# Maslowian Portfolio Theory

## Why Goal Based Investing Makes Sense

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# EXISTING THEORIES

$$\boxed{\textit{Normative Theories}} \Longrightarrow \boxed{\textit{All Investments in One Portfolio}}$$

e.g. Mean-Variance (Markowitz 1952a)

$$\boxed{\textit{Descriptive Theories}} \Longrightarrow \boxed{\textit{Many Sub} - \textit{Portfolios}}$$

e.g. Behavioural Portfolio Theory (Shefrin and Statman 2000)





# MISSING . . .

People making choices based on the normative theories

. . . OR . . .

Normative theories that allow for portfolio segmentation (mental accounts)

# Maslowian Portfolio Theory – MaPT
## The Idea

### Core Idea

Investments serve a purpose in life. The life-goals are the purpose of the investments, and money is only a means to attain a life-goal, it is not a goal in itself.





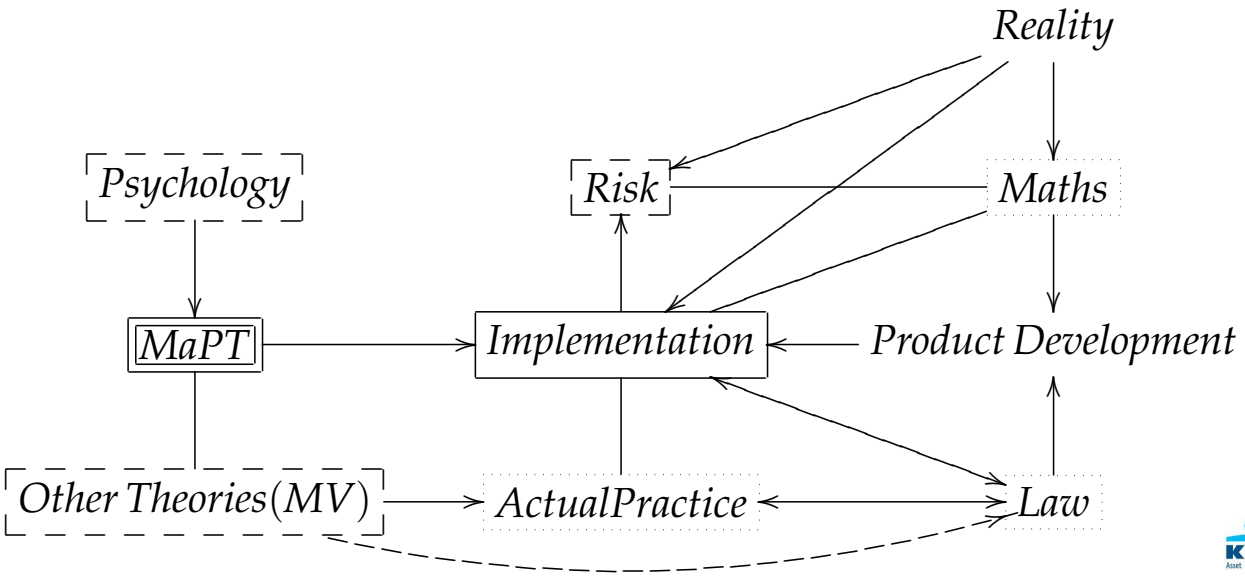
# Maslowian Portfolio Theory (MaPT)
## The Investment Portfolio

| **Human Needs** | **Investments/MaPT** |
|---|---|
| Physiological Needs | liquid/cash |
| Safety Needs | insurance, retirement savings |
| Love Needs | mixed portfolios for projects |
| Esteem Needs | mixed portfolios for projects |
| Self Actualization | broker account |

Table 1: Maslowian Portfolio Theory.

# Further Scope Possible and Necessary

## Opening the Box of Pandora ...








# Where to Focus?

## A Few Steps are Taken

- Problem formulation ca. 2000
- Refereed Publications:
  - investment horizon is relevant: (De Brouwer and Van den Spiegel 2001)
  - analogy (first ideas): (De Brouwer 2006)
  - MaPT: (De Brouwer 2009)
  - TOIA: (De Brouwer 2011)
- "Goal Based Investing in KBC" = TOIA — 2012





# Target Oriented Investment Advice (TOIA)
## The Logic

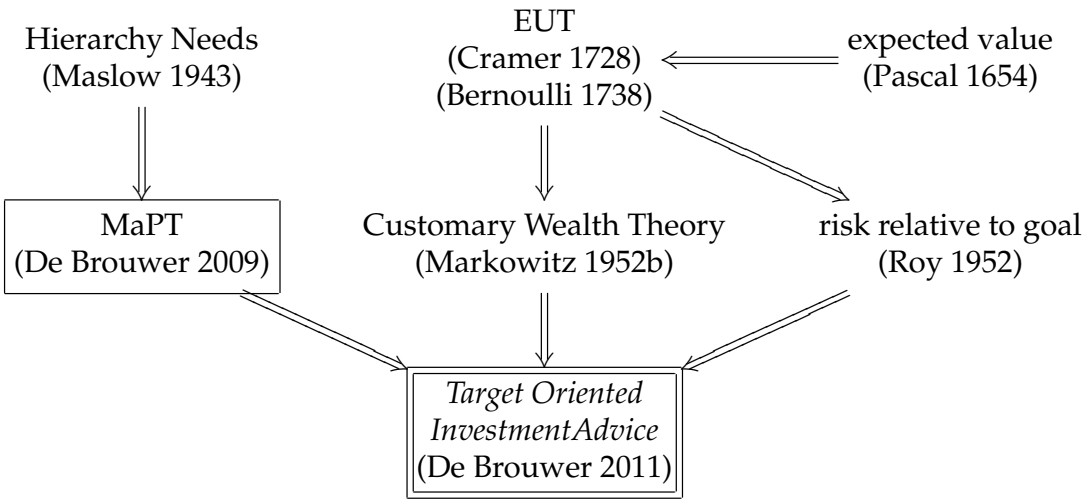



Figure 1: Milestones for the formulation of TOIA.

# The Steps Within TOIA (I)

## Define Projects

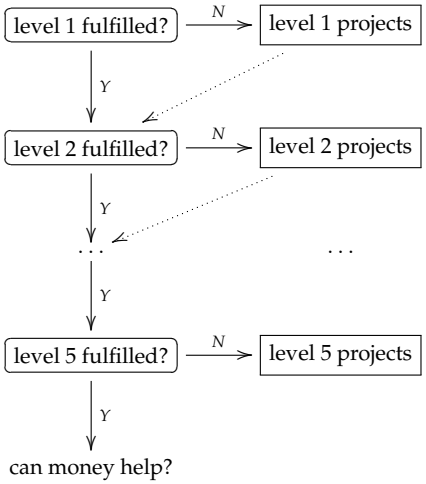



Figure 2: Define the projects: start with the most urgent needs and if money is left, cater for the next need.





# The Steps Within TOIA (II)

## A correction to the previous: what if the S is not yet pleased

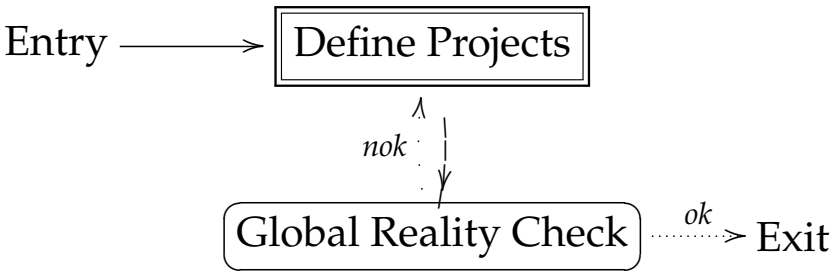



Figure 3: The basic scheme to get a set of realistic investment projects in appropriate proportions. The important "Define Projects" segment is Figure 2.





# The Maths of TOIA
## The Logic

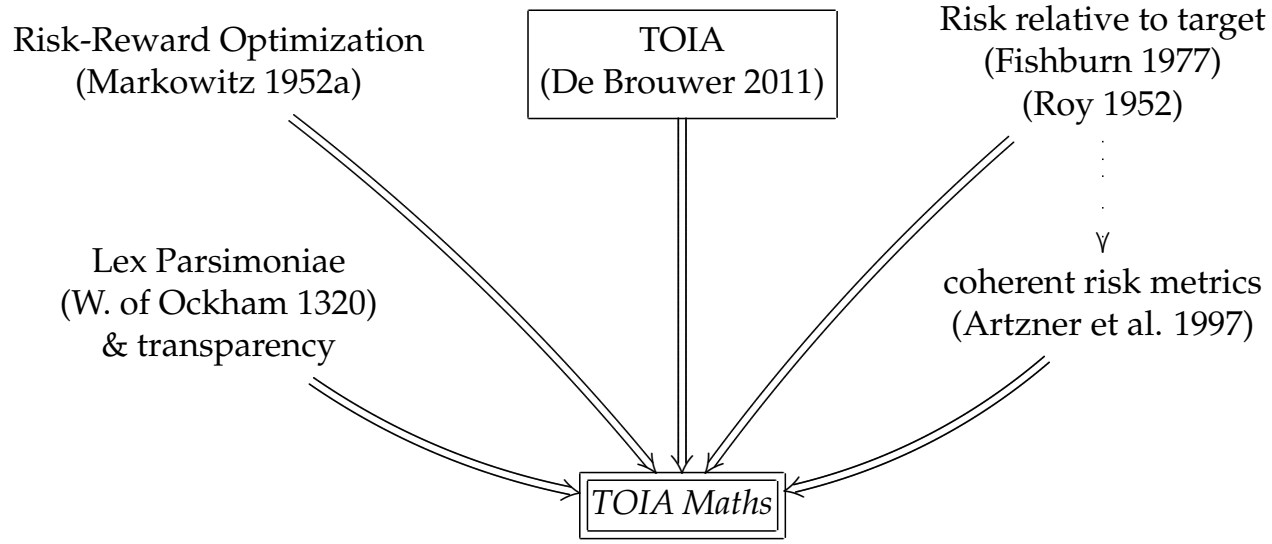



Figure 4: An Implementation of TOIA.

# Possible Maths of TOIA

## The Concept

### Definition (Possible Maths of TOIA)

The mathematical implementation of TOIA aims to find a solution for TOIA by adding the following assumptions

- a risk-reward optimization (as opposed to a utility optimization)
- uses a coherent risk measure
- calculates the risk measure relative to the target
- focusses only on the parsimonious aspects (the 93% question[a]: the strategic asset allocation)

[a] 93% of the outcome of the investment is defined by the strategic asset allocation (Gary P. Brinson and Beebower 1986); performance of asset managers is not a parsimonious parameter (Annaert, Van Den Broeck, and Vander Vennet 2003), (Annaert, De Ceuster, and Van Hyfte 2005) and others






# —Intermezzo: Some Definitions (1)

### Definition

$\mathcal{P}$ = the absolute return

### Definition

$\sigma$ = standard deviation = $\sqrt{VAR}$

### Definition (Value-at-Risk (VaR))

For the stochastic profit variable, absolute return $\mathcal{P}$, and a probability $\alpha \in [0, 1]$, we define the Value at Risk (VaR):

$$VaR_\alpha(\mathcal{P}) := -Q_{\mathcal{P}}(\alpha)$$

### Definition

$ES_\alpha(\mathcal{P})$ = the average of the $\alpha 100\%$ worst outcomes of $\mathcal{P}$

# —Intermezzo: Some Definitions (2)

## Interpretation of ES, VaR and $\sigma$

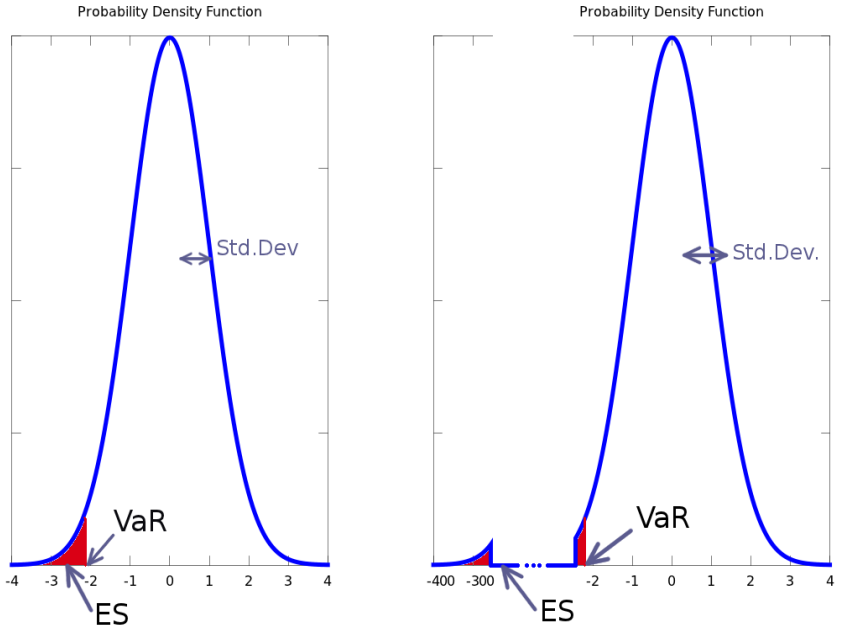



Figure 5: Interpretation of ES, VaR and $\sigma$.





# —Intermezzo: Thinking Coherently—(I)

## The Definition

**Definition (Coherent Risk Measure)**

A function $\rho : \mathbb{V} \mapsto \mathbb{R}$ (where $\mathbb{V}$ is the set of real-valued stochastic variables) is called a **coherent risk measure** if and only if it is

1. **monotonous**: $\forall X, Y \in \mathbb{V} : X \leq Y \Rightarrow \rho(X) \geq \rho(Y)$
2. **sub-additive**: $\forall X, Y, X + Y \in \mathbb{V} : \rho(X + Y) \leq \rho(X) + \rho(Y)$
3. **positively homogeneous**: $\forall a > 0 \text{ and } \forall X, aX \in \mathbb{V} : \rho(aX) = a\rho(X)$
4. **translation invariant**: $\forall a > 0 \text{ and } \forall X \in \mathbb{V} : \rho(X + a) = \rho(X) - a$

After the paper "Thinking Coherently"—(Artzner, Delbaen, Eber, and Heath 1997)

**Law-invariance under P**: $\forall X, Y \in \mathbb{V}$ *and* $\forall t \in \mathbb{R} : P[X \leq t] = P[Y \leq t] \Rightarrow \rho(X) = \rho(Y)$

# —Intermezzo: Thinking Coherently—(II)

## Example for (In)Coherence of Risk Meaures

**Example**

Assume one bond with a 0.7% probability to default in one year in all other cases it pays 105% in one year.
*The 1% VaR is* $-5\% \Rightarrow$ *VaR spots* ***no*** *risk!*

**Example**

Consider two identical bonds with the same parameters, but independently distributed
*The 1% VaR of the diversified portfolio is 47.5%!*





# —Intermezzo: Thinking Coherently—(III)

## Continuity in $\alpha$

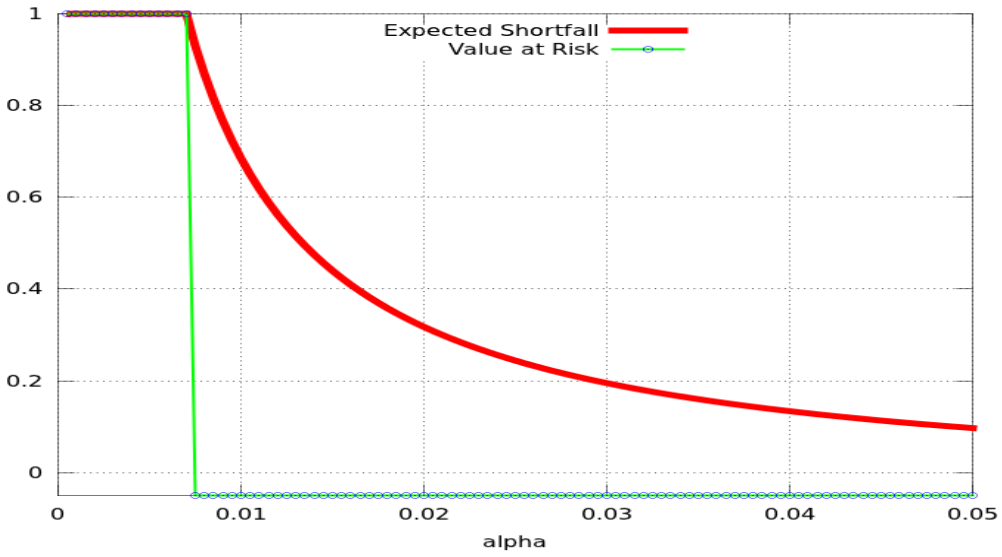



Figure 6: ES and VaR in function of $\alpha$ for one bond.

# —Intermezzo: Thinking Coherently—(IV)

## Convecity (I)

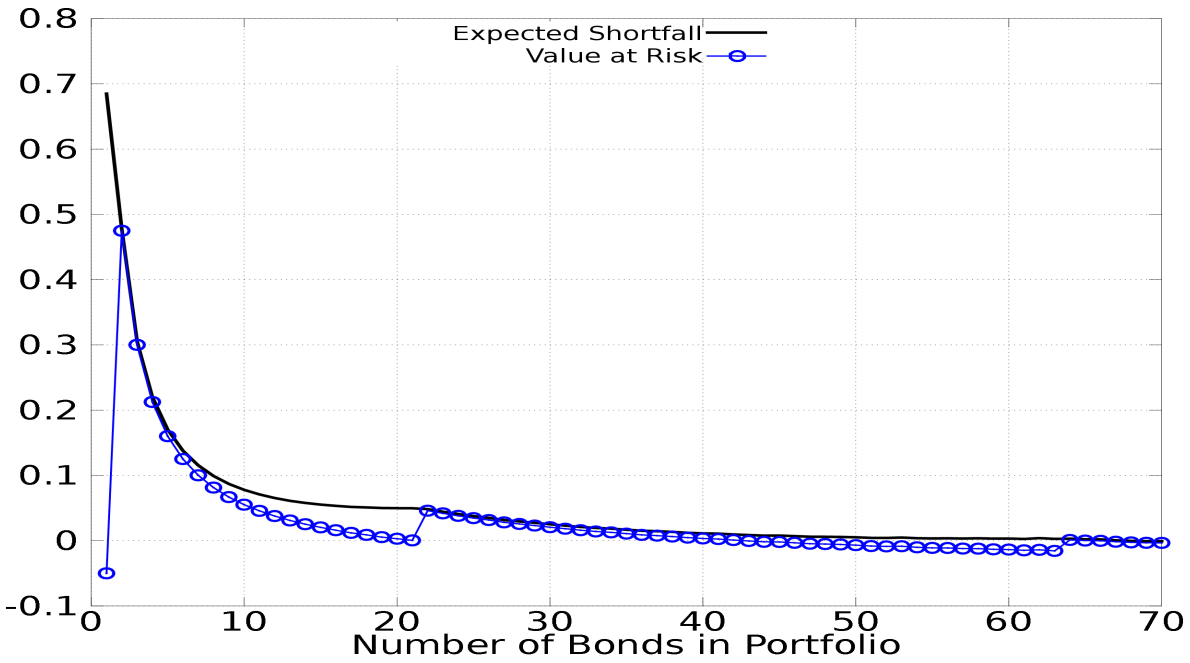



Figure 7: ES and VaR in function of number of bonds.





# —Intermezzo: Thinking Coherently—(V)

## Convexity (II)

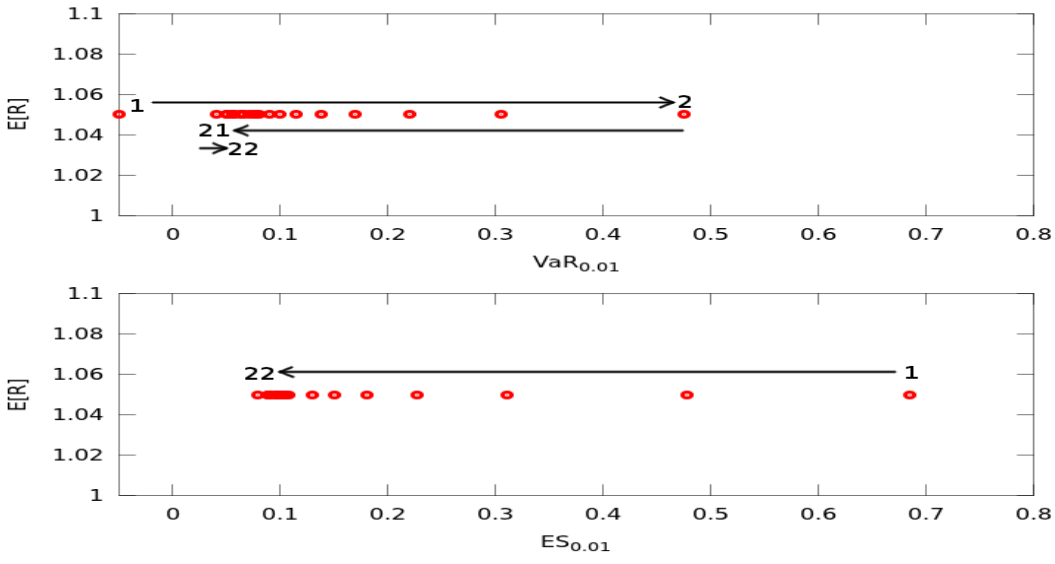



Figure 8: The result on the risk surface.

# Example 1
## The Mechanics of a Risk-Reward Method

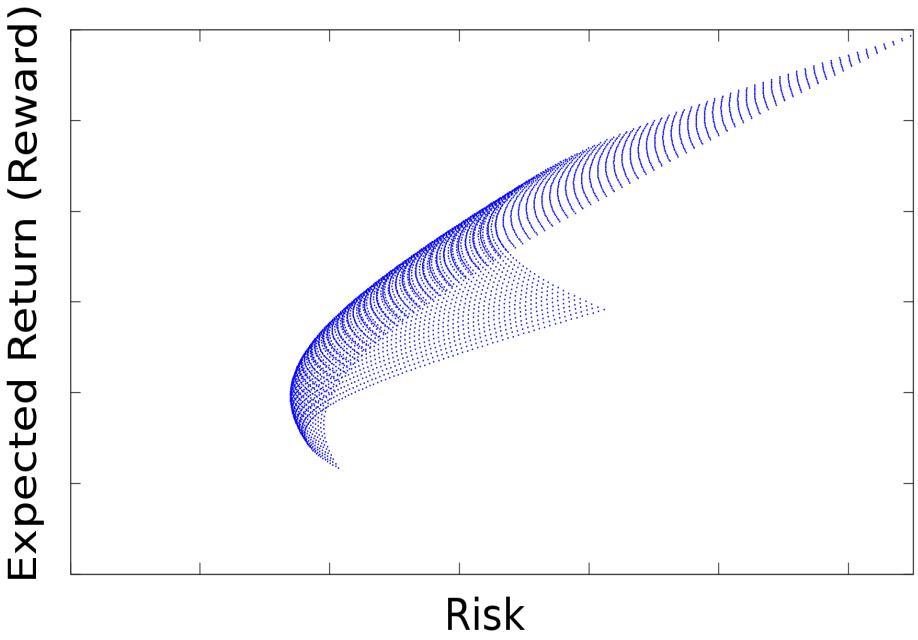



Figure 9: Portfolios in the risk/reward plane.





# Example 1
## Gausian Equities, Bonds and Cash—inflation adjusted

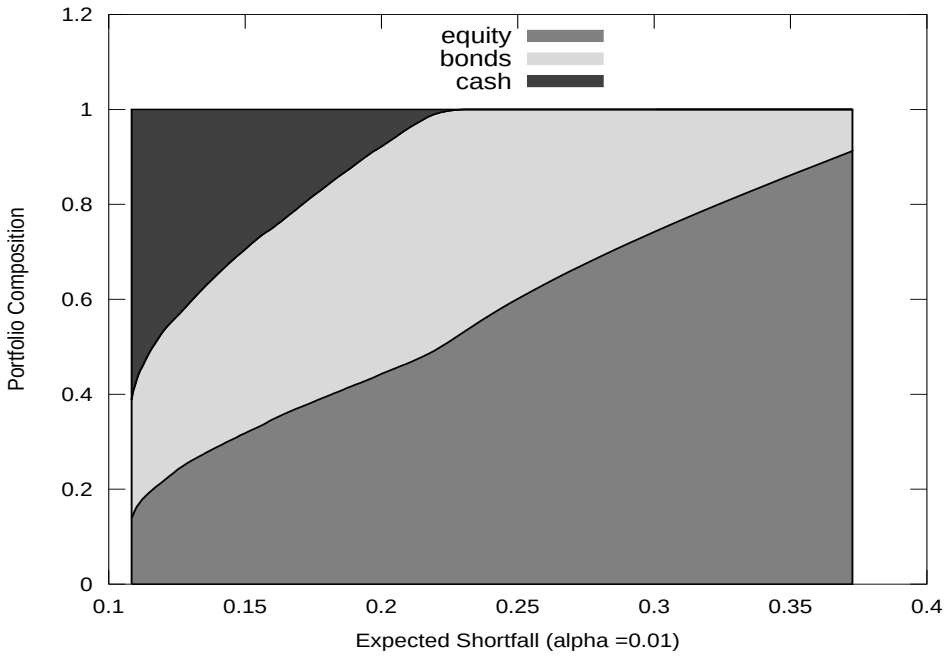



Figure 10: Recommended portfolios in function of ES.

# Example 2: Non-Gaussian Assets

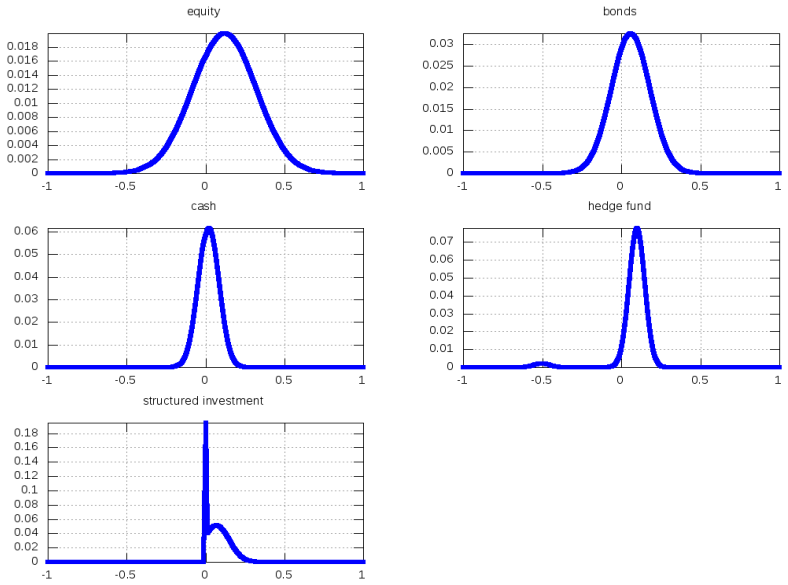



Figure 11: The pdfs in the example (the y-axis for the structured fund is truncated—this fund is a long call plus a deposit).





# Example 2: Non-Gaussian Assets
## Mean-ES and Mean-VAR Optimization

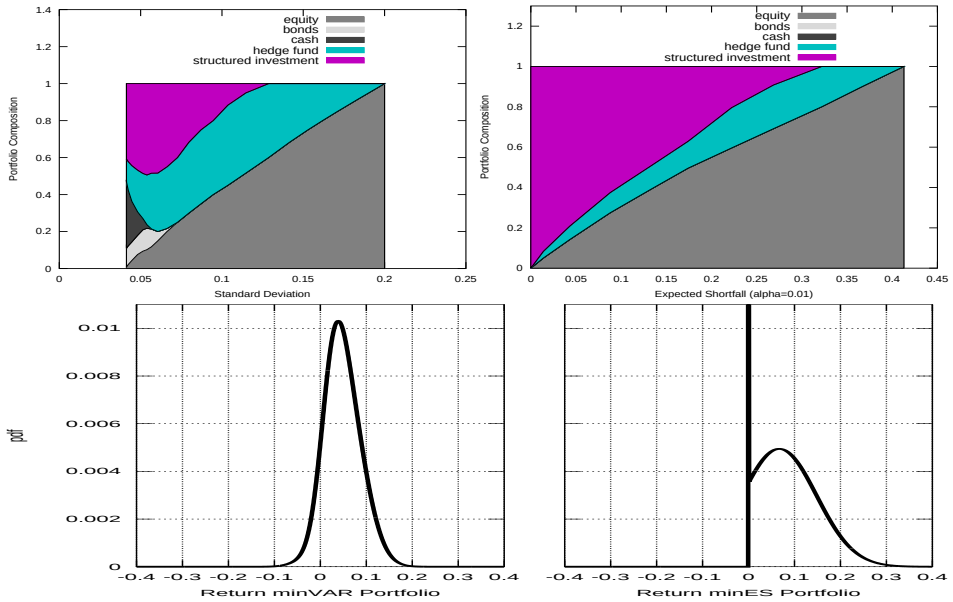



Figure 12: The min-VAR and min-ES portfolios compared.

# Example 3: A Complex Example

| Goal | $\tau$ | $T$ | CF | $V_0$ | $\alpha$ | $ES_{max}$ |
|---|---|---|---|---|---|---|
| school | € 100,000 | 1 | € 0 | € 100,000 | 0.01 | 10% of $\tau$ |
| yacht | € 120,000 | 5 | € 0 | € 100,000 | 0.1 | 20% of $\tau$ |
| retirement | € 200,000 | 10 | € 10,000 | € 100,000 | 0.01 | minimal |
| extra | € 50,000 | 10 | € 0 | € 50,000 | 0.05 | € 5,000 |

Table 2: The investment parameters for in Example 3. The investor wants to invest $V_0$ (plus annually $CF$) and wants it to grow to $\tau$ in $T$ years, the expectation of the average of the $\alpha 100\%$ worst outcomes is to be limited to $ES_{max}$.





# Example 3: Feedback to Investor

| Goal | Equities | Bonds | Cash | ES | Feedback |
|---|---|---|---|---|---|
| school | 12.8% | 24.4% | 62.8% | 10.8% | add |
| yacht | 100% | 0% | 0% | 18% | reduce |
| retirement | 21% | 30% | 49% | € 3161.20 | ES |
| extra | 100% | 0% | 0% | € 3836.07 | is less |
| total portfolio | 50.46% | 16.12% | 33.42% | — | |

Table 3: An overview of the ES-optimal portfolio compositions, as well as their proportion of the total portfolio. In the last two columns one finds respectively the percentage of the sub-portfolio at $t = 0$ (i.e. at the moment of writing the financial plan), and the Expected Shortfall as obtained after optimization.

# Example 3: A Complex Example

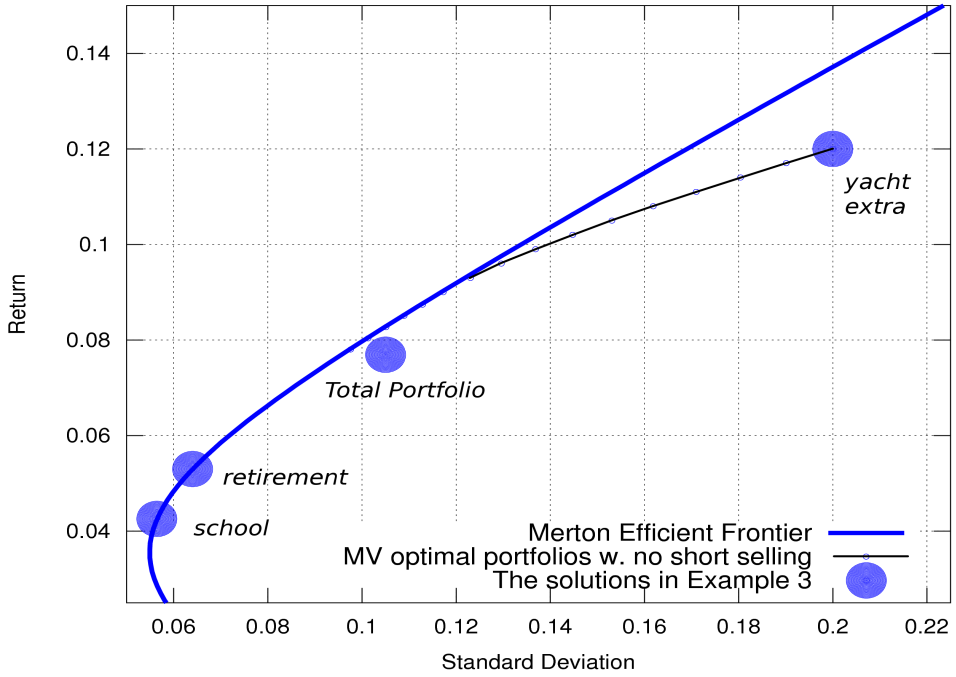



Figure 13: An example with four target portfolios.







# Different from Markowitz (1952)

1. $ES \neq VAR$
   - ES is coherent
2. Mental Accounting is Not Optimal
   - How to test? Which $T$?
   - If so: a small price to pay (as a premium for an additional insurance): reduces model risk, diversification in diversification, ring-fencing, framework that counteracts behavioural biases, etc.





# Maslow's Theory is Contested

- criticisms
  - nativism
  - hierarchy
  - B-needs do not emerge from a deprivation
  - lower needs are unworthy
  - Maslow mixes evolutionary function, developmental sequence and cognitive priority
  - self-actualization (might) not be a distinctive motive
- not contested
  - separate needs
  - framing in addressing needs

Maslow is well known and well adapted to financial thinking.





# The Suitability Requirement
## in the Markets in Financial Instruments Directive (MiFID)

Rules for Know-Your-Customer: *suitability requirements* guide the industry to a one-risk-profile-per-investor approach based on a questionnaire

1. increases model risk (all in one portfolio)
2. soft-focus concept of "risk-tolerance" (not defined and changeable)
3. empowers emotions to become decisive ⇒ stimulates bubbles and crashes
4. little understanding of the investor's targets
5. questionnaire = the worst MCDM to find something that does little matter and use it as the only parameter for the only decision, and map this arbitrary parameter in arbitrarily to an arbitrary set of investments.





# Disadvantages of TOIA

1. portfolios are not necessarily MV-optimal
   1. because of **mental accounting** . . . however in a *very* abstract way (multiple horizons in MaPT/TOIA!)
   2. **ES used in stead of VAR** . . . however this is much more logical, coherent and intuitive
2. **time consuming** for advisers
3. **computing time intensive** to optimize portfolios
4. **if applied, should be complete** – *all* needs should be covered (facilitated by Maslow's framework)
5. More research is needed (e.g. efficient investment strategies)





# Advantages of TOIA

1. creates a **natural language** to guide the investor;
2. investment advice that **serves a purpose**, that makes sense for the investor, helps people to realize goals;
3. **no use of ill-defined concepts** such as "risk tolerance", no need for magical beliefs about the ability to define, determine and use this parameter;
4. provides a framework to hold onto, to temper emotions
   1. **portfolio returns are not/less deteriorated** by behavioural biases
   2. **bubbles and crashes are tempered**—if TOIA is widely used
5. ideal method to **build trust and a long term relationship** between advisor and investor
6. TOIA **reduces model risk** (diversification within diversification)





# Conclusions

- MaPT **puts investing in a frame: the frame of life**! Investments not a goal in their own right
- MaPT is **valid**, **normative**, **coherent**, and **applicable in practice** (e.g. TOIA)
- MaPT and its implementation TOIA have distinctive advantages: they
  - **answer to real needs** with interpretable parameters
  - Maslow offers a **natural language** in communication with investors + helps not to forget goals
  - are a rational approach **to mitigate some behavioural biases**, while other biases are used to help the investor
  - offers diversification within diversification

# Thanks for Your Attention!






# Back-matter

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# NOMENCLATURE I

| | |
|---|---|
| $\rho$ | a risk measure, page 19 |
| $E[x]$ | the expected value of a stochastic variable $x$: $E[x] = \int p(x)x\,\mathrm{d}x$, page 17 |
| $ES_\alpha(\mathcal{P})$ | Expected Shortfall = the average of the $\alpha 100\%$ worst outcomes of $\mathcal{P}$; aka CVaR, Tail-VaR, etc., page 17 |
| $Q_X(\alpha)$ | Quantile Function of the stochastic variable $X$, page 17 |
| $VAR(x)$ | Variance: $VAR(x) = E[x^2] - E[x]^2 = \sigma^2$, page 17 |
| $VaR_\alpha(\mathcal{P})$ | Value at Risk, page 17 |
| MaPT | Maslowian Portfolio Theory, i.e. the stance where investments should be chosen in function of human needs, page 7 |
| MCDM | Multi Criteria Decision Method, page 35 |
| MiFID | Markets in Financial Instruments Direc tive, page 35 |
| MV | Mean-Variance criterion, as proposed by (Markowitz 1952a), page 37 |
| pdf | probability density function, page 27 |
| TOIA | Target Oriented Investment Advice $\equiv$ Goal Based Investing, page 11 |