

Presentational format and financial consumers' behaviour: an eye-tracking study

Financial
consumers'
behaviour

821

Maria Gabriella Ceravolo
*Department of Clinical and Experimental Medicine,
Centre for Health Care Management,
Università Politecnica delle Marche, Ancona, Italy*

Vincenzo Farina
*Department of Management and Law,
Università degli Studi di Roma Tor Vergata, Roma, Italy*

Lucrezia Fattobene
*Department of Clinical and Experimental Medicine,
Università Politecnica delle Marche, Ancona, Italy and
Department of Management and Law,
Università degli Studi di Roma Tor Vergata, Roma, Italy*

Lucia Leonelli
*Department of Management and Law,
Università degli Studi di Roma Tor Vergata, Roma, Italy, and*

GianMario Raggetti
*Centre for Health Care Management,
Università Politecnica delle Marche, Ancona, Italy*

Received 17 February 2018
Revised 13 May 2018
28 June 2018
26 July 2018
Accepted 5 September 2018

Abstract

Purpose – The purpose of this paper is to examine whether financial consumers are sensitive to presentational format of financial disclosure documents and whether this influences the financial attractiveness of products.

Design/methodology/approach – In order to observe and measure consumers' attention, the authors exploit the unobtrusive methodology of eye tracking on a sample of nonprofessional investors, applying an ecological protocol, through a cross-sectional design.

Findings – The analysis reveals that financial information processing and attention distribution are influenced by the way the information is conveyed. Moreover, some layouts induce individuals to rate the products as less financially attractive, independent of the information content. This suggests the importance of studying the neural mechanisms of investors' behaviour in the scrutiny of financial product documents.

Practical implications – The results lead to recommend regulators and managers to study how investors respond to financial disclosure documents by exploiting neuroscientific techniques. Moreover, there is a role for the search of any benefit coming from emphasising specific sources of information inside documents.

Originality/value – This research investigates the influence of presentational format on consumers' information processing measuring the underlying neurophysiological processes; the consequent perception of financial attractiveness is also explored.

Keywords Consumer, Information processing, Eye tracking, Investor, Attention, Neurofinance

Paper type Research paper



International Journal of Bank
Marketing
Vol. 37 No. 3, 2019
pp. 821-837
© Emerald Publishing Limited
0265-2323
DOI 10.1108/IJBM-02-2018-0041

1. Introduction

The financial services sector is one of the most highly regulated industry in the world (Anning-Dorson *et al.*, 2017). In order to raise the level of consumers' protection, the European Commission has recently introduced the Key Investor Information Document (KIID) – a standard, short, plainly worded, consumer-friendly and comparable across Europe document – which should provide investors with basic information they would need

to take their investment decisions in an informed way. KIID testing carried out through focus groups, surveys and telephone interviews have led to delineate a specific content and layout[1] that includes the title, objectives and investment policy, risk-reward profile, charges, past performance and some practical information. Since attention is a scarce resource (Kahneman, 1973), the phase of processing information is often demanding for the brain and, at the same time, its efficiency may affect the quality of the decision. The reading of financial disclosure documents involves the activation of several brain networks, thus representing a burden on the attentional component of the working memory (Lavie *et al.*, 2004) and in contrast with the hypothesis of rational decision makers, attention allocation is expected to be influenced by the documents' layout. For many years, marketing and finance have been isolated from each other, since consumption markets and investment markets were considered two distinct areas of research (Aspara and Tikkanen, 2010). Recently, several studies have started investigating the influence of the presentation of information and recommendations of financial products and how the same message can be "packaged" in different ways (Carlsson Hauff *et al.*, 2014). In this paper, we argue that besides the provision of mandatory information, it is important to study the interplay of senders and receivers of financial information and the relative process of attention allocation. Traditional methods study the decision-making process by self-reported measures, which suffer from several biases, such as the lack of introspective access to affective and cognitive resources and the tendency to over-attribute behaviour to controlled processes. Some brain functions, including the process of attention allocation, mostly occur in an automatic and unconscious manner, below the awareness level. Given people's lack of introspective access, researchers encounter difficulties in examining such processes. The field of neuroeconomics aims at overcoming these limitations, studying the neurobiological bases of behaviour and the neural correlates of economic and financial decision making. Brain activity measurement is now made possible using neuroscientific techniques such as functional magnetic resonance imaging (fMRI), electroencephalography, psychopharmacological manipulations, eye tracking and transcranial magnetic stimulation. Attention is a neural function difficult to measure through traditional economic methods; it is responsible for the information captured by the brain, which is mainly governed by automatic and affective processes (Camerer *et al.*, 2005). In this paper, we endorse a neuroscientific approach opening the door on understanding the neurobiological mechanisms of attention, and taking a small step forward the opening of the black box of financial consumers' decisions.

On these premises, we aim to study the underlying physiological mechanisms of the communications' recipients, verifying whether and how the format of the financial disclosure documents influences the process of attention allocation and the subsequent phase of products' financial attractiveness perception. In order to do so, we propose the new method of eye tracking, largely employed in marketing and neuroscience, and in the new field of neuroeconomics, to investigate investors' behaviour during the information-processing phase. By measuring eye muscle behaviour, eye tracking provides information about the inner working of the brain. For many years, researchers in oculomotor studies have extensively investigated the association between brain mechanisms and human behaviour (Luna *et al.*, 2008), observing that eye tracking provides non-invasive and rich indices of brain function and cognition processes. Since it is known that multiple stimuli appearing at the same time in the visual field compete for neural representation, oculomotor behaviour can be studied in order to understand how the brain automatically filters simultaneous stimuli and drops irrelevant information from cluttered visual scenes (McMains and Kastner, 2010). In this sense, eye movements represent a proxy of attention function – that allows understanding of how the flow of information in the brain can be driven by the stimulus characteristics – and eye tracking is the most widely used tool for attention measurement. To elaborate, this method enables detecting the immediate,

automatic and unconscious responses to visual stimuli, the exploration pattern and the duration of visual scanning, and as its major strength it provides such data through studying individuals within their natural environment, without the space restriction imposed by fMRI. Since most cognitive and affective processes occur without awareness, self-reported measures suffer from some limitations. Eye tracking allows overcoming these limitations by providing reliable measures of the unconscious underlying processes[2].

In neuromarketing, the eye tracking has fostered the knowledge of how consumers' behaviour is influenced by nutrition labels (Kim *et al.*, 2018), package design (Husić-Mehmedović *et al.*, 2017), price (Menon *et al.*, 2016), online reviews (Luan *et al.*, 2016) and so on. While this neuroscientific method is widely applied by both academics and practitioners to study consumers' behaviour, only recently it has been employed to study financial consumers' behaviour while no study used it in a bank marketing perspective, so far. Shavit *et al.* (2010) analysed the presence of biases such as mental accounting and loss aversion in investors' behaviour, Hüsser and Wirth (2014) examined the effectiveness of disclaimers in mutual fund disclosure and tested whether investors suffer from extrapolation bias. Duclos (2015) investigated the end-anchoring effect and how financial consumers process graphical financial information. Finally, Rubaltelli *et al.* (2016) studied the influence of individual differences in investing behaviour.

In the present study, we have developed an ecological protocol that permits tracking eye movements to objectively quantify and measure investors' attention distribution during the visual scanning of KIID documents and their decision outcome.

The analysis of financial information processing reveals a key role of the presentational format in modulating the amount of time dedicated by investors to specific sources of information of the financial disclosure documents. Moreover, results show a clear link between the layout of the documents and their financial attractiveness as perceived by nonprofessional investors. In particular, some KIID formats are associated with a high proportion of positive evaluations, while another is linked to a high proportion of products rated as less financially attractive.

The paper is relevant to the literature in different ways. First, we detect specific KIID layouts that attract more attention and drive a greater visual focus to some source of information, influencing also the financial attractiveness perception. Second, we highlight that in financial consumer research it is important to deepen the unconscious physiological mechanisms that underlie the decision-making of the final recipients of the communications, besides their mandatory content. Finally, we demonstrate the utility of the neuroscientific approach of the eye-tracking to collect unbiased and reliable metrics to explore brain role in economic and financial decisions.

The remainder of the paper continues as follows: Section 2 describes the literature review, Section 3 reports on the method, Section 4 illustrates the results and the discussion is provided in Section 5.

2. Literature

The influence of the presentational format, i.e. the way in which the information is presented, has been shown to influence the decision-making process (Libby and Lewis, 1982; Maines, 1995; Roggeveen *et al.*, 2015). Several studies have investigated this issue with respect to financial consumers. Lipe and Salterio (2002) have shown that presenting information in meaningful categories helps to reduce the cognitive load. Weber *et al.* (2005) found that the presentational format of historical returns influences the perceived volatility; information provided through a probability density function leads to greater estimates of volatility than information provided through time series in the form of a bar graph. Diacon and Hasseldine (2007) test the difference in perception when presenting data using fund value charts or percentage yield bar charts, reporting a higher return and risk perception in the second case.

Kozup *et al.* (2008), relying on previous research on drug and nutrition, hypothesise an influence of the format of supplementary material on the perception and the evaluations of mutual funds, finding that the graphical format (as opposed to the written-text) verified their hypothesis. Bloomfield *et al.* (2015) observe that nonprofessional investors recall more information and more accurately when presenting the complex item on a financial statement that is disaggregated rather than aggregated, while Ragland and Reck (2016) report that this leads investors to higher item complexity perception. Overall, research conducted in marketing, accounting, finance, psychology and neuroscience all point out that the presentational format of the information impact on decision-making, influencing meaning, readability, comprehensibility, ability to recall and risk perception of that information.

In order to protect investors from information overload and to ensure a higher level of comprehensibility and comparability of mutual fund products across Europe, regulators have recently established new requirements for disclosure information documents, substituting the previous simplified prospectus with the KIID. Even if the KIID does not represent marketing material, it is relevant for the bank marketing area since it plays a crucial role in the banker-customer relationship by influencing products' perceived financial attractiveness. Some studies have investigated the efficacy of this new financial disclosure document. Walther (2015) reports that the KIID is better evaluated than the simplified prospectus in several different dimensions. He also reports that participants suffer less information overload in the case of the KIID, hence reducing the probability of naïve diversification. Oehler *et al.* (2014) reveal that subjects find the document as moderately appropriate in reporting the key characteristics, suggesting the need to produce even easier and more comprehensible documents. The presence of visual distractors in the frame of the disclosure documents has been investigated by Hillenbrand and Schmelzer (2017) who found that this presence leads to gathering of less correct information, investing more and expecting smaller return variance. The authors find that a potential mechanism that could potentially explain their results is "distracted attention". Attention, i.e. the ability to selectively process information (Fougnie, 2008), is a key component of the working memory that, in turn, is responsible for the coordination of storage and information processing (Bayliss *et al.*, 2003; Kane and Engle, 2002) and the quality of the decisions. Previous studies have demonstrated the crucial role of attention in influencing the decision-making process in general (Loewenstein *et al.*, 2014) and of financial consumers in particular (Hirshleifer *et al.*, 2011; Li and Yu, 2012). Neuroscience highlights that individuals have only limited volitional control on how they allocate their attention and that in the initial phase of the visual search process they scan visual stimuli consciously only up to a certain level. For these reasons, a broad array of methodologies, such as focus groups and interviews, are biased by the absence of long-term memory of those visual stimuli (Simons, 2000). To overcome this limitation, we sought to study the process of attention allocation and of the perceived attractiveness of financial products by exploiting the eye-tracking methodology whereby outcome measures have been found to be more accurate and reliable than self-reported ones, also with respect to observational behaviour itself (O'Connell *et al.*, 2011). This methodology allows objectively detecting where and what subjects look at (and do not look at) and for how long; moreover, it informs about the visualisation pattern and changes in subjects' pupil dilations during exposition to stimuli. In marketing, several studies have employed the eye tracking methodology to explore consumers' behaviour (for a review please see Wedel and Pieters, 2008). To the best of our knowledge, no studies have investigated the role played by the format presentation in the phase of information processing by financial consumers. The present research, therefore, aims to fill this gap by studying whether and how the format presentation of information in financial disclosure documents influences individuals' attention and, in turn, financial attractiveness rating.

3. Method

Participants

In total, 19 students at a major university voluntarily participated in this study, for a total number of 456 observations, as result of 24 stimuli presented to each participant. The sample size is in line with many previous studies conducted using eye-tracking (i.e. Djamasbi *et al.*, 2010; Sharif and Maletic, 2010; Davenport, 2007). Participants were recruited during June 2017 through a call for participants posted on the university bulletin board. A window of no more than two weeks has been selected in order to ensure rigorous data collection, avoiding students telling other participants about the experiment. Participants were given a brief introduction about eye tracking data recording and were informed about their rights and the experimental procedure. All the participants gave their written informed consent to the study. Out of the 19 participants in the sample, nine (47.37 per cent) are males and ten (52.63 per cent) are females; nine are undergraduate students at the School of Medicine, while ten are at the School of Economics. The mean age is 25 years (± 3). Before starting the experiment, we asked participants some questions to ascertain that they were not experts in financial investment decisions, i.e. they do not have investment experience in financial products. Moreover, we ascertained that students had never read a KIID until that moment and that they were completely unfamiliar with the disclosure documents. This allowed to rule out any influence of students' affiliation, guaranteeing a homogenous sample of nonprofessional investors. In order to estimate whether the affiliation has a relationship with the observed measures, we run a regression analysis showing that the independent variable coefficient is not statistically significant.

Eye-tracking device

Eye movements were recorded using the SMI REDn Scientific (SensoMotoric Instruments GmbH, Berlin, Germany) system, contact-free eye tracking that allows head movement compensation. The sampling rate was 60 Hz. The system has a spatial resolution of 0.05° and a gaze position accuracy of 0.4° . Participants were seated at a distance of 60–80 cm from the 15.6 inches laptop (screen resolution: $1,366 \times 768$; grey background). Before each test, the device was calibrated using the software's five-point monitor calibration[3]. SMI REDn Scientific is also highly robust for vision corrections (glasses and contact lenses).

Task and procedure

The structure of the KIIDs used in this study follows the UCITS directive and consists of the following sections: investment objectives and policy; risk-reward indicator (IRR); costs and charges; and past performance. The fifth section established by the directive – practical information – has been excluded since it discloses the name of the financial institution offering the product. Such information is associated to the institution's image and reputation that, in turn, can elicit affective reactions and modulate the perception of the convenience of the product. Moreover, previous studies have demonstrated that logo firm-related elements, such as logos, banners and colours, represent visual distractors (Hillenbrand and Schmelzer, 2017). In order to provide standard documents and ensure scientific validity, different precautions have been taken. In more detail, the stimulus background is white and the information is written in black with a constant font size of 12; the graphical elements are in grey. This is to avoid the influence of colours on judgement and decision-making. In written-text sections, the number of text lines is always the same across different stimuli, to ensure comparison of eye tracking variables across the trials. The time period to which past performance refer always consists of ten years, in line with Commission Regulation (n.583/2010) implementation of the Directive (2009/65/EC) which establishes that “the information about the past performance of the UCITS shall be presented in a bar chart covering the performance of the UCITS for the last

10 years”. We fix the interval of the ten years to the period ranging between 2007 and 2016, for all the KIIDs. An identical time span ensures that people do not infer other information, which in turn might influence their behaviour (i.e. if past performances would be presented up to 2013, subjects could deduce that the fund is not profitable and not present on the market any longer, thus lowering their perceived convenience). In the seven-point scale of the risk-reward indicators, the classes 1 and 7 have never been selected to avoid anchoring effect driven by extreme values. An example of the standard stimulus presented to subjects is displayed in Figure 1.

To study the role played by the presentational format of the document, the position of the four blocks is rotated in the display along the trials; each block of information occupies each of the four possible quarters in the screen, six times. We considered four different presentational formats of the KIID. Figure 2 provides an example of the rotated KIID. A synthesis of the different combinations of the quarters is provided in Table I.

The study protocol implies the presentation of 24 consecutive slides, displaying as many different KIIDs, for a maximum of 60 s each. Participants are allowed to move to the next trial by simply pressing the space bar as soon as they feel ready to rate the convenience of the product. The possibility to go forward is given to ensure subjects’ eyes do not wander while waiting for the following stimulus. After the stimulus presentation, the task consists of rating the product as “Low”, “Medium” and “High” financially attractive, using the laptop touchpad. Before each trial, a fixation cross appears in the centre of the screen (approximately 1 cm x 1 cm) and the trial starts automatically if the participants fixate their gaze on it for at least 500 ms. This is to ensure that every participant would be looking at the centre of the stimulus display at the beginning of the trial. Figure 3 synthetises the experimental procedure.

Outcome measures

The eye-tracking analysis software allows the extrapolation of several quantitative variables describing the spatial and temporal parameters of gaze. Moreover, it is possible to

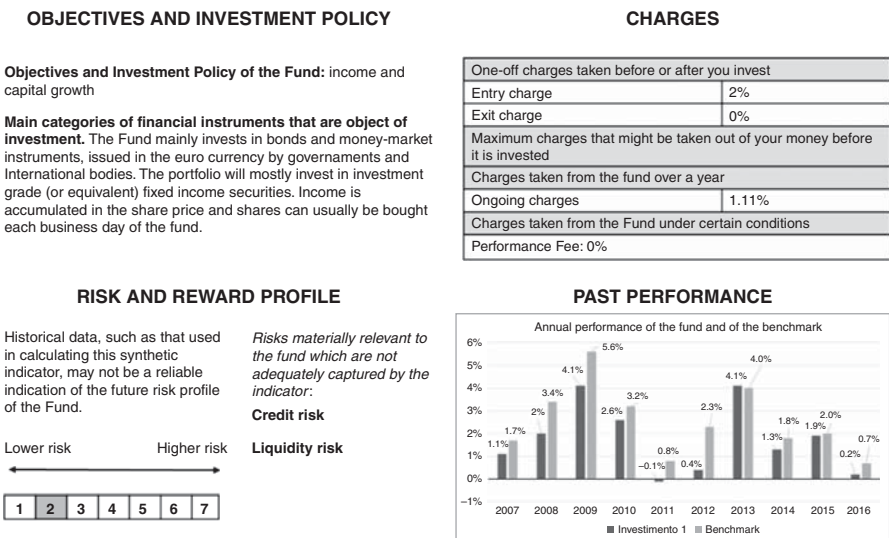


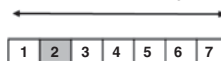
Figure 1.
Example of the visual stimulus represented by a standard KIID

Source: Authors’ elaboration from an original KIID

RISK AND REWARD PROFILE

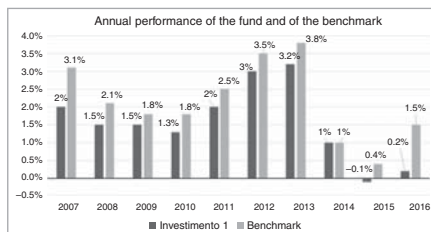
Historical data, such as that used in calculating this synthetic indicator, may not be a reliable indication of the future risk profile of the Fund.

Lower risk → Higher risk



The risk and reward category shown is not guaranteed to remain unchanging and may shift over time.

Additional key risks relevant to investors and not captured by the indicator are: liquidity risk and credit risk.

PAST PERFORMANCE

The fund is active since 2003. Past performance is not a guide to future performance.

CHARGES

One-off charges taken before or after you invest	
Entry charge	0%
Exit charge	0%
Maximum charges that might be taken out of your money before it is invested	
Charges taken from the fund over a year	
Ongoing charges	0.55%
Charges taken from the Fund under certain conditions	
Performance Fee: 0%	

OBJECTIVES AND INVESTMENT POLICY

Objectives and Investment Policy of the Fund: to increase the value of investments through diversified financial and monetary instruments.

Main categories of financial instruments that are object of investment. The Fund mainly invests in bonds and money-market instruments, denominated in euro and issued by governments or national Central Banks of the European Union, as well as by the European Union, by the European Central Bank, and by the European Investment Bank (EIB).

Source: Authors' elaboration from an original KIID

Figure 2.
Example of the visual
stimulus in a rotated
KIID (Layout B)

Quarter	Format A	Format B	Format C	Format D
Top – Left	Objectives	IRR	Costs	Performance
Bottom – Left	IRR	Costs	Performance	Objectives
Top – Right	Costs	Performance	Objectives	IRR
Bottom – Right	Performance	Objectives	IRR	Costs

Table I.
Scheme of the
presentational formats
obtained by rotating
the KIID's quarters

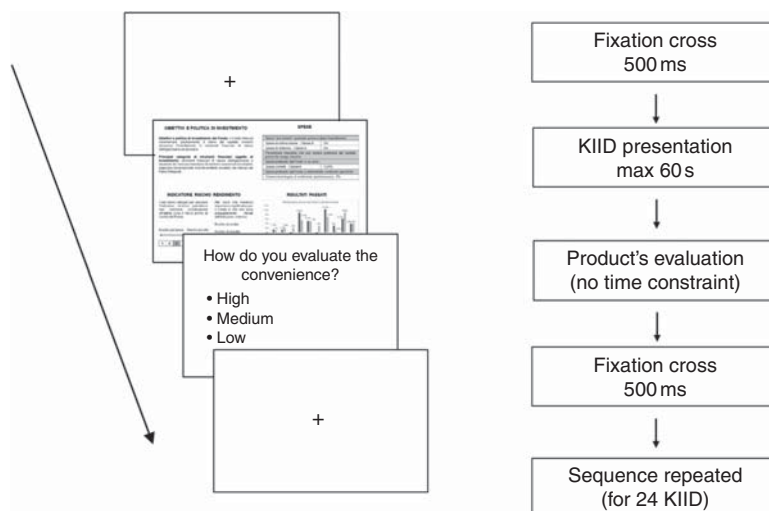


Figure 3.
Experimental design

divide the presented stimulus into different areas of interest (AOIs) in order to better understand the influence of different features of visual information on attention allocation. We chose to divide each slide into four main AOIs corresponding to the four KIID mandatory sections. We also detected four minor AOIs as follows: the years 2007–2009, representing the product trends through the years of the global financial crisis, the years 2014–2016, showing the performance of the latest years, the disclaimer, informing financial consumers that past performances are not predictive of future returns, and the graphical risk scale in the IRR sections that ranges from 1 to 7.

We analysed the following gaze features:

- Entry time: expresses the average interval (in milliseconds – ms) from the presentation of the KIID document (start of the trial) to the first gaze fixation on each AOI. It may be considered as a proxy of the relevance of information for the individual subject and allows tracking the scan path that is the sequence by which the document is visually scanned by each subject.
- End trial time: expresses the average time interval (ms) between the presentation of the KIID document (start of the trial) and the participants' answer. It synthesises average trial duration.
- Net dwell time (NDT): represents the sum of NDT of all subjects divided by the number of subjects.
- Normalised dwell (ms/coverage) (NormD): allows scaling of the dwell time each participant dedicates to the AOI for the actual size of the AOI. This last indicator is particularly useful since it permits stating that the differences in time spent looking at a specific target are not modulated by the dimension of the target.

Data analysis

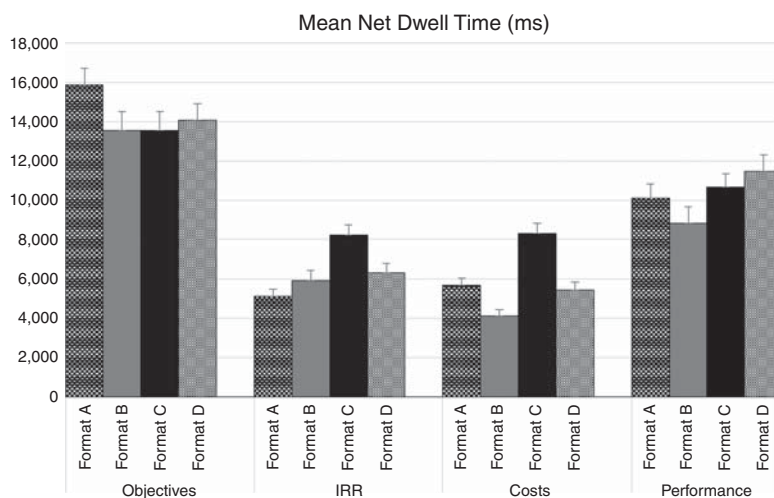
Descriptive statistics with mean, standard deviations and percentages have been used to report the distribution of continuous parametric variables. The analysis of variance has been used to compare the distribution of outcome variables by AOIs and presentational format. The statistical significance level was set at the conventional value of 0.05, in accordance with eye-tracking previous studies on consumers' behaviour.

4. Results

Our analysis reveals that subjects' attention allocation varies across the four quarters of the KIID; in particular, the sections that need more time to be processed are the objectives and the performance (NDW: $15.1\text{ s} \pm 9.3\text{ s}$ and $10.31\text{ s} \pm 8.33\text{ s}$, respectively), while IRR and expenses are observed, on average, for a shorter time ($6.37\text{ s} \pm 5\text{ s}$ and $6\text{ s} \pm 4.54\text{ s}$, respectively) ($p < 0.0001$).

By changing the presentational format of the financial document, we observe a significant variation of the attention dedicated to the main AOIs, proxied by the NDT, as graphically presented in Figure 4. Moreover, a considerable modulation of attention induced by the format is observed for the costs quarter ($p < 0.0001$), and for the IRR quarter ($p < 0.0001$) and, to a lesser extent, for the section of the objectives ($p < 0.05$). When the costs' quarter is placed on the top left of the document, subjects spend more time processing it. The role played by the top left position on attention allocation is also detected for the section related to objectives. On the contrary, the section related to the IRR appears to grab more attention when it is placed in the bottom right part of the document.

As a robustness test, we checked that the NDT dedicated to each AOI according to the presentational format does not follow a decreasing function. It means that individuals do not

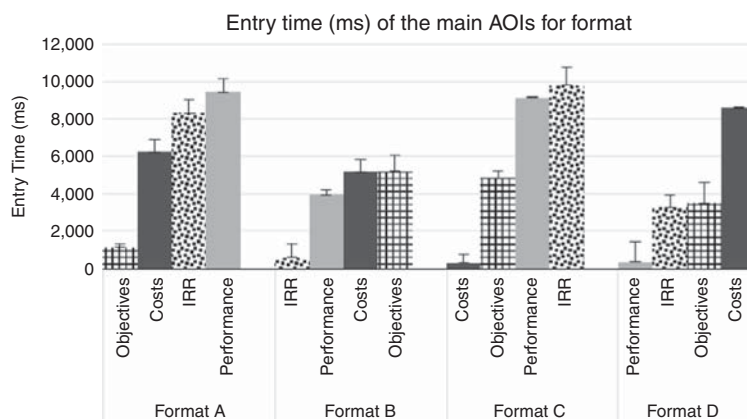


Notes: The lines at the top of each bar represent the standard errors of the mean.
 $p < 0.0001$ (format; AOI); $p < 0.05$ (format \times AOI)

Figure 4.
Attention distribution
expressed by net
dwell time (ms)
according to
presentational format
for the main AOIs

generally dedicate a greater amount of attention to the first element of the trial and a lower amount of attention to the last element of the trial, as a rule. In particular, the NDT dedicated to the first quarter varies from a minimum of 5.93 s to a maximum of 15.88 s, while it varies from a minimum of 5.46 s to a maximum of 13.55 s, for the last quarter. The absence of a pattern of decreasing attention as the trial goes on allows confirming and isolating the role played by the format in modulating the attention.

The graphical representation of the variable entry time (ms) in Figure 5 reveals that the way individuals scan financial documents is not sensitive to the presentational format, i.e. changing the positions of the different sources of information in the visual stimuli does not lead individuals to a different ocular behaviour in exploring the documents.



Notes: The lines at the top of each bar represent the standard errors of the mean.
 $p < 0.0001$ (format; AOI; format \times AOI)

Figure 5.
Scan path for the
different KIIDs'
presentational format

On average, participants explore the documents following this sequence: top left to top right to bottom left to and bottom right ($p < 0.0001$). This result is different from that reported in a previous study (Ceravolo *et al.*, 2017) where the following sequence has been observed: top left (objectives) to bottom left (IRR) to top right (costs and charges) to bottom right (past performances), which meets the regulators' expectations. This difference can originate from the fact that in the present experiment, the continuous and random rotation of the quarters of the KIIDs allows detection of the real unconscious visual scanning strategy of the subjects, while the experimental design based on the presentation of standard KIIDs leads the subjects to read the documents following the meaningful sequence expected by regulators.

Although the format has not been found to influence subjects' scan path, it does influence the duration of the trial, measured through the variable end trial time ($p < 0.0001$). Among the different formats, the one that leads individuals to scan the stimuli faster is Format B ($35.22 \text{ s} \pm 17 \text{ s}$), while the one to which individuals dedicate more attention is Format C ($46.29 \text{ s} \pm 15.8 \text{ s}$). On the contrary, Format A and Format D seem to require the same amount of time to be processed ($39.48 \text{ s} \pm 17.19 \text{ s}$ and $39.7 \text{ s} \pm 17.37 \text{ s}$).

We also explore the influence of the presentational format on the attention distribution with respect to minor AOIs. Since minor AOIs have different sizes, we rely on the metric NormD that is a normalised measure. As displayed in Figure 6, the attention dedicated to the sub-group of AOIs is clearly modulated by the way information is communicated. In more detail, we observe a statistically significant effect of the presentational format in modulating the attention allocated to the section of the last years of the graph bar ($p < 0.002$) and to the disclaimer ($p < 0.001$). The format does not notably influence the physiological process of attention for the risk scale and the years of the financial crisis.

Finally, we report the relationship between the presentational format and subjects' perception of financial attractiveness, with respect to KIIDs displaying either high or low IRR scores, as charted in Figure 7.

When the risk is low, Format A and Format D are associated with a higher proportion of products rated as highly convenient (58 and 63 per cent), while Format C with a higher proportion of products rated with a medium (55 per cent) and lower convenience (21 per cent).

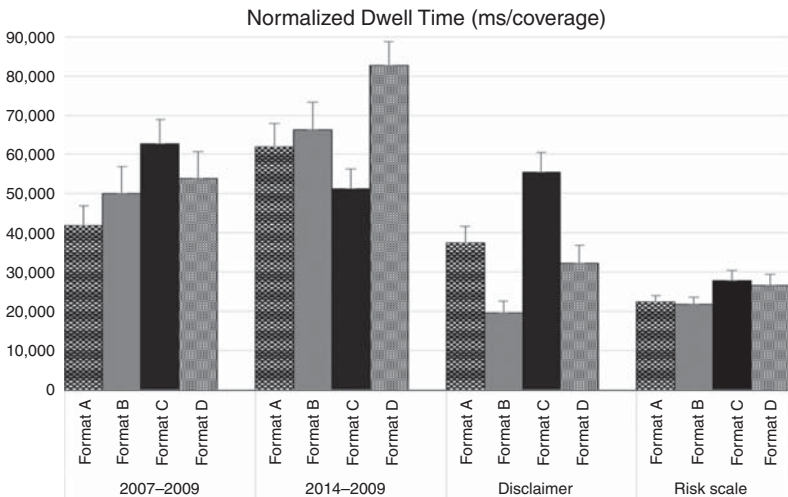
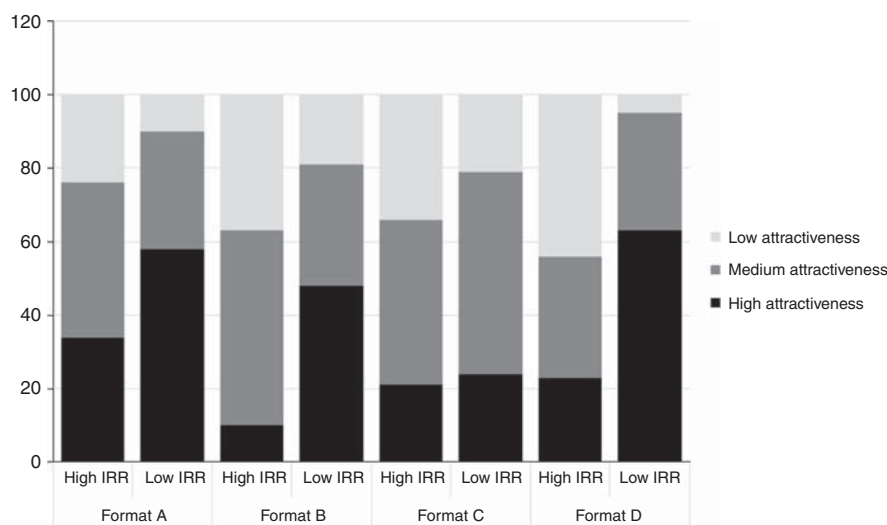


Figure 6.
Attention distribution
expressed by
normalised dwell
(ms/Coverage)
according to
presentational format
for the minor AOIs

Notes: The lines at the top of each bar represent the standard errors of the mean.
 $p < 0.0001$ (format; AOI); $p < 0.05$ (format \times AOI)



Note: $p < 0.0001$

Figure 7.
Percentage of
products rated as
high, medium or low
financially attractive
according to the
presentational format
and the IRR value

In other words, when the KIID starts with the written-text part of the objectives or the graphical part of the performance, products where risk is low are considered convenient. On the contrary, when the costs and charges' section is the first to be processed, it negatively modulates subjects' rating of attractiveness. We propose two possible interpretations of this result. The first is based on previous neuroeconomics studies. In fact, it has been demonstrated that negative stimuli displayed before or during the decision-making process can unconsciously modulate the insula, a neural structure associated with the processing of negative emotions, such as fear, anger and disgust, and trigger conservative behaviour through increasing the level of risk aversion (Kuhnen and Knutson, 2011). The second possible interpretation is that displaying costs and charges at the beginning of the document leads to placing a conscious and informed higher weight on the cost component rather than on other components, reducing the evaluation of overall convenience of the product.

For high IRR values, the current format of the KIID (Format A), where investment objectives are placed in the top left quarter, induces the higher proportion of products (34 per cent) to be rated as financially attractive, contrary to Format B (10 per cent) where the top left position is dedicated to the risk-reward indicator (IRR).

Finally, Format C does not induce discrimination between high and low IRR values by any means. In fact, when subjects are presented with Format C, they tend in fact to evaluate KIIDs in a similar way, irrespective of the IRR level displayed.

5. Discussion

The rapid development of the financial service industry and the growing competition have steered investors to navigate in a multitude of information. Given that attention is scarce, selective and cognitively demanding, the provision of information itself is not sufficient to improve decision-making. Therefore, the need to explore the tension between abundance of stimuli from a complex environment, individuals' cognitive abilities and financial decision making, has emerged. In this study, we aim at exploring how investors' respond to financial disclosure documents, analysing if the presentational format modulates attention, and in which way. Considering the flaws of self-reported measures in describing behaviours and

assuming that most eye movements occur unconsciously, we exploit a neuroscientific approach based on the eye-tracking methodology, which allows us to objectively measure the attention distribution over the visual stimuli/financial document. In the statistical analysis, the eye-gaze features represent our dependent variables. We do not study the relationship between attention and behaviour. We rather study how individuals scan visual information and the relationship between presentational format and attention, i.e. whether there is an influence of the document layout on individuals' attention allocation, where the latter is proxied by the metrics obtained from the eye-tracking device. The eye-tracking is a more accurate method to measure attention than self-reporting. Shortly, the former is thought to provide precise and objective measures of visual attention while the latter suffers from several limitations such as individuals' poor awareness concerning the level of attention, absence of awareness with respect to the part they look at vs the part they ignore (Graham *et al.*, 2012). Eye-tracking also provides a larger set of information beyond those available from accuracy-based methodologies and response time (Goldberg and Helfman, 2011).

The participants selected for the experiment are students with no experience with financial products and KIIDs, thus representing a good proxy of retail financial consumers. Our analysis reveals that the presentational format influences attention allocation and financial products' attractiveness. In particular, higher attention is generally dedicated to the top left quarter of the document. A specific layout, Format C, which presents the costs and charge section as the first quarter, is the one that leads subjects to spend more time to read the whole document, allocating more attention to the costs section and to the IRR section. Moreover, it represents the format that induces greater attention to the disclaimer about the absence of predictive power of past performance on future returns. Therefore, this finding is relevant also for regulators, while organising the layout of the documents, if they aim to emphasise the above-mentioned sources of information.

The analysis of the link between financial consumers' judgement and documents' presentational format highlights that the current layout, together with Format D, conduct nonprofessional financial consumers to rate the larger number of products as highly attractive (around 50 per cent in total, ranging from 34 per cent with high IRR, to 60 per cent with low IRR), at variance with Format C, where products are assumed to be very attractive in only 20 per cent of cases, irrespective of their IRR value.

Overall, our results underpin the existence of an influence of the presentational format on the physiological mechanisms underlying the reading of financial documents.

Summing up, we show that: attention allocation differs across the different sections of the KIID; presentational format modulates the process of attention allocated to financial documents; and although it does not impact on subjects' scan path, it also modulates the overall attention dedicated to the document. Interestingly, the way information is communicated influences the attention dedicated to the minor AOIs of the last financial crisis and the disclaimer; and it also affects the perceived attractiveness of financial products.

Financial advising is a very large industry and advisors play a crucial role in guiding retail investors; despite that, very few studies have observed bank advisors-customers relationship and their communications (Monti *et al.*, 2014). Traditionally, researchers in marketing-communications have considered the ultimate receiver of the information as a passive reader (Percy and Elliot, 2005) while the recent integrated marketing communication approach regards the reader as an active important element of the communication process (Laurie and Mortimer, 2011). Financial advising and advisors-investors communication are receiving increasing attention from legislators; therefore, in a practical bank marketing perspective, these findings are useful since knowing that the presentational format influences the phase of financial information processing implies that additional effort should be invested in the design of the message beside to its content. Given that several discussions already exist on the content of the financial documents, we argue that the banker-customer relationship

would benefit from understanding the influence of layouts on financial agents' decision making through neuroscientific methods. In addition, our findings could be applied successfully to bank advertising. We show, in fact, that individuals, while reading financial materials, allocate more attention to the first content of the information conveyed. Starting a prospectus with neutral elements such as a narrative part that describes the product, might elicit a positive involvement of readers thus affecting product's attractiveness. On the contrary, when the first part of the information displayed is negative, this might negatively modulate the decision-making process by activating brain structures generally involved in processing unpleasant stimuli, consequently leading to a personal negative perception of the product financial attractiveness.

Shortly, our neuroscientific study is intriguing for those who are responsible in formulating bank marketing strategies since we observe that by modulating the factors used to graphically present a product or a service it is possible to influence the unconscious and automatic process of investors' attention allocation towards specific components. Bank marketing would definitely improve its efficacy, by applying neuroscientific methods in addition to standard approaches, following the pattern of big multinationals that since few years have set and use their own neuroscientific laboratories.

This study also presents a few limitations. We investigate financial products' attractiveness (measured through a self-reported measure), without actually requesting the experimental subjects to purchase any product. Hence, we do not compare attention behaviour with investors' choices but only with individuals' judgement. With respect to this last element, previous studies have highlighted the importance of studying financial decision-making when individuals' behave in a real environment with their own financial resources (Raggetti *et al.*, 2017; Ayaz *et al.*, 2013; Ariely and Berns, 2010). Moreover, we do not distinguish for subjects' different levels of financial education, risk aversion, income, and experience, therefore larger and different samples of participants should be analysed in order to study the influence of other variables and the generalisation of the results.

A future development of the present work would hopefully overcome these limitations by comparing samples of subjects with different characteristics in order to measure the impact of single psycho-social features on attention distribution and judgement. Also, the relationship between emotions, physiological reactions, and financial decision-making could be explored in more depth; since the rapid adjustment of pupil diameter – a correlate of autonomic nervous system activation – has been associated to both cognitive and affective information processing, we suggest exploitation of the eye tracking research tool in order to study pupil dilation during financial decisions, as a new research frontier in the so-called field of neurofinance. An integration of eye tracking with the EEG and the fMRI investigation tools would provide better insight into temporal dynamics of brain networks involved in financial decisions. Finally, a further test on financial products marketing materials could be conducted in order to corroborate these findings.

Notes

1. The template is provided in the CESR/10-794 consultation paper.
2. For a comprehensive analysis of the eye tracking methodology, please see Holmqvist *et al.* (2011).
3. Calibration is necessary in order to control for eyeball radius and shape, ensuring maximal data quality.

References

- Anning-Dorson, T., Boadi Nyamekye, M. and Odoom, R. (2017), "Effects of regulations and competition on the innovativeness-performance relationship: evidence from the financial services industry", *International Journal of Bank Marketing*, Vol. 35 No. 6, pp. 925-943.
- Ariely, D. and Berns, G.S. (2010), "Neuromarketing: the hope and hype of neuroimaging in business", *Nature Reviews of Neuroscience*, Vol. 11 No. 4, pp. 284-292.

- Aspara, J. and Tikkanen, H. (2010), "Consumers' stock preferences beyond expected financial returns: the influence of product and brand evaluations", *International Journal of Bank Marketing*, Vol. 28 No. 3, pp. 193-221.
- Ayaz, H., Onaral, B., Izzetoglu, K., Shewokis, P.A., McKendrick, R. and Parasuraman, R. (2013), "Continuous monitoring of brain dynamics with functional near infrared spectroscopy as a tool for neuroergonomic research: empirical examples and a technological development", *Frontiers in Human Neuroscience*, Vol. 7, pp. 1-13, doi: 10.3389/fnhum.2013.00871.
- Bayliss, D.M., Jarrold, C., Gunn, D.M. and Baddeley, A.D. (2003), "The complexities of complex span: explaining individual differences in working memory in children and adults", *Journal of Experimental Psychology: General*, Vol. 132 No. 1, pp. 71-92.
- Bloomfield, R., Hodge, F., Hopkins, P. and Rennekamp, K. (2015), "Does coordinated presentation help credit analysts identify firm characteristics?", *Contemporary Accounting Research*, Vol. 32 No. 2, pp. 507-527.
- Camerer, C., Loewenstein, G. and Prelec, D. (2005), "Neuroeconomics: how neuroscience can inform economics", *Journal of Economic Literature*, Vol. 63 No. 1, pp. 9-64.
- Carlsson Hauff, J., Carlander, A., Gamble, A., Gärling, T. and Holmen, M. (2014), "Storytelling as a means to increase consumers' processing of financial information", *International Journal of Bank Marketing*, Vol. 32 No. 6, pp. 494-514.
- Ceravolo, M.G., Farina, V., Fattobene, L., Leonelli, L. and Raggetti, G.M. (2017), "Gender differences in attention to financial information: a neurobiological approach", paper presented at the International Rome Conference on Money, Banking and Finance, Palermo, 14-16 December.
- Davenport, J.L. (2007), "Consistency effects between objects in scenes", *Memory & Cognition*, Vol. 35 No. 3, pp. 393-401.
- Diacon, S. and Hasseldine, J. (2007), "Framing effects and risk perceptions: the effect of prior performance presentation format on investment fund choice", *Journal of Economic Psychology*, Vol. 28 No. 1, pp. 31-52.
- Djamasbi, S., Siegel, M. and Tullis, T. (2010), "Generation Y, web design, and eye tracking", *International Journal of Human-Computer Studies*, Vol. 68 No. 5, pp. 307-323.
- Duclos, R. (2015), "The psychology of investment behavior: (De)biasing financial decision-making one graph at a time", *Journal of Consumer Psychology*, Vol. 25 No. 2, pp. 317-325.
- Fougnie, D. (2008), "The relationship between attention and working memory", in Johansen, N.B. (Ed.), *New Research on Short-Term Memory*, Nova Science, New York, NY, pp. 1-45.
- Goldberg, J. and Helfman, J. (2011), "Eye tracking for visualization evaluation: reading values on linear versus radial graphs", *Journal of Information Visualization*, Vol. 10 No. 3, pp. 182-195.
- Graham, D.J., Orquin, J.L. and Visschers, V.H. (2012), "Eye tracking and nutrition label use: a review of the literature and recommendations for label enhancement", *Food Policy*, Vol. 37 No. 4, pp. 378-382.
- Hillenbrand, A. and Schmelzer, A. (2017), "Beyond information: disclosure, distracted attention, and investor behavior", *Journal of Behavioral and Experimental Finance*, Vol. 16, pp. 14-21.
- Hirshleifer, D., Lim, S.S. and Teoh, S.H. (2011), "Limited investor attention and stock market misreactions to accounting information", *Review of Asset Pricing Studies*, Vol. 1 No. 1, pp. 35-73.
- Holmqvist, K., Nyström, M., Andersson, R., Dewhurst, R., Jarodzka, H. and Van de Weijer, J. (2011), *Eye-Tracking: A Comprehensive Guide to Methods and Measures*, Oxford University Press, Oxford.
- Husić-Mehmedović, M., Omeragić, I., Batagelj, Z. and Kolar, T. (2017), "Seeing is not necessarily liking: advancing research on package design with eye-tracking", *Journal of Business Research*, Vol. 80, pp. 145-154.
- Hüsser, A. and Wirth, W. (2014), "Do investors show an attentional bias toward past performance? An eye-tracking experiment on visual attention to mutual fund disclosures in simplified fund prospectuses", *Journal of Financial Services Marketing*, Vol. 19 No. 3, pp. 169-185.

- Kahneman, D. (1973), *Attention and Effort*, Prentice-Hall, Englewood Cliffs, NJ.
- Kane, M.J. and Engle, R.W. (2002), "The role of prefrontal cortex in working-memory capacity, executive attention, and general fluid intelligence: an individual differences perspective", *Psychonomic Bulletin & Review*, Vol. 9 No. 4, pp. 637-671.
- Kim, E., Tang, L.R., Meusel, C. and Gupta, M. (2018), "Optimization of menu-labeling formats to drive healthy dining: an eye tracking study", *International Journal of Hospitality Management*, Vol. 70, pp. 37-48.
- Kozup, J., Howlett, E. and Pagano, M. (2008), "Effects of summary information on consumer perceptions of mutual fund characteristics", *Journal of Consumer Affairs*, Vol. 42 No. 1, pp. 37-59.
- Kuhnen, C.M. and Knutson, B. (2011), "The influence of affect on beliefs, preferences, and financial decisions", *Journal of Financial and Quantitative Analysis*, Vol. 46 No. 3, pp. 605-626.
- Laurie, S. and Mortimer, K. (2011), "'IMC is dead. Long live IMC': academic vs practitioners' views", *Journal of Marketing Management*, Vol. 27 Nos 13-14, pp. 1464-1478.
- Lavie, N., Hirst, A., De Fockert, J.W. and Viding, E. (2004), "Load theory of selective attention and cognitive control", *Journal of Experimental Psychology: General*, Vol. 133 No. 3, pp. 339-354.
- Li, J. and Yu, J. (2012), "Investor attention, psychological anchors, and stock return predictability", *Journal of Financial Economics*, Vol. 104 No. 2, pp. 401-419.
- Libby, R. and Lewis, B.L. (1982), "Human information processing research in accounting: the start of the art in 1982", *Accounting, Organizations and Society*, Vol. 7 No. 3, pp. 231-285.
- Lipe, M.G. and Salterio, S.E. (2002), "A note on the judgmental effects of the balanced scorecard's information organization", *Accounting, Organizations and Society*, Vol. 27 No. 6, pp. 531-540.
- Loewenstein, G., Sunstein, C.R. and Golman, R. (2014), "Disclosure: psychology changes everything", *Annual Review of Economics*, Vol. 6 No. 1, pp. 391-419.
- Luan, J., Yao, Z., Zhao, F. and Liu, H. (2016), "Search product and experience product online reviews: an eye-tracking study on consumers' review search behavior", *Computers in Human Behavior*, Vol. 65, pp. 420-430.
- Luna, B., Velanova, K. and Geier, C.F. (2008), "Development of eye-movement control", *Brain and Cognition*, Vol. 68 No. 3, pp. 293-308, available at: <http://dx.doi.org/10.1016/j.bandc.2008.08.019>
- McMains, S.A. and Kastner, S. (2010), "Defining the units of competition: influences of perceptual organization on competitive interactions in human visual cortex", *Journal of Cognitive Neuroscience*, Vol. 22 No. 11, pp. 2417-2426.
- Maines, L.A. (1995), "Judgment and decision making research in financial accounting: a review and analysis", in Ashton, R.H. (Ed.), *Judgment and Decision Making Research in Accounting and Auditing*, Cambridge University Press, Cambridge, pp. 77-131.
- Menon, R.G.V., Sigurdsson, V., Larsen, N.M., Fagerstrøm, A. and Foxall, G.R. (2016), "Consumer attention to price in social commerce: eye tracking patterns in retail clothing", *Journal of Business Research*, Vol. 69 No. 11, pp. 5008-5013.
- Monti, M., Pelligra, V., Martignon, L. and Berg, N. (2014), "Retail investors and financial advisors: new evidence on trust and advice taking heuristics", *Journal of Business Research*, Vol. 67 No. 8, pp. 1749-1757.
- O'Connell, B., Walden, S. and Pohlmann, A. (2011), *Marketing and Neuroscience: What Drives Customer Decisions?*, white paper, American Marketing Association, Chicago, IL.
- Oehler, A., Höfer, A. and Wendt, S. (2014), "Do key investor information documents enhance retail investors' understanding of financial products? Empirical evidence", *Journal of Financial Regulation and Compliance*, Vol. 22 No. 2, pp. 115-127.
- Percy, L. and Elliot, R. (2005), *Strategic Advertising Management*, 2nd ed., Oxford University Press, Oxford.

- Raggetti, G.M., Ceravolo, M.G., Fattobene, L. and Di Dio, C. (2017), "Neural correlates of direct access trading in a real stock market: an fMRI investigation", *Frontiers in Neuroscience*, Vol. 11, pp. 1-14, doi: 10.3389/fnins.2017.00536.
- Ragland, L. and Reck, J.L. (2016), "The effects of the method used to present a complex item on the face of a financial statement on nonprofessional investors' judgments", *Advances in Accounting, Incorporating Advances in International Accounting*, Vol. 34, pp. 77-89.
- Roggeveen, A.L., Grewal, D., Townsend, C. and Krishnan, R. (2015), "The impact of dynamic presentation format on consumer preferences for hedonic products and services", *Journal of Marketing*, Vol. 79 No. 6, pp. 34-49.
- Rubaltelli, E., Agnoli, S. and Franchini, L. (2016), "Sensitivity to affective information and investors' evaluation of past performance: an eye-tracking study", *Journal of Behavioral Decision Making*, Vol. 29 Nos 2-3, pp. 295-306.
- Sharif, B. and Maletic, J.I. (2010), "An eye tracking study on the effects of layout in understanding the role of design patterns", *26th IEEE International Conference on Software Maintenance (ICSM 2010)*, Timisoara, 12-18 September, pp. 1-10.
- Shavit, T., Giorgetta, C., Shani, Y. and Ferlazzo, F. (2010), "Using an eye tracker to examine behavioral biases in investment tasks: an experimental study", *Journal of Behavioral Finance*, Vol. 11 No. 4, pp. 185-194.
- Simons, D.J. (2000), "Attentional capture and inattention blindness", *Trends in Cognitive Sciences*, Vol. 4 No. 4, pp. 147-155.
- Walther, T. (2015), "Key investor documents and their consequences on investor behaviour", *Journal of Business Economics*, Vol. 85 No. 2, pp. 129-156.
- Weber, E.U., Siebenmorgen, N. and Weber, M. (2005), "Communicating asset risk: how name recognition and the format of historic volatility information affect risk perception and investment decisions", *Risk Analysis*, Vol. 25 No. 3, pp. 597-609.
- Wedel, M. and Pieters, R. (2008), "A review of eye-tracking research in marketing", in Malhotra, N.K. (Ed.), *Review of Marketing Research (Review of Marketing Research, Volume 4)*, Emerald Group Publishing, Armonk, NY, pp. 123-147.

Further reading

- Campbell, J.Y., Jackson, H.E., Madrian, B.C. and Tufano, P. (2011), "Consumer financial protection", *Journal of Economic Perspectives*, Vol. 25 No. 1, pp. 91-114.
- Eckstein, M.K., Guerra-Carrillo, B., Miller Singley, A.T. and Bunge, S.A. (2017), "Beyond eye gaze: what else can eyetracking reveal about cognition and cognitive development?", *Developmental Cognitive Neuroscience*, Vol. 25, pp. 69-91.
- Orquin, J.L. and Mueller Loose, S. (2013), "Attention and choice: a review on eye-movements in decision making", *Acta Psychologica*, Vol. 144 No. 1, pp. 190-206.
- Raney, G.E., Campbell, S.J. and Bovee, J.C. (2014), "Using eye movements to evaluate the cognitive processes involved in text comprehension", *Journal of Visual Experimentation*, Vol. 83, pp. 1-7, doi: 10.3791/50780.

About the authors

Maria Gabriella Ceravolo is Full Professor of Physical Medicine and Rehabilitation at Polytechnic University of Marche, where she is also Vice-Dean for Education activity Quality Assurance ;and Director of the Post-Graduate School in Physical and Rehabilitation Medicine. She is Head of Neurorehabilitation Clinic – AOI and President of the European Board of Physical and Rehabilitation Medicine.

Vincenzo Farina is Associate Professor of Financial Markets and Institutions in the Department of Management and Law at the University of Rome Tor Vergata, Adjunct Professor of Financial Management and Financial Markets in the Department of Finance at Bocconi University, and member of scientific board of PhD in Management, University of Rome Tor Vergata.

Lucrezia Fattobene is Research Fellow at Polytechnic University of Marche and University of Rome Tor Vergata. Before earning a PhD in Management from the University of Rome Tor Vergata in 2016, she was a visiting research scholar at the Rotterdam School of Management, Erasmus University. Lucrezia Fattobene is the corresponding author and can be contacted at: l.fattobene@univpm.it

Lucia Leonelli is Associate Professor of Financial Markets and Institutions in the Department of Management and Law at the University of Rome Tor Vergata and member of scientific board of PhD in Management, University of Rome Tor Vergata.

GianMario Raggetti is Professor of Behavioural Finance and Scientific Director of the Health Care Management Centre at Polytechnic University of Marche. His previous academic institutions include University of Siena, University of Pescara and Bocconi University. He is member of the research group of Health Care Risk Management of the Ministry of Health.