minima. The solution is to work with a coherent risk measure. For example, Markowitz (1959)[1] suggests semi-variance, and De Brouwer (2011) uses expected shortfall (henceforth ES). Both solutions seem to be practically applicable for TOIA, because both allow to include explicitly an aspiration level. The main difference is that ES can focus on the tail of the distribution. The SF approach is also in many aspects an ancestor to SP/A theory of Lopez (1987), which is in turn a predecessor to behavioural portfolio theory of Shefrin and Statman (2000).
3. *Customary wealth theory Markowitz (1952b)*: Reflecting on MaPT, one can conclude that because financial investments are a tool in optimizing overall well-being, the utility function changes over time. However, this was first

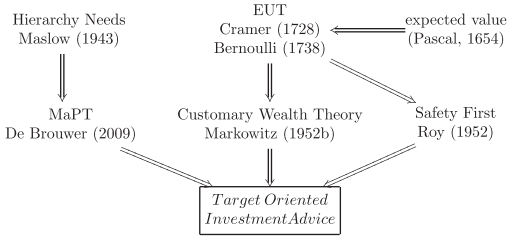

Figure 1: Milestones that allowed the formulation of TOIA. The arrows represent the logical connections between theories.

noted by Markowitz. The genius of Markowitz' seminal paper lies herein that he accepts a utility function to vary over time. His key idea is that one gets used to new levels of wealth and that consequently the utility function[2] would always be 'centred' in the actual wealth level. Combining the insights from customary wealth theory and MaPT, one will understand that this is how it should be. Needs change as life unfolds and financial investments *should* follow these changing needs.[3]

Summary of TOIA

To summarize, TOIA is the stance where

1. we subscribe to MaPT and emphasize that money is not a goal in itself, but serves other purposes, and hence allocate a separate portfolio to each investment target (this portfolio will have its own risk profile, and hence the overall 'risk profile of the investor' – if at all definable in scientific way – plays no more than a secondary role);
2. we use MaPT as a guide that helps to identify the investor's goals; however, this is only a guide – not a straitjacket – and people must be allowed to review and re-think targets based on a total overview, as presented in Figures 2 and 3;

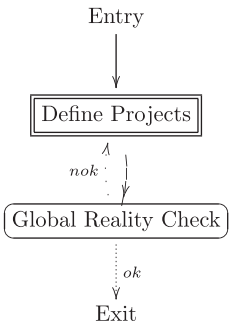

Figure 2: The basic scheme to get a set of realistic investment projects in appropriate proportions. The important 'Define Projects' block is detailed further in Figure 3.

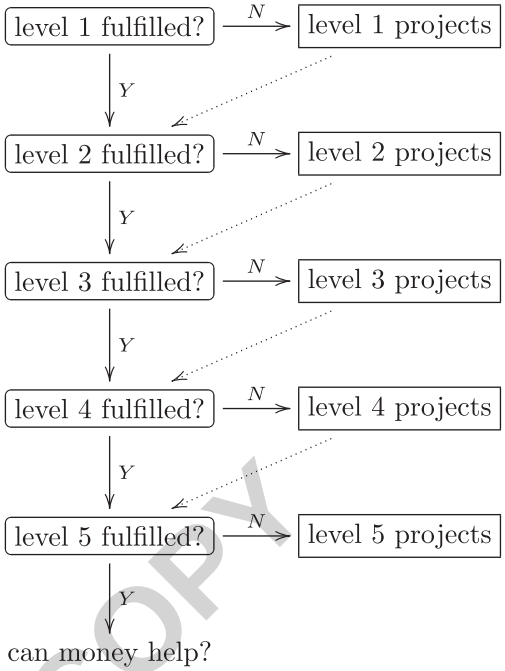

Figure 3: A typical scheme to define all projects for all need levels, starting from the lowest and most urgent needs, and then working up towards the higher needs. The dotted lines are to be followed after the fulfilment of the needs of the relevant level, if resources are still left to the investor. This figure is a detail of the important step 'Define Projects' in Figure 2.

3. portfolio optimization is done for each goal separately and with the investment goal in mind, therefore, if we use a risk-reward optimization,we will use a coherent risk measure that is able to focus on the tail-risk or – if we use a utility function – the utility will depend on the different investment targets separately (as an investment target as in an asset-liability approach);
4. the investor will have to update his or her financial plan on a regular basis (every few years) in order to keep it in line with the driving force: his or her life goals and resources;
5. the investment advice focusses on the parsimonious parameters of each mental account, and hence the main purpose is to present a strategic asset allocation; TOIA does not really try to give an answer to secondary questions, such as investment style (growth or value), active or passive management and so on.[4]

NEED LEVEL-SPECIFIC ADVICE

In a first approach, one could just go through all the need levels of the Hierarchy of Human Needs, and allocate resources starting from the most basic needs. As resources are limited, one will want to allocate as few as possible to a certain need, because remaining financial resources can be used to satisfy higher needs and hence increase overall well-being.

As mentioned in previous section, human needs are less hierarchical as Maslow's scheme would suggest. Therefore, we propose a scheme – as presented in Figure 2 – that allows for ample flexibility, but choose to keep Maslow's framework as a guideline to help find common language between investor and advisor, and to offer a framework that help investors to identify projects.

Level 1: Physiological needs

To sustain physiological needs, it is essential to keep the most vital life functions secured. Therefore, one must take care to have sufficient cash to pay for food and shelter, for example.

A simple way to satisfy this need is to cover current expenses from the current income via a buffer in cash. This buffer should be available on very short notice to cover foreseeable expenses such as food, shelter, clothing, but also unexpected expenses such as urgent hospitalization, important travel or work interruption for important family reasons and so on.

Keeping a multiple (such as 3) of the monthly income from labour would be a good rule of thumb. For example, if there is no income from labour, a 6-month rent value of the main residence could be another rule of thumb. The exact number in this paragraph is not crucial, but the importance lies herein that we have a portfolio set apart that would be able to cover most eventualities, and whose level is somehow linked to the life standard.

This, however, uses an major assumption. We assume here that the regular expenses are lower than the regular income. If a person does not have enough savings to survive on and must rely on income from labour, then the first and foremost thing to do here is to create a positive balance of the regular income flow, so that income is higher than expenses.

If we feel confident to have this basic stock of cash available on a sustainable base, then we can move on to the next level.

Level 2: Safety needs

The challenge here is more diffuse and complex. Safety needs should be understood as referring to a reasonably safe fulfilment of the physiological needs in a foreseeable future. These abstract provisions are the answer to a real need and they contribute to a feeling of safety.

The following are the important needs to be covered:

- *Retirement* – The state will in certain countries and population groups take care of a basic income during retirement. It is important to note that there are generally some exceptions in these systems, and that they might not be sufficient. One also has to consider that laws and policies can change. For all these reasons, any personal financial plan should include retirement savings.
- *Real estate* – Owning a place to live should be an important goal in life. At retirement, generally, the income drops to lower levels (even to zero), and it might be hard to fund rent from this source. Owning a place to live assures that some of the most basic needs will be fulfiled, leaving more room for other needs. If the investor is not yet able to buy his or her own real estate, it is recommendable to set aside a separate portfolio that will aid the purchase in the future.

  One can generally trust his or her ability to generate future income and does not

need to rely solely on investment return. A safe investment profile that has a high probability to recover from any drawdown in 1–3 years is a good option here. Collective investment schemes investing in real estate are a good choice as they match the goal very well.

- *Loss of the ability to generate income from labour* – If one has a modest capital, it is not possible to cover this risk by savings alone, then one must buy an insurance. The same remarks about the provisions made by the state hold here as well for retirement.
- *Unforeseen expenses* – In addition to the above mentioned investments, one might want to keep a special portfolio for unforeseen expenses: hospitalization, a fine, a period of unemployment and so on. Also here a simple, liquid and safe portfolio is highly advisable.

Retirement savings are a well-defined investment problem. The target can be an amount at retirement or from that moment on a regular income, and the investment horizon is each month exactly 1 month shorter.

Ensuring income when the regular income stream stops owing to unfortunate fate (incapability to work, business that fails and so on) is more complex. It might not be possible to provide this safety via investments. There are two possibilities (of course with many degrees of mixing both):

1. the investor has sufficient savings available;
2. the investor has no savings available.

In the first case, it would make sense to create a portfolio in order to cover for the risk of losing the regular income. In the second case, when no significant investments are available, this is not possible. The way out is buying an insurance that covers the risk of being left without income. Even in the first case, it can make sense to buy an insurance (even if the expected return of an insurance is negative[5]). Buying an insurance can increase total well-being because it frees resources that can be used to satisfy higher need levels.

The same reasoning is valid for other insurances to cover large but important unlucky events, such as: hospitalization, loss of real estate owing to disaster, theft of valuables and so on. However, one will notice that the importance of an insurance fades as the value of the insured risk cover becomes 'relatively small' for the insurance buyer. Once the insurance buyer is able to cover the risk himself from other holdings or savings and the covered risk is not a very big part of his holdings, then it might be rational not to buy any insurance.[6]

When the needs of the safety level are covered, it is safe to investigate the third level.

Level 3: Love/belonging needs

Here we enter the domain of very interesting investment problems, where asset managers and financial advisers of all kinds are active and can bring the most added value.

Typical examples are: financing the studies of a child, providing a certain amount of money for the child to start its own business (or provide a certain sum at the occasion of marriage), leaving a certain heritage, depositing a nice amount for a good cause (charity), making sure that close relatives have enough to live decently when one suddenly stops generating income and so on.

In this need level, it is very clear that priorities and goals in life change. It can be expected that appearing, changing and disappearing goals will need to be matched by different sub-portfolios.

As Markowitz pointed out in his customary wealth theory Markowitz (1952b), one gets used to any level of wealth. Therefore, a rich person will set higher goals in absolute numbers. However, generally, one can expect that a rich person might be able to define more investment goals.

The investment problems from the level of love needs seem to break down to a limited number of generic investment problems:

1. *Gather an amount V_1 in a time t_1*: Examples include donating to a child an amount of money in a certain period of time, making a donation at retirement and so on.
2. *Spend an amount C_t from t_1 till t_2*, so that at t_2 the value of the portfolio is not below zero: $V(t_2) \geqslant 0$; (with t_1 in the future and $t_1 < t_2$). Examples include financing the studies for a child, surviving a period of unemployment with the whole family, co-financing a handicapped relative for a certain (or less certain) period of time, helping children in the third world and so on.

The first type of investment problem is the most straightforward and its formulation is very close to the formulation of a typical SF investment problem.

The second type of investment problems (the 'financing studies' investment problem) can in a first phase be approached in the same way. The safe value of the portfolio at t_1 is simply the sum of all cash flows needed between t_1 and t_2. This is an unnecessarily strict constraint, because investments can still earn money after t_1. More complex methods might take this into account.

Level 4: Esteem needs

The fulfilment of this need level is very individual. One can draw fulfilment of the esteem needs from different sources. In some cases, one might want to buy something that is the source of esteem (a yacht, a special trip/expedition, a cottage and so on) or money is needed to fulfil the goal (gear to make an expedition, for example). In one particular case, fulfilment of this need level can be drawn directly from owning money itself.

Despite the wide range of possibilities of individual goals, one will notice that the investment problems that play a role are quite simple.

1. *Gather and amount V_1 at time t_1*: This investment problem is very similar to the previous, and is a formulation that leads directly to the Tesler generalization of a SF portfolio.
2. *Gather V_1 as soon as possible*: Nevertheless, the constraints are the same, although the problem will need a different approach.
3. *Maximize $V(t_1)$ … but be careful*: This is the investment problem that arises if money itself is the source to gain esteem. The constraints are quite vague and even if one can formulate it as an SF problem, this is not necessarily the only way to formulate it. Certainly, depending on the specific case and the specific goals and desires of the investor, other methods can be used as well. One can, for example, use SF, the Tesler generalization of SF, MPT, CAPM and many variations. The exact formulation of the problem can be: protect capital, grow capital safely, or even grow capital by taking some risks. The psychology of the investor becomes important to determine the exact nature of the investment problem.

The target is (very) flexible. For example, a yacht might cost €4 million or €8 million, and both might suit the investor quite well. Whereas in previous need levels this fuzziness was linked to objective parameters (can we save some more, can we spend each month of studies somewhat less, we can choose for a cheaper school and so on), here we find this fuzziness linked to the preferences of the investor him- or herself.

Level 5: Need for self-actualization

The search for self-actualization will generally show some independence from money. However, one can imagine cases where money becomes an important tool in the fulfilment of the self-actualization needs. Examples include: owning an art collection,

financing charity, undertaking an expedition, trip with space shuttle, record attempts … or finding pleasure and satisfaction from managing one's own portfolio.

All these investment problems are formulated in the same way as those from the previous need level except the last one in that list. When one finds self-actualization by managing his or her own portfolio and competing with the most experienced professionals, then we have an investment problem of a totally different nature.

There are no boundaries or targets, nor is there an investment problem that an advisor can pull together. The investor needs to make all decisions him- or herself in order to gain from it the satisfaction of being a good portfolio manager.

Whereas for all previous need levels the rational choice would be to get a managed portfolio (via an investment fund for example), here collective portfolios are generally no option. The investor will have to open his or her own trading account and make his or her own decisions.

Often, people who do so prefer not to set themselves an objective and testable benchmark beforehand. In order to increase happiness, it is more comfortable to allow the behavioural biases to govern. A good dose of self-serving bias will feed overconfidence, which will then become a source of happiness and self-esteem for that person.

FURTHER RESEARCH: OPTIMAL PORTFOLIOS

This article focusses on TOIA, its practical implementation and its reason to exist. There is, however, still a last step to be made in order to recommend a portfolio: finding the optimal portfolio composition in terms of investable assets. It is beyond the scope of this article to present a complete solution here, but we believe that it is useful to present the main idea in this chapter.

If we would strictly follow the hierarchy imposed by MaPT, then this problem would be solved by finding an optimal portfolio for each need level. Each sub-portfolio could then be optimized using an existing selection portfolio method. This approach, however, fails to cover a few phenomena that are of importance in practice. First, there can be multiple goals within one need level (and hence are of similar importance), and second the hierarchy is not absolute.

Chapter 4 shows that most investment problems are posed in similar terms as the SF theory. In the first approach, we focus on these portfolios, and remind that in Roy's SF theory portfolios are optimized by minimizing the probability that the wealth (W) ends up below a certain subsistence threshold (W_s).

$$\min\{P(W < W_s)\} \tag{1}$$

Equation 1 is equivalent to maximizing the complementary cumulative distribution function (which we will denote as $D_X(x)$): $\max\{D_W(W_s)\}$.

This approach fits in MaPT if one allows the aspiration level (A_i) for each sub-portfolio i to play the role of the subsistence level, and if we consider for each sub-portfolio the value of assets allocated to that sub-portfolio (V_i) instead of the total wealth W:

$$W = \sum_{i=1}^{N} V_i + \text{non-investable assets}$$

Implementing these alterations, we find that the ideal composition for sub-portfolio i is determined by $\min\{P(V_i < A_i)\}$. This in turn is equivalent to:

$$\max\{D_{V_i}(A_i)\}$$

This reasoning at the level of the sub-portfolio inspires us to write the overall expected utility in its most general form as:

$$EU_{\text{TOIA}} = U(D_{V_1}(A_1), D_{V_2}(A_2), \ldots D_{V_N}(A_N); t, \ldots) \tag{2}$$

where N denotes the number of sub-portfolios. The missing parameters should describe the (relative) importance of the different goals and the acceptable level of risk related to those investment targets.

The stochastic variables about which we can make some predictions are the returns of the sub-portfolios (R_i). Therefore, we have to rewrite the probability that V_i exceeds A_i in terms of R_i. If there are no cash flows during the investment period, this can be done by noting that $V_i(t) = V_i(0) + R_i$. Where $V_i(0)$ is the wealth allocated to sub-portfolio i at the moment of investment decision ($t = 0$).

$$D_{V_i}(A_i) = D_{R_i}(A_i - V_i(0)) \qquad (3)$$

Equation 2 is nevertheless too general, and it will be necessary to select a particular model. For example, one could consider the following form:

$$EU_{\text{TOIA}} = \prod_{i=1}^{N} [\gamma_i + \delta_i D_{R_i}(A_i)^{\varepsilon_i}] \qquad (4)$$

$$= \prod_{i=1}^{N} [\gamma_i + \delta_i D_{R_i}[A_i - V_i(0)]^{\varepsilon_i}] \qquad (5)$$

Where

- δ_i is the parameter that scales the relative importance of a certain investment target with aspiration level A_i on a certain time horizon.
- ε_i models the acceptable risk. For low ε_i, a level lower than A_i is acceptable; a high ε_i indicates that a result below the aspiration level is of little use.
- γ_i is a parameter that could be zero or one; its relevance lays herein that when γ_i equals zero, the total utility is zero without investments in that sub-portfolio. Therefore, $\gamma_i = 0$ for all essential portfolios that require a share of the first euro; and $\gamma_i > 0$ for all other sub-portfolios.

This utility function seems to catch some of the most essential aspects that TOIA would require: multiple needs are covered and we have a hierarchy, a relative importance and a level of acceptable risk. In addition, the utility function is automatically bound, and therefore avoids any problem with a St. Petersburg paradox. Indeed

$$\max\{U_{\text{TOIA}}\} = \prod_{i=1}^{N} [\gamma_i + \delta_i]$$

In order to solve the investment problem completely and find an optimal portfolio, it is useful to expand the expression of 5 in terms of the unknown variables that have to be identified. A possible way to do this is as follows:

$$\begin{cases} V &= \Sigma_{i=1}^{N} V_i \\ V_i &= \Sigma_{j=1}^{M} V_{ij} \\ &= V_i(0) + R_i \\ &= \frac{V_{ij}}{w_{ij}} \qquad (\text{for any } j) \\ R_i &= \Sigma_{j=1}^{M} w_{ij} R_j \end{cases}$$

With V the total value of assets to invest, V_i the value of the sub-portfolio i, V_{ij} the value invested in asset(class) j for sub-portfolio i, N the number of sub-portfolios and M the number of assets (or asset classes); and the return R is defined so that it is additive to the value of the portfolio (so in monetary terms, not in per cent) – in order to prepare mathematical treatment via as convolutions or comonotonic approximations. The parameters in function of which the expected utility should be optimized are $\boldsymbol{w}$ and $\mathbf{V}(0)$.

Example 1 In the particular case of a Gaussian distribution, this form reduces to

$$EU_{\text{TOIA-Gauss}} = \prod_{i=1}^{N} \left\{ \gamma_i + \delta_i \left[\frac{1}{2} erfc\left(\frac{A_i - V_i(0) - \mu_i}{\sqrt{2\sigma_i^2}} \right) \right]^{\varepsilon_i} \right\}$$

With $erfc(x) = 1 - erf(x) = 2/\sqrt{\pi} \times \int_x^{\infty} e^{-t^2}\, dt$, the complementary error function. The parameters $\mu_i = E[R_i]$

and $\sigma_i = \sqrt{\mathrm{VAR}(R_i)}$ are determined by the universe of acceptable investments; and the parameters that have to be filled out by studying the specific investment problem are: $\boldsymbol{\gamma}$, $\boldsymbol{\delta}$, $\boldsymbol{\varepsilon}$ and $\mathbf{A}$.

This preliminary analysis is only an introduction to the subject. Essential questions are still open, and much work has to be done before the solutions can be implemented in everyday practice.

The presented formalism is of simplified case, which makes a few important assumptions. For example, we assume that there is only consumption at the end of the investment. Its importance lies herein that it shows that it is possible that TOIA can be optimal for expected utility maximizers.

This mathematical framework – despite of its theoretical appeal – is unlikely to be practically applicable. It seems to make much more sense to use a risk-reward optimization (similar to what is proposed by Markowitz (1952a)). De Brouwer (2011), for example, uses ES (a coherent risk measure in the definition of Artzner *et al*, 1997 and Artzner *et al*, 1997) in a multiple mental account framework.

CONCLUSIONS

In a very natural way, via MaPT, we were able to describe different portfolios that would cover the needs of almost all private investors. We have found that one person should hold *multiple ring-fenced sub-portfolios* that each cover a specific need. In other words, the portfolios are *need based* and are not based on a hypothetical risk profile linked to the investor.

The main reason for a portfolio to exist is its goal. To some degree, personal preferences and risk tolerance become more important in the higher need levels, but up to and including the love needs the portfolios are basically determined by the need that they cover and its objective parameters.[7]

Our approach is target oriented instead of risk-profile oriented. The psychological risk profile of the investor is only a secondary consideration in some of the sub-portfolios that cover the highest need categories. Therefore, we refer to this approach as TOIA.[8]

In TOIA, financial plans are rather an instrument than a goal in itself; the purpose they serve is overall well-being. They should seamlessly fit into the life that the investor is living, and as things change in life, financial plans should fit the priorities of life.

An investment without a target is like a ship without a compass lost in the ocean, and chances are that the outcome will be disappointing for the crew and ship owner. TOIA provides the advisor with the necessary tools to communicate with the investor in order to identify goals, and creates for the investor an opportunity to test the realization of his or her goals. In addition to this consideration, there are many advantages and disadvantages related to TOIA. We list them below.

Disadvantages of TOIA

- TOIA is not promoting the *transaction-based business* that brokerage companies thrive on; however, their role remains essential.
- Financial advisers are commercially driven, and hence must regard time as a valuable resource. *TOIA inherently requires a minimal time* for each investor. The advisor should seek to understand the investor and his goals (which requires not only valuable time, but also specific qualities and training).
- The portfolios constructed via TOIA will be *sub-optimal in a mean-variance sense because of the segregation in sub-portfolios*. It might, for example, be possible to find a total portfolio with a lower variance and the same return. However, investors are humans and humans rely heavily on the framing heuristic. Taking away the clear

link between sub-portfolio and its goal opens the door to behavioural biases to dominate the decision making. We argue that it is therefore worth paying that price in order to get more clarity and a better overview that creates a framework to hold onto.

- TOIA suggests to use a risk-reward optimization that relies on a coherent risk measure that focusses on the tail of the distribution (for example, ES). This can also lead to *different results than Markowitz' mean-variance optimization – even if we disregard the effect of the mental accounting*. This, however, is a desired deviation. Acerbi and Tasche (2002) and De Brouwer (2011) provide examples that clearly show that optimization with ES will lead to coherent and logical results and that a coherent risk measure – with a focus on the left tail of the distribution – is essential in order to always get logical results.[9]

Advantages of TOIA

- TOIA based on MaPT creates in a natural way an understandable and *common language for investor and advisor*. Investors will find that advisers listen to their needs, and advisers will by using TOIA have a framework to hold on.
- When the 'one-risk-profile-based-on-a-questionnaire' is used, the investor will have the impression that he or she got advice, whereas in practice there was not even an understanding about what he or she wanted to achieve. In TOIA, there is necessarily an *understanding of both parties about the investment goals*.
- 'Risk tolerance' as a general concept is for most people just a proxy for the last months' returns. Using risk tolerance as unique parameter to advice on investments allows behavioural biases to decrease returns.[10] Those *behavioural biases are mitigated* by a rigid framework where emotions are not the only guidelines but where investment goals are the conclusive factors.
- If all assets are taken together in one portfolio and that portfolio is optimized according to the soft-focus concept 'investor's risk profile', which is then mapped in a quite arbitrary way to investment portfolios – because of the lack of scientific insight – there is a huge potential for mistakes; see for example, Marinelli and Mazzoli (2010) who find that one investor can be ranked as 'cautious' in one bank and 'dynamic' in another. If on the other hand one relies on TOIA and uses multiple portfolios, the probability to get all portfolios wrong is much smaller. Almost inevitably there will be some diversification. In addition to that, because the probability to get the asset allocation wrong is smaller, one can rely on more concrete parameters (such as the importance of the goal). This means that TOIA *reduces the model risk significantly*.
- TOIA reduces panic selling during market downturns and euphoric buying following exuberant times that otherwise happen because of the lack of guidance by an investment target. Target-linked compartmentalization provides structure and discipline for emotion-free investment decision making. This helps the individual investor – because he or she will not deteriorate performance too much and – if widely used – *reduce the impact of bubbles and crashes*.
- Compartmentalization is the *best guarantee that the different goals are met*, because it avoids that one goal consumes assets that should serve another purpose. Even if things go wrong, TOIA offers a framework for renewed discussion and damage control.
- TOIA *stimulates thinking about all needs and life goals* and helps to remind projects and needs that might be overlooked when the financial plan is drawn. More general investors will have to make their goals

explicit and rethink priorities. Doing so, they increase the probability that they know what makes them happy, as well as the probability to achieve these goals.
- TOIA offers to the investor a *tool to check the performance* of his or her portfolios relative to the goals. This is generally more relevant for the investor than the tracking error relative to a market benchmark.

We hope to have demonstrated that TOIA is a worthy alternative, logically coherent, rational, normative, has many advantages, and that it is a good tool in personal financial decision making and for governments to build their financial policies.

NOMENCLATURE

$erfc(x) =$	$1 - erf(x) = 2/\sqrt{\pi}\int_x^\infty e^{-t^2}\,dt =$ the complementary error function
A_i	the aspiration level for portfolio i; this is the minimal return that we should target
C_t	cash flow impacting a portfolio at moment t so that $V(t) = V(t-\delta t) + Ct$. Please note that income yields $Ct \geqslant 0$ and expenses are covered by: $Ct \leqslant 0$
$D_X(x)$	the complementary cumulative distribution function (ccdf) for a stochastic variable X, which is defined by $D_X(x) = P(X > x)$
Rp	the return of a portfolio
$V(t)$	the value of a portfolio at moment t
$V_i(t)$	the value of sub-portfolio i at moment t
W	the total wealth
W_s	the subsistence level of wealth
CAPM	capital asset pricing model
ES	expected shortfall, ES_α is defined as the average of the 100α per cent worst outcomes
EUT	expected utility theory, referring to the Vonn Neuman Morgenstern Utility – von Neumann and Morgenstern (1944)
MaPT	Maslowian portfolio theory – see De Brouwer (2009)
MPT	modern portfolio theory – this refers to mean-variance analysis – Markowitz (1952a)
SF	safety first (theory) – see Roy (1952)
SP/A	a general behavioural decision model (security, potential and aspiration) – see Lopez (1987)
TOIA	target-oriented investment advice
VaR	value at risk

NOTES

1. The concept of optimization with respect to semi-variance is introduced by Markowitz (1959) and further elaborated in Markowitz (1991), where he (a) mentions that it seems more logical to use semi-variance and (b) introduces a very important parameter: the investment goal.
2. It is also worth having a look at the detailed form of the utility curve presented by Markowitz; it includes some interesting aspects (such as both risk-averse and risk-seeking behaviour for both gains and losses) that disappeared in many later theories such as (cumulative) prospect theory – see Kahneman and Tversky (1979) and Tversky and Kahneman (1992). The 'value function' in (cumulative) prospect theory could be considered as a simplification of Markowitz' utility function.
3. A corollary of this insight is that financial plans have to be re-evaluated at regular time intervals (even if we assume that there is no model risk).
4. This has to be understood in the light of the results of Brinson *et al* (1986) and Brinson *et al* (1991) who find that the strategic asset allocation is the parameter that drives the variations of an investment portfolio much more than any other parameter. They find that about 93 per cent of the variation of any portfolio is explained by its strategic asset allocation.
5. Indeed, the price of an insurance is roughly given by: $p_{\text{insurance}} = E[\text{risk cover}] + \text{profit margin insurer} + \text{profit margin agent} + \text{administrative and other costs} + \text{risk buffer}$.
6. An elegant reasoning about this subject can be found in Bernoulli (1738). In §15, Bernoulli deducts a minimal level of wealth that makes insurance unnecessary and defines a minimal level of wealth for the insurer to make it rational to accept the insurance contract.
7. One could conclude from this that the 'one-risk-profile-per-investor' approach is dangerous and misleading. The result is even worse when this method is accompanied with a 'questionnaire', especially when this questionnaire uses the additive method (also referred to as 'weighted sum') to solve the multi-criterion decision problem resulting from it. This results in basing important decisions on the outcome of the worst aggregation method, which is used to look for something that does not exist (and even if it would exist, it would be of little relevance).

8. TOIA could also signify 'target-oriented investments allocation', or 'target-oriented investment approach'. All of these alternatives seem to describe well the central idea.
9. For example, variance leads to counter-intuitive results when structured investments that offer capital protection are present – see De Brouwer (2011).
10. For example, Shefrin and Statman (1985) show that investors sell winning stocks too soon and hold on to losers too long. Odean (1999) finds that investors trade too much, and even Barber and Odean (2001) demonstrate that on average investors worsen their results at every trade.

REFERENCES

Acerbi, C. and Tasche, D. (2002) Expected shortfall: A natural coherent alternative to value at risk. *Economic Notes* 31(2): 379–388.

Amenc, N., Martellini, L., Milhau, V. and Ziemann, V. (2009) Asset-liability management in private wealth management. *The Journal of Portfolio Management* 36(1): 100–120.

Artzner, P., Delbaen, F., Eber, J.-M. and Heath, D. (1997) Thinking coherently. *Risk* 10(11): 68–71.

Barber, B.M. and Odean, T. (2001) Boys will be boys: Gender, confidence, and common stock investment. *Quarterly Journal of Economics* 116(1): 261–292.

Bernoulli, D. (1738) Specimen Theoriae Novae de Mensura Sortis. *Comentarii Academiae Scientiarum Imperialis Petropolitanae* Tomus V: 175–192.

Brinson, G., Hood, R. and Beebower, G (1986) Determinants of portfolio performance. *Financial Analysts Journal* 4: 39–44.

Brinson, G., Singer, B. and Beebower, G. (1991) Determinants of portfolio performance II: An update. *Financial Analysts Journal* 3: 40–48.

Cramer, G. (1728) Solution to the St Petersburg paradox. In a correspondence letter to Johann Bernoulli, cited by Bernoulli (1738).

Das, S., Markowitz, H.M., Scheid, J. and Statman, M. (2010) Portfolio optimization with mental accounts. *Journal of Financial and Quantitative Analysis* 45(2): 311–334.

De Brouwer, P.J. (2011) Maslowian portfolio theory. PhD thesis, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussel, Belgium.

De Brouwer, P.J.S. (2006) Behavioural finance and decision making in financial markets. In: W. Milo and P. Wdowinski (eds.) *Financial Markets, Principles of Modeling Forecasting and Decision-Making*. Łódź, Poland: Łódź University Press, pp. 24–44.

De Brouwer, P.J.S. (2009) Maslowian portfolio theory: An alternative formulation of the behavioural portfolio theory. *Journal of Asset Management* 9(6): 359–365.

Kahneman, D. and Tversky, A. (1979) Prospect theory: An analysis of decision under risk. *Econometrica* 47(2): 263–291.

Kenrick, D.T., Griskevicius, V., Neuberg, S.L. and Schaller, M. (2010) Renovating the pyramid of needs: Contemporary extentions built upon ancient foundations. *Perspectives on Psychological Science* 5(3): 292–314.

Lopez, L.L. (1987) Between hope and fear: The psychology of risk. *Advances in Experimental Social Psychology* 21: 255–295.

Marinelli, N. and Mazzoli, C. (2010) An insight into the MiFID suitability practice: Is a standard questionnaire the answer? http://www2.sa.unibo.it/seminari/Papers/20110125%20Marinelli_Mazzoli.pdf.

Markowitz, H.M. (1952a) Portfolio selection. *Journal of Finance* 6: 77–91.

Markowitz, H.M. (1952b) The utility of wealth. *Journal of Political Economy* 60: 151–158.

Markowitz, H.M. (1959) *Portfolio Selection: Efficient Diversification of Investments*. New York: John Wiley & Sons.

Markowitz, H.M. (1991) Foundations of portfolio theory. *Journal of Finance* 46(2): 469–477.

Maslow, A.H. (1943) A theory of human motivation. *Psychological Review* 50: 370–396.

Maslow, A.H. (1954) *Motivation and Personality*. New York: Harper.

Odean, T. (1999) Do investors trade too much? *The American Economic Review* 89(5): 1279–1298.

Pascal, B. (1654) Expected utility theory. In correspondence with Louis de Fermat on the subject of gambling.

Roy, A.D. (1952) Safety first and the holding of assets. *Econometrica* 20(3): 431–449.

Shefrin, H. and Statman, M. (1985) The disposition to sell winners too early and ride losers too long: Theory and evidence. *Journal of Finance* 40: 777–790.

Shefrin, H. and Statman, M. (2000) Behavioral portfolio theory. *Journal of Financial and Quantitative Analysis* 35(2): 127–151.

Tversky, A. and Kahneman, D. (1981) The framing of decisions and the psychology of choice. *Science* 211(4481): 453–458.

Tversky, A. and Kahneman, D. (1992) Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty* 5(4): 297–323.

von Neumann, J and Morgenstern, O. (1944) *Theory of Games and Economic Behaviour*. Princeton, New Jersey: Princeton University Press.